FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

COMPLETE CONSTRUCTION CONTRACT PACKAGE

APRIL 13, 2021

Prepared by:

Jeff Goble

Director of Public Works

Town of Frisco, CO

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT A

INVITATION TO BID / REQUEST FOR PROPOSALS

TOWN OF FRISCO, CO

REQUEST FOR PROPOSALS (RFP)
FRISCO BAY MARINA OFFICE BUILDING AND CIVIL CONSTRUCTION

Invitation:

The Town of Frisco is seeking proposals, in this RFP, for the construction of a new Marina Office Building, as well as civil construction near and around the new building. Proposals will be due no later than 12 PM, Friday, March 5, 2021 to Jeff Goble, Frisco Public Works Director, at JeffG@townoffrisco.com.

Background:

Currently, the Lund house houses retail, offices and staff restroom/locker room. Since the Marina expanded, with the Big Dig/Phase 1 in 2019, the Town now has a better location picked out for a new building, closer to Lake Dillon, and will give visitors a breathtaking view of the Continental Divide. This location was decided upon based on observing and studying the flow of pedestrians and Marina users, since the expansion. Town staff feels that it is the right time to construct this new building, as well as rework some of the asphalt, sidewalk and curb/gutter.

Project Scope and Description:

The Town of Frisco is seeking proposals from qualified firms to complete the construction of the new Marina office building, in addition to civil construction near and around the new building. Project scope to include:

- Grading new building site
- Demolish, re-grade and pour/pave areas as noted
    - Near new building and turnaround
    - Near fuel island
- Construction of building
- Landscaping around building

Installation Notes:

(See attached plan set)

Project Schedule:

The Town of Frisco would like to see final completion of this project by April 1, 2022

RFP Advertisement	January 15, 2021
Site Visit	January 25, 2021 10AM
Questions Due, via email	February 10, 2021 3PM
Questions Answered, via email	February 17, 2021 3PM
RFP Submissions Deadline	March 5, 2021 @ 12pm

Select Firm	March 10, 2021
**Pending Council Approval*	
Contract to Council	March 23, 2021

Additional Information:

Additional information and access to project document folder concerning this Request for Proposals (RFP) is available from:
Jeff Goble
Public Works Director
Frisco Public Works
JeffG@townoffrisco.com

Project Contacts:

- Jeff Goble
  - Public Works Director
  - JeffG@townoffrisco.com
  - 719.839.1236
- Matt Stais
  - Stais Architecture & Interiors, Principal Architect
  - Matt@staisarchitects.com
  - 970.376.3076

All Proposals Shall Include:

- Name, address and telephone number of person(s) authorized to legally represent firm.
- Any confidential information in the proposal shall be labeled or marked as *CONFIDENTIAL.*
- Background experience in building construction and civil site work.
- Proof of insurance coverage that the firm maintains.
  - Town of Frisco will require insurance certificates naming the Town as co-insured.
- List of references for projects completed by the firm.
  - References should show agency, contact person, contact information and a brief description of the project.
- Provide project costs for services provided in an itemized format.
  - Any and all alternatives should be accounted for in same manner.

Proposed Fees:

Proposal should include all fees the contractor anticipates based on the plans and information given in this RFP. Fees should be based on, as much as possible, on unit prices where units are noted, or a lump sum where appropriate. Include bonding costs in fee proposal, in addition to any other anticipated design costs.

Proposal Response:

Proposal response shall contain all information as requested herein, and any additional information necessary to summarize the overall benefit of the proposal to the Town. Proposing firms should submit their proposal electronically no later than 12:00 PM on March 5, 2021. Late proposals will not be accepted under any circumstance. Since proposals will be sent electronically, all emails shall have the subject line of "FRISCO BAY MARINA OFFICE BUILDING AND CIVIL CONSTRUCITON."

If file sizes are too large to attach to an email, please use a Google Doc with access restricted to only Jeff Goble, Project Manager. Please note that access to folder and documents will be shared with Town staff, in addition to Town contractors.

Submittals directed to:

Jeff Goble
Public Works Director, Frisco Public Works
Town of Frisco
JeffG@townoffrisco.com

The submittal of a proposal shall be taken as evidence that the proposing individual/firm has full knowledge of the scope, nature, quality and quantity of the project to be performed and the detailed requirements and conditions under which the project is to be performed.

This solicitation does not commit the Town of Frisco to award a contract, to pay any cost incurred with the preparation of a proposal, or to procure or contract for services or supplies. The Town of Frisco reserves the right to accept or reject any or all proposals received in response to this request, to negotiate with any qualified source, or cancel in whole or part this proposal process if it is in the best interest of the Town to do so. Subsequent to contract negotiations, prospective consultants may be required to submit revisions to their proposals. All proposers should note that any contract pursuant to this solicitation is dependent upon the recommendation of the Town staff and the approval of the Frisco Town Council.

General Requirement of the Selected Proposing Firm:

- Enter into a contract with the Town. (These documents and proposal submittals become part of the contract).
- Maintain insurance coverage for the duration of the contract period.
- Prohibited from assigning or subcontracting the whole or any part of the contract without the prior written consent of the Town.
- Shall not hire, discharge, promote, demote or otherwise discriminate in matters of compensation, terms, conditions or privileges of employment against any person otherwise qualified solely because of race, creed, sex, national origin, ancestry, physical or mental disability, color or age.

- All work done by the selected firm will be in compliance with all Town of Frisco, Colorado State, Fire and American Society of Mechanical Engineering codes. Need to add appropriate codes here for the building and civil work
- Operate as an independent contractor and will not be considered employee(s) of the Town of Frisco.
- Successful contractor will be paid on actual invoices as work is completed.
- Performance and Payment Bonds will be required.
- Obtain a Town of Frisco Business License prior to commencement of work
- Obtain any required construction or building permits from Town of Frisco Building Department, Town of Frisco Public Works Department, Summit Fire & EMS and any other authority having jurisdiction in the project area.

Selection Criteria:

The Town will select the contractor it deems best for this project with consideration to price, experience, proposed project methodology, proposed timeline, references, and other materials presented by the firm.

Attachments:

1) Frisco Bay Marina Phasing Plan
2) Marina Office Building Plan Set
   a. Plan Set Contains Civil Plans
3) Xcel Energy Electrical Layout

TOWN OF FRISCO, CO

REQUEST FOR PROPOSALS (RFP)

FRISCO BAY MARINA OFFICE BUILDING AND CIVIL CONSTRUCTION

The Town of Frisco is seeking proposals from qualified firms for the construction of a new Marina Office Building, in addition to civil construction near and around the new building. Additional information and access to all documents and plan sets related to this project can be obtained by contacting Jeff Goble, Public Works Director, at jeffg@townoffrisco.com

Optional pre-bid site meeting will be conducted at 10:00AM, Monday, January 25th at the Frisco Bay Marina, 267 Marina Rd., Frisco, CO 80443

Proposals will be due no later than 12:00 PM, Friday, March 5, 2021 to Jeff Goble, Frisco Public Works Director, at jeffg@townoffrisco.com

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT B

BID FORM

BID FORM - MARINA OFFICE BUILDING AND CIVIL WORK TOWN OF FRISCO, COLORADO

Bidder:	**<insert bidder name here>**
Date:	**<insert date here>**

note: please limit input to shaded cells only - other cells contain formulas.

Division	Description	Base Bid	Bid Alternate #1	Total
00	Procurement & Contracting Requirements			$ -
01	General Requirements			$ -
02	Existing Conditions			$ -
03	Concrete			$ -
05	Metals			$ -
06	Wood, Plastics & Composites			$ -
07	Thermal & Moisture Protection			$ -
08	Openings			$ -
09	Finishes			$ -
10	Specialties			$ -
11	Equipment			$ -
12	Furnishings			$ -
22	Plumbing			$ -
23	HVAC			$ -
26	Electrical			$ -
31	Earthwork			$ -
32	Exterior Improvements			$ -
33	Utilities			$ -
	Other			$ -
	Total	**$ -**	**$ -**	**$ -**

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT C

BID SCHEDULE

BID FORM - MARINA OFFICE BUILDING AND CIVIL WORK
TOWN OF FRISCO, COLORADO

Bidder:	**Saunders Heath**
Date:	**3/5/2021**

*Saunders Heath acknowledges receipt of Addendums #1, #2 & #3.

note: please limit input to shaded cells only - other cells contain formulas.

Division	Description	Base Bid	Bid Alternate #1	Total
00	Procurement & Contracting Requirements	$ 74,090.00	$ 2,080.00	$ 76,170.00
01	General Requirements	$ 168,307.00		$ 168,307.00
02	Existing Conditions	$ 57,808.00	$ 279.00	$ 58,087.00
03	Concrete	$ 73,006.00	$ 5,128.00	$ 78,134.00
05	Metals	$ 9,844.00		$ 9,844.00
06	Wood, Plastics & Composites	$ 195,795.00	$ 13,631.00	$ 209,426.00
07	Thermal & Moisture Protection	$ 131,717.00	$ 11,705.00	$ 143,422.00
08	Openings	$ 78,362.00		$ 78,362.00
09	Finishes	$ 50,425.00	$ 2,108.00	$ 52,533.00
10	Specialties	$ 8,000.00		$ 8,000.00
11	Equipment	$ 6,000.00		$ 6,000.00
12	Furnishings	$ 14,740.00		$ 14,740.00
22	Plumbing	$ 53,850.00		$ 53,850.00
23	HVAC	$ 77,670.00		$ 77,670.00
26	Electrical	$ 129,460.00	$ 6,557.00	$ 136,017.00
31	Earthwork	$ 230,530.00		$ 230,530.00
32	Exterior Improvements	$ 195,608.00	$ 646.00	$ 196,254.00
33	Utilities	$ -		$ -
	Other			$ -
	Total	**$ 1,555,212.00**	**$ 42,134.00**	**$ 1,597,346.00**

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT D

CONSTRUCTION AGREEMENT

CONSTRUCTION AGREEMENT

THIS CONSTRUCTION AGREEMENT is made and entered into this 13th day of April, 2021, by and between the TOWN OF FRISCO, a Colorado home rule municipal corporation with an address of 1 Main Street, Frisco, CO 80443 (the "Town"), and **Heath Construction dba Saunders Heath**, a **Limited Liability Corporation** ("Contractor") (collectively the "Parties").

For the consideration described herein, the receipt and sufficiency of which is hereby acknowledged, the Parties hereby agree as follows:

Scope of Work. Contractor shall perform the following described work (the "Project"), in accordance with this Agreement and the Contract Documents, which Contract Documents are as defined in the General Conditions attached hereto and incorporated herein by this reference as Exhibit "A". The Project is generally described as follows:

Construction of a new Office Building and related Civil Work at the Frisco Bay Marina, bid alternate #1, as per the project manual and construction plans attached hereto.

The Project is described and/or depicted with particularity in the "Scope of Work" attached hereto as Exhibit B, which Exhibit is incorporated herein by this reference.

1. Bonds. Within ten (10) days of the date of this Agreement, Contractor shall provide the performance and payment bonds and certificate of insurance required by the Contract Documents.

2. Commencement and Completion of Work. Contractor shall commence the Project within ten (10) days of date of the Notice to Proceed. Substantial Completion of the Project shall be accomplished **200** days of the date of the Notice to Proceed, unless the period for completion is extended otherwise in accordance with the Contract Documents. Final Completion of the Project shall be accomplished within ten (10) days of the date of Substantial Completion.

3. Compensation/Contract Price. The Town agrees to pay Contractor, subject to all of the terms and conditions of the Contract Documents, for the Project, an amount not to exceed **One million, five hundred ninety-seven thousand, three hundred forty-six 00/100 DOLLARS ($1,597,346.00)** (the "Contract Price"). The Town shall pay Contractor in the manner and at such times as set forth in the General Conditions such amounts as required by the Contract Documents. The Town has appropriated funds equal to or in excess of the Contract Price.

4. Governing Law and Venue. This Agreement shall be governed by the laws of the State of Colorado, and any legal action concerning the provisions hereof shall be brought in Summit County, Colorado.

5. No Waiver. Delays in enforcement or the waiver of any one or more defaults or breaches of this Agreement by the Town shall not constitute a waiver of any of the other terms or obligation of this Agreement.

6. Integration. This Agreement and any attached exhibits constitute the entire Agreement between Contractor and the Town, superseding all prior oral or written communications.

7. Third Parties. There are no intended third-party beneficiaries to this Agreement.

8. Notice. Any notice under this Agreement shall be in writing, and shall be deemed sufficient when directly presented or sent pre-paid, first class United States Mail, addressed to:

The Town: Jeff Goble, Public Works Director
Project Manager
P.O. Box 4100
Frisco, CO 80443

Contractor: David Sandlin
President
1212 Riverside Ave. Suite 130
Fort Collins, CO 80550

9. Severability. If any provision of this Agreement is found by a court of competent jurisdiction to be unlawful or unenforceable for any reason, the remaining provisions hereof shall remain in full force and effect.

10. Modification. This Agreement may only be modified upon written agreement of the Parties.

11. Assignment. Neither this Agreement nor any of the rights or obligations of the Parties hereto, shall be assigned by either party without the written consent of the other.

12. Governmental Immunity. The Town, its officers, and its employees, are relying on, and do not waive or intend to waive by any provision of this Agreement, the monetary limitations (presently three hundred eighty-seven thousand dollars ($387,000) per person and one million ninety-three thousand dollars ($1,093,000) per occurrence) or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, *et seq.*, as amended, or otherwise available to the Town and its officers or employees.

13. Rights and Remedies. The rights and remedies of the Town under this Agreement are in addition to any other rights and remedies provided by law. The expiration of this Agreement shall in no way limit the Town's legal or equitable remedies, or the period in which such remedies may be asserted, for work negligently or defectively performed.

IN WITNESS WHEREOF, this Construction Agreement has been executed by the Parties as of the date first above written, whether or not the date of signing is some other date.

TOWN OF FRISCO, COLORADO

_____
Hunter Mortensen, Mayor

ATTEST:

_____
Deborah Wohlmuth,
Town Clerk

CONTRACTOR

By: _____
Its:_____

STATE OF COLORADO)
) ss.
COUNTY OF _____)

The foregoing instrument was subscribed, sworn to and acknowledged before me this ___ day of _____, 20__, by _____, as _____ of _____.

My commission expires:

(S E A L)

_____
Notary Public

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT E

GENERAL CONDITIONS

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

PART 1. DEFINITIONS

1.01 CONTRACT DOCUMENTS:

A. Invitation to Bid;
[B. Bid Form];
[C. Bid Schedule];
D. Construction Agreement;
E. General Conditions;
F. Special Conditions;
G. Technical Specifications;
H. Notice of Award;
I. Notice to Proceed;
J. Payment Bond;
K. Performance Bond;
L. Construction Drawings;
M. Documentation submitted by Contractor prior to Notice of Award; and
N. Addenda ___ through ____.

1.02 CHANGE ORDER:

A written order issued by the Town after execution of the Construction Agreement authorizing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time.

1.03 CONTRACT:

The entire written agreement covering the performance of the Work described in the Contract Documents including all supplemental agreements thereto and all general and special provisions pertaining to the Work and materials therefor.

1.04 CONTRACT PRICE:

The amount set forth in Paragraph 3 of the Construction Agreement.

1.05 CONTRACT TIME:

The time for completion of the Project as set forth in Paragraph 2 of the Construction Agreement.

1.06 DAY:

Calendar day, unless otherwise specified. When the last day for the occurrence of an event falls on a Saturday, Sunday or legal holiday as recognized by the Town, the time for performance shall be automatically extended to the next business day.

1.07 FINAL COMPLETION:

The date as certified by the Project Manager when all of the Work on the Project is completed and final payment may be made.

1.08 PROJECT:

The construction task or tasks more fully described in the "Scope of Work" provisions (Exhibit B) of the Construction Agreement.

1.09 PROJECT MANAGER:

The Town's duly authorized representative in connection with the Project.

1.10 SUBCONTRACTOR:

Any person, firm or corporation with a direct contract with Contractor who acts for or in behalf of Contractor in executing any part of the Contract, excluding one who merely furnishes material.

1.11 SUBSTANTIAL COMPLETION:

The date as certified by the Project Manager when the Town occupies or takes possession of all or substantially all of the Project, or when the Town may occupy or take possession of all or substantially all of the Project and put it to beneficial use for its intended purposes.

1.12 TOWN

The Town of Frisco, Colorado, a Colorado municipal corporation.

1.13 WORK:

All the work specified, indicated, shown or contemplated in the Contract Documents to construct the Project, including all alterations, amendments or extensions thereto made by supplemental agreements or written orders of the Project Manager.

PART 2. TIME

2.01 TIME OF THE ESSENCE:

All times stated in the Contract Documents are of the essence.

2.02 FINAL ACCEPTANCE:

Upon Final Completion, the Project Manager will issue final acceptance.

2.03 CHANGES IN THE WORK:

The Town reserves the right to order changes in the Work, in the nature of additions, deletions or modifications, without invalidating the Contract, and to make corresponding adjustments in the Contract Price and the Contract Time. All changes shall be authorized by a written Change Order signed by the Project Manager. The Change Order shall include appropriate changes in the Contract Documents and the Contract Time. The Work shall be changed and the Contract Price and Contract Time modified only as set forth in the written Change Order. Any adjustment in the Contract Price resulting in a credit or a charge to the Town shall be determined by mutual agreement of the parties before the work set forth in the Change Order is commenced. If a Change Order results in an increase in the Contract Price, approval of the Frisco Town Council may be required.

The Town shall provide Contractor with written assurance of additional appropriations should any change in the Work result in an increase in the Contract Price exceeding the amount originally appropriated for the Work.

2.07 DELAYS:

A. If Contractor is delayed in the progress of the Work by fire, unusual delay in transportation, adverse weather conditions not reasonably to be anticipated, or other unavoidable casualties beyond Contractor's control, the Contract Time shall be extended for a reasonable period of time.

B. Any request for extension of the Contract Time shall be made in writing to the Project Manager not more than seven (7) days after commencement of the delay; otherwise it shall be waived. Any such request shall contain an estimate of the probable effect of such delay on the progress of the Work.

C. Contractor shall not be entitled to any increase in the Contract Price, or to damages, or to additional compensation as a consequence of any such delays.

2.08 NO DAMAGES FOR DELAY:

The Town shall not amend the Contract Price nor shall Contractor be entitled to additional compensation of any sort for costs or damages incurred as a result of any delays in performance unless such delay is the direct result of the acts or omissions of the Town or persons acting on behalf of the Town, in accordance with C.R.S. § 24-91-103.5.

PART 3. CONTRACTOR'S RESPONSIBILITIES

3.01 COMPLETION/SUPERVISION OF WORK:

Contractor shall be responsible for completion of all Work in a timely and workmanlike manner in accordance with the terms and specifications of the Contract Documents, including the techniques, sequences, procedures and means. Contractor shall be responsible for the coordination of all Work. Contractor shall supervise and direct the Work and give it all attention necessary for proper supervision and direction. Contractor shall maintain a supervisor on site at all times when Contractor or any subcontractor is performing Work.

3.02 DUTY TO INSPECT AND CONTRACTOR'S REPRESENTATIONS:

Contractor shall inspect all Contract Documents, tests and reports, including soil tests and engineering tests, if applicable, and shall conduct a site or field review prior to executing the Contract. Contractor assumes the risk of all conditions which are disclosed, or which are reasonably suggested by any such tests or reports, or which would be disclosed by a field or site review. Contractor shall have the affirmative duty to advise the Town of any concerns which Contractor may have regarding construction conditions prior to executing the Contract.

In order to induce Town to enter into the Contract, Contractor makes the following representations:

a. Contractor has examined and carefully studied the Contract Documents and the other related data identified in or related to the Contract Documents;

b. Contractor has visited the site(s) and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work;

c. Contractor is familiar with and is satisfied as to all federal, state and local laws and regulations that may affect cost, progress, performance and furnishing of the Work; and

d. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the site(s), reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.

3.03 FURNISHING OF LABOR AND MATERIALS:

A. Contractor shall provide and pay for all labor, materials and equipment, including: tools; construction equipment and machinery; utilities, including water; transportation; and all other facilities and services necessary for the proper completion of the Work.

B. While engaged in the performance of the Work, Contractor shall maintain employment practices that do not violate the provisions of the Colorado Antidiscrimination Act of 1957, C.R.S. § 24-34-301, *et seq.*, as amended.

3.04 EMPLOYEES AND SAFETY:

A. Contractor shall maintain at all times strict discipline of its employees, and Contractor shall not employ on the Project any person un-fit or without sufficient knowledge, skill, and experience to perform properly the job for which the employee was hired.

B. Contractor shall be fully responsible to the Town for the acts, negligence and omissions of all direct and indirect employees and subcontractors. The Contract Documents shall not be construed as creating any contractual relation between any subcontractor and the Town.

C. Contractor shall provide for and oversee all safety orders and precautions necessary for the safe performance of the Work. Contractor shall take reasonable precautions for the safety of all employees and others whom the Work might affect, all work and materials incorporated into the Work, and all property and improvements on the Project site(s) and adjacent property.

3.05 CLEANUP:

A. Contractor shall keep the Project site(s) and adjoining ways free of waste material and rubbish caused by its employees or subcontractors. Contractor shall remove all such waste material and rubbish daily during construction, together with all tools, equipment, machinery and surplus materials. Contractor shall, upon termination of its Work, conduct general cleanup operations on the Project site(s), including the cleaning of all surfaces, paved streets and walks, and steps. Contractor shall also conduct such general cleanup operations on adjacent properties which were disturbed by the Work.

B. If Contractor fails to perform the cleanup required by this Section, after written notice, the Town may cause the cleanup to be performed at Contractor's expense. Upon receipt of a statement for such cleanup, Contractor shall pay to the Town the costs incurred by the Town for such cleanup, or the Town shall have the right to withhold said amount from any final payment due to Contractor.

3.06 PAYMENT OF ROYALTIES AND LICENSE FEES:

Contractor agrees to pay all royalties and license fees necessary for the Project, and to defend against all actions for infringement of copyright or patent rights, and to save and hold the Town harmless from such actions.

3.07 TAXES, LICENSES AND PERMITS:

Contractor shall pay all taxes imposed by law in connection with the Project and shall procure all permits and licenses necessary for the prosecution of the Work.

3.08 SAMPLES AND SHOP DRAWINGS:

Contractor shall furnish, upon the request of the Project Manager, samples and shop drawings to the Project Manager, who shall review them for conformance with the Contract Documents. All Work shall comply with approved samples and drawings.

3.09 COMPLIANCE WITH LAWS AND REGULATIONS:

Contractor shall comply with all federal, state and local laws, ordinances, rules, regulations and orders in any manner relating to the Project. If any provision of the Contract Documents is at variance therewith, Contractor shall notify the Project Manager promptly.

3.10 SUBCONTRACTORS:

A. Contractor shall furnish to the Project Manager at the time the Construction Agreement is executed, a list of names of subcontractors to whom Contractor proposes to award the portions of the Work to be subcontracted by Contractor.

B. Contractor shall not employ a subcontractor to whose employment the Project Manager reasonably objects, nor shall Contractor be required to hire a subcontractor to whose employment Contractor reasonably objects.

C. All contracts between Contractor and subcontractor shall conform to the provisions of the Contract Documents, and shall incorporate the relevant provisions of the Contract Documents.

3.11 CORRECTIVE WORK:

When any Work does not conform to the Contract Documents, Contractor shall make the necessary corrections so that the Work will so conform. Such corrections shall be accomplished within the time period approved by the Project Manager. Failure to complete such required corrections within the time period required shall constitute a breach of the Contract.

3.12 OTHER CONTRACTS:

The Town reserves the right to let other contracts in connection with the Project. Contractor shall cooperate with all other contractors so that their work is not impeded by the Work, and Contractor shall give other contractors access to the Project site(s) necessary to perform their contracts.

3.13 COMMUNICATION:

Contractor shall direct all communications to the Town regarding the Project to the attention of the Project Manager.

PART 4. TERMINATION

4.01 LABOR DISPUTES:

Notwithstanding any other provision contained in this Contract, in the event of any picket or other form of labor dispute at the construction site(s), Contractor shall continue to perform the Work without interruption or delay. If Contractor ceases performance of the Work because of such picket or other form of labor dispute, the Town may terminate the services of Contractor after giving forty-eight (48) hours' written notice of its intent to do so.

4.02 DEFAULT:

The Town may terminate this Contract upon seven (7) days' written notice to Contractor if Contractor defaults in the timely performance of any provision of the Contract Documents, or otherwise fails to perform the Work, or any part thereof, in accordance with the Contract Documents. Termination of the Contract by the Town shall not be the Town's exclusive remedy, and the Town may pursue such other remedies and actions lawfully available to the Town including, but not limited to, an action at law for damages against Contractor or any bonding agency issuing a bond hereunder, or an action in equity for injunctive relief.

PART 5. WARRANTIES:

5.01 WARRANTY OR FITNESS OF EQUIPMENT AND MATERIALS:

Contractor represents and warrants to the Town that all equipment and materials used in the Project, and made a part of the Project, or placed permanently in the Project, shall be new unless otherwise specified in the Contract Documents. All equipment and materials used shall be of good quality, free of defects and in conformity with the Contract Documents. All equipment and materials not in conformity with the Contract Documents shall be considered defective.

5.02 GENERAL WARRANTY:

Contractor shall warrant and guarantee all material furnished and work performed by Contractor for a period of two (2) years from the date of final acceptance of the Project by the Project Manager. Under this warranty, Contractor agrees to repair or replace, at its own expense and under the direction of the Project Manager, any portion of the Project which fails or is defective, unsound, unsatisfactory because of materials or workmanship, or which is not in conformity with the provisions of the Contract. Should Contractor fail to perform any such work within the warranty period after a request by the Town, the Town may withdraw from the Performance and/or Payment Bonds any and all amounts necessary to complete the required work. The expiration of the warranty period shall in no way limit the Town's legal or equitable remedies, or the period in which such remedies may be asserted, for work negligently or defectively performed.

PART 6. BONDS, INSURANCE AND INDEMNIFICATION

6.01 INDEMNIFICATION:

Contractor agrees to indemnify and hold harmless the Town and its officers, insurers, volunteers, representative, agents, employees, heirs and assigns from and against all claims, liability, damages, losses, expenses and demands, including attorney fees, on account of injury, loss, or damage, including, without limitation, claims arising from bodily injury, personal injury, sickness, disease, death, property loss or damage, or any other loss of any kind whatsoever, which arise

out of or are in any manner connected with this Agreement or the Scope of Services if such injury, loss, or damage is caused in whole or in part by, the act, omission, error, professional error, mistake, negligence, or other fault of Contractor, any subcontractor of Contractor, or any officer, employee, representative, or agent of Contractor or of any subcontractor of Contractor, or which arise out of any worker's compensation claim of any employee of Contractor or of any employee of any subcontractor of Contractor.

6.02 NOTICE OF CLAIM:

If Contractor receives any claim arising from the performance of the Work, Contractor shall notify the Town in writing of the nature of the claim within twenty-four (24) hours of receipt of the claim by Contractor. In this notice, Contractor shall provide evidence that Contractor has notified Contractor's insurer of the claim. Contractor shall keep the Town apprised of the disposition of the claim, and Contractor shall take all necessary action to resolve the claim and make restitution, if required, as quickly as possible.

6.03 INSURANCE:

A. Contractor agrees to procure and maintain, at its own cost, a policy or policies of insurance sufficient to insure against all liability, claims, demands, and other obligations assumed by Contractor pursuant to this Agreement. Such insurance shall be in addition to any other insurance requirements imposed by law.

B. Without limiting the generality of the foregoing, Contractor shall procure and maintain, and shall cause any subcontractor of Contractor to procure and maintain, the minimum insurance coverages listed below. Such coverages shall be procured and maintained with forms and insurers with a current Best's Insurance Guide Rating of A- or better and authorized to do business in the State of Colorado. In the case of any claims-made policy, the necessary retroactive dates and extended reporting periods shall be procured to maintain such continuous coverage.

1. Worker's compensation insurance to cover obligations imposed by applicable law for any employee engaged in the performance of Work under the Contract, and Employer's Liability insurance with minimum limits of five hundred thousand dollars ($500,000) each accident, one million dollars ($1,000,000) disease – policy limit, and one million dollars ($1,000,000) disease – each employee. Evidence of qualified self-insured status may be substituted for the worker's compensation requirements of this paragraph.

2. Commercial general liability insurance with minimum combined single limits of at least one million dollars ($1,000,000) each occurrence and two million dollars ($2,000,000) general aggregate. The policy shall be applicable to all premises and operations. The policy shall include coverage for bodily injury, broad form property damage (including completed operations), personal injury (including coverage for contractual and employee acts), blanket contractual, products, and completed operations. The policy shall contain a severability of interests provision, and shall be endorsed to include the Town and the Town's officers, employees, and consultants as additional insureds. No additional insured endorsement shall contain any exclusion for bodily injury or property damage arising from completed operations.

3. "All Risk" Builder's Risk insurance in a form acceptable to the TOWN upon the entire Project for the full cost of replacement at the time of any loss. This insurance shall

include, as named insureds, the Town, Contractor, and any Subcontractors. This insurance shall include "all risk" insurance for physical loss or damage including without duplication of coverage, at least theft, vandalism, malicious mischief, transit, materials stored off site, collapse, falsework, temporary buildings, debris removal, flood, earthquake, testing, and damage resulting from defective design, workmanship or materials. The Contractor shall increase limits of coverage, if necessary, to reflect estimated replacement cost. The insurance shall be written without a co-insurance clause.

C. Any insurance carried by the Town, its officers, its employees, or its consultants shall be excess and not contributory insurance to that provided by Contractor. Contractor shall be solely responsible for any deductible losses under any policy of insurance required by this Section 6.03.

D. Contractor shall provide to the Town a certificate of insurance as evidence that policies providing the required coverages, conditions, and minimum limits are in full force and effect. The certificate shall identify this Contract and shall provide that the coverages afforded under the policies shall not be cancelled, terminated or materially changed until at least thirty (30) days prior written notice has been given to the Town. The Town reserves the right to request and receive a certified copy of any policy and any endorsement thereto.

6.04 PERFORMANCE AND PAYMENT BONDS:

Contractor shall furnish a Performance Bond and a Payment Bond, each in the full amount of the Contract Price, as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents, including the warranty. These bonds shall remain in effect at least until two (2) years after the date of Final Completion.

PART 7. PAYMENT

7.01 PROGRESS PAYMENTS:

A. The Town shall make periodic progress payments to Contractor within fifteen (15) days following the Project Manager's approval of the Work completed. A progress payment shall be made only after Contractor has submitted an application for a progress payment on a form approved by the Project Manager, and if requested by the Project Manager, Contractor shall submit copies of invoices from subcontractors or supplies and partial waivers executed by each.

B. Progress payments shall be in an amount equal to ninety percent (90%) of the Work actually completed until fifty percent (50%) of the total Work on the Project, as determined by the Project Manager, is completed. Such determination shall include materials and equipment not incorporated in the Work but delivered to the Project Site and suitably stored. After fifty percent (50%) of the total Work is completed, no additional retainage shall be held.

C. If Contractor fails to complete any required Work within the time period agreed between Contractor and the Project Manager, or within any time period set forth in the Contract Documents, as modified or extended, the Town is expressly authorized to withhold any progress payment for such Work until such Work is completed.

D. Whenever Contractor receives payment pursuant to this Contract, Contractor shall make payments to each of its Subcontractors of any amounts actually received that were included in Contractor's request for payment to Town for such subcontracts. Contractor shall make such payments within fifteen (15) days of receipt of payment from Town in the same manner as Town is required to pay Contractor pursuant to the Contract Documents if the Subcontractor is

satisfactorily performing under its contract with Contractor. Nothing in this paragraph shall be construed to affect the retention provisions of the Contract Documents.

7.02 FINAL PAYMENT:

Upon final acceptance of the Project, the Town shall pay the Contractor the remainder of the Contract Price theretofore unpaid. Notwithstanding any other part of this Section, the Contractor agrees that the Town shall, when required by C.R.S. § 38-26-107(1), publish a "notice of final payment" in a legal Summit County newspaper prior to making final payment to the Contractor. This notice of final payment advertises the date, time, and place when final payment will be made and is intended to alert subcontractors so they can present any claims for unpaid amounts to the Town. The final payment procedure typically delays the final payment made to the Contractor of the retainage amount.

Regardless of whether "notice of final payment" is required by state statute, final payment shall not be made to the Contractor until the Town has complied with all applicable requirements of C.R.S. § 38-26-107 and all claims, if any, have been resolved to the satisfaction of the Town.

7.03 LIQUIDATED DAMAGES:

A. Because time is of the essence and delayed performance constitutes a compensable inconvenience to the Town and its residents, the liquidated damages established in this Section shall be enforced. Such damages are not a penalty. For each day Final Completion is delayed after the Final Completion date stated in the Construction Agreement, as modified through approved change orders, Contractor shall be assessed the following amounts:

Contract Price	**Amount per day**
$0-$50,000	$350
$50,000-$100,000	$380
$100,000-$250,000	$440
$250,000-$500,000	$520
$500,000-$1,000,000	$640
$1,000,000-$2,000,000	$820
$2,000,000-$4,000,000	$1,080
$4,000,000-$8,000,000	$1,450
$8,000,000-$12,000,000	$1,820
$12,000,000 or greater	$2,250

B. Allowing Contractor to continue and finish the Work or any part thereof after the Final Completion date shall not operate as a waiver on the part of the Town of any of its rights under the Contract Documents. Any liquidated damages assessed shall not relieve Contractor from liability for any damages or costs of other contractors caused by a failure of Contractor to complete the Work in the Contract Time. Liquidated damages may be deducted from any payment due Contractor or the retainage. If the liquidated damages exceed the amount owed to Contractor, Contractor shall reimburse the Town.

7.04 ORAL AGREEMENTS PROHIBITED:

This Contract is expressly subject to the provisions of C.R.S. § 29-1-110(1), and Contractor acknowledges that neither the Town nor any employee or agent thereof is authorized to expend or contract for the expenditure of any monies in excess of those appropriated by the Frisco Town

Council. The Town acknowledges and agrees that sufficient funds have been appropriated to pay the Contract Price, but Contractor shall not rely upon the appropriation of any monies or other funds in addition to those already appropriated unless and until the same are lawfully appropriated by the Frisco Town Council.

7.05 ITEMS NOT INCLUDED IN BID:

No additional compensation shall be paid for any costs or services listed in the Contract Documents but not specifically listed in the Bid as a Bid item.

7.06 CHANGES IN QUANTITY:

A. Except as provided in Section 7.07, the unit Bid price shown in the Bid Schedule shall be used to determine the payment owed Contractor for any changes in quantity.

B. The actual quantity placed, as determined by the Project Manager, shall be used to calculate the payment due to Contractor.

C. Prior to any Work being performed in excess of any of the Bid Schedule quantities, Contractor shall notify the Town, in writing, of every quantity that will exceed one hundred five percent (105%) of the quantity listed on the Bid Schedule.

D. Except as provided in Section 7.08, Contractor shall not be entitled to compensation for any increased expense, loss of expected reimbursement or loss of anticipated profits, directly or indirectly caused by any changes in quantity.

7.07 BID PRICE ADJUSTMENTS:

A. When a major item is increased to more than one hundred twenty five percent (125%) or decreased below seventy five percent (75%) of the original quantity stated on the Bid Schedule, the unit Bid price shall be modified by written change order. Payment for major items shall be calculated by multiplying the actual quantity placed by the modified Bid price.

B. For purposes of this Section, a major item is any item having a Bid value, determined by multiplying the Bid quantity by the unit Bid price, that exceeds ten percent (10%) of the original Contract Price.

7.08 ELIMINATED ITEMS:

Should any items contained in the Bid Schedule be found unnecessary for completion of the Work, the items shall be eliminated. The Contract Price shall be modified through written change order, and the amount of the change order shall be the eliminated quantity multiplied by the unit Bid price stated in the Bid Schedule, minus any reasonable costs incurred by Contractor for the eliminated items. Reasonable costs shall be determined by the Project Manager based on information provided by Contractor, and may include mobilization of eliminated materials and equipment mobilization costs, if the sole purpose of the equipment was to place the eliminated material. In no case shall the costs exceed the amount of the eliminated items.

7.09 MATERIALS STORED BUT NOT INCORPORATED:

Payments may be made to Contractor for materials stored on the Project site(s) but not incorporated into the Work as evidenced by invoices or cost analyses of material produced, if the material has been fabricated or processed and is ready for installation into the Project and conforms with the Contract Documents. Payments shall not exceed eighty-five percent (85%) of

the price shown in the Bid Schedule or one hundred percent (100%) of the certified invoice cost of the stockpiled material, whichever is less. Payment for stockpiled materials shall not relieve Contractor of responsibility for loss or damage to the material. Payment for living plant materials or perishable materials shall not be made until the living or perishable material is made an integral part of the finished Work.

7.10 COST RECORDS:

Contractor shall make cost records available to the Town if the Town deems it necessary to determine the validity and amount of any item claimed.

PART 8. MISCELLANEOUS

8.01 PUBLICATIONS:

Any and all publications relating to the Project and authored by Contractor or any of its subcontractors shall be submitted to the Town for its prior written approval of the content of the publication. If the Town disapproves of the content of the publication, the author shall withdraw it from publication. The term "publication" as used herein shall include articles or letters to be published in any newspaper, magazine, trade journal or other periodical.

8.02 CONFIDENTIALITY:

Any and all reports, information, data, statistics, forms, designs, plans, procedures, systems, studies and any other communication form of knowledge given to or prepared or assembled by Contractor under this Contract shall, to the extent authorized and permitted by law, be kept as confidential and not be made available by Contractor to any individual, company or organization without the prior written consent of the Town. Notwithstanding the foregoing, Contractor shall not be restricted from releasing information in response to a subpoena, court order, or legal process, but Contractor shall notify the Town in writing before responding.

8.03 INDEPENDENT CONTRACTOR:

Contractor, for all purposes arising out of this Contract, is an independent contractor and not an employee of the Town. It is expressly understood and agreed that Contractor shall not be entitled to any benefits to which the Town's employees are entitled, such as overtime, retirement benefits, worker's compensation, injury leave or other leave benefits.

8.04 CONFLICTS:

Should any conflict arise in the Contract Documents, the order of precedence is as follows:

1. Construction Agreement.
2. Special Conditions.
3. General Conditions.
4. Supplemental Specifications.
5. Detailed Plans (Calculated dimensions will govern over scaled dimensions).
6. Standard Plans (Calculated dimensions will govern over scaled dimensions).

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT G

TECHNICAL SPECIFICATIONS

STAIS
ARCHITECTURE
& INTERIORS

FRISCO
COLORADO

Frisco Bay Marina
Phase 2.1 Site Improvements

277 Marina Road
Frisco, Colorado

Project Manual

5 February 2021

www.staisarchitects.com

SECTION 00 0102
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. The Ownerof the Project, hereinafter referred to as Owner: Town of Frisco.
   1. Sales Tax Exemption Number: to be provided by Owner.

B. Owner's Project Manager: Jeff Goble
   1. Department: Town of Frisco Public Works Director
   2. Address: P.O. Box 4100
   3. City, State, Zip: Frisco, CO 80443
   4. Phone/Fax: 970-668-0836
   5. E-mail: JeffG@townoffrisco.com

1.02 NOTICE TO PROSPECTIVE BIDDERS

A. These documents constitute an Invitation to Bid to and request for qualifications from General Contractors for the construction of the project described below.

1.03 PROJECT DESCRIPTION

A. Summary Project Description:
   1. The project scope includes a new building for Marina retail and offices, along with related site and utility work.

B. Contract Scope: site preparation including demoiltiion of certain elements as noted on plans, site preparation, utility and grading work, building construction including structural, mechanical, electrical and information technology systems as noted on plans..

C. Contract Terms: Cost plus a fee, with a guaranteed maximum price (GMP).

1.04 PROJECT CONSULTANTS

A. The Architect, hereinafter referred to as Architect: Stais Architecture & Interiors.
   1. Address: 409 East Main Street, suite 107.
   2. City, State, Zip: Frisco, CO 80443.
   3. Phone/Fax: 970-453-0444.
   4. E-mail: matt@staisarchitects.com.
   5. Other Design Consultants: as noted on Cover Sheet of the drawings.

1.05 TIMETABLE

A. As established by Owner in RFP Documents.

1.06 PROCUREMENT DOCUMENTS

A. Documents may be viewed at online locations as specified by the Owner in RFP documents.

1.07 BID SECURITY

A. Bids shall be accompanied by a security deposit as follows:
   1. as specified by the Owner in RFP documents (bid form).

PART 2 PRODUCTS (NOT USED)

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SECTION 00 0110

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SECTION 00 2113

INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 THE INSTRUCTIONS IN THIS DOCUMENT AMEND OR SUPPLEMENT THE INSTRUCTIONS TO BIDDERS AND OTHER PROVISIONS OF THE BIDDING AND CONTRACT DOCUMENTS.

INVITATION

2.01 BID SUBMISSION

A. Bids signed, executed and dated will be received by the Owner as noted in RFP documents.

B. Offers submitted after the above time shall be returned to the bidder unopened.

C. Amendments to the submitted offer will be permitted if received in writing prior to bid closing and if endorsed by the same party or parties who signed and sealed the offer.

2.02 CONTRACT TIME

A. Identify Contract Time in the Bid Form. The completion date in the Agreement shall be the Contract Time added to the commencement date.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 CONTRACT DOCUMENTS IDENTIFICATION

A. Contract Documents are identified as Project Number 1951, as prepared by Architect, and with contents as identified in the Table of Contents.

3.02 AVAILABILITY

A. Bid Documents may be obtained online at the website of the Owner .

3.03 EXAMINATION

3.04 INQUIRIES/ADDENDA

A. Direct questions to Owner, via email: JeffG@townoffrisco.com.

B. Addenda may be issued during the bidding period. All Addenda become part of Contract Documents. Include resultant costs in the Bid Amount.

C. Verbal answers are not binding on any party.

D. Clarifications requested by bidders must be in writing as outlined in RFP documents. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients.

3.05 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. Substitute products will be considered if submitted as an attachment to the Bid Form. Approval to submit substitutions prior to submission of bids is not required.

B. In submission of substitutions to products specified, bidders shall include in their bid all changes required in the work and changes to Contract Time and Contract Sum to accommodate such substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Sum because of changes in work necessitated by use of substitutions shall not be considered.

C. The submission shall provide sufficient information to determine acceptability of such products.

D. Provide complete information on required revisions to other work to accommodate each proposed substitution.

E. Provide products as specified unless substitutions are submitted in this manner and accepted.

OFFER ACCEPTANCE/REJECTION

4.01 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of sixty (60) days after the bid closing date.

4.02 ACCEPTANCE OF OFFER

A. Owner reserves the right to accept or reject any or all offers.

B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

END OF SECTION

SECTION 00 3110

AVAILABLE PROJECT INFORMATION

USING THE PROJECT MANUAL

THE INFORMATION CONTAINED IN THIS PROJECT MANUAL HAS BEEN ORGANIZED UTILIZING MASTERFORMAT, A PUBLICATION JOINTLY PRODUCED BY THE CONSTRUCTIONS SPECIFICATIONS INSTITUTE (CSI) AND CONSTRUCTION SPECIFICATIONS CANADA (CSC).

THE PROJECT MANUAL CONSISTS OF FOUR MAJOR PARTS:

Bidding Requirements

Contract Forms

Conditions of the Contract

Schedules and Specifications

SPECIFICATIONS HAVE BEEN DIVIDED INTO 33 DIVISIONS. NOTE THAT NOT ALL DIVISIONS ARE NECESSARILY USED. THE DIVISIONS ARE FURTHER DIVIDED INTO SECTIONS OF WORK.

WORK AND REQUIREMENTS ARE SPECIFIED IN PARTICULAR DIVISIONS AND SECTIONS ACCORDING TO THE TYPE OF WORK OR PRODUCT TO BE FURNISHED AND NOT ACCORDING TO TRADE JURISDICTION NOR LOCAL PRACTICES.

SPECIFICATIONS ARE WRITTEN IN IMPERATIVE AND ABBREVIATED FORM. THIS IMPERATIVE LANGUAGE OF THE TECHNICAL SECTIONS IS DIRECTED AT THE CONTRACTOR, UNLESS SPECIFICALLY NOTED OTHERWISE. INCOMPLETE SENTENCES SHALL BE COMPLETED BY INSERTING "SHALL", "THE CONTRACTOR SHALL", AND "SHALL BE", AND SIMILAR MANDATORY PHRASES BY INFERENCE IN THE SAME MANNER AS THEY ARE APPLIED TO NOTES ON THE DRAWINGS. THE WORDS "SHALL BE" SHALL BE SUPPLIED IN INFERENCE WHERE A COLON (:) IS USED WITHIN SENTENCES OR PHRASES. EXCEPT AS WORDED TO THE CONTRARY, FULFILL (PERFORM) ALL INDICATED REQUIREMENTS WHETHER STATED IMPERATIVELY OR OTHERWISE.

NOTICE TO BIDDERS

The following information regarding site survey and subsurface conditions was obtained or otherwise acquired by the Owner for his use. It is presented here to aid the Bidder in the preparation of his bid.

Neither the Owner nor the Architect warrant the accuracy of this information, which has been furnished or prepared by other parties. Bidders should verify this information prior to submitting their bid.

SITE SURVEY

A topographical survey of the existing site has been provided by Schmidt Land Surveying, Inc, PO Box 5761, Frisco, CO 80443 (970-409-9963). The Owner and the Architect make no warranty or representation with reference to the accuracy and completeness of the existing conditions indicated or not indicated on the survey. Bidders shall submit all questions about the survey to the Architect, in writing.

SUBSURFACE INVESTIGATION

A geotechnical report specific to this site is not available at this time. Further information regarding geotechnical conditions in the local area may be available from the Owner.

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of the General Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Payment procedures relating to allowances.

B. Section 01 6000 - Product Requirements.

1.03 SCHEDULE OF VALUES

A. Forms filled out by hand will not be accepted.

B. Submit an electronic copy of AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

C. Submit Schedule of Values in duplicate within 30 days after date of Owner-Contractor Agreement or as established in Notice to Proceed.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

E. Include in each line item, the amount of Allowances specified herein. Allowances shall be for purchase of products only. Include installation in base bid, unless otherwise noted.
   1. Door Hardware: $500.00 per opening.
   2. Signage: $3,000.00.
   3. Toilet and Bath Accessories: $4,000.00.
   4. Fire Protection Specialties: $1,000.00.
   5. Kitchen Appliances: $6,000.00

F. Include separately from each line item, a direct proportional amount of the General Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: monthly.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Owner and Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Present required information in typewritten form.

E. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.

F. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.

8. Percentage of Completion.
9. Balance to Finish.
10. Retainage.

G. Execute certification by signature of authorized officer.

H. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

I. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

J. Submit one copy of each Application for Payment.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to the General Contractor.

B. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.

C. Change Order: Architect may issue a document, signed by Owner, instructing the General Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
2. Promptly execute the change.

D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. the General Contractor shall prepare and submit a fixed price quotation within ____ days.

E. the General Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.

F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on the General Contractor's price quotation.
2. For change requested by the General Contractor, the amount will be based on the the General Contractor's request for a Change Order as approved by Architect.
3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.
4. For change ordered by Owner without a quotation from the General Contractor, the amount will be determined by Owner based on the General Contractor's substantiation of costs as specified for Time and Material work.

G. Substantiation of Costs: Provide full information required for evaluation.
1. On request, provide the following data:
   a. Quantities of products, labor, and equipment.
   b. Taxes, insurance, and bonds.
   c. Overhead and profit.
   d. Justification for any change in Contract Time.
   e. Credit for deletions from Contract, similarly documented.
2. Support each claim for additional costs with additional information:
   a. Origin and date of claim.
   b. Dates and times work was performed, and by whom.
   c. Time records and wage rates paid.
   d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

K. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 01780.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300

BID ALTERNATES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

To enable the owner to compare total costs where alternate materials and methods might be used, bid alternates have been established as described herein. Certain alternates may be selected on the basis of payback period through lower operating costs. Accordingly, these alternates [as well as the base bid for these items] may include requirements for annual energy use and/or savings, as noted below. The general contractor shall be responsible for cost analysis of base bids and alternates for owner review.

If the owner elects to proceed on the basis of one or more bid alternates, the general contractor shall make all modifications to the work required in order to furnish and install the selected alternate or alternates to the approval of the owner and architect and at no additional cost to the owner other than as proposed on the bid form.

Immediately after the owner has made decisions on which alternates to include in the work, the general contractor shall thoroughly and clearly advise all necessary personnel and suppliers as to the nature and extent of selected alternates.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.03 BID ALTERNATES

Provide change in contract sum for the following alternates as described below:

A. ALTERNATE #1 - LARGER MULTI-PURPOSE SPACE:

B. PROVIDE CHANGE IN CONTRACT SUM TO ENLARGE BUILDING BY 297 SQ FT FOR LARGER MULTI-PURPOSE SPACE, AS INDICATED ON PLANS. THIS ALTERNATE PRICE SHALL INCLUDE THE COST DELTA FOR THE LARGER PV SYSTEM AS SHOWN ON SOUTH ELEVATION (ALT #1) 2/A302 VERSUS BASE BID PV SYSTEM..

C. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

D. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

2.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. A Substitution Request for specified installer constitutes a representation that the submitter:

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. the General Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, Architect's, and the General Contractor's names.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.
         3) Issue date.
         4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         5) Description of Substitution.
         6) Reason why the specified item cannot be provided.
         7) Differences between proposed substitution and specified item.
         8) Description of how proposed substitution affects other parts of work.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
      d. Impact of Substitution:
         1) Savings to Owner for accepting substitution.
         2) Change to Contract Time due to accepting substitution.

E. Limit each request to a single proposed substitution item.

2.02 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify the General Contractor in writing of decision to accept or reject request.

2.03 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION

SECTION 01 3000

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Progress meetings.

D. Construction progress schedule.

E. Progress photographs.

F. Submittals for review, information, and project closeout.

G. Requests for Interpretation (RFI) procedures.

H. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Owner and/or Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Manufacturer's instructions and field reports.
   6. Applications for payment and change order requests.
   7. Progress schedules.
   8. Coordination drawings.
   9. Correction Punch List and Final Correction Punch List for Substantial Completion.
   10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, the General Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. the General Contractor and Architect are required to use this service.
   3. It is the General Contractor's responsibility to submit documents in allowable format.
   4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
   5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.

7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by the General Contractor; include the cost of the service in the Contract Sum.

C. Submittal Service: The selected service is:

D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and the General Contractor participating; further training is the responsibility of the user of the service.

E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.

B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Contractor, Architect, as appropriate to agenda topics for each meeting.

D. Record minutes and distribute copies within five days after meeting to participants, with copies to Architect, Owner, the owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 5 days after date of the Agreement, submit preliminary schedule defining planned operations for the Work. .

B. If preliminary schedule requires revision after review, submit revised schedule within 2 days.

C. Within 5 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 2 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.

3.05 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
   2. Prepare in a format and with content acceptable to Owner.
   3. Prepare using software provided by the Electronic Document Submittal Service.

4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request the General Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and the General Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. the General Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. Highlight items for which a timely response has not been received to date.
   5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to the General Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in the General Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.

4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.06 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data - See Section 013400 for submittal requirements.
   2. Shop drawings - See Section 013400 for submittal requirements.
   3. Samples for selection - See Section 013400 for submittal requirements.
   4. Samples for verification.

B. Submit to Architect for review per Section 013400.

3.07 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions - See Section 013400: Shop Drawings, Product Data, and Samples for submittal requirements.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.09 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to the General Contractor unless specifically so stated.

3.10 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
   1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:

a. "Approved", or language with same legal meaning.
b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
    1) At the General Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
    1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
    2) Non-responsive resubmittals may be rejected.

2. Not Authorizing fabrication, delivery, and installation:
    a. "Revise and Resubmit".
        1) Resubmit revised item, with review notations acknowledged and incorporated.
        2) Non-responsive resubmittals may be rejected.
    b. "Rejected".
        1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
    a. "Received" - to notify the the General Contractor that the submittal has been received for record only.
2. Items for which action was taken:
    a. "Reviewed" - no further action is required from the General Contractor.

END OF SECTION

SECTION 01 3400

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.01 SHOP DRAWINGS

A. General:
   1. Provide newly prepared information. Contract Documents and standard information reproduced or copied for use as Shop Drawings will be rejected.
   2. Mechanical and Electrical Shop Drawings: Provide electronic copies in PDF format of manufacturer's literature and drawings, unless specified otherwise in Mechanical and Electrical specifications sections.
   3. All Other Shop Drawings: Provide electronic copies in PDF format .
   4. Sheet Size (when printed): Not smaller than 8-1/2 X 11" or larger than 24x36", in multiples of 8-1/2 X 11".
   5. Present in clear and thorough manner.
   6. Title each drawing with Project Name, subcontractor and date.
   7. Identify each drawing element by reference to sheet number and detail, schedule, or room number of Contract Documents.
   8. Identify field dimensions; show relation to adjacent or critical features or Work or products.

1.02 SUBMISSION REQUIREMENTS

A. General:
   1. The General Contractor is to review, upon receipt, for completion of submittals in accordance with this section. The General Contractor is to perform their review process, as indicated below, prior to submitting to the Architect and/or Engineer.
   2. The General Contractor is to submit to project team via email or upload to project management software platform. Deliver in sequence and time to avoid delay in Work or work of other contracts.
   3. Transmit complete submittals required by Mechanical and Electrical Specification Divisions at one time; partial or incomplete submittals will be rejected.
   4. Coordinate submittals into logical groupings to facilitate interrelation of the several items.
   5. Finishes which involve Owner/Architect/Engineer selection of colors, textures, or patterns.

B. Architect/Engineer Duties:
   1. Review submittals with reasonable promptness.
   2. Affix stamp and initials or signature, and indicate resubmittal requirements or approval of submittal.
   3. Return submittals to Contractor for distribution, or for resubmission.

C. General Contractor Duties:
   1. Review submittals before submission; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers and similar data, and conformance of submittal with requirements of Contract Documents.
   2. Coordinate submittals with requirements of Work and Contract Documents.
   3. Sign or initial each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify Architect/Engineer, in writing at time of submittal, of all deviations from requirements of Contract Documents.

1.03 RESUBMISSION REQUIREMENTS

A. Make corrections or changes required by Architect/Engineer and resubmit until approved.

B. Shop Drawings and Product Data: Revise initial drawings or data and resubmit as specified for initial submittal; indicate changes which have been made other than those requested by Architect/Engineer.

C. Samples: Submit new samples as required for initial submittal.

1.04 DISTRIBUTION

A. Distribute reproductions of shop drawings and copies of product data which carry Architect/Engineer stamp of approval to job site and record documents file, other affected contractors, subcontractors, and suppliers, fabricators, and other entities requiring information.

B. Distribute samples with Architect/Engineer stamp of approval as directed by Architect/Engineer.

C. Provide electronic copies of complete project archive upon project completion to Owner and Architect, via permanent storage device (external hard drive, USB drive, or approvaed equal).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3553
SECURITY MEASURES

PART 1 GENERAL

1.01 SECURITY PROGRAM

A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.

B. Maintain program throughout construction period until Owner occupancy.

1.02 ENTRY CONTROL

A. Coordinate with Owner's operations team to restrict entrance of persons and vehicles into Project site .

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SUBMITTALS

A. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

C. Test Reports: After each test/inspection, promptly submit electronic copies of report to Architect.
   1. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and the General Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit report in duplicate within 30 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.02 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Owner, it is not practical to remove and replace the work, Owner will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4216
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Provide: To furnish and install.

E. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4218
ABBREVIATIONS

PART ONE - GENERAL

1.01 RELATED INFORMATION

A. Refer to various Sections of Project Manual - Abbreviations and Definitions may also be found applicable to that Section.

B. Additional abbreviations defined or undefined may be found in the Contract Documents. Request clarification if in doubt as to meaning.

1.02 LIST OF ABBREVIATIONS

A/E	Architect/Engineer
AASHTO	American Association of State Highway & Transportation Officials
AB	Anchor bolt
ABAN	Abandon
ABC	Aggregate base course
AC	Air conditioning
AC PNL	Acoustical panel
ACT	Acoustical tile
ACI	American Concrete Institute
ACP	Asphaltic concrete paving
ACU	Acoustical
ACWT	Acoustical wall treatment
AD	Area drain
ADC	Automatic door closer
ADDL	Additional
ADD	Addendum
ADH	Adhesive
ADJ	Adjustable
ADJ	Adjacent
ADS	Automatic door seal
AF	Access floor
AFF	Above finish floor
AFG	Above finish grade
AFS	Above finish slab
AGA	American Gas Association
AGG	Aggregate
AHU	Air handling unit
AIA	American Institute of Architects
AL	Aluminum
ALT	Alternate
ANOD	Anodized
ANSI	American National Standards Institute
AP	Access panel

APPROX	Approximate
ARCH	Architectural
ASC	Above suspended ceiling
ASHRAE	American Society of Heating Refrigeration and Air Conditioning
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineers
ASSY	Assembly
ASTM	American Society of Testing and Materials
AUTO	Automatic
AUX	Auxiliary
AVE	Avenue
AVG	Average
AWI	American Woodwork Institute
AWWA	American Water Works Association
B/	Bottom of
B&B	Balled and burlapped
BB	Bulletin board
BD	Board
BTWN	Between
BEV	Beveled
B/FTG	Bottom of footing
BITUM	Bituminous
BLDG	Building
BLK	Block
BLKG	Blocking
BLKHD	Bulkhead
BM	Beam
BMK	Benchmark
BOF	Bottom of footing
BOR LT	Borrowed light
BOT	Bottom
BOW	Bottom of wall
BR	Bear
BRCG	Bracing
BRG	Bearing
BRK	Brick
BRKT	Bracket
BS	Bullshit
BSMT	Basement
BT	Bolt

B/FTG	Bottom of footing
C	Centigrade
C&G	Curb and gutter
C/C	Center to center
CAB	Cabinet
CB	Catch Basin
CDOT	Colorado Department of Transportation
CEM	Cement
CFM	Cubic feet per minute
CG	Corner guard
CI	Cast iron
CISPI	Cast Iron Soil Pipe Institute
CJ	Control joint
CL	Centerline
CLG	Ceiling
CL	Closet
CLR	Clear
CMP	Corrugated metal pipe
CMU	Concrete masonry unit
CNR	Counter
COL	Column
COMM	Communication
CONC	Concrete
CONF	Conference
CONN	Connection
CONST	Construction
CONT	Continuous
CONTR	Contractor
COORD	Coordinate
CORR	Corridor
CS	Commercial standard
CSB	Concrete splash block
CSI	Construction Specifications Institute
CSMT	Casement
CT	Ceramic tile
CTR	Center
CU	Cubic
D or d	Penny (nail)
DBL	Double
DCL	Door closer

DEG	Degree
DEPT	Department
DET	Detail
DF	Drinking fountain
DIAG	Diagonal
DIAM	Diameter
DIM	Dimension
DL	Dead load
DM	Demountable partition
DN	Down
DO	Ditto
DOW	Department of Wildlife
DR	Door
DS	Downspout
DT	Drain tile
DVTL	Dovetail
DW	Dishwasher
DWG	Drawing
DWR	Drawer
DWTR	Dumbwaiter

E	East
EA	Each
EF	Each face
EIFS	Exterior insulation and finish system
EL	Elevation
ELEC	Electric/electrical
ELEV	Elevator
EMER	Emergency
ENCL	Enclosure
ENG	Engineer, engineering
ENT	Entrance
EQ	Equal
EQP	Equipment
EQV	Equivalent
ESC	Escalator
ESMT	Easement
EST	Establish
EW	Each way
EWC	Electric water cooler
EXC	Excavation
EXH	Exhaust

EXP	Exposed
EXP	Expansion
EX	Existing
EXT	Exterior
F	Fahrenheit
F/	Face of
FA	Fire alarm
FAB	Fabricate
FD	Floor drain
FDN	Foundation
FE	Fire extinguisher
FEC	Fire extinguisher cabinet
FF	Finish face
FG	Fiberglass
FHC	Fire hose cabinet
FHP	Full height partition
FIN	Finish
FL, FLUOR	Fluorescent
FLR	Floor
FLEX	Flexible
FLG	Flashing
FLR	Floor
FP	Fireplace
FPRFG	Fireproofing
FR	Fire rated
FS	Full size
FSTNR	Fastener
FT	Foot/feet
FTG	Footing
FURN	Furniture
FURR	Furring
FWC	Fabric Wall Covering
FXT	Fixture
GA	Gage
GALV	Galvanized
GB	Grab bar
GC	General contractor
GI	Galvanized Iron
GL	Glass
GLZ	Glazing

GR	Grade/grading
GRL	Grille
GWB	Gypsum wallboard
GYP	Gypsum
HB	Hose bibb
HC	Hollow Core
HD	Head
HDWR	Hardware
HEX	Hexagonal
HT	Height
HM	Hollow metal
HORIZ	Horizontal
HP	Horsepower
HR	Hour
HTG	Heating
HVAC	Heating, Ventilating, and Cooling
HWY	Highway
HYD	Hydrant
IBC	International Building Code
ID	Inside diameter
IF	Inside face
IFC	International Fire Code
IMC	International Mechanical Code
IN	Inch, inches
INC	Incorporated
INCAND	Incandescent
INCL	Include/inclusive
INSUL	Insulation
INT	Interior
INV	Invert
IPC	International Plumbing Code
IPS	Inside pipe size
JST	Joist
JT	Joint
KD	Knockdown
KIT	Kitchen
KLF	Kips per linear foot
KO	Knockout

KSF	Kips per square foot
KSI	Kips per square inch
L	Left
LAB	Laboratory
LAM	Laminated
LAV	Lavatory
LB	Pound
LF	Linear foot
LG	Length/long
LH	Left hand
LHR	Left hand reverse
LIB	Library
LIN	Linear
LL	Live load
LLH	Long leg horizontal
LLV	Long leg vertical
LNTL	Lintel
LR	Living room
LT	Light
LTG	Lighting
LVR	Louver
MAINT	Maintenance
MAS	Masonry
MATL	Material
MAX	Maximum
MBR	Master bedroom
MDO	Medium density overlay
MECH	Mechanical
MEM	Membrane
MET	Metal
MEZZ	Mezzanine
MFR	Manufacturer
MH	Manhole
MIN	Minimum
MIR	Mirror
MISC	Miscellaneous
ML	Metal lath
MLDG	Molding
MO	Masonry Opening
MTD	Mounted

MTG	Meeting
MTP	Metal toilet partition
MTR	Mortar
MULL	Mullion
MWP	Membrane waterproofing
N	North
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electric Manufacturer's Association
NFPA	National Fire Protection Association
NIC	Not in contract
NO	Number
NOM	Nominal
NPA	National Particleboard Association
NRC	Noise reduction coefficient
NSF	National Sanitation Foundation
NSPI	National Swimming Pool Institute
NTS	Not to scale
O/O	Outside to outside
OA	Overall
OC	On center
OD	Outside diameter
OF	Outside face
OFCI	Owner furnished - contractor installed
OFF	Office
OFOI	Owner furnished - owner installed
OPNG	Opening
OPP	Opposite
OVHD	Overhead
OZ	Ounce
P LAM	Plastic laminate
PAR	Parallel
PB	Panic bar
PBD	Particle board
PCF	Pounds per cubic foot
PCI	Precast Concrete Institute
PDI	Plumbing and Drainage Institute
PERF	Perforated
PERIM	Perimeter

PERP	Perpendicular
PG	Pipe guide
PIV	Post indicator valve
PKG	Parking
PL	Plate
PLAS	Plaster
PLF	Pounds per linear foot
PLY, PLYWD	Plywood
PNL	Panel
PNT	Paint
POL	Polished
PP	Power pole
PR	Pair
PREFAB	Prefabricated
PREFIN	Prefinished
PROJ	Project
PROP	Property
PSF	Pounds per square foot
PSI	Pounds per square inch
PT	Pressure or preservative treated
PTD	Paper towel dispenser
PTN	Partition
PTR	Paper towel receptacle
PVC	Polyvinyl chloride
PVMT	Pavement
QT	Quarry tile
QTY	Quantity
R	Riser
RA	Return air
RAD	Radius
RC	Resilient channel
RCVR	Receiver
RD	Roof drain
REBAR	Reinforcing bar
REC	Recessed
RECPT	Receptacle
RECT	Rectangular
RE	Reference
REF	Refrigerator
REINF	Reinforcing/reinforcement

REM	Removable
REQD	Required
RES	Resistant
RESIL	Resilient
RET	Return
REV	Revise/revision
RFG	Roofing
RH	Right hand
RHR	Right hand reverse
RM	Room
RMV	Remove
RND	Round
RO	Rough opening
ROW	Right of way
RV	Roof vent
S	South
SA	Supply air
SAN	Sanitary
SAT	Suspended Acoustic Tile
SB	Splash block
SC	Solid Core
SCH, SCHED	Schedule
SF	Square Feet
SECT	Section
SHT	Sheet
SHTHG	Sheathing
SHWR	Shower
SIGMA	Sealed Insulating Glass Manufacturers Association
SIM	Similar
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SND	Sanitary napkin dispenser
SNR	Sanitary napkin receptacle
SPEC	Specifications or project manual
SPKLR	Sprinkler
SPKR	Speaker
SQ	Square
ST STL	Stainless steel
ST	Street
STAG	Staggered
STC	Sound transmission classification
STL	Steel

STOR	Storage
STR, STRUCT	Structural/structure
SUB	Subcontractor
SURF	Surface
SUSP	Suspended
SW	Switch
SYM	Symmetrical
T/	Top of
T&B	Top and bottom
T&G	Tongue and groove
T/BM	Top of beam
TEL	Telephone
TEMP	Temporary
TER	Terrazzo
THRSH	Threshold
TOB	Town of Breckenridge
TOC	Top of concrete
TOF	Top of footing
TOJ	Top of joist
TOPO	Topography
TOS	Top of slab
TOW	Top of wall
TP	Telephone pole
TR	Tread
TYP	Typical
UC	Undercut
UF	Under floor
UG	Underground
UH	Unit heater
UL	Underwriters Laboratories, Inc.
UNEX	Unexcavated
UNFN	Unfinished
UON	Unless otherwise noted
UTIL	Utility
VB	Vapor barrier
VCT	Vinyl composition tile
VENT	Vent, venting, ventilating
VERT	Vertical
VEST	Vestibule

VNR	Veneer
VOL	Volume
VR	Vapor retarder
VWC	Vinyl wall covering
W	Wide/width
W	West
W/	With
W/O	Without
WC	Water closet
WD	Wood
WDW	Window
WGL	Wire glass
WH	Water heater
WP	Weatherproof
WSCT	Wainscot
WT	Weight
WWF	Welded wire fabric
YD	Yard

PART TWO PRODUCTS - NOT USED

PART THREE EXECUTION - NOT USED

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 TEMPORARY UTILITIES - SEE SECTION 01 5100

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. Existing facilities may be used.

C. New permanent facilities may be used.

1.02 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

1.03 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide protection for plants designated to remain. Replace damaged plants.

1.05 FENCING

A. Provide 6 foot high fence around construction site unless otherwise noted in construction documents or as required by municipality; equip with vehicular gates with locks.

1.06 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 SECURITY - SEE SECTION 01 3553

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.08 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

1.09 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

1.10 PROJECT SIGNS - SEE SECTION 01 5813

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5100

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 TEMPORARY ELECTRICITY

A. Cost: By the General Contractor.

1.02 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

1.03 TEMPORARY HEATING

A. Cost of Energy: By the General Contractor.

B. Maintain minimum ambient temperature of 40 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.04 TEMPORARY WATER SERVICE

A. Cost of Water Used: By the General Contractor.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5500
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

PART 2 PRODUCTS

2.01 MATERIALS

A. Temporary Construction: the General Contractor's option.

PART 3 EXECUTION

3.01 ACCESS ROADS

A. Use of existing on-site streets for construction traffic is not permitted unless authorized by municipal authorities.

B. Tracked vehicles not allowed on paved areas.

C. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

3.02 PARKING

A. Use of existing parking facilities by construction personnel is not permitted.

B. Provide temporary parking areas to accommodate use of construction personnel.

3.03 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

3.04 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

3.05 REMOVAL, REPAIR

A. Remove temporary roads before Substantial Completion or at Substantial Completion.

B. Repair existing and new permanent facilities damaged by use, to specified condition.

END OF SECTION

SECTION 01 5719

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 PROJECT GOALS

A. Ventilation: Design and construct the HVAC system to achieve the minimum requirements for ventilation specified in ASHRAE 62.1 .

1.02 SUBMITTALS

A. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.

B. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

C. Duct and Terminal Unit Inspection Report.

PART 2 PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Begin construction ventilation when building is substantially enclosed.

B. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

C. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:

3.02 BUILDING FLUSH-OUT

A. the General Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform building flush-out before occupancy.

C. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.

D. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

A. the General Contractor's Option: Either full continuous flush-out, or satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.

C. Perform air contaminant testing before occupancy.

3.04 VENTILATION EFFECTIVENESS TESTING

A. Perform ventilation effectiveness testing before occupancy.

B. Test each air handler zone in accordance with ASHRAE Std 129.

END OF SECTION

SECTION 01 5813
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 QUALITY ASSURANCE

1.02 SUBMITTALS

PART 2 PRODUCTS

2.01 PROJECT IDENTIFICATION SIGN

A. One sign for installation by the Contractor at location designated by Owner.

B. Content:
   1. Names and titles of Architect and Consultants.
   2. Name of Prime the General Contractor and major Subcontractors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Erect at designated location.

3.02 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data Submittals: Submittals shall be in electonic PDF format. Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Submittals shall be in electonic PDF format. Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

B. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

END OF SECTION

SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SUBMITTALS

A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.

1.02 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

D. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

F. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

PART 3 EXECUTION

3.01 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.03 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.

D. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.04 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

3.05 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.06 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

3.07 CLOSEOUT PROCEDURES

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

1.02 SUBMITTALS

A. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 6000 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

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

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

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

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

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

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

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

END OF SECTION

SECTION 01 7800

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SUBMITTALS

A. Project Record Documents: Submit documents to Architect and Owner in electronic PDF format suitable for archival storage: external hard drive, USB drive or approved alternate method.

B. Operation and Maintenance Data:
   1. Submit electronic copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.
   4. Reviewed shop drawings, product data, and samples.
   5. Manufacturer's instruction for assembly, installation, and adjusting.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

END OF SECTION

SECTION 01 7900

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUBMITTALS

A. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.

B. Training Manuals: Provide electronic training manual in PDF format for each attendee; allow for minimum of two attendees per training session.

C. Training Reports:

D. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to the General Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge the General Contractor for personnel "show-up" time.

END OF SECTION

SECTION 02 3000
SUBSURFACE INVESTIGATION

GENERAL

1.01 SUMMARY

A. Subsurface investigations and reporting have been performed for the purpose of obtaining data for the planning and design of this project. Copies of such reporting are available from the Owner.

1.02 LIMITATIONS

A. The subsurface investigations and reporting are being made available solely for the convenience of the Bidder and shall not relieve the Bidder or the Contractor of any risk, duty to make examinations and investigations as required by Article 4 of the Instructions to Bidders, or any other responsibility under the Contract Documents.

B. It is mutually agreed to by all parties:
   1. Written reports are reference documents and are not part of the Contract Documents.
   2. Subsurface investigations are for the purpose of obtaining data for planning and design of the project.
   3. Data concerning borings and test pits is intended to represent with reasonable accuracy conditions and material found in specific borings and test pits at the time the borings and test pits were made.

C. It is expressly understood and agreed the Owner and Engineer assume no responsibility whatsoever in respect to the sufficiency or accuracy of the investigation thus made, the records thereof, or of the interpretations set forth therein, or made by the Owner in his use thereof; and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations, or records thereof, are representative of those existing throughout such areas, or any part, or that unforeseen developments may not occur.

D. The Owner's subsurface investigations and reporting are made available to Bidder or Contractor only on the basis of the understandings and agreement herein stated.

1.03 PRODUCTS - NOT USED

1.04 EXECUTION - NOT USED

END OF SECTION

SECTION 02 4100
DEMOLITION

GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Demolition and removal of existing facilities.
   2. Abandoning and removing utilities.

1.02 RELATED SECTIONS:

A. Section 31 05 16 - Aggregates for Earthwork

B. Section 31 10 00 - Site Clearing

C. Section 31 22 13 - Rough Grading

D. Section 31 23 16 - Excavation

1.03 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Submit to Engineer a copy of written permission of private property owners, with copy of fill permit for said private property, as may be required for disposal of materials.

1.04 QUALITY ASSURANCE

A. Existing Conditions: Determine the extent of work required and limitations before proceeding with Work.

B. Conform to applicable local, state, and federal codes for environmental requirements in relation to disposal of debris.
   1. Burning at the Site for the disposal of refuse, debris, and waste materials resulting from demolition and site clearing operations shall not be permitted.

C. Permits: The Contractor is responsible for obtaining all necessary permits required for completion of the Work described in this Section.

D. Protection of Persons and Property: Meet all federal, state, and local safety requirements for the protection of workmen, other persons, and property in the vicinity of the Work and requirements of the General Provisions.

E. If the existing material to be demolished and removed contains any hazardous materials which will require special handling upon removal, such as asbestos or lead, it is the responsibility of the Contractor to remove and dispose of the material in accordance with all applicable federal, state and local regulations.

PRODUCTS

2.01 MATERIALS

A. Existing Materials: All materials, equipment, miscellaneous items, and debris involved, occurring, or resulting from demolition, clearing, and grubbing work shall become the property of the Contractor at the place of origin, except as otherwise indicated in the Drawings or Specifications.

B. Crushed Rock: As specified in Section 31 05 16-2.1, Aggregates for Earthwork. Of the size shown in the Drawings or specified herein.

C. Sand: As specified in Section 31 05 16-2.2, Aggregates for Earthwork.

EXECUTION

3.01 EXAMINATION

A. The Owner assumes no responsibility for the actual condition of the facilities to be demolished. The Contractor shall visit the site, inspect all facilities and be familiar with all existing conditions and utilities.

B. Demolition drawings identify major equipment and structures to be demolished only.

C. Identify waste and salvage areas for placing removed materials.

3.02 PREPARATION

A. Carefully coordinate the work of this Section with all other work and construction.

B. Call Local Utility Line Information service at 811, not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.
   2. Disconnect or arrange for disconnection of utilities (if any) affected by required work.
   3. Keep all active utilities intact and in continuous operations.

3.03 PROTECTION

A. Utilities: Locate, identify, and protect utilities located by utilities and indicated in the Drawings to remain from damage.

B. Survey control: Protect benchmarks, survey control points, and existing structures from damage or displacement.

C. Preservation and Trimming of Trees, Shrubs and Other Vegetation: As specified in Section 31 10 00-3.4.C, Site Clearing.

D. Landscaped Areas: Protect existing landscaped areas as specified in Section 31 10 00-3.4.D, Site Clearing.

E. Miscellaneous Site Features: Protect all existing miscellaneous site features from damage by excavating equipment and vehicular traffic, including but not limited to existing structures, fences, picnic tables, mailboxes, sidewalks, paving, guy wires, utility poles, and curbs.

F. Repair and Replacement:
   1. Damaged items, including but not restricted to those noted above, shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of Work of this contract.
   2. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.

3.04 DEMOLITION

A. Areas which are to be excavated for the purpose of demolition shall be cleared and stripped in accordance with Section 31 10 00-3.6, Site Clearing.

B. Carefully consider all bearing loads and capacities for placement of equipment and material on site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, consult with Engineer prior to the placement of such equipment or material.

C. Demolition of Existing Structures:
   1. Excavate around existing structures as required to perform demolition operations and to plug associated existing pipelines where shown in the Drawing.
   2. Provide shoring, bracing, and supports, as required, to ensure adjacent structures are not damaged and structural elements of existing structure are not overloaded during demolition activities.
      a. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this Contract.
      b. Remove all temporary protection when the Work is complete or when so authorized by the Engineer.
   3. Any floors or slabs that are to remain in place shall be completely cracked through to allow for drainage. Cracking shall be accomplished by dropping a demolition ball or by other methods approved by the Engineer.
   4. Remove and dispose of all exposed and/or protruding metalwork, piping, plumbing, and conduits resulting from demolition activities, and all woodwork, roofing, and electrical and mechanical equipment removed from demolished structures.
      a. Reinforcing bars shall be cut flush with final wall elevations as shown in the Drawings.

b. No detached metalwork, excluding concrete reinforcing bars, shall be buried with the concrete and masonry rubble.

D. Backfill at Demolished Structures:
   1. For structures designated to be abandoned and/or demolished in place, concrete and/or masonry rubble and excavated soils resulting from demolition activities shall be used for backfill or placed in the bottoms of said structures only as directed by the Engineer.
   2. Concrete and masonry rubble used for backfilling shall be broken into pieces no larger than 12 inches on any one side.
   3. Materials resulting from abandonment/demolition activities approved for backfill shall be combined with imported filler sand to create a dense, compacted backfill.
   4. Backfilling or placement of the excavated material in the structures shall meet the following requirements.
      a. Furnish, place and compact filler sand along with the concrete and masonry rubble so that all voids are filled and a dense, compacted backfill is obtained.
      b. Filler sand shall be placed in horizontal layers completely filling all voids between pieces of rubble and not exceeding 12 inches in thickness.
      c. Each layer of filler sand shall be compacted to obtain at least 90 percent of maximum density as determined by ASTM Method D-698-78 (AASHTO T-99).
      d. Water shall be furnished by the Contractor and added to each layer as required to maintain optimum moisture content.
      e. The amount of filler sand used shall only be the amount needed to fill all voids created by placement of the concrete and asphalt rubble, as directed by the Engineer.
      f. At locations where concrete and masonry rubble are used for backfill, they shall be placed such that a minimum of 3 feet of compacted non-rubble backfill material (crushed rock) exists between any rubble and finished grade. Protruding reinforcing bars shall be cut to lengths that allow granular backfill to be placed and compacted to required levels in and above the rubble.
   5. Disposal of all materials not used for backfill shall be performed off-site and in compliance with applicable local, state, and federal codes and requirements.
   6. In areas where new construction will take place, no trace of these structures shall remain prior to placing of backfill.

E. Backfilling within the footprint of new structures with rubble material resulting from demolition activities will not be allowed.

F. All existing improvements designated in the Drawings or specified to be removed, including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing, and similar structures occurring above, at, or below existing ground surface shall be included in the demolition work.

G. Unless otherwise specified, any resulting voids shall be backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.

3.05 ASPHALTIC CONCRETE DEMOLITION

A. Asphalt pavement shall be removed to the limits shown in the Drawings.

B. The limits of the removal shall be saw cut, protecting the pavement to remain.

C. Asphalt pavement may not be used as rubble fill.

3.06 CONCRETE SIDEWALK AND CURB AND GUTTER DEMOLITION

A. Concrete shall be removed to the limits shown in the Drawings.

B. The limits of the removal shall be saw cut, protecting the concrete to remain.

3.07 REMOVAL

A. Remove debris, rock, excavated materials, rubble, abandoned piping, and extracted plant life resulting from abandonment and/or demolition activities from site.

B. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

C. Removal: All material resulting from demolition, clearing, and grubbing, and trimming operations shall be removed from the project site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.

3.08 GRADING

A. All grading work shall be completed in accordance with Section 31 22 13, Rough Grading.

3.09 CLEANUP:

A. During and upon completion of work, promptly remove all unused tools and equipment, surplus materials, debris, and dust and leave all areas affected by the work in a clean, condition, as may be subject to Engineer approval.

B. Adjacent structures shall be cleaned of dust, dirt, and debris resulting from demolition.

C. Adjacent areas shall be returned to their existing condition prior to the start of work.

3.10 SCHEDULES

A. The following materials and structures are to be demolished and removed for the project site:
   1. As shown on the plans.

B. Protect the following materials and structures:
   1. As shown on the plans.

END OF SECTION

SECTION 03 1000

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Formwork for cast-in-place concrete.
   2. Formwork accessories.
   3. Dovetail slots for masonry anchors.
   4. Waterstops.

B. Products Installed But Not Furnished Under This Section:
   1. Cast-in Items such as Angles, Plates, Pipe Rail Sleeves, Anchor Bolts. Etc.: Supplied under Sections 05 12 00 and 05 50 00.

C. Related Requirements:
   1. General Notes on Structural Drawings.
   2. Layout: Section 01 71 23 Field Engineering.
   3. Steel Reinforcement and Accessories: Section 03 20 00 Concrete Reinforcing.
   4. Concrete and Flatwork Screeds: Section 03 30 00 Cast-In-Place Concrete.
   5. Masonry Anchors: Section 04 43 00 Stone Masonry.
   6. Steel Form Deck and Accessories: Section 05 31 00 Steel Deck.
   7. Underslab Vapor Retarder: Section 07 26 16 Below-Grade Vapor Retarders.
   8. Blockouts for Plumbing: Division 22 Plumbing.
   9. Blockouts for HVAC Piping and Equipment: Division 23 Heating, Ventilating, and Air Conditioning.
   10. Blockouts for Electrical Work: Division 26 Electrical.
   11. Exterior Concrete: Section 32 13 13 Concrete Paving.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with listed reference standards except as modified by supplemental requirements on the Drawings or by these specifications.
   1. ACI 117-10 – Specification for Tolerances for Concrete Construction and Materials.
   2. ACI 301-10 – Specifications for Structural Concrete.
   3. ACI 318-11 – Building Code Requirements for Structural Concrete, Chapter 6.
   4. Embedment Tolerances: AISC 303-10 - Code of Standard Practice for Steel Buildings and Bridges.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Attend concrete conference. See Section 03 30 00.

1.04 ACTION SUBMITTALS

A. Procedures: Submit for review, action and return in accordance with Section 01 33 00.

B. Product Data: Submit manufacturer's current product literature for the following.
   1. Waterstops.
   2. Construction joint dowels.
   3. Basket plate assemblies.

C. Shop Drawings:
   1. Submit locations of joints desired for construction to Architect for acceptance.
      a. Layout of Slab-On-Grade Construction Joints: Indicate spacings of dowels.
   2. Submit drawings indicating form joint and tie locations for all architectural concrete.
   3. All shop drawings shall be original drawings produced by the subcontractor or supplier and shall not be reproductions of the Contract Documents.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Storage and Handling Requirements:
   1. Stack all wood and wood-based form-facing materials minimum of 6 inches above ground to ensure proper ventilation and cover with waterproofing covering.
   2. Store metal form-facing materials above ground on platforms, skids, or other supports. Protect metals from corrosion.

PART 2 PRODUCTS

2.01 PRODUCT OPTIONS

A. Substitution Requests: Required for all manufacturers and products not named as Basis of Design or as Acceptable Manufacturer and Product.
   1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
   2. During Construction Phase: Submit in accordance with Section 01 25 00.

2.02 DESIGN CRITERIA

A. Safety: Assume responsibility for safety of formwork. Provide necessary design, construction, materials and maintenance of formwork. Design formwork to be capable of supporting and containing fresh concrete placements and of supporting safely all applied vertical and lateral loads until new concrete construction has developed sufficient strength to support applied loads and its own weight without temporary support.

B. Vertical Formwork: Design formwork to withstand pressure resulting from placement and vibration of fresh concrete and to maintain specified tolerances.

C. Horizontal Formwork:
   1. Design formwork to support dead load weight of fresh concrete and construction live load of 50 psf and to maintain specified tolerances.
   2. Design formwork to have sufficient camber to maintain tolerances specified. Provide camber sufficient to compensate for weight of fresh concrete.
   3. Comply with requirements indicated on Structural Drawings.

D. Clamps, Brackets, Braces, Washers, Wedges, Walers, and Other Formwork Support Components.: Contractor's option.

E. Shoring System: Contractor's option.

2.03 CAST-IN-PLACE CONCRETE FORM-FACING MATERIALS

A. For Forming Footings and Other Non-Exposed Concrete: Plywood, plastic lumber, steel or dressed lumber.

B. For Forming Exposed Walls and Columns: One of the following:
   1. APA B-B Plyform Class 1 EXT.
      a. Walls and Grade Beams: 4-foot by 8-foot sheets.
   2. Tempered concrete-form-grade hardboard.

C. For Forming Exposed Ceilings: One of the following:
   1. New APA B-B Plyform Class 1 EXT.
   2. New APA High Density Overlay Plyform Class 1 EXT.

D. Chamfer Strips For Vertical Outside Corners:
   1. For Exposed Corners: 3/4-inch, 45 degree PVC.
   2. For Unexposed Corners: 3/4-inch, 45 degree job cut wood or 3/4-inch, 45 degree PVC.

2.04 SLAB JOINT FORMS AND ACCESSORIES

A. Slab Edge and Expansion Joint Premolded Filler: Bituminous fiber type complying with ASTM D1751. Thickness as indicated by full depth of slab.

B. Slab Construction [and Control]Joint Forms: Dayton/Richmond G-33 Screed Key Joint or approved substitute. Provide G-35 Plastic Cap Strip strippable vinyl insert at joints to receive sealant specified in Section 07 92 00.

C. Construction Joint Dowels:

1. Basis of Design Manufacturer and Product: PNA Construction Technologies, Inc.; www.pna-inc.com - PNA Diamond Dowel System.
2. Description:
   a. Diamond Shaped Load Plate: [1/4-inch][3/8-inch] by 4-1/2 inches by 4-1/2 inches, saw cut from hot rolled steel plate meeting ASTM A36.
   b. Diamond Shaped Load Plate: 4-1/2 inches by 4-1/2 inches, saw cut from hot rolled steel plate meeting ASTM A36.
      1) Thickness: As scheduled on Structural Drawings.
      2) Thickness for 5- to 6-Inch Deep Slabs: 1/4-inch.
      3) Thickness for 7- to 8-Inch Deep Slabs: 3/8-inch.
   c. Diamond Shaped Load Plate: 3/4-inch by 4-1/2 inches by 4-1/2 inches, saw cut from cold rolled steel plate meeting ASTM A108 grade 1018.
   d. Pocket Former: High density plastic with internal collapsible fins and spacer to hold diamond shaped load plate in correct position and create a void to its vertical faces. This void, in addition to its tapered shape, shall allow for differential movement and shall prevent horizontal stress accumulation at joint, thus reducing likelihood of random cracking.

D. Alternating Tapered Basket Plate Assembly for Sawn Control Joints.
1. Basis of Design Manufacturer and Product: PNA Construction Technologies, Inc.; www.pna-inc.com - PNA PD3 Basket assembly.
2. Description:
   a. Alternating Tapered Plate Dowels: Plasma cut from hot rolled steel bar certified to meet ASTM A36 standards to within 3/16-inch of specified dowel length with a 4-inch taper from the widest end to the narrow end.
   b. Side Frame Supports: Fabricated from 1/4-inch diameter cold drawn wire certified to meet ASTM A108 grade 1010-1020 standards.
   c. De-Bonding Agent: Tectyl 506.
3. Fabrication:
   a. Weld plate dowels (on widest end only) into side frames, with welded ends alternating along length of assembly.
   b. Weld eight gauge wires across side frames at no more than 3'-0" on center to keep assembly stable during shipping and installation.
   c. Factory Applied De-Bonding Agent: Thinly and evenly coat plate dowels without excessive drips or thickness.
   d. Finished assembly shall hold alternating tapered plate dowels to within plus-or-minus 1/8-inch of 1/2 slab depth.
4. Cross-Sectional Area Of Steel Required at Saw-Cut Joint: 2-1/2 inch by 3/4-inch unless indicated otherwise on Drawings.
5. Dowel Length: 12 inches.

E. Slab Preformed Control Joint Forms: W. R. Meadows Speed-E-Joint rigid, 2-part preformed contraction joint or accepted substitute. Top section removable after insertion of preformed joint in fresh concrete slab.

2.05 FORMWORK ACCESSORIES

A. Form Ties:
1. Exposed Concrete: Bar breakback type with break-off point minimum of 1 inch behind face of concrete. No cones.
2. Non-Exposed Concrete: Any type leaving no metal closer than one inch to surface nor holes or depressions larger than 7/8-inch in diameter.
3. Form Ties for Heavy Formwork: Coil tie type with screw-on plastic cones.
   a. Bolt Diameter: As required by Contractor's formwork design.
   b. Coil Ties:
      1) Manufacturer and Model: Dayton Superior B-3 Screw-On Coil Tie or equivalent. Standard, Heavy, or Extra Heavy as selected by Contractor based on formwork design.
   c. Plastic Cones:
      1) Manufacturer and Model: Dayton Superior B-30 Screw-On Plastic Cones or equivalent.

2) Setback: 2 inches.

B. Form Release Agent: Colorless biobased oil that will not stain concrete. VOC compliant.
   1. Manufacturer and Product: Contractor's option, among products meeting specification requirements.
   2. Comply with EPA Architectural Coatings Rule, including VOC content limit.

C. Vinyl Foam Tape for Architectural Concrete Formwork:
   1. Acceptable Manufacturers:
      a. Saint-Gobain Performance Plastics; www.plastics.saint-gobain.com.
      b. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
   2. Tape: Saint-Gobain Norseal V714 or accepted substitute. Medium firm density closed-cell compressible PVC foam gasket tape with pressure sensitive adhesive on one side.
   3. Thickness: 1/8 inch.
   4. Width: Match width of form.

2.06 WATERSTOPS

A. General: Provide flat, dumbbell-type or centerbulb-type waterstops at construction joints and other joints as indicated. Size to suit joints.

B. Rubber Waterstops:
   1. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
      a. JP Specialties, Inc.; www.jpspecialties.com.
      b. Progress Unlimited.
      c. Williams Products, Inc.; www.willliamsproducts.net.

C. Polyvinyl Chloride Waterstops:
   1. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
      a. BoMetals, Inc.; www.bometals.com.
      b. Greenstreak Plastic Products Company
      c. W.R. Meadows, Inc.; www.wrmeadows.com.
      d. Progress Unlimited.
      e. Schlegel Corporation.
      f. Vinylex Corporation, www.vinylex.com

D. Preformed Adhesive Waterstops:
   1. Mitsubishi International Corporation – Adeka Ultra Seal MC-2010M.
   2. Colloid Environmental Technologies Company (CETCO) – Volclay Waterstop – RX or Akwastop.
   3. Henry Company; www.henry.com – SF312 Synko-Flex FR Preformed Adhesive Waterstop.

2.07 EMBEDS

A. Dovetail Slots: Provide continuous dovetail slots cast into concrete where masonry walls abut concrete. Dovetail slots shall accommodate masonry anchors to be provided under Division 04 Masonry.

PART 3 EXECUTION

3.01 EXAMINATION

A. Foundation Bearing Surfaces: Inspected and approved by Geotechnical Engineer prior to start of formwork.

B. Formwork: Provide ample notice to Architect to allow for review of formwork surfaces that will provide finish surface of exposed concrete.

3.02 PREPARATION

A. Layout: See Section 01 71 23.

B. Subgrade Under Slabs, Grade Beams and Footings: Fine grade to smooth, level surface prior to installation of forms.

3.03 ERECTION

A. Construction and Erection: ACI 301.
   1. Lap Forming: Not allowed.
   2. Provide forms conforming to shape, lines and dimensions of members indicated on Drawings, substantial and sufficiently tight to prevent leakage of mortar.
   3. Properly brace or tie to maintain position, shape and lateral stability.
   4. Clearly mark top surface of concrete on form walls. Set elevations and verify formwork locations and alignment using surveying instruments in accordance with Section 01 71 23.
      a. Make required adjustments prior to concrete placement.

B. Tolerances: ACI 117.

C. Footings:
   1. Use of earth as form not allowed.
   2. Formed Footings:
      a. Butt form material end to end.
      b. Close gaps greater than 3/4 inches between bottom of forms and soil surfaces at isolated over-excavated depressions.

D. Walls and Grade Beams:
   1. Use of earth as form not allowed.
   2. Provide sufficient strength to carry construction operations and material dead loads without deflection or vibration.
   3. Design forms to be capable of needed adjustments. Watch carefully as work proceeds and promptly correct faults.
   4. Where finished concrete will remain exposed, space joints regularly and hold to minimum both horizontally and vertically.
   5. Provide access panels in formwork for cleanout or placing as required.

E. Exposed Ceilings:
   1. Where underside of horizontal concrete surfaces remain as ceiling of occupied or usable spaces or stairways, exercise exceptional care in selection, installation, alignment and removal of formwork to produce clean, smooth surface.
   2. Tape form joints. Remove form oil at area to be covered before applying tape.
   3. Apply protective coat of varnish over joint tape to prevent slippage or wrinkling.

F. Embeds:
   1. Anchors, Inserts, Blockouts and Built-in Items: Securely fasten anchor bolts, inserts, form blockouts and other items built into concrete to formwork or hold in place with templates. Insertion into concrete after placement not allowed.
      a. Unless shown otherwise, anchor bolts shall be set perpendicular to the theoretical bearing surface.
   2. Dovetail Slots: Install vertically 24 inches o.c. Coordinate with Section 04 23 00.
   3. Plate Dowel Basket Assembly:
      a. Do not cut shipping wires.
      b. Measure and mark (notch or nail) saw-cut joint location on forms.
      c. Pull string lines. Spray paint saw-cut locations on subgrade.
      d. Lay-out one row of baskets over painted marks on subgrade. End alternating tapered plate dowel is placed up to six inches of joint intersection.
      e. Maintain alignment of baskets over paint marks during concrete placement. Stake dowel basket if required to prevent displacement.
      f. Dowel Plate Spacing: 18 inches on center unless noted otherwise on Drawings.
   4. Tolerances for Anchor Bolts and Other Embedded Items:
      a. Plus or minus 1/8 inch center-to-center of any two bolts within an anchor bolt group where an anchor bolt group is defined as the set of anchor bolts which receive a single fabricated steel shipping piece.
      b. Plus or minus ¼ inch center-to-center of adjacent anchor bolt groups.

c. Maximum allowable accumulation of ¼ inch per hundred feet along the established column line of multiple anchor bolt groups, but not to exceed a total of 1 inch, where the established column line is the actual field line most representative of the centers of the as-built anchor bolt groups along line of columns.
d. Plus or minus ¼ inch from the center of any anchor bolt group to the established column line through that group.
e. The tolerances of above paragraphs apply to offset dimensions shown on the Drawings, measured parallel and perpendicular to the nearest established column line for individual columns shown on the Drawings to be offset from established column lines.
f. Other embedded items or connection material supplied by others for embedment in concrete shall be set in accordance with the tolerance requirements of the AISC Code of Standard Practice.

G. Chamfer Strips: Install strips at exposed outside corners.
1. Securely nail within forms using finish nails
2. Chamfer exposed vertical exterior corners of concrete 3/4-inch unless otherwise indicated.
3. Coordinate with work specified in Section 03 30 00 for replacement of removed rustication strips prior to sandblasting.

3.04 JOINTS

A. Construction Joints in Footings, Walls and Grade Beams:
1. Use construction joints at temporary stopping of concrete placement or as indicated on Drawings.
2. Submit locations of joints desired for construction to Architect for acceptance.
3. Leave joints in reinforced structural members rough and provide longitudinal or vertical keys as indicated at least 1-1/2 inches deep.
4. Install continuous waterstop between pours wherever exterior grade is above interior floor level.

B. Slab Joint Layout: Locate joints as indicated on the Drawings or as otherwise accepted by Architect.
1. Locate under partitions wherever possible.
2. Center a control joint on each column line unless indicated otherwise.
3. Avoid creation of reentrant corners and panels with length greater than twice the width.
4. Coordinate joint locations with scored joints where indicated on Drawings.
5. Slabs on Grade:
a. Panels: Not longer than 12 feet in any direction.

C. Slab Construction Joints:
1. Place joint forms in straight line flush with finished surface and in accordance with manufacturer's recommendations.
2. Wire bottom alignment slots and bottom of key to metal support stakes.
3. Do not extend reinforcement through joint form unless so noted on Drawings.

D. Slab Construction Joints: Install diamond-shaped load plate dowels at formed construction joints in accordance with manufacturer's written instructions and using manufacturer-provided installation template and pocket former.
1. Locate dowels no closer than 6 inches from construction joint intersections.
2. Space dowels as indicated on Drawings.
3. Provide minimum 2-1/4 inch concrete cover to load plate dowel surface.
4. Insert pocket former into installation template in formwork for first slab placement.
5. Within two weeks of first slab placement and prior to second slab placement, insert load plates into pocket formers.

E. Formed Slab Control Joints:
1. Keyed Metal Control Joint Forms: Comply with requirements for construction joints.
2. Preformed Plastic Control Joint Forms: Insert joint forms into fresh concrete in straight line, accurately aligned, and flush with finished surface in accordance with manufacturer's recommendations.
3. Slabs to Be Covered by Finish Flooring: Sawed joints may be substituted for joint forms[except at slabs with embedded hydronic heating system].

F. Sawed and Tooled Slab-On-Grade Control Joints: See Section 03 35 00.

3.05 FORM COATING

A. Coat surface of formwork prior to each pour.

B. Apply in accordance with manufacturer's recommendations.

C. Apply coating prior to placing of reinforcement.

D. Promptly remove excess coating material.

E. Remove coatings of dust from contact surfaces of forms prior to depositing concrete.

3.06 SHORING, RESHORING AND REMOVAL OF FORMS

A. Shoring Design: Design shoring to take full load of concrete. Place directly above any reshoring occurring below and keep in place until structural members have obtained minimum concrete strength as called for on Drawings.
   1. Make shoring and reshore calculations available at request of Architect.

B. Removal of Forms: Comply with ACI 301 and the following. Remove forms only in manner to ensure safety of structure.
   1. Formwork not supporting weight of concrete such as sides of beams, walls, columns and similar parts of the Work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete provided the concrete is sufficiently cured to be undamaged by form removal operations and provided that supplementary curing and protection is provided for the exposed concrete.
   2. Formwork supporting weight of concrete such as beam soffits, joists, slabs and other structural elements may not be removed in less than 14 days or until concrete has attained 75 percent of design strength at 28 days, whichever is greatest.
      a. Form removal time may be altered if a reshoring program is used that is acceptable to the Architect and Structural Engineer.
      b. Potential compressive strength of cast-in-place concrete shall be determined by testing field-cured concrete specimens representative of the concrete location of members.
         1) Field-cured concrete specimens (as requested by the Contractor for early form removal) shall be made and tested by the Owner's testing facility and paid for by the Contractor.
   3. Form facing material may be removed 4 days after placement only if shores and other vertical supports have been designed and arranged to permit removal of form facing material without loosening or disturbing shores and supports.
   4. See also Cold Weather requirements in Section 03 30 00.

C. Reshoring: Comply with ACI 301 and the following.
   1. Remove forms and re-shore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support the work without excessive stress or deflection at time of form removal.
   2. Keep reshores in place a minimum of 15 days, and longer if required, until the concrete has attained its required 28-day strength and until heavy loads due to construction operations have been removed.

3.07 REUSE

A. Reuse forms to greatest extent possible without damaging structural integrity of concrete and without damaging aesthetics of exposed concrete.
   1. Form material will not be acceptable for reuse, if in opinion of the Architect, it will not produce finished surface required by these specifications or called for on Drawings.

B. Clean form material suitable for reuse before erection.

3.08 SITE QUALITY CONTROL

A. Special Inspection: See Section 01 45 00 Quality Control. Special inspection is required for the following work under this Section:
   1. Bolts secured in forms for embedment in cast-in-place concrete.

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Reinforcing bars for cast-in-place concrete.
   2. Welded wire fabric for cast-in-place concrete.
   3. Epoxy-coated steel reinforcement.
   4. Doweling for joints in slabs-on-grade.

B. Products Supplied But Not Installed Under This Section:
   1. Reinforcing steel for exterior concrete for: Section 32 13 13 Concrete Paving.

C. Related Requirements:
   1. General Notes on Structural Drawings.
   2. Sustainability Certification Project Procedures: Section 01 35 66.
   3. Formwork: Section 03 10 00 Concrete Forming and Accessories.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with listed reference standards except as modified by supplemental requirements on the Drawings or by these Specifications.
   1. ACI 117-10 – Specification for Tolerances for Concrete Construction and Materials.
   2. ACI 301-10 – Specifications for Structural Concrete.
   3. ACI 318-11 - Building Code Requirements for Structural Concrete, Parts 2 and 3.
   4. ASTM D3963 - Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

B. Guide References and Standard Practices:
   1. SP-66(04) – ACI Detailing Manual 2004.
   2. CRSI MSP - Manual of Standard Practice of the Concrete Reinforcing Steel Institute, 2009, 28th edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Multi-Section Assembly Coordination Requirements: Coordinate the work of this Section with work under the following Sections to provide complete assemblies indicated on the Drawings.
   1. Cast-in-Place Reinforced Concrete Foundations, Walls, Beams, Slabs and Other Elements:
      a. Section 03 30 00 Cast-In-Place Concrete.
   2. Heated Slabs:
      a. Section 03 30 00 Cast-In-Place Concrete.
      b. Division 23 Heating, Ventilation, and Air-Conditioning (HVAC).

B. Pre-Installation Conference: Attend cast-in-place concrete pre-installation conference. See Section 03 30 00.

1.04 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Shop Drawings:
   1. Indicate size, configuration, pertinent dimensions, number, exact position, and spacing of reinforcement and exact location of openings, framing, and special conditions affecting work.
   2. All shop drawings shall be original drawings produced by the subcontractor or supplier and shall not be reproductions of the Contract Documents.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Reinforcing Steel Suppliers: All reinforcing steel suppliers must meet the following qualifications in addition to any other requirements of the Project Manual.
      a. Business longevity under current business names of five years or more immediately prior to bidding this Project.

b. Previous experience showing successfully completed projects of similar size and complexity as this project involving fabrication of reinforcing steel.
c. Any change of reinforcing steel fabricator required as a result of failure to meet the above requirements shall be made at no additional cost to the Owner.

2. Reinforcing Steel Installers: All reinforcing steel placing contracts must meet the following qualifications in addition to any other requirements of the Project Manual.
   a. Business longevity under current business names of five years or more immediately prior to bidding this Project.
   b. Previous experience showing successfully completed projects of similar size and complexity as this project involving placing of reinforcing steel.
3. Welder Qualifications: Welding shall be performed by AWS certified welding operators only.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Reinforcing Steel: Unload and store reinforcing steel to keep clean. Store on timber skids while awaiting use.

C. Handling of Epoxy-Coated Reinforcing Bars: Comply with ASTM D3963.

PART 2 PRODUCTS

2.01 REINFORCING STEEL

A. Carbon Steel Reinforcing Bars: ASTM A615, Grade 60, except as follows, and unless otherwise indicated on Structural Drawings.
   1. Epoxy-Coated Bars: ASTM A775 or ASTM A934, and ASTM D3963.

B. Welded Wire Fabric: ASTM A185. Furnish in sheets.

C. Dowels for Joints in Slabs-On-Grade: ASTM A36 or A307 smooth round bars.
   1. Bar Size and Length: As indicated on the Drawings.
   2. Diameter: 3/4 inch.
   3. Length: 16 inches. Sawn to length, not sheared.
   4. Bond Break: Grease along half bar length.

2.02 ACCESSORIES

A. Tie Wire: No. 14 or No. 16 gauge, black, soft iron wire.

B. Wire Bar Supports and Spacers: Comply with CRSI MSP. Provide rigid support and clearances required in footings, walls, columns and flatwork.
   1. Against Exterior Exposed Surfaces or Interior Exposed Ceilings: Class 1, plastic protected, or Class 2, Type A, stainless steel protected.
      a. Stainless Steel: ASTM A493.
   2. Supported on Soil: Class 3. Provide earth-bearing plates.
   3. Supports and Spacers for Epoxy-Coated Reinforcement: Coated with epoxy or plastic, compatible with concrete, for minimum 2 inches each way from point of contact with bars.

C. All-Plastic Bar Supports: Comply with CRSI MSP. Provide rigid support and clearances as indicated. Do not use where construction traffic over supported bar mats will be required.

D. Precast Concrete Bar Supports: Comply with CRSI MSP.
   1. Locations: Use to support foundation mats, reinforcing bars and welded wire fabric in slabs-on-grade, and bars supported on fiber voids only.
   2. Types: Provide plain for single mats, doweled for double mats.
   3. Sizes:
      a. Depth: Sized to provide exact clearances indicated.
      b. Width and Length: 2 inches minimum, 6 inches maximum.

E. Epoxy Coating Patching Material: ASTM A775. Patching material shall be supplied by epoxy coating manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Reinforcement: Provide minimum 48 hour notice to Architect to allow for review of completed concrete reinforcement before placing concrete.

3.02 PREPARATION

A. Reinforcement: Clean prior to placing concrete to remove oil, soil, ice or other coatings that will destroy or reduce bond.

3.03 PLACEMENT

A. General: Comply with General Notes on Structural Drawings and ACI 318.

B. Bending:
   1. Bend reinforcement cold.
   2. Provide full-length bars, accurately bent to details by fabricator.
   3. Do not field-bend bars partially embedded in concrete except as indicated on the Drawings or specifically permitted by the Architect. Do not field-bend dowels adhesively bonded to concrete.

C. Placing:
   1. Place reinforcement accurately and hold firmly in place before and during the placing of concrete.
   2. Provide minimum concrete protective cover for reinforcement from the exterior face of members in accordance with ACI 318 and notes on Drawings.
   3. Provide bar supports and spacers to place bars in the proper location and wire adequately at intersections to hold bars firmly in position while concrete is placed.
   4. Project dowels adequately to provide Class B splice unless otherwise indicated. Wire bent dowels in place before pouring.
   5. Tolerances: Comply with ACI 117.

D. Supports and Spacers:
   1. Provide supports properly spaced and with sufficient strength to carry loads of reinforcing steel and deposited concrete without collapsing or allowing bars to sag.
   2. Use support chairs or bolsters attached to formwork to support vertical curtains of wall reinforcement. Use material of proper size to provide specified cover for reinforcement.
   3. Provide plastic coated or stainless steel protected bar supports and spacers where they will be in contact with concrete surfaces exposed to weather.
   4. Do not use bar supports to support runways for concrete buggies or similar loads.
   5. Brickbats or precast blocks used to support mats of bars only with acceptance of Architect.

E. Lap Splicing:
   1. Wherever it is necessary to splice reinforcement other than as indicated on Drawings, submit proposed splice locations to Architect for review and approval prior to construction.
   2. Do not splice at points of maximum stress nor splice adjacent bars at same point.
   3. Where spliced, lap continuous bars 48 diameters, but not less than 12 inches, unless otherwise indicated on the Drawings.

F. Dowels at Joints:
   1. Location: As shown on Drawings.
   2. Dowel Size and Position: As shown on Drawings. Dowels shall be kept horizontal and perpendicular to the joint, with a maximum variation of 1/4-inch in 8 inches.
   3. Method of Installation: Insert Dowels through side forms prior to start of pour and hold in position during concrete placement operations. Take care to keep the dowels in place during the pour.
   4. Grease: At construction joints, coat at least half the length of each dowel with petroleum grease.

3.04 WELDED WIRE FABRIC

A. Lay welded wire fabric continuously, with edges and ends overlapping adjoining sheets minimum of one full mesh, plus 2-inches, and not less than 6-inches, tied and placed over all piping and conduit.

B. Support fabric on bar supports at position indicated on Drawings.

C. Where required, construct bulkheads at construction joints and screeds to place fabric in proper position.

3.05 REPAIR OF DAMAGE TO EPOXY-COATING

A. Repair: Repair coating damage areas greater than 0.1 square inches and ends of field cut bars in accordance with coating manufacturer's recommendations.

B. Replacement: Epoxy-coated bars with coating damage greater than 2 percent of the total surface area in any single linear foot of the bar length shall be rejected. Replace with undamaged bar of the same size and length.

3.06 SITE QUALITY CONTROL

A. Inspection:
   1. Notify Architect and Structural Engineer at least 48 hours before reinforcing steel installation is ready for inspection.
   2. Coordinate scheduling of placement of concrete under Section 03 30 00 to allow sufficient time for Architect and Structural Engineer's observations of completed installation and for making any necessary adjustments to the reinforcing placement before delivery of concrete.
   3. For walls above 4 feet in height, notify Structural Engineer in time to allow observation of reinforcing before buttoning up forms.

B. Special Inspection: See General Notes on Structural Drawings and Section 01 45 00 Quality Control. Special Inspection is required for the following work under this Section.
   1. Placement of reinforcing steel for concrete requiring special inspection.
      a. See Section 03 30 00 for related requirements.
   2. Adhesive bonding of dowels into existing concrete.
   3. Welding of reinforcing steel.
   4. Periodic verification of weldability of reinforcing steel other than reinforcing steel conforming to ASTM A706.
   5. Mechanical connections for steel bar reinforcement.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete materials and placement.
   2. Cast-in-place structural concrete.
   3. Concrete materials and placement for slabs-on-grade.
   4. Concrete materials and placement for slabs on metal deck.
   5. Concrete for steel pan stairs and landings.
   6. Concrete mixes.
   7. Miscellaneous concrete.

B. Products Supplied But Not Installed Under This Section:
   1. Concrete for Section 32 13 13 Concrete Paving.

C. Related Requirements:
   1. Structural General Notes on Drawings.
   2. Sustainability Certification Project Procedures: Section 01 35 66.
   3. Quality Control and Testing: Section 01 45 00 Quality Control.
   4. Formwork: Section 03 10 00 Concrete Forming and Accessories.
   5. Steel Reinforcement: Section 03 20 00 Concrete Reinforcing.
   6. Concrete Finishing: Section 03 35 00.
   7. Polished Concrete Finishing: Section 03 35 43.
   8. Concrete Curing: Section 03 39 00.
   9. Non-Shrink Grout: Section 03 62 00 Non-Shrink Grouting.
   10. Metal Form Deck: Section 05 31 00 Steel Decking.
   11. Heated Slabs: Division 23 Heating, Ventilation, and Air-Conditioning (HVAC).
   12. Subgrade Preparation, Underslab Gravel and Compaction: Section 31 23 10 Excavation and Fill for Buildings.

1.02 REFERENCES

A. Reference Standards: Comply with following except as modified by supplementary requirements of this Project Specification.
   1. American Concrete Institute (ACI) Standards:
      a. ACI 117-10 – Specification for Tolerances for Concrete Construction and Materials.
      b. ACI 301-10 - Specifications for Structural Concrete.
      c. ACI 306.1-90 – Standard Specifications for Cold Weather Concreting.
      d. ACI 318-11 – Building Code Requirements for Structural Concrete, Parts 2 and 3.
      e. ACI 503.2-92 – Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive.
   2. ASTM International Standards:
      a. ASTM C94/C94M – Ready-Mixed Concrete.
      b. ASTM C494/C494M-11 – Chemical Admixtures for Concrete.
      c. Other ASTM standards as referenced in this Section or in ACI 301.

B. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.
   1. ACI 211.5R-01 – Guide for Submittal of Concrete Proportions.
   2. ACI 302.1R-04 – Guide for Concrete Floor and Slab Construction.
   3. ACI 305R-10 – Guide to Hot Weather Concreting.
   4. ACI 306R-10 – Guide to Cold Weather Concreting.
   5. ACI 309R-05 – Guide for Consolidation of Concrete.
   6. PCA – Design and Control of Concrete Mixtures.

C. Field References:

1. ACI SP-15 (10) – Field Reference Manual: Keep at least one (1) copy on site at all times.
2. Other reference standards, guide references and standard practices listed above shall be kept on site when directed by Architect or Engineer.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Before submittal of mix designs, hold conference with General Contractor's superintendent, independent testing laboratory, concrete formwork installer, reinforcement installer, concrete supplier, concrete installer, pumping equipment operator, and manufacturer(s) representative(s) in accordance with Section 01 31 00. Also notify Architect and Structural Engineer of meeting at least 10 days in advance.
   1. Discuss all matters pertaining to proper forming, reinforcement placement, concrete supply, concrete placing, concrete testing and concrete curing.
   2. Take minutes and distribute to attending parties, Architect and Structural Engineer.

B. Scheduling:
   1. Scheduling Snow Melt System Embedded in Concrete: Coordinate scheduling with Division 23 HVAC work.

1.04 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Design Data:
   1. Concrete Mix Designs: Not less than two (2) weeks prior to placing any concrete, submit written reports and laboratory tests of each proposed concrete mix for each class of concrete for acceptance.
      a. Submit for acceptance in accordance with Product Data provisions of Section 01 33 00 and ACI 211.5R.
      b. Concrete mix designs shall be proportioned by either the Field Experience Method or Laboratory Trial Batch Method in accordance with procedures in referenced ACI standards.
      c. The concrete mix designs shall conform to the requirements of this Specification and both ACI 301 and ACI 318.
      d. Mix designs prepared more than twelve (12) months prior to the date of submittal for review are not acceptable.
      e. Submit manufacturer's data and/or certifications verifying conformance of mix materials including admixtures with specified requirements.
      f. Include following:
         1) Mix identification designation.
         2) Statement of intended use for mix.
         3) Mix proportions, including admixtures.
         4) Wet and dry unit weight.
         5) Entrained air content.
         6) Design slump.
         7) Design compressive strength.
         8) Water/cementitious materials ratio
         9) Aggregate Source
         10) Strength qualification data.
      g. Strength Qualification Data:
         1) Submit required average strength qualification data and documentation in accordance with ACI 301 4.2.3.
         2) If trial batches are used to qualify average strength, mix design shall be prepared by an independent testing laboratory and shall achieve average compression strength a minimum of 1200 psi greater than specified strength with slump within one inch of maximum permitted and air content within 0.5 percent of maximum allowable.
         3) If field test data is used to qualify average strength, submit separate qualification data for each production facility that will supply concrete to Project, including copies of concrete testing agency's reports from which data was compiled.

h. Submit manufacturer's data and/or certifications documenting conformance of mix materials, including admixtures, with specified requirements.
i. Identify each mix-by-mix identification indicated in Article "Concrete Mix Types."

C. Samples:
1. Submit samples of stained colored concrete for color selection. Coordinate with Section 03 35 43.

1.05 QUALITY ASSURANCE

A. Mock-Ups: Supply and place concrete for mock-up panels.
1. Supply concrete and place for polished slab mock-up panel required under Section 03 35 43.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Delivery and Acceptance Requirements:
1. Ready-Mixed Concrete: Materials handling and batching shall conform to applicable provisions of ASTM C94.
a. Hauling Time: Discharge concrete transmitted in truck mixer, agitator or other transportation device within 1-1/2 hours after mixing water has been added.
b. Deliver concrete to site in exact proportions required by design mix.
c. Extra Water: Should extra water be required for workability before depositing concrete and water/cementitious material ratio of accepted mix design will not be exceeded thereby, General Contractor's superintendent shall have sole authority to authorize addition of water.
1) Additional water added to mix after leaving batch plant shall be indicated on truck ticket and signed by person responsible.
2) Where extra water is added to concrete it shall be mixed thoroughly for 50 revolutions of drum before depositing.
3) Water may be added at the site only once for each batch.
d. Redosage with High Range Water Reducing Admixture (Superplasticizer): May be done with prior acceptance of Architect regarding dosage and time periods.
e. Return excess concrete to supplier.
f. Minimize water used to wash mixing and delivery equipment.
2. Chemical Products: Deliver products in original unopened manufacturer's containers with labels intact.

C. Storage and Handling Requirements:
1. Chemical Products: Comply with Manufacturer's printed instructions. Store in an interior, cool, dry place at above 45 degrees F.
a. Material temperature shall be at least 50 degrees F before use.

1.07 AMBIENT CONDITIONS

A. Cold Weather Placement:
1. When for three successive days prior to concrete placement the average daily outdoor temperature drops below 40 degrees F or when the average outdoor temperature is expected to drop below 40 degrees F on the day of concrete placement, preparation, protection and curing of concrete shall comply with ACI 306.1.
2. Minimum temperature of concrete upon delivery shall conform to ACI 301 4.2.2.7. Concrete temperature at placement shall conform to minimum values of ACI 306.1 Table 3.2.1, and shall not exceed minimum values by more than 20 degrees F..
3. Subject to acceptance of Architect, an accelerating admixture may be used. Admixtures shall meet requirements of Part 2. Calcium chloride and other chloride-type accelerating admixtures will not be allowed.
4. Subject to acceptance of Architect, Contractor may substitute cement for equal weight of fly ash in design mix.
5. Comply with concrete protection temperature requirements of ACI 306.1. Record concrete temperatures during specified protection period at intervals not to exceed 16 hours and no less than twice during any 24-hour period.

6. Provide strong and secure weather protection around the building for at least one story above and one story below the floor being concreted to allow the floor to maintain temperatures between 50 and 70 degrees F for not less than 72 hours after depositing. Obtain one (1) temperature reading of air at floor level for each 600 square feet of floor area just prior to concreting, and provide additional heat should the measured temperature be less than 50 degrees F. Record and submit temperature readings for Architect and Structural Engineer review no later than 24 hours after concreting.
7. Submittal of detailed procedures, means, and methods for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather is not required.

B. Hot Weather Placement:
1. When depositing concrete in hot weather, follow recommendations of ACI 305R.
2. Temperature of concrete at time of placement shall not exceed 85 degrees F.
3. When air temperatures on day of placement are expected to exceed 90 degrees F, mix ingredients shall be cooled before mixing. Flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for all or part of mix water.
4. Retarding Admixture may be used subject to acceptance of Architects Admixtures shall meet requirements of Part 2.
5. Protect to prevent rapid drying. Start finishing and curing as soon as possible.

C. Wet Weather Placement: Unless adequate protection is provided, concrete shall not be placed during rain, sleet, or snow. Rainwater shall not be allowed to increase the mixing water nor to damage the surface finish.

D. Application of Epoxy Adhesives and Joint Fillers: Condition all components to between 75 degrees F and 90 degrees F for a minimum of 24 hours prior to mixing and placement.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Concrete Materials, General: Provide materials in accordance with ACI 301, 4.2.1 unless amended or superseded by requirements of this section or General Notes on Structural Drawings.

B. Cementitious Materials: Sourced within 500 miles of the building site.
1. Portland Cement: ASTM C150.
   a. Type: Type I/II.
2. Supplementary Cementitious Materials:
   a. Fly Ash: ASTM C618, Class C or F. Pre-consumer (post-industrial) recycled coal fly ash byproduct of coal burning at electric utility plants.
      1) Allowable Fly Ash Replacement of Portland Cement in Concrete Mixes: See Article "Proportioning and Design of Concrete Mixes".

C. Aggregate: Sourced within 500 miles of the building site.
1. Fine Aggregate: Natural sand.
2. Coarse Aggregate: Gravel or crushed stone containing no deleterious substances that cause surface spalling.
3. Normal Weight Aggregate: ASTM C33, obtained from same source throughout Project.
   a. Aggregate for Concrete Floor Mixes: Contain 0.2 percent or less coal, lignite, or low-density deleterious material.
4. Aggregate for Colored Concrete: Buff or gray aggregate only. Pink not allowed. One source for all concrete.

D. Water: Potable.

E. Air Entraining Admixture: ASTM C260/C260M-10a.

F. Chemical Admixtures:
1. Water Reducing Admixture: ASTM C494, Type A. One of the following:
   a. BASF - Pozzolith 200 N or 322 N.
   b. Euclid - Eucon WR-75, WR-89, or WR-91.
   c. Sika Plastocrete 161.

d. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.

2. High Range Water Reducing Admixture (Superplasticizer): ASTM C494, Type F or G. One of the following:
   a. BASF - Rheobuild 1000.
   b. Euclid Eucon 37 or 537.
   c. Grace Construction Products. – Daracem 19.
   d. Sika - Sikament 300.
   e. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
3. Non-Corrosive, Non-Chloride Accelerator: ASTM C494. Type C or E, containing not more chloride ions than present in municipal drinking water and with long term test data from independent testing laboratory providing non-corrosive effect on reinforcing steel. Calcium chloride and admixtures containing more than 0.10 percent chloride ions or sodium thiocyanates not allowed. One of the following:
   a. Euclid Accelguard 80 or 90.
   b. Grace Construction Products. – Daraset 400.
   c. Sika Plastocrete 161 FL.
   d. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
4. Water-Reducing, Retarding Admixture: ASTM C494, Type D. One of the following:
   a. Euclid Eucon Retarder 75
   b. Grace Construction Products. – Daratard-17
   c. Sika Plastocrete 161R
   d. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.

2.02 PROPORTIONING AND DESIGN OF CONCRETE MIXES

A. Reference Standards: ACI 301 Section 4, and ACI 318, Chapter 4.

B. Design: Conform to General Notes on Structural Drawings. Proportion ingredients for mixes in accordance with ACI 301 4.2.2 and 4.2.3.
   1. Should Contractor require special mix due to structural requirements, weather or materials, submit samples of cement and aggregate to be used to approved testing laboratory. Testing laboratory will make analysis of materials and design proper mix to be used.

C. Supplementary Cementitious Materials: Fly ash will be allowed as a cementitious component of any mix unless otherwise indicated under Concrete Mix Types. Fly ash shall not exceed 20 percent of total cementitious material by weight, nor limitations indicated in Schedule of Concrete Mixes.

D. Aggregate: Maximum coarse aggregate size as indicated under Concrete Mix Types.

E. Admixtures: No admixtures will be allowed except as specified unless authorized by the Architect. All requests for approval or substitution must be made by the General Contractor and be accompanied by sufficient information and test data for evaluation.
   1. All admixtures shall be chemically compatible with cementitious materials and all other admixtures used in the mix.
   2. All admixtures shall be chloride free. No calcium chloride shall be added to concrete.
   3. Air Entrainment: All concrete work that will be exposed to frost action in its final form shall contain an air-entraining agent. Other concrete work may also have an air-entraining agent at the option of the Contractor unless otherwise specified under Concrete Mix Types.
   4. Water Reducing Admixture: Use where indicated in Schedule of Concrete Mixes and other locations at Contractor's option.
   5. Non-Corrosive, Non-Chloride Accelerator: Use at all concrete slabs placed at air temperature below 50 degrees F.
   6. Superplasticizer: Contractor's option at:
      a. All pumped concrete.
      b. Concrete with water/cement ratio below 0.50.

F. Chloride Ions: Maximum water-soluble chloride ion concentration in all concrete mixes shall not exceed 0.15 percent by weight of cementitious materials, except as follows.
   1. Concrete Over Metal Decks: Maximum 0.06 percent.

G. Strengths: 4,500 psi unless otherwise indicated or scheduled.

H. Water/Cementitious Material Ratio: Conform to ACI 301, 4.2.2, and ACI 318, Chapter 4, as modified herein and as scheduled in General Notes on Structural Drawings. Comply with strictest applicable requirement:
   1. Concrete Placed by Pumping: 0.50 maximum.
   2. Concrete with Design Strength of 4,000 psi or Greater: 0.50 maximum.
   3. Concrete Exposed to Weather or Freeze-Thaw Including Paving, Site Work and Exterior Slabs: Meet requirements of ACI 301 and 318 Tables 4.2.2 and 4.2.3 except that concrete shall have a water-cement ratio not exceeding 0.45.
   4. Concrete for Floor Slabs to Receive Coating, Carpeting, or Adhered Flooring: 0.45 maximum.
   5. Calculation of Water-Cementitious Material (w/cm) Ratios: Water includes free surface moisture on aggregates and liquid admixture.
   6. Provide minimum cement content of 470 lbs. per cubic yard unless otherwise indicated or scheduled.

I. Slump: Design concrete mixes to provide slumps indicated under Mix Types.
   1. Concrete Containing High Range Water Reducing Admixture (Superplasticizer): Slump of 2 to 3 inches upon arrival at site, maximum slump of 8 inches after addition of superplasticizer.
   2. Other Concrete: Maximum 4 inches.

J. Concrete for Floors: Follow recommendations of ACI 302.1R except as otherwise specified. In addition to other requirements specified, concrete for floors shall be proportioned to comply with the following:
   1. Proportion concrete to minimize shrinkage.
   2. Concrete for trowel-finished interior floors shall be non-air-entrained.
   3. Aggregate Grading: Grade aggregate to optimize finishing characteristics of mix while minimizing drying shrinkage and mixing water requirement.
      a. Fine Aggregate Grading: Comply with ACI 302.1R, Table 5.1.
      b. Coarse Aggregate Grading: Comply with the following unless otherwise specified.
         1) Maximum Coarse Aggregate Size for Slabs 5-inches and Thicker: 1½-inch.
         2) Maximum Coarse Aggregate Size for 4-Inch Thick Slabs: 1-inch.
         3) Maximum Coarse Aggregate Size for Slabs on Metal Deck: ¾-inch.
      c. Combined Aggregate Grading:
         1) The percent retained on two adjacent sieve sizes shall be not less than 5 percent.
         2) The percent retained on three adjacent sieve sizes shall not be less than 8 percent.
         3) When the percent retained on each of two adjacent sieve sizes is less than 8 percent, the total percent retained on either of these sieves and the adjacent outside sieve shall be at least 13 percent.
   4. Cementitious Material Content: Comply with ACI 301, Table 4.2.2.1. Provide amount necessary to properly cut, trim, finish, and compact the floor slab surface.
   5. Proportion concrete to include Type A water-reducing admixture or Type F or G high-range water-reducing admixture.
   6. Concrete for Floors Subject to Vapor Emission Limitations: Design mix with minimum water content necessary for proper placement, so that, after curing and drying, moisture content can be controlled to within 3 pounds per 1000 square foot over 24 hours using quantitative testing methods specified in Section 09 05 61.
      a. Water content of mix shall be limited to that required to produce a slump between 2 and 3 inches prior to addition of water-reducing admixture.
         1) Maximum Slump at Placement with Type A Water-Reducing Admixture: 4 inches..
         2) Maximum Slump at Placement with High-Range Water-Reducing Admixture: 8 inches.
      b. Maximum Water/Cementitious Material Ratio: 0.42.

K. Concrete Design Mix Schedule: In addition to all requirements indicated by General Notes on Structural Drawings, design mix for each concrete component or application to meet the following criteria.
   1. Mix SC1 - For Footings, Formed Piers, Columns, and Walls:

a. 4,500 psi minimum compressive strength at age of 28 days.
b. Minimum of 470 pounds of total cementitious materials per cubic yard.
c. Type I/II Cement.
d. 1 Inch Maximum Aggregate Size.
e. 6% + 1-1/2% Entrained Air.
f. 4 Inch (8 Inches with Superplasticizer) Maximum Slump.

2. Mix FL1 - For Interior Slabs-On-Grade, Including Garage Floor Slab:
   a. 4,500 psi minimum compressive strength at age of 28 days.
   b. Minimum of 540 pounds of total cementitious materials per cubic yard.
   c. Fly ash not allowed.
   d. Type I/II Cement.
   e. 3/4 Inch Maximum Aggregate Size.
   f. 4 Inches (8 Inches with Superplasticizer) Maximum Slump.
   g. No air entraining admixture (3% maximum air)
   h. Water Reducing Agent: Use in accordance with manufacturer's recommendations.
   i. See Paragraph "Concrete for Floors" in Article "Proportioning and Design of Mixes for additional requirements.
3. Mix FL2 - For Structural Beams and Slabs:
   a. 4,500 psi minimum compressive strength at age of 28 days.
   b. Minimum of 540 pounds of total cementitious materials per cubic yard.
   c. Fly ash not allowed.
   d. Type I/II Cement.
   e. 3/4 Inch Maximum Aggregate Size.
   f. 4 Inches (8 Inches with Superplasticizer) Maximum Slump.
   g. No air entraining admixture.
   h. Water Reducing Agent: Use in accordance with manufacturer's recommendations.
   i. See Paragraph "Concrete for Floors" in Article "Proportioning and Design of Mixes for additional requirements.
4. Mix FL3 - For Slabs on Metal Decking:
   a. 4,500 psi minimum compressive strength at age of 28 days.
   b. Minimum of 540 pounds of total cementitious materials per cubic yard.
   c. Fly ash not allowed.
   d. Type I/II Cement.
   e. 3/4 Inch Maximum Aggregate Size.
   f. 4 Inches Maximum Slump.
   g. Water Reducing Agent: Use in accordance with manufacturer's recommendations.
   h. See Paragraph "Concrete for Floors" in Article "Proportioning and Design of Mixes for additional requirements.
5. Mix FL4 - For Topping Slabs at Exterior Decks:
   a. 4,500 psi minimum compressive strength at age of 28 days.
   b. Minimum of 540 pounds of total cementitious materials per cubic yard.
   c. Fly ash not allowed.
   d. Type I/II Cement.
   e. 3/4 Inch Maximum Aggregate Size.
   f. 4 Inches Maximum Slump.
   g. 6% + 1-1/2% Entrained Air.
   h. Water Reducing Agent: Use in accordance with manufacturer's recommendations.
   i. See Paragraph "Concrete for Floors" in Article "Proportioning and Design of Mixes for additional requirements.
6. Mix FL5 - For Concrete Stair Pans and Landings:
   a. 4,000 psi minimum compressive strength at age of 28 days.
   b. Minimum of 540 pounds of total cementitious materials per cubic yard.
   c. Fly ash not allowed.
   d. Type I/II Cement.

e. Aggregate: 1/2-inch maximum size, graded to maximize gravel and minimize sand.
f. Slump: 2 inches minimum, 4 inches maximum (8 Inches with Superplasticizer).
g. No air entraining admixture.
h. Water Reducing Agent: Use in accordance with manufacturer's recommendations.
i. See Paragraph "Concrete for Floors" in Article "Proportioning and Design of Mixes for additional requirements.

7. Mix P1 - For Sidewalks, Concrete Paving and Other Exterior Concrete: See Section 32 13 13.

2.03 BATCHING AND TRANSIT MIXING

A. Provide ready-mixed concrete in accordance with ASTM C94. On-site mixed concrete not allowed.

2.04 ADHESIVES AND BONDING COMPOUNDS

A. Epoxy Adhesives for Use in All Structural Repairs: Two-component. 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces and in compliance with ASTM C881.
1. Acceptable Manufacturers and Products:
a. Euclid Chemical Company; www.euclidchemical.com - Euco Epoxy 452 or 620.
b. Sika Corporation; www.sikaconstruction.com - Sikadur 32 Hi-Mod or Armatec 110.
c. US Mix Products Co.; www.usspec.com – Gelbond or Maxi-Bond.
d. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
2. Viscosity: Use formulation appropriate to type of repair and installation limitations. Where epoxy injection procedures are used, use low viscosity epoxy made by one of above manufacturers.

B. Bonding Compound (Interior only): Re-emulsifiable polyvinyl acetate emulsion. Use only at areas not subject to moisture.
1. Acceptable Manufacturers and Products:
a. Euclid Chemical Company; www.euclidchemical.com - Euco Weld.
b. Larsen Products – Weldcrete.
c. US Mix Products Co.; www.usspec.com – Bondcoat.
d. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.

2.05 SOURCE QUALITY CONTROL

A. Architect shall be offered uninterrupted access to ready-mix batching plant while work is in progress.

PART 3 EXECUTION

3.01 EXAMINATION

A. Architect's Review: Provide minimum of 48-hour notice to Architect to allow for review of forms and reinforcement just before concrete is placed and for observation of concrete placement.

B. Contractor's Review: Contractor shall inspect forms and reinforcing prior to concrete placement to assure accurate placement of embedded items.

3.02 INSTALLATION, GENERAL

A. Install concrete work in accordance with ACI 301, paragraphs as listed, unless amended or superseded by this section or notes on Structural Drawings.

B. Installation Tolerances: Comply with ACI 117.

3.03 PREPARATION

A. Do not begin concrete work until operations are complete enough to allow placement to be carried on as a continuous operation.

B. Clean equipment for mixing and transporting the concrete.

C. Clean forms of debris and ice.

D. Wet (except in freezing weather) and coat temporary forms as specified in Section 03 10 00. If water accumulates in the forms, pump it out before concrete is deposited.

E. Clearly mark finish top surface of vertical members on the form walls.

F. Protection: Cover masonry walls, glazing, and other finish materials with polyethylene or otherwise protect from damage due to placing of slabs, sidewalks or floors above.

3.04 PLACEMENT

A. General: Comply with ACI 301, Section 5.

B. Placement: Place concrete in approximately uniform horizontal layers not over twelve inches in height. Piling up of concrete in forms or chuting in manner to separate aggregates will not be permitted. Do not drop concrete in free fall over 5 feet.

C. Water: Prevent accumulations of water on surface of concrete due to water gain, segregation, or other causes, during placement or compacting. Make provision for removal of water as may accumulate so that concrete not be placed in such accumulation.

D. Consolidation: Consolidate concrete during and immediately after depositing by means of mechanical vibrators. Supplement by hand spading at corners and angles of forms, around embedded fixtures and in other difficult areas.
   1. Mechanical Vibrator: Comply with ACI 301, Table 5.3.2.5.
   2. Do not use vibrators to transport concrete inside forms.
   3. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.
   4. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set.
   5. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

E. Finishing: Section 03 35 00.

3.05 CONSTRUCTION JOINTS OF STRUCTURAL MEMBERS

A. Construction Joints of Structural Members: ACI 301 5.3.2.6. Use polyvinyl acetate bonding compound, applied as recommended by manufacturer.
   1. Joints Subject to Moisture: Do not use bonding compound, use epoxy adhesive.
   2. Use of other bonding methods such as surface retarder, Portland cement grout, or roughening of surface not allowed without written acceptance of Architect.

3.06 FLATWORK

A. Interior Slabs and Parking Garage Slabs: Finish in accordance with Section 03 35 00.

B. Exterior Slabs: Installed under Section 32 13 13.

3.07 CURING AND PROTECTION

A. Comply with Section 03 39 00

B. Form Removal: Do not remove forms until times as specified. Remove carefully to not injure concrete surface. Protect edges and corners to prevent cracking, chipping or other damage and premature drying.

C. Protection: Protect concrete surfaces from staining, cracking, chipping, and other damage during progress of the work, and leave in good condition upon completion.
   1. Protect freshly placed concrete from rain damage.
   2. Protect finished slabs from mortar leakage from pouring of slabs above.

3.08 FINISHING OF HARDENED CONCRETE

A. Finishing, Patching, Treatment of Formed Surfaces, and Repair of Surface Defects: Section 03 35 00.

3.09 MISCELLANEOUS CONCRETE REQUIREMENTS

A. Other Concrete Work: Furnish and install other concrete work indicated on Drawings, even though not specifically mentioned herein to complete work, including following:
   1. Anchors: Install anchors furnished under other Sections in accordance with accepted shop drawings for structural and miscellaneous steel.
   2. Equipment Bases: Furnish and install concrete bases for pumps, boilers, tanks, fans, transformers, floor mounted electrical equipment, etc. as indicated. Furnish and install concrete fill in inertia base frames provided under Division 22 or Division 23. Install anchor bolts and

inserts in accordance with setting diagrams furnished by contractor responsible for installing the equipment. Finish bases in workmanlike manner with troweled finish. Locate and size bases as determined by contractor furnishing equipment.

3. Supply concrete for signage, fencing, and bases of miscellaneous items indicated on Site Drawings.
   a. Supply concrete for fence post footings installed under Division 32 – Exterior Improvements.
   b. Site Signage: Coordinate with work specified in Section 10 14 53 Traffic Signage.
   c. Light Pole Bases: Form and pour light pole bases shown on Electrical Drawings. Coordinate with work specified in Division 26 Electrical.
4. Fence Post Sleeves: Furnish and install sleeves for fencing to be furnished and installed by Owner. Coordinate sizes and locations with Owner. Concrete encasement as indicated.
5. Concrete Benches: Form and pour concrete benches indicated on site Drawings. Provide smooth finish with chamfered edges as detailed. Slope top for drainage.
6. Supply concrete for bollards indicated on Site Drawings.
7. Steel Angle Corner Guards: Section 05 50 00. Install steel angle corner guards at exposed garage concrete columns. Extend 4 feet above floor.

3.10 SITE QUALITY CONTROL

A. Reference Standard: ACI 301, 1.6 and 1.7.

B. Contractor's Quality Control: The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.
   1. Inspection or testing by the Owner does not relieve Contractor of his responsibility to perform the Work in accordance with the Contract Documents.
   2. Workmanship: The Contractor is responsible and shall bear the cost of correcting concrete work which does not conform to the specified requirements, including, but not limited to, strength, tolerances, and finishes. Correct deficient concrete by means acceptable to the Architect. The cost of extra work incurred by the Architect to approve corrective work shall be borne by the Contractor.

C. Record of Work: Keep record listing time, location and date of placement of concrete for structure. Keep such record until completion of Project and make available to Architect for examination at any time.

D. Testing Agency: Testing will be conducted by an approved testing laboratory. See Section 01 45 00.
   1. Test Reports: Reports of control tests, special tests and core tests shall be distributed by independent testing laboratory in accordance with Section 01,45,00. Test reports will be reported, in writing, to Architect, Structural Engineer and Contractor on same day tests are made. Test reports shall be numbered identically to test specimen sets. Show all cylinders of a given set on one report. Submit and re-submit same report to show tests of subsequent cylinders of same set. Reports of compressive strength test shall include a minimum of the following.
      a. Name of concrete testing service.
      b. Project identification name and number.
      c. Test report (specimen set) number.
      d. Date of concrete placement.
      e. Copy of concrete batch ticket for specimen set.
      f. Concrete type and class.
      g. Location of concrete batch in structure.
      h. Design compressive strength in 28 days.
      i. Concrete mix proportions and materials.
      j. Compressive breaking strength of each cylinder of set.
      k. Type of break for both 7 day test and 28 day tests.
      l. Identification of lab and field cured cylinders.

E. Test Priority: Control tests shall be used to determine concrete quality throughout Project; however, special tests shall have precedence over control tests, and core tests shall have precedence over all previous tests.

F. Tests: Cooperate fully with those making tests. Following tests and procedures are subject to change during construction at discretion of Architect:
   1. Sample Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94 as indicated below. All tests shall be associated by reference to particular batch ticket. Sample concrete at point of placement.
   2. Slump Tests: The General Contractor shall provide necessary equipment and shall make tests in conformity with ASTM C143. The Contractor shall make one (1) test for each concrete load at point of discharge; one (1) test for each set of compressive strength test specimens; and as often as deemed necessary by the Contractor to maintain the required slump and adequate records. In addition, the Contractor shall make slump tests when directed by the Architect or Engineer.
      a. Tests shall be made by person thoroughly familiar with requirements specified.
      b. Should slump exceed limits stated Concrete Mix Types in Part 2, batch shall be rejected.
      c. Keep accurate record of time, location in work and results of slump tests that shall be available for inspection by Owner and Architect.
   3. Concrete Temperature: Test each load at time of arrival. At point of discharge test hourly when temperature is 40 degrees F and above. Test each time a set of compression test specimens are made.
   4. Control Tests:
      a. Control tests of concrete shall be made on every 50 cubic yards or fraction thereof of concrete placed and, in any case, minimum of once during each day's placement. Each test sample shall consist of six standard 6 inch test cylinders cast and cured in accordance with ASTM C31 and ASTM C172.
         1) When total quantity of a given class of concrete is less than 50 cu. yards, control test may be waived by Architect if, in his/her judgement, adequate evidence of satisfactory strength and concrete quality is provided.
         2) Where cold weather placing conditions occur, as defined in this Specification, two (2) additional standard cylinders are required for each complete set of test specimens. These two cylinders shall be field cured, at a location determined by the Testing Agency. Where field cured specimens are required, Contractor shall be responsible for storage, temperature control, and protection of specimens while at site. Testing Agency shall be responsible for handling and transportation of specimens.
         3) Should Contractor desire control tests to facilitate early removal of forms. They shall be made in addition to those specified for control tests and shall be completely site-cured. Expense for making additional test cylinders, testing, curing and protection shall be Contractor's.
         4) If the concrete load is redosed with superplasticizer after the required set of cylinders has been taken, then an additional set of cylinders shall be taken as required herein. This extra set shall not count against the regular number of required test cylinders and shall be paid for by the Contractor.
      b. Tests shall be made at time control tests are taken and so stated in reports to determine slump, air content, unit weight and temperature of concrete.
         1) Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete. ASTM C231, pressure method for normal weight concrete. One (1) for each of compressive strength test specimens.
         2) Unit Weight: Determine unit weight of normal weight concrete in accordance with ASTM C138.
      c. Compressive Strength Tests: ASTM C39.
         1) Two cylinders shall be broken at end of seven days after placing, two cylinders shall be broken at end of 28 days after placing, and remaining cylinders shall be stored until their disposition is determined by Architect. In general, remaining cylinders will be broken only when previous test reports indicated unsatisfactory results. Tests on remaining cylinders shall be at expense of the Contractor.
         2) Where cold weather field cured specimens are required, transport and test one (1) specimen with companion laboratory cured specimen at seven (7) days and transport

and test the remaining field cured specimen with companion laboratory cured specimens at twenty-eight (28) days.

3) Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

d. Architect reserves right to stop future concrete work when seven or 28 day tests indicate unsatisfactory results until, in his opinion, proper corrective measures have been taken to ensure quality concrete in future work and corrections deemed necessary have been made.

5. Core Tests:
   a. If, at any time, concrete control test specimens show compressive strength of 28 days below required level, or if concrete has been frozen before it has taken final set, so severely that, in opinion of Architect, its strength has been adversely affected, Contractor shall, at his own expense, have sufficient core tests taken, number and location to be accepted by Architect on such portions of work as may have been affected to determine actual conditions of concrete.
   b. Securing, Preparing and Testing: ASTM C42. Should tests reveal that concrete does not meet requirements of this specification, Contractor shall, at his own expense, replace entire section involved or make corrections deemed necessary by Architect.
6. Load Tests:
   a. Should core tests as previously outlined be deemed by Contractor to be inadequate or insufficient, he may at his own expense when authorized by Architect perform load tests on areas in question.
   b. Areas selected for testing shall be accepted by Architect, and test results shall be made in accordance with ACI 318.

G. Special Inspection: See Section 01 45 00 Quality Control and General Notes on Structural Drawings. Special Inspection is required for the following work under this Section.
   1. Placement of structural concrete with design strengths greater than 2,500 psi. Slabs-on-grade not included.
   2. See Section 03 10 00 and Section 03 20 00 for additional requirements.

H. Vapor Emission Testing, Alkalinity Testing and Bond Testing for Floor Slabs: Section 09 05 61 Common Work Results for Flooring Preparation.

3.11 CLEANING AND WASTE MANAGEMENT

A. Comply with applicable requirements of Sections 01 50 00 and 01 74 19.

B. Waste Management:
   1. Formwork: Reuse forms to greatest extent possible without damaging structural integrity of concrete and without damaging aesthetics of exposed concrete.
   2. Mixing Equipment: Return excess concrete to supplier; minimize water used to wash equipment.
   3. Moisture Curing: Prevent water run-off.

END OF SECTION

SECTION 03 3500
CONCRETE FINISHING

PART 1 GENERAL

1.01 SUMMARY

A. Work Results:
   1. Finishing top surface of freshly placed concrete in wall forms.
   2. Finishing freshly placed concrete floor slabs-on-grade, concrete floor slabs on metal deck, and concrete topping slabs.
      a. Finishing parking garage floor slabs.
      b. Hand-tooled and sawed control joints.
   3. Concrete floor slab flatness requirements, testing and surface tolerance verification.
   4. Finishing cured concrete floor slabs.
      a. Sealing Class 1 floor slabs not receiving other concrete finish or finish flooring.
      b. Sealing Class 4 floor slabs not receiving other concrete finish or finish flooring.
      c. Sealing, densifying, hardening, and dustproofing Class 5 floor slabs.
   5. Treatment of formed surfaces.
   6. Architectural concrete finishing.
   7. Repair of surface defects.

B. Related Requirements:
   1. Sustainability Certification Project Procedures: Section 01 35 66.
   2. Low-Emitting Material Requirements: Section 01 61 65.
   3. Forming: Section 03 10 00 Concrete Forming and Accessories.
   4. Placing and Consolidating Concrete: Section 03 30 00 Cast-In-Place Concrete.
   5. Polished Concrete Finishing: Section 03 35 43.
   6. Concrete Curing: Section 03 39 00.
   7. Silane Water Repellents: Section 07 19 16.
   8. Joint Sealing: Section 07 92 00 Joint Sealants.
   9. Common Work Results for Flooring Preparation: Section 09 05 61.

1.02 REFERENCES

A. Definitions:
   1. Class 1 Floor: Single course concrete floor slab designed to remain exposed in service and to bear foot traffic only.
   2. Class 2 Floor: Single course concrete floor slab designed to receive applied floor covering and to bear foot traffic only.
   3. Class 4 Floor: Single course concrete floor slab designed to remain exposed in service or to receive applied floor covering and to bear foot traffic and light vehicular traffic.
      a. Includes new single-course parking garage floor slabs bearing on subgrade.

B. Reference Standards: Comply with following except as modified by supplementary requirements of this Project Specification.
   1. American Concrete Institute (ACI) Standards:
      a. ACI 117-10 – Specification for Tolerances for Concrete Construction and Materials.
      b. ACI 301-10 - Specifications for Structural Concrete.

C. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.
   1. American Concrete Institute (ACI) Committee Reports, Guides, Standard Practices, and Commentaries:
      a. ACI 302.1R-04 – Guide for Concrete Floor and Slab Construction.
   2. American National Standards Institute (ANSI) Standards:
      a. ANSI A108 - American National Standard Specifications for Installation of Ceramic Tile:
         1) A108.01 – General Requirements: Subsurfaces and Preparations by Other Trades – 2010 (Revised).

3. ASTM International Standard Practices:
   a. ASTM F710-11 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

D. Field References:
   1. ACI SP-15 (10) – Field Reference Manual: Keep at least one (1) copy on site at all times.
   2. Other reference standards, guide references and standard practices listed above shall be kept on site when directed by Architect or Engineer.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Comply with requirements of related Division 03 sections for concrete forming, placement, and curing.
   2. Concrete Floor Slabs: Coordinate with requirements of Section 09 05 61 and with various finish flooring sections under Division 09 to ensure concrete finishing is proper to receive finish flooring. Comply with requirements of various Sections for slab tolerances, finishes, curing, etc. Be responsible to repair or replace slabs as required and specified in those sections to meet flooring requirements.

B. Concrete Floor Slab Pre-Installation Conference: Between 1 and 2 weeks prior to beginning placement of concrete floor slabs, hold conference with General Contractor's superintendent, independent testing laboratory, concrete formwork installer, reinforcement installer, concrete supplier, concrete flatwork contractor, pumping equipment operator, finish flooring installer(s) and manufacturer(s) representative(s) in accordance with Section 01 31 00.
   1. Notify Architect and Structural Engineer of meeting at least 10 days in advance.
   2. Discuss all matters pertaining to underslab vapor retarder installation, proper forming, reinforcement placement, concrete supply, concrete placement, concrete testing, concrete curing, concrete finishing, vapor emission control and preparation of slabs to receive finish flooring.
   3. Take minutes and distribute to attending parties, Architect and Structural Engineer.

1.04 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Product Data: Submit copies of manufacturer's current catalog literature for the following:
   1. Sealers.
      a. VOC Data: Provide a cut sheet and Material Safety Data Sheet (MSDS) for every sealer and liquid chemical treatment compound used within the building with VOC levels highlighted. Refer to Section 01 61 65 for specific VOC content limits.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Concrete flatwork finisher shall have a minimum of two years experience on equivalent projects.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Delivery and Acceptance Requirements:
   1. Deliver products in original unopened manufacturer's containers with labels intact.

C. Storage and Handling Requirements: Comply with Manufacturer's printed instructions.
   1. Sealers: Store in an interior, cool, dry place at above 45 degrees F.
      a. Material temperature shall be at least 50 degrees F before use.

1.07 AMBIENT CONDITIONS

A. General: Comply with Section 03 30 00.

B. Acrylic Sealing:
   1. Cold Weather: Do not apply sealer when the temperature of the concrete is below 40 degrees F.
   2. Humidity: Do not apply sealer when the relative humidity is 80 percent or above.

PART 2 PRODUCTS

2.01 PRODUCT OPTIONS

A. Substitution Requests: Required for all manufacturers and products not named as Acceptable.
   1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
   2. During Construction Phase: Submit in accordance with Section 01 25 00.

2.02 EVAPORATION RETARDANTS

A. Acceptable Manufacturers and Products:
   1. BASF; www.basf-admixtures.com, Master Builders brand – Confilm (MasterKure ER 50).
   2. L&M Construction Chemicals, Inc.; www.lmcc.com – E-Con.
   3. US Mix Co.; US Spec division;www.usspec.com – Monofilm ER.

2.03 SEALERS FOR FLOOR SLABS

A. All concrete sealers and other concrete treatment products shall be certified to be VOC compliant with all applicable federal, state and local regulations.
   1. Sealers: Include compliance with Federal EPA 40 CFR Part 59 Table 1, Subpart D for Concrete Curing and Sealing.

B. Curing and Sealing Compounds: Section 03 39 00.

C. Water-Based Acrylic Sealers for Class 1 Floor Slabs: ASTM C309, Type I and ASTM C1315, Class B. Minimum 30 percent solids content.
   1. Acceptable Manufacturers and Products:
      a. L&M Construction Chemicals, Inc.; www.lmcc.com - Dress & Seal WB 30.
      b. US Mix Co.; US Spec division; www.usspec.com – Hydrasheen 30%.
      c. W.R. Meadows - Sealtight Vocomp-30.

D. Sodium-Silicate-Based Hardening and Dustproofing Compounds for Sealing Class 4 Floor Slabs: Use at areas to be left exposed without polishing or color:
   1. Acceptable Manufacturers and Products:
      a. BASF; www.buildingsystems.basf.com – Sonosil.
      b. Euclid Chemical Co.; www.euclidchemical.com – Eucosil.
      c. US Mix Co.; US Spec division;www.usspec.com - Permasil.
   2. Material: Penetrating sodium silicate type densifier, sealer, and dustproofer.
   3. Maximum VOC Content Allowed: 600 grams/liter.

2.04 CONCRETE CLEANERS AND DEGREASERS

A. Acceptable Manufacturers and Products:
   1. BASF; www.buildingsystems.basf.com - Sonneborn brand, Citrus Degreaser and Cleaner.
   2. L&M Construction Chemicals, Inc. – Citrex.
   3. US Spec - Maxi-Concrete Cleaner.
   4. W.R. Meadows - Sealtight Ultrite Degreaser.

PART 3 EXECUTION

3.01 FINISHING FORMED CONCRETE AFTER PLACEMENT

A. Where tops of cast-in-place concrete walls will form finished surface, immediately finish concrete in form by skilled cement finisher. Strike smooth at indicated elevation and float to texture consistent with finish of adjacent formed surface. Top of walls and similar unformed surfaces not finished to level will be subject to removal and replacement.

3.02 FINISHING CONCRETE FLOOR SLABS AFTER PLACEMENT

A. General: Comply with ACI 301 5.3.4.

B. Screeding: Screed and consolidate surfaces to shape slabs to indicated grades and elevations. Finish surfaces sparingly forcing coarse aggregate slightly below surface.
   1. Mechanical Screeding of Slabs-On-Grade:
      a. Strip Placements: Utilize vibrating screed supported by edge forms.

b. Block Placements: Utilize dry-screed guides or laser-guided screed. For large placement areas, utilize appropriate mechanical screeding tools, such as vibratory roller screeds and laser-controlled screeds.

2. Jitterbug Tampers: Jitterbug tampers not allowed except for use on very stiff mixes, and then only with prior acceptance of Architect.
3. Slabs on Metal Deck: Establish elevation control using movable dry-screed guides, and screed from structural steel beams, compensating for beam and decking deflections during placement. Elevated slabs on metal deck shall be placed with top surface screeded flat and level. Nominal thickness of slabs indicated on Drawings shall be increased as required to offset deflection of decking and supporting members. Provide sufficient concrete quantity to allow for deflections while achieving flat slab surface.

C. Finishing Slabs in Hot Weather Conditions: Initiate curing immediately after concrete placement to prevent premature drying and excessive evaporative water loss from the fresh concrete. Use one of the following methods or other industry-accepted procedure:
1. Fogging: Use equipment that produces a fog spray from atomizing nozzles that will uniformly cover the concrete surface at a minimum rate of 10.6 gal./h/sq.yd.
2. Evaporation Retardant Application: When finishing slabs during hot weather conditions, apply evaporation retardant after screeding and between floating operations in accordance with manufacturer's written instructions.

D. Bull Floating or Darbying:
1. Complete initial floating using a wide bull float, darby, or modified highway straightedge before any excess moisture or bleeding water is present on the surface. Smooth out ridges and fill voids, if any, left after screeding. Embed coarse aggregate slightly.
2. After initial floating is complete, wait for concrete to stiffen before commencing further finishing operations. No subsequent operation shall be performed until the concrete will sustain foot pressure with only approximately 1/4 inch indentation. Dusting of wearing surfaces with dry materials not allowed.

E. Hand-Tooled Control Joints for Class 1 and Class 4 Slabs-On-Grade: Where hand-tooled joints are required, tool in slab after most bleed water and excess moisture have left or been removed from the surface. Use straight edge board as a guide.
1. Class 1 and Class 4 Slabs-on-Grade, and Slabs with Embedded Hydronic Heating System: Control joints shall be tooled as indicated. Sawed joints not permitted without prior approval of Architect.
2. Jointing Tool: Bit shall be deep enough to cut grooves 1/4 of the thickness of the slab with a 1/8-inch edge radius.

F. Power Floating: After the slab has stiffened sufficiently, complete floating and compaction of concrete utilizing a nonvibratory, disk-type floats or troweling machines equipped with float blades or pans fitted over the trowel blades.
1. Troweling machines with combination blades or normal trowel blades shall not be used for floating.
2. Troweling machines with water attachments for wetting the concrete surface are prohibited.
3. In the event that multiple floating passes are required, each floating operation shall be made perpendicular to the direction of the immediately previous pass.
4. After the initial power-float pass, and while the surface mortar is still fresh, use modified highway straightedge to restraighten the slab surface by removing the troughs and ridges left by the power float. Supplement with hand floating around columns, sleeves, and similar projections.

G. Troweling:
1. Class 1 Floor Slabs Indicated to Have Exposed and Sealed Concrete Finish and Class 2 Floor Slabs to Receive Floor Coverings or Tenant Finish: Steel troweled finish in accordance with ACI 301, Paragraph 5.3.4.2.c with two trowelings. Hand-trowel the surface smooth and free of trowel marks. Continue hand-troweling until a ringing sound is produced as the floor is troweled.
2. Class 4 Floors: Provide three machine trowelings.

H. Light Broom Finish: ACI 301, Paragraph 5.3.4.2.d. Draw a soft-bristled broom over freshly troweled surface.

I. Slab-On-Grade Floors to Receive Ceramic, Porcelain or Stone Tile Bonded to Slab With Portland Cement Mortar: Provide one of the following finishes:
   1. Steel trowel and fine broom finish;
   2. Wood float finish in accordance with ACI 301, Paragraph 5.3.4.2.b; or
   3. Steel trowel finish followed later by mechanical scarification.

J. Slabs Indicated to Receive Waterproofing, Roofing, or Insulation: Floated finish in accordance with ACI 301, Paragraph 5.3.4.2.b.

K. Parking Deck Finish: Medium broom finish perpendicular to dominant direction of travel in accordance with ACI 301, Paragraph 5.3.4.2d.
   1. Begin bull floating after bleeding of water through surface of concrete has been completed and water sheen has disappeared from surface of concrete and concrete has stiffened sufficiently to allow operation.
   2. Immediately after bull floating, give concrete a medium coarse transverse-scored texture by drawing broom across surface. Grooves shall not be overly rough or deep.

3.03 SAW-CUTTING FLOOR SLAB CONTROL JOINTS

A. Class 2 Slabs to Be Covered by Finish Flooring: Sawed joints may be substituted for joint forms except at slabs with embedded hydronic heating system, where tooled jointing is required.

B. Form weakened-plane contraction joints, sectioning concrete into areas as indicated with early entry dry-cut power saws equipped with shatterproof abrasive or diamond-rimmed blades.

C. Provide sawed joints 1/4 of slab thickness in depth by 3/16-inch wide.

D. Time joint sawing properly with setting of concrete. Start cutting as soon as concrete has hardened sufficiently to prevent aggregates being dislodged by saw. Complete cutting before shrinkage stresses have developed sufficiently to induce cracking.

E. Control Joint Layout: Locate joints as indicated on the Drawings or as otherwise accepted by Architect.
   1. Locate under partitions wherever possible.
   2. Center a control joint on each column line unless indicated otherwise.
   3. Avoid creation of reentrant corners and panels with length greater than twice the width.
   4. Slabs on Grade:
      a. Panels: Not longer than 12 feet in any direction.

3.04 FLOOR SLAB FLATNESS AND LEVELNESS TOLERANCES

A. Floor Levelness Tolerances: Floor slabs shall be level within following maximum tolerances measured with 10-foot long straightedge, except slope to drains as indicated.
   1. Floors to Receive Thin-Set Ceramic, Porcelain or Stone Tile: ANSI A108.01 and as follows.
      a. Permissible Levelness Variation for Tile With All Edges Shorter Than 15 Inches:
         1) With 1/4-Inch Grout Joints and Larger: 1/4-inch in 10 feet.
         2) With 3/16-Inch Grout Joints: 3/16-inch in 10 feet.
         3) With 1/8-Inch Grout Joints: 1/8-inch in 10 feet.
      b. Permissible Variation for Tile With At Least One Edge 15 Inches or Longer:
         1) 18-Inch Through 24-Inch Tile Edge Sizes With 1/8-Inch Grout Joints: 3/32-inch in 10 feet.
         2) 36-Inch and Larger Tile Edge Sizes With 3/16-Inch or 1/8-Inch Grout Joints: 3/32-inch in 10 feet.
         3) Other Tile Sizes and Grout Joint Widths: 1/8-inch in 10 feet.
   2. Permissible Levelness Variation for Other Floors: 1/4-inch in 10 feet.

B. Floor Flatness Tolerances: Floor slabs shall be flat within following maximum tolerances measured by straightedge, except slope to drains as indicated.
   1. Floors to Receive Thin-Set Ceramic, Porcelain or Stone Tile: ANSI A108.01 and as follows.
      a. Permissible Flatness Variation for Tile With All Edges Shorter Than 15 Inches: No more than 1/16 inch variation in 12 inches when measured from the high points in the surface.

b. Permissible Flatness Variation for Tile With At Least One Edge 15 Inches or Longer: No more than 1/16 inch variation in 24 inches when measured from the high points in the surface.

C. Comply with stricter tolerance requirements of floor finish manufacturers where applicable.

D. Flatness Tests: All floor flatness tests shall be made on each newly installed floor slab within 8 hours after completion of the final troweling operation.
   1. Remedy for Out of Tolerance Work:
      a. Each floor shall be subdivided into sections bounded either by the column and half column lines, or the construction and control joints, whichever subdivision yields the smaller areas.
      b. All floor sections measuring within the specified tolerance shall be accepted for flatness compliance as constructed.
      c. All floor sections which fail to meet the specified tolerance shall be corrected in their entirety.
         1) Such corrective work on slabs-on-grade may take the form of grinding, depression-and-retopping, or removal-and-replacement.
         2) In all cases, the particular method of correction to be employed shall be determined by the Architect.

3.05 SEALING FLOOR SLABS

A. General: Comply with manufacturer's instructions and recommendations.
   1. Seal Class 1 floor slabs not receiving other concrete finish or finish flooring as scheduled on Drawings.

B. Preparation of Old or New Hardened Concrete to Receive Acrylic Sealer:
   1. Degrease and clean surfaces of all contaminates with concrete cleaner and degreaser.
   2. Thoroughly rinse surface. Broom out all standing water. Comply with manufacturer's instructions for wetting and drying concrete prior to sealing.

C. Sealer Application:
   1. Apply in thin, even applications with low pressure airless sprayer or applicator. Do not dilute or puddle.
   2. Apply in two uniform coats at manufacturer's recommended coverage rates, allowing 2 to 3 hours between coats.

D. Silane Sealer for Parking Garage Ramps and Slabs: Section 07 19 16.

3.06 TREATMENT OF FORMED SURFACES

A. Reference Standard: ACI 301, 5.3.3.

B. Form Removal: Finish and cure concrete surfaces covered by formwork immediately after forms have been removed. Do not expose more surface area than can be finished and cured in one working day.

C. Patching:
   1. Patch voids, honeycombs or damaged areas in accordance with repair of surface defects above.
   2. Add white cement to patching grout as required to match color of existing concrete where patches are exposed to view.
   3. Patch tie holes where concrete is in contact with earth and where concrete is to be left exposed.
   4. Use specified bonding compound and epoxy adhesive.

D. Laitance: Remove deposits of laitance occurring on top of concrete surfaces as soon as concrete has hardened sufficiently to prevent injury to concrete. Repair areas where laitance is removed as specified for patching.

E. Unexposed Concrete Surfaces: Surfaces of concrete wall, slabs, beams, and columns, which are to be covered by subsequent work shall have rough-form finish, leaving surfaces with the texture imparted by the forms, except as specified under "Patching".
   1. Chip or rub off fins exceeding 1/2 inch in height.

F. Exposed Concrete Surfaces: Smooth-form finish.
   1. Carefully protect from damage and soiling concrete surfaces, both interior and exterior, to remain exposed.
   2. Patch where required as specified under "Patching".

3. Remove fins exceeding 1/8 inch in height.
4. Upon completion of work, reclean damaged or soiled surface as required to make clean, smooth and finished in every respect.

3.07 ARCHITECTURAL CONCRETE FINISHING

A. Concrete Surfaces to Receive Paint or Other Coating, and Concrete Surfaces to Remain Exposed in Parking Garage: Provide grout cleandown:
   1. Remove fins and irregularities from surfaces with dry carborundum stone.
   2. Repair defective areas as specified under "Patching".
   3. Thoroughly wet down surface and apply grout mixture with brushes or spray gun uniformly and completely filling air bubbles and holes.
      a. Grout Mixture: One part cement, 1-1/2 parts fine sand, and 50:50 mixture of Euclid SBR Latex or equal and water to consistency of thick paint.
   4. Immediately after applying slurry, float surfaces with cork or other suitable floats, scouring surfaces vigorously.
   5. While slurry is still plastic, finish with sponge rubber float removing any dried material. There shall be no noticeable film or slurry remaining after this rubbing.
   6. Complete entire cleaning operation for any area same day it is started. Do not leave slurry on any surfaces overnight.

3.08 REPAIR OF SURFACE DEFECTS

A. Reference Standard: ACI 301 5.3.7.

B. Inspection: Allow Architect to inspect concrete surfaces immediately upon removal of forms.

C. Repair:
   1. Modify or replace concrete not conforming to required lines, details, and elevations.
   2. Repair or replace concrete not properly placed resulting in excessive honeycombing and other defects. Do not patch, repair or replace exposed architectural finished concrete except upon express direction of Architect.
   3. Patch holes and defects.

D. Repair defects in structural concrete walls as follows:
   1. Deep Defects Exposing Reinforcing: Chip to sound concrete and clean thoroughly to remove loose concrete and dust. Apply thin coat of epoxy adhesive. Form and pour full with non-shrink grout prior to development of tack-free condition of epoxy adhesive. Strip forms after grout has hardened and provide specified finish. Moist cure and apply clear curing and sealing compound immediately after finishing.
   2. Defects Greater Than 1/2 Inch Depth Not Exposing Reinforcing: Chip, clean and apply epoxy adhesive. Place or dry pack using non-shrink grout prior to development of tack-free condition of epoxy adhesive. If dry pack consistency is required, use non-shrink grout damp pack formula. Provide specified finish and cure.
   3. Defects Less Than 1/2 Inch Depth and All Tie Holes:
      a. For concrete having a specified compressive strength of 5,000 psi or less: Chip and clean per 1, above. Dry pack, finish and cure per 1, above.
   4. Other equivalent repair procedures may be used subject to review of Architect.

E. Unformed Surfaces:
   1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope in addition to smoothness using a template having required slope.
   2. Correct high areas in unformed surfaces by grinding or other methods acceptable to the Architect after concrete has cured a minimum of 14 days.
   3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend with adjacent concrete. Where acceptable to the Architect, the specified underlayment compound, applied in accordance with the manufacturer's instructions, may be used.

4. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch patching concrete and apply specified bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
5. Repair isolated random cracks and single holes not over 1-inch in diameter by dry pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned surfaces and apply specified bonding compound. Mix dry pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

3.09 PROTECTION

A. Protect concrete surfaces from staining, cracking, chipping, and other damage during progress of the work, and leave in good condition upon completion.
   1. Protect freshly placed concrete and finished slabs from weather damage.

END OF SECTION

SECTION 03 3900
CONCRETE CURING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Final curing of cast-in-place concrete slabs.
   2. Final curing of formed cast-in-place concrete.

B. Related Requirements:
   1. Structural General Notes on Drawings.
   2. Sustainability Certification Project Procedures: Section 01 35 66.
   3. Placing and Consolidating Concrete: Section 03 30 00 Cast-In-Place Concrete.
   4. Concrete Finishing, Initial Curing, and Sealing: Section 03 35 00 Concrete Finishing.
   5. Common Work Results for Flooring Preparation: Section 09 05 61.
   6. Concrete Staining: Section 09 61 19.
   7. Curing Exterior Concrete Sidewalks and Slabs: Section 32 16 22 Walks, Patios, and Exterior Slabs.

1.02 REFERENCES

A. Definitions:
   1. Class 1 Floor: Single course concrete floor slab designed to remain exposed in service and to bear foot traffic only.
   2. Class 2 Floor: Single course concrete floor slab designed to receive applied floor covering and to bear foot traffic only.
   3. Class 4 Floor: Single course concrete floor slab designed to remain exposed in service or to receive applied floor covering and to bear foot traffic and light vehicular traffic.

B. Reference Standards: Comply with following except as modified by supplementary requirements of this Project Specification.
   1. American Concrete Institute (ACI) Standards:
      a. ACI 301-10 - Specifications for Structural Concrete.
      b. ACI 306.1-90 – Standard Specifications for Cold Weather Concreting.
      c. ACI 308.1-11 – Standard Specification for Curing Concrete.

C. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.
   1. ACI 302.1R-04 – Guide for Concrete Floor and Slab Construction.
   2. ACI 305R-10 – Guide to Hot Weather Concreting.
   3. ACI 306R-10 – Guide to Cold Weather Concreting.

D. Field References:
   1. ACI SP-15 (10) – Field Reference Manual: Keep at least one (1) copy on site at all times.
   2. Other reference standards, guide references and standard practices listed above shall be kept on site when directed by Architect or Engineer.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Comply with requirements of related Division 03 sections for concrete forming, placement, and finishing.
   2. Concrete Floor Slabs: Coordinate with requirements of Section 09 05 61 and with various finish flooring sections under Division 09 to ensure concrete curing methods are proper to allow slabs to receive finish flooring. Comply with requirements of various Sections for slab tolerances, finishes, curing, etc. Be responsible to repair or replace slabs as required and specified in those sections to meet flooring requirements.

B. Concrete Floor Slab Pre-Installation Conference: Attend concrete finishing conference. See Section 03 35 00.

1.04 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Product Data: Submit copies of manufacturer's current catalog literature for the following:
   1. Curing compounds, if used.
      a. VOC Data: Provide a cut sheet and Material Safety Data Sheet (MSDS) for every curing compound and liquid chemical treatment compound used within the building with VOC levels highlighted. Refer to Section 01 61 65 for specific VOC content limits.

1.05 QUALITY ASSURANCE

A. Mock-Ups: Cure concrete mockups required by other Division 03 sections in accordance with the requirements of this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Delivery and Acceptance Requirements:
   1. Deliver products in original unopened manufacturer's containers with labels intact.

C. Storage and Handling Requirements: Comply with Manufacturer's printed instructions.
   1. Curing Compounds: Store in an interior, cool, dry place at above 45 degrees F.
      a. Material temperature shall be at least 50 degrees F before use.

1.07 AMBIENT CONDITIONS

A. Cold Weather Curing:
   1. When for three successive days prior to concrete placement the average daily outdoor temperature drops below 40 degrees F or when the average outdoor temperature is expected to drop below 40 degrees F on the day of concrete placement, preparation, protection and curing of concrete shall comply with ACI 306.1 and ACI 308.1 part 3.5.
   2. Maintain concrete temperature as required by ACI 306.1 during the curing period. Record concrete temperatures during specified protection period at intervals not to exceed 16 hours and no less than twice during any 24-hour period.
   3. Provide strong and secure weather protection around the building for at least one story above and one story below the floor being concreted to allow the floor to maintain temperatures between 50 and 70 degrees F for not less than 72 hours after depositing. Obtain one (1) temperature reading of air at floor level for each 600 square feet of floor area just prior to concreting, and provide additional heat should the measured temperature be less than 50 degrees F. Record and submit temperature readings for Architect and Structural Engineer review no later than 24 hours after concreting.
   4. Protect the concrete against direct, uneven heating and carbonation due to the exposure to combustion heater exhaust.
   5. Do not initiate the application of water when freezing weather is to occur during the curing period. Do not expose saturated concrete to cycles of freezing and thawing until the concrete has reached the compressive strength of 3,500 psi. After termination of application of water to the surface, protect the surface from freezing temperatures for at least 3 days.
   6. Submittal of detailed procedures, means, and methods for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather is not required.

B. Hot Weather Curing: Comply with ACI 308.1, part 3.6. Protect to prevent rapid drying. Start finishing and curing as soon as possible. Use liquid applied evaporation retardants, fogging, wind screens, or shade (individually or in combination) to control the rate of bleed water evaporation and subsequent drying of the concrete. When loss of moisture from the concrete cannot be controlled by the aforementioned measures, alternate curing procedures must be implemented such as placing and finishing concrete at night or postponing or delaying placement until conditions are acceptable.

PART 2 PRODUCTS

2.01 PRODUCT OPTIONS

A. Substitution Requests: Required for all manufacturers and products not named as Acceptable.

1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
2. During Construction Phase: Submit in accordance with Section 01 25 00.

2.02 WATER

A. Water used for curing shall be free of materials that have the potential to stain concrete or are known to cause deterioration of concrete or reinforcing steel.

2.03 CURING COMPOUNDS

A. All concrete curing compounds and other concrete treatment products shall be certified to be VOC compliant with all applicable federal, state and local regulations.
   1. Include compliance with Federal EPA 40 CFR Part 59 Table 1, Subpart D for Concrete Curing and Sealing.

B. Curing Compound - Vertical Surfaces: 'ASTM C309.

C. Water-Based Curing and Sealing Compounds for Class 1 Floor Slabs: ASTM C309, Type I and ASTM C1315, Class B. Minimum 30 percent solids content.
   1. Acceptable Manufacturers and Products:
      a. L&M Construction Chemicals; www.lmcc.com; brand of Laticrete International, Inc.- Dress & Seal WB 30.
      b. US Mix Co.; US Spec division; www.usspec.com – Hydrasheen 30%.
      c. W.R. Meadows - SealTight Vocomp-30.

D. Solvent-Based Curing and Sealing Compounds for Class 1 Floor Slabs: ASTM C309, Type I and ASTM C1315, Class B. Minimum 30 percent solids content, maximum moisture loss of 0.030 grams per square centimeter (300 square feet per gallon coverage):
   1. Acceptable Manufacturers and Products:
      a. BASF – Kure-N-Seal 30 (AKA MasterKure CC 300 SB).
      b. US Mix Co.; US Spec division; www.usspec.com - CS-30-1315.

E. Dissipating Resin Type Curing Compounds: ASTM C309, Type I (ID), Class B, VOC-compliant.
   1. Acceptable Manufacturers and Products:
      a. Euclid Chemical Co. – Kurez DR VOX.
      b. L&M Construction Chemicals; www.lmcc.com; brand of Laticrete International, Inc. - Cure R.
      c. Tamms Industries – Horncure WB 30.
      d. US Spec - Maxcure Resin Clear.

F. Curing Compounds for Exterior Slabs and Sidewalks: Section 32 16 22.

G. Concrete Floor Sealers: Section 03 35 00.

2.04 CURING BLANKETS AND COVERS

A. Moisture-Retaining Covers: One of the following complying with ASTM C171-07:
   1. Non-Staining Concrete Curing Papers:
      a. Acceptable Manufacturers and Products:
         1) Fortifiber Building Products Systems; www.fortifiber.com - Orange Label Sisalkraft.
   2. Non-Staining Waterproof Sheets:
      a. Acceptable Manufacturers and Products:
         1) Blue Shield Poly Laminating, Inc.; www.blueshieldpoly.com – Blue Shield.
         2) Covertech Fabricating Inc. - Concrete Curing Blankets.
         3) Reef Industries, Inc., www.reefindustries.com - Transguard 4000.
      b. Cold Weather Curing: Provide black insulating type when curing in cold weather.
      c. Hot Weather Curing: White.

B. Absorptive Cover for Wet Curing: One of the following in accordance with ACI 308.1.
   1. Burlap: AASHTO M182.
   2. Cotton mats.

PART 3 EXECUTION

3.01 FINAL CURING, GENERAL

A. Reference Standards: ACI 301 5.3.6 and ACI 308.1. Curing shall be in accordance with ACI 301 and ACI 308.1 procedures.

B. Protect exposed surfaces of concrete from premature drying and frost.

C. Maintain concrete with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of concrete.

D. Avoid rapid drying at the end of the curing period.

3.02 CURING FORMED CONCRETE

A. Curing With Forms In Place: Use soaker hoses for curing of concrete walls and columns after checking that water will not damage the surface and before form removal. Place hoses at the top of walls and columns so that water will enter between concrete and formwork.

B. Form Removal: Comply with Section 03 10 00. Do not remove forms until times as specified. Remove carefully to not injure concrete surface. Protect edges and corners to prevent cracking, chipping or other damage and premature drying.

C. Curing After Form Removal: Clean surfaces of loose sand, mortar, debris and grout; spray lightly with water and coat with clear or translucent curing compound as soon as possible after removing forms. Apply curing compound same working day that forms are removed.

3.03 FINAL CURING OF CONCRETE SLABS

A. Horizontal Surfaces: Perform curing of concrete by one of the methods specified herein, or by combinations thereof. Keep the concrete surfaces continuously wet. Do not allow alternate wetting and drying of concrete surfaces.

B. Final curing shall commence as soon as free water has disappeared from the concrete surface after placing and finishing.

C. Moisture Retaining Cover Method:
   1. Cover all exposed concrete surfaces and beyond the edge of the concrete surface with specified moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   2. Keep the concrete continuously wet under the sheeting.

D. Ponding Method: Build a dike of earth, sand, or other material around the concrete and flood the surface with water. The entire surface is to remain covered with water for the duration of the curing period.
   1. Start ponding on the concrete surface as soon as possible without marring the surface.
   2. Replace water lost due to evaporation or leakage at a rate sufficient to maintain the pond.
   3. Limitations: Do not use ponding method for slabs-on-grade placed over granular protection layer over underslab vapor retarder.

E. Sprinkling Method: Perform sprinkling for final curing by using either soaker hoses or lawn sprinklers. Exercise care so the surface of the concrete is not eroded by running water.

F. Fogging Method: Set up fogging equipment to allow complete coverage of the area to be cured. Maintain the relative humidity above the slab at a level to prevent surface drying and the accumulation of standing water on the surface.

G. Absorbent Cover Method: After final finishing, uniformly distribute nonstaining absorbent materials on the concrete surface without marring the surface unless otherwise specified. Apply water, thoroughly saturating cover materials, taking care not to displace them.
   1. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.
   2. Apply water during the curing period as needed to keep the concrete surfaces continuously wet.

H. Curing Compound Method: Apply curing compounds immediately after final finishing and as soon as bleeding has essentially ceased, as evidenced by the disappearance of free water and no visible water sheen.
   1. Coat exposed horizontal surfaces with curing compound applied in accordance with Manufacturer's written instructions.
   2. Preparation of Freshly Placed Concrete:
      a. Allow all surface water to dissipate prior to application.
      b. Verify concrete to be free of oil, dirt, waxes and other foreign materials.
   3. Apply in thin, even applications with low pressure airless sprayer or applicator. Do not dilute or puddle.
   4. Apply in two uniform coats at manufacturer's recommended coverage rates, allowing 2 to 3 hours between coats. Apply in two applications at right angles to each other.
      a. Application Rate, Each Coat: Not less than 1 gallon per 200 square feet.
   5. Give special attention to providing adequate curing of slab edges.
   6. Protect the membrane from damage for the duration of the curing period. Cover with polyethylene sheeting of minimum six mil nominal thickness. Provide polyethylene sheeting as wide as practical, edges lapped minimum of six inches, weighted to prevent blowing, and sealed to prevent loss of moisture. Keep sheeting in place a minimum of seven days.
   7. Limitations:
      a. Curing compound method not allowed on any surface where waterproofing, finish flooring or other material is to be bonded to concrete surface, unless sufficient time is allowed for dissipative type compound to fully dissipate, or unless curing compound membrane is to be completely removed mechanically.
      b. Slabs to Receive Thin Set Ceramic Tile or Polyurethane Floor Sealer: Wet cure for at least seven days. Do not use curing compounds.
      c. Slabs to Receive Stain: Wet cure for at least seven days. Do not use curing compounds.
      d. Parking Garage Slabs-on-Grade and Topping Slabs: Wet cure for at least seven days. Do not use curing compounds.

I. Waste Management During Wet Curing: Prevent water run-off.

3.04 PROTECTION DURING CURING

A. Protect the concrete from damaging mechanical disturbances during the curing period. Protect finished surfaces from damage by construction equipment, materials or methods, application of curing procedures, or by running water.

B. Protect finished slabs from mortar leakage from placing of slabs above.

3.05 TERMINATION OF CURING

A. The curing period shall be a minimum of 7 days, and curing may be terminated at the end of this time period provided that the following other conditions are also met:
   1. Concrete surface temperature has been maintained at no lower than 50 degrees F during entire curing period.
   2. Concrete compressive strength meets or exceeds 70 percent of design concrete compressive strength required by the Structural Drawings and Section 03 30 00.
      a. Compressive Strength Testing: Section 03 30 00.

B. Cold Weather Curing: Extend curing period when required to comply with ACI 306.1 and Article "Ambient Conditions" in Part 1 of this Section.

END OF SECTION

SECTION 03 6200
NON-SHRINK GROUTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Shrink-resistant, cementitious, non-metallic grout under steel column base plates.
   2. Shrink-resistant grout elsewhere as indicated.

B. Related Requirements:
   1. Structural General Notes on Drawings.
   2. Concrete: Section 03 30 00 Cast-In-Place Concrete.
   3. Concrete Curing: Section 03 39 00.
   4. Steel Framing and Base Plates: Section 05 12 00 Structural Steel Framing.

1.02 REFERENCES

A. Reference Standards:
   1. ASTM C1107/C1107M-11 – Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).

1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Product Data: Submit manufacturer's product data sheets for each grout product to be installed under this Section.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Delivery and Acceptance Requirements: Deliver palletized in original sound, dry, unopened containers with manufacturer's source code marking.

C. Storage and Handling Requirements:
   1. Store under cover in dry area.
   2. Storage Temperature: Minimum 40 degrees F, maximum 90 degrees F unless recommended otherwise by manufacturer.
   3. Storage Damage: Immediately remove from site any material which becomes damp or otherwise defective during storage.
   4. Storage Time: 6 months maximum, or shorter time if so recommended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products:
   1. BASF – MasterFlow 928, MasterFlow 713 or MasterFlow 100.
   2. Dayton Superior Corporation – 1107 Advantage Grout.
   3. Euclid Chemical Company – Euclid NS Grout.
   4. L&M Construction Chemicals; www.lmcc.com; brand of Laticrete International, Inc. – Duragrout.
   5. Sika Corporation - SikaGrout 212.
   6. US Mix Co.; US Spec division; www.usspec.com - US Spec MP Grout or Premium Grout.

B. Substitution Requests: Required for all manufacturers and products not named as Acceptable.
   1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
   2. During Construction Phase: Submit in accordance with Section 01 25 00.

2.02 DESCRIPTION

A. Grout Description: Packaged dry, non-gas forming, non-metallic, cementitious, non-shrink grout.
   1. Grout shall contain no aluminum powder.

2.03 PERFORMANCE

A. Grout Performance Requirements:

1. Meet or exceed all performance requirements of ASTM C1107.
2. Compressive Strength: In addition to compressive strength performance requirements of ASTM C1107, grout shall provide the following minimum strengths when tested in accordance with ASTM C1107 at plastic consistency.
   a. 3 Day Strength: 4,500 psi minimum.
   b. 7 Day Strength: 6,000 psi minimum.
   c. 28 Day Strength: 7,500 psi minimum.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Preparation for Cementitious Grouting:
   1. Clean steel and concrete surfaces of dirt, oil, grease, laitance, loose concrete and other contaminants.
   2. Remove free-standing water from concrete surfaces before grouting.

3.02 PLACEMENT OF CEMENTITIOUS GROUT

A. General: Mix and install grout in accordance with manufacturer's recommendations.
   1. Mix with minimum water necessary for placement method to be used.
   2. Extend grout with gravel for placements greater than 3 inches in depth.

B. Grouting: Place grout at non-sag, damp pack consistency, completely filling area below plates with grout. Manually compact to eliminate air pockets and voids.

3.03 FINISHING

A. Finishing Edges of Cementitious Grout: Before grout has reached final set, remove all grout above bottom edge of plate. In no case shall grout extend upward alongside of base plate. Trowel edges at approximately 45 degree angle from bottom of plate to top of substrate. Horizontal shoulders will not be allowed.

3.04 CURING

A. Curing Cementitious Grout: Comply with manufacturer's instructions.
   1. Maintain grout temperature between 40 degrees F and 90 degrees F for minimum 24 hours following placement.
   2. Cover exposed grout surfaces with clean, wet rags and maintain moisture for minimum 6 hours following placement.
   3. Immediately after removal of wet rags, apply Curing and Sealing Compound as specified in Section 03 39 00.

END OF SECTION

SECTION 05 0519

POST-INSTALLED CONCRETE ANCHORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Methods common to multiple sections for fastening metals, fabrications, manufactured products, hangers, and equipment to in-place concrete, precast concrete, or concrete masonry,. including:
      a. Post-installed mechanical anchors.
      b. Post-installed adhesive anchors.

B. Related Requirements:
   1. Cast-In Anchor Rods and Anchor Bolts and Inserts: Section 03 10 00 Concrete Forming and Accessories.
   2. Steel-to-Steel Bolting and Welding: Section 05 05 23 Metal Fastening..

1.02 REFERENCES

A. Definitions:
   1. Interior Use: For purposes of this Section, "Interior Use" shall mean interior applications in a non-corrosive environment.
   2. Exterior Use: For purposes of this Section, "Exterior Use" shall mean applications exposed to weather in service and interior applications in a potentially corrosive environment, including, but not limited to, the interior of parking structures, pool rooms, pool equipment rooms, vehicle service and wash areas, animal holding rooms, shower areas and steam rooms.

B. Reference Standards: See Section 01 42 00.
   1. American Concrete Institute (ACI) Standards:
      a. ACI 355.2-07 - Qualification of Post-Installed Mechanical Anchors in Concrete.
      b. ACI 355.4-11 - Qualification of Post-Installed Adhesive Anchors in Concrete.
   2. International Code Council Evaluation Service (ICC-ES) Standards:
      a. AC01 – Acceptance Criteria for Expansion Anchors in Masonry Elements.
      b. AC58 – Acceptance Criteria Adhesive Anchors in Masonry Elements.
      c. AC193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements.
      d. AC308 – Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
   3. National Fire Protection Association (NFPA) – NFPA 13 – Standard for the Installation of Sprinkler Systems.

1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, action and return in accordance with Section 01 33 00.

B. Product Data: Submit manufacturer's technical data for the following.
   1. Post-Installed Anchors: Submit for each type proposed for use on Project. Include statement of proposed applications and locations for each type of anchor.

1.04 INFORMATIONAL SUBMITTALS

A. Procedures: Submit for information and verification in accordance with Section 01 33 00.

B. Evaluation Reports: Submit ICC-ES Evaluation Report for each manufactured anchor product proposed for use on the Project.

C. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.

D. Manufacturer's Instructions:
   1. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Post-Installed Adhesive Anchors Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the installer on the Project. Training to consist of a review of the complete installation process for post-installed anchors, to include but not limited to:

1. Hole drilling procedure.
2. Hole preparation and cleaning technique.
3. Adhesive injection technique and dispenser training / maintenance.
4. Proof loading/torqueing.

B. Post-Installed Structural Expansion Anchors Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the installer on the Project. Training to consist of a review of the complete installation process for post-installed anchors, to include but not limited to:
1. Hole drilling procedure.
2. Proof loading/torqueing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.
1. Protect metals from corrosion.

B. Storage and Handling Requirements:
1. Storage: Store manufactured anchors in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 PRODUCT OPTIONS

A. Basis of Design Anchor Manufacturer and Model: Where anchor manufacturer and model is indicated on Drawings, provide indicated product.

B. Where anchor manufacturer and model is not indicated on Drawings, subject to compliance with other specified requirements, provide one of the products named in this Section for anchor type indicated.
1. Include anchors required to comply with installation instructions and typical details of product manufacturers and equipment suppliers under all divisions of these Specifications, where anchors are not furnished by supplier of the product or equipment to be anchored.

C. Substitution Requests: Required for all proposed post-installed anchor manufacturers and products not named in this Section or on Drawings.
1. Submit current ICC-ES report with each proposed anchor substitution request. Report shall include compliance documentation for the proposed:
   a. Base material to receive anchor;
   b. Base material condition limitations;
   c. Applicable loading conditions; and
   d. Load direction(s).
2. Submittals:
   a. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
   b. During Construction Phase: Submit in accordance with Section 01 25 00.

2.02 REGULATORY REQUIREMENTS

A. Manufactured post-installed anchors shall have published ICC-ES Evaluation Report (ICC-ESR) indicating conformance with current applicable ICC-ES Acceptance Criteria and ICC approval as acceptable method of construction under the IBC. Comply with all limitations on use of anchors stipulated in Evaluation Report.

B. Post-Installed Anchors for Supporting Fire Sprinkler Systems: Comply with NFPA 13. Anchors shall be qualified in accordance with UL for use with "Pipe Hanger Equipment and Fire Protection Systems."

2.03 POST-INSTALLED ANCHOR MATERIALS, GENERAL

A. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) or hot-dip galvanizing in accordance with ASTM A153.

B. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 stainless steel, and where applicable, provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Stainless steel nuts shall conform to ASTM F594 unless otherwise specified.

2.04 MECHANICAL ANCHORS

A. Regulatory Requirements:
   1. Mechanical Anchorage to Concrete: Expansion anchors, wedge anchors, sleeve anchors, undercut anchors, and drop-in anchors shall have current ICC-ES report that demonstrates compliance with ACI 355.2 as supplemented by AC193 for use in cracked concrete.

B. Wedge Anchors for Anchorage to Solid Concrete:
   1. Manufacturers and Products: Where anchor manufacturer and product is not indicated, subject to compliance with requirements and acceptance by the Architect, provide one of the following:
      a. Hilti Inc.; www.us.hilti.com - Kwik Bolt TZ (KB-TZ). Refer to ICC ESR-1917.
      b. ITW Red Head division of Illinois Tool Works; www.itwredhead.com - Trubolt+ Wedge Anchor. Refer to ICC ESR-2427.
      c. Powers Fasteners, Inc.; www.powers.com - Power-Stud+SD2. Refer to ICC ESR-2502.
      d. Simpson Strong Tie Co.; www.strongtie.com – Strong-Bolt 2. Refer to ICC ESR-3037.
      e. Wej-it Fastening Systems division of Mechanical Plastics Corporation; www.toggler.com/wejit - ANKR-Tite CCAT. Refer to ICC ESR-2777.
   2. Description: Wedge type expansion anchor, torque-controlled, complete with required nuts and washers.
   3. Provide anchors with length identification markings conforming to ICC ES AC193.
   4. Type and size as indicated on Drawings or by manufacturer of product to be anchored.

C. Heavy-Duty Sleeve Expansion Anchors for Anchorage to Concrete:
   1. Manufacturers and Products: Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide one of the following:
      a. Hilti Inc.; www.us.hilti.com - HSL-3. Refer to ICC ESR-1545.
   2. Description: Torque-controlled, exhibiting follow-up expansion under load, with provision for rotation prevention during installation. Type and size as indicated on Drawings or by manufacturer of product to be anchored.
   3. Material: Carbon steel.
   4. Use: Interior only.

D. Undercut Anchors for Anchorage to Concrete:
   1. Manufacturers and Products: Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide one of the following:
      a. Hilti Inc.; www.us.hilti.com - HDA. Refer to ICC ESR-1546.
      b. Powers Fasteners, Inc.; www.powers.com - Atomic+. Refer to ICC ESR-3067.
      c. Simpson Strong Tie Co.; www.strongtie.com – Torq-Cut. Refer to ICC ESR-2705.
   2. Description: Torque-controlled, mechanical, self-undercutting anchors consisting of a threaded rod, spacer sleeve, undercut expansion ring, expansion cone, hex nut, and washer.
   3. The installed anchor shall exhibit a form fit between the bearing elements and the undercut in the concrete.
   4. Type and size as indicated on Drawings.

E. Drop-In Anchors for Anchorage to Concrete:
   1. Manufacturers and Products: Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide one of the following:
      a. Hilti Inc.; www.us.hilti.com - HDI / HDI-L Drop-In Anchors.
      b. ITW Red Head division of Illinois Tool Works; www.itwredhead.com - Multi-Set II.
      c. Simpson Strong Tie Co.; www.strongtie.com – Drop-In.
      d. Wej-it Fastening Systems division of Mechanical Plastics Corporation; www.toggler.com/wejit - Power-Drop.
   2. Description: Internally-threaded impact expansion anchor inserts, complete with required internal plugs. Sized to receive threaded rods with diameters indicated on Drawings.

2.05 CARTRIDGE INJECTION ADHESIVE ANCHORS

A. Regulatory Requirements.

1. Adhesive Anchorage to Concrete: Adhesive anchors shall have current ICC-ES report that demonstrates compliance with ACI 355.4 as supplemented by AC308 for use in cracked concrete.

B. Manufacturers and Products – Anchorage to Concrete: Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide one of the following:
   1. Hilti Inc.; www.us.hilti.com – HIT RE 500-SD Adhesive Anchoring System with two-component epoxy with threaded rod anchors. Refer to ICC ESR-2322.
   2. ITW Red Head division of Illinois Tool Works; www.itwredhead.com – Epcon G5 Adhesive Anchoring System with two-component epoxy and threaded rod anchors. Refer to ICC ESR-1137.
   3. Powers Fasteners; www.powers.com - PE1000+ Epoxy Adhesive Anchoring System with two-component epoxy and threaded rod anchors. Refer to ICC ESR-2583.
   4. Simpson Strong Tie Co.; www.strongtie.com – Set-XP Epoxy Adhesive Anchors with two-component epoxy and threaded rod anchors. Refer to ICC ESR-2508.

C. Steel Anchors: Threaded steel rod or inserts, complete with nuts, washers, adhesive injection system. Type and size as indicated on Drawings.
   1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel threaded rods conforming to ASTM A36, ASTM A 193 Type B7 or ISO 898 Class 5.8 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) or carbon steel rods conforming to ASTM A510 with chemical composition of AISI 1038.
   2. Anchorage to Hollow Concrete Block Masonry, Brick with Holes, or Cavity Walls: Provide with stainless steel screen tubes.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install post-installed anchors and inserts in accordance with applicable ICC-ES Report and with manufacturer's instructions in accurately drilled holes of required diameter and depth.
   1. Avoid installing anchors in contact with galvanically dissimilar metals.

B. Drilling:
   1. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, and grout has achieved full design strength.
   2. Drill holes with rotary impact hammer drills using carbide-tipped bits and core drills using diamond core bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
      a. Cored Holes: Where anchors are to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer.
      b. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Architect and Structural Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

C. Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10 percent of the specified torque, 100 percent of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Architect and Structural Engineer.

D. Cartridge Injection Adhesive Anchors: Clean all holes in accordance with manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Holes may be dry, damp or wet. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer

recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

E. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

3.02 ADJUSTING

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.
   1. Non-Shrink Grout: Section 03 62 00.

3.03 SITE QUALITY CONTROL

A. Testing, General: See Section 01 45 00.

B. Testing of Post-Installed Anchors: . Quality control testing shall be performed by independent testing agency in consultation with manufacturer's representative.
   1. Testing: 10 percent of each type and size of post-installed anchor shall be proof loaded by the independent testing laboratory. Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Architect. If any of the tested anchors fail to achieve the specified torque or proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Architect.
      a. Torque shall be applied with a calibrated torque wrench.
      b. Proof loads shall be applied with a calibrated hydraulic ram. Displacement of adhesive and capsule anchors at proof load shall not exceed D/10, where D is the nominal anchor diameter.
   2. Minimum anchor embedments, proof loads and torques shall be as shown on the Drawings.

C. Special Inspection: See Section 01 45 00.
   1. Special inspection is required for all post-installed anchor installations.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Steel bollards.
   2. Steel opening frames in metal deck floors and roofs.
   3. Overhead door steel frames.
   4. Steel support for counters.
   5. Elevator sill support angles.
   6. Steel plate panels.
   7. All other miscellaneous angles, channels, tubes and plates as indicated and required.

B. Products Furnished But Not Installed Under This Section:
   1. Anchor bolts and weld plates for anchoring metal fabrications installed under Section 03 10 00 Concrete Forming and Accessories.
   2. Steel angle lintels installed under Section 04 23 00 Stone Masonry.
   3. Railing sleeves installed under Section 03 10 00 Concrete Forming and Accessories.

C. Related Requirements:
   1. Post-Installed Concrete Anchors: Section 05 05 19.
   2. Metal Fastenings: Section 05 05 23.
   3. Structural Steel: Section 05 12 00 Structural Steel Framing.
   4. Architecturally-Exposed Structural Steel Framing: Section 05 12 13.
   5. Steel Stairs and Ladders: Section 05 51 00 Metal Stairs.
   6. Steel Pipe Railings and Handrail Brackets: Section 05 52 00 Metal Railings.
   7. Decorative Metal: Section 05 70 00.
   8. Field Painting and High Performance Coating: Section 09 90 00 Painting and Coating.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with following:
   1. Design, Detailing, and Fabrication: ANSI/AISC 360-10 - Specification for Structural Steel Buildings.
   2. AISC 303-10 - Code of Standard Practice for Steel Buildings and Bridges, limited to the following:
      a. Fabrication, Delivery and Erection of Steel: Comply with Sections 5 through 8.
      b. Fabrication, Erection, and Dimensional Tolerances for Exposed Steel Fabrications: Comply with Section 10.
   3. Welding: AWS D1.1/D1.1M – 2010 Structural Welding Code – Steel.
   4. Painting: Society for Protective Coatings SSPC-PA 1 - Shop, Field and Maintenance Painting of Steel.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinating and Scheduling Deliver of Materials To Be Installed By Others:
   1. Deliver anchor bolts and other anchorage devices that are embedded in cast-in-place concrete or masonry construction to Project site in time to be installed before start of cast-in-place concrete operations and masonry work.
   2. Provide setting drawings, templates, and directions for installation of anchor bolts and other devices.

B. Steel Opening Frames for Mechanical Units: Coordinate with Division 23. Do not fabricate frames until final mechanical unit size and configuration has been provided.

1.04 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Shop Drawings: Submit for all custom fabricated items under this Section. Include loose steel lintels, plates and welded steel opening frames.

1. Shop drawings shall clearly indicate the following:
   a. Profiles, sizes, spacing, and locations of members.
   b. Connections, attachments, and anchorages.
   c. Size and type of fasteners.
   d. Finishes, coatings and shop painting.
2. Include erection drawings, elevations and details where applicable.
3. Indicate weld lengths and sizes.

1.05 INFORMATIONAL SUBMITTALS

A. Procedures: Submit for information and verification in accordance with Section 01 33 00.

B. Certifications:
   1. Welder Certificates: Furnish for all welding operators used for fabrication and erection.
   2. Submit certification that specified surface preparation and primer have been applied to steel items to receive high performance coating under Section 09 90 00.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Welder Qualifications: Welding shall be performed only by certified welding operators currently qualified in accordance with the testing procedures of AWS D1.1 for the weld types and positions required for the fabrications and installations indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Storage and Handling Requirements:
   1. Store metals above ground on platforms, skids, or other supports. Protect metals from corrosion.
   2. Store other materials in weathertight and dry place, until ready for use.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Shapes, Bars and Plates: ASTM A36.

B. Steel Pipe and Tubing: ASTM A53, Grade B, or A500, Grade B, minimum wall thickness 11 gage.

C. Threaded Rod: ASTM A36.

D. Fasteners and Anchors: Section 05 05 23.

E. Welding Materials for Steel: Section 05 05 23.

2.02 PIPE BOLLARDS

A. Bollards [Four][Six][Eight]-inch diameter steel pipe, standard weight, Schedule 40 black iron.
   1. Concrete Base and Fill: Supplied under Section 03 30 00 Cast-In-Place Concrete and installed with concrete rounded at top.
   2. Size, Height and Embedment: As indicated on Drawings.

2.03 STEEL LINTELS

A. Steel Lintels: All masonry openings 16 inches in width and over shall have lintels. Provide loose steel lintels except where masonry lintels are indicated on Drawings.
   1. Sizes and Bearing Lengths: See Lintel Schedule on Structural Drawings.
   2. Weld or bolt members together where indicated to form complete assembly. Where welds will be exposed in the completed installation, provide continuous welds and grind flush.

2.04 STEEL OPENING FRAMES

A. Steel Frames for Openings in Metal Floor or Roof Deck: Support all openings in metal roof deck greater than 10 inches in any direction on all four sides by a steel frame spanning between steel joists, beams, purlins or other structural deck supports.
   1. Steel Member Sizes: As indicated on Drawings.
   2. Weld members as indicated to form complete and rigid assembly.

3. Coordinate with Section 05 12 00 and Section 05 21 19 Open Web Steel Joist Framing. Fabricate members based on dimensions indicated on structural steel and steel joist shop drawings that have been approved for construction. Provide adequate length to allow for normal sweep and installation tolerances of supporting members.

B. Steel Section Door Frames: Fabricate of shapes indicated, fully welded, uniform, square and true. Grind exposed welds smooth. Securely and rigidly anchor to concrete as indicated.

2.05 WIRE ROPE ASSEMBLIES

A. Wire Rope Assemblies: Jakob Inox Line wire rope with swaged eye ends.
1. Supplier: DecorCable Innovations, LLC, 648 West Randolph Street, Chicago, Illinois, 60661-2114, (800) 444-6271.
2. Provide all accessories and connectors required for complete assemblies as indicated, including wire rope guardrail.
3. Wire Rope: Jakob rope, Nos. 10820 or 10830, diameters as indicated.

B. Clevises, Turnbuckles and Sleeve Nuts: AISC standard with UNC and 4 UN Class 2B threads.

2.06 FABRICATION

A. Exposed Steel Fabrications: Interior and exterior steel fabrications and connections which will remain exposed and subject to normal view by the public or occupants of the completed structure shall be subject to all requirements for Architecturally Exposed Structural Steel specified in Section 10 of the AISC Code of Standard Practice.

B. Shop Assembly: Fabricate custom metal fabrications as indicated, scheduled or listed in Article 1.01.
1. Fabricate in accordance with details and accepted shop drawings.
2. Provide miscellaneous items of metal work indicated or as necessary to complete work.
3. Materials: New stock of types and sizes indicated.
4. Make cuts clean and sharp with wire edges ground smooth. Provide straight, rigid, and tight work, free from defects.
5. Close exposed ends of steel pipe or tubing with welded caps.
6. Verify dimensions on site prior to shop fabrication.
7. Fabricate items with joints neatly fitted and properly secured.
8. Fit and shop assemble, in largest practical sections, for delivery to site.
9. Exposed mechanical fastenings shall be flush, countersunk screws or bolts, unobtrusively located, consistent with design of structure, except where specifically noted otherwise.
10. Make exposed joints flush butt-type, hairline joints where mechanically fastened.
11. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified or detailed.
12. Welding: AWS D1.1. Miter and cope intersections and weld all around. Remove splatter, grind exposed welds to blend and contour surfaces to match those adjacent.
13. Substitutions: Where exact sizes and weights called for are not available, secure Architect's acceptance of suitable sizes prior to proceeding.

C. Welding and Fastening: Section 05 05 23.

2.07 SHOP FINISHES

A. Galvanizing: Provide corrosion resistant galvanized coating on indicated or specified steel items after fabrication and shop assembly. Include exterior handrails and gate frames as indicated on Drawings.
1. Hot Dip Galvanized Steel Bars, Shapes and Plates: ASTM A123.
2. Galvanized Steel Fabrications to Receive Painted Finish: Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop Paint:
1. Steel Items to Receive Painted Finish or To Be Concealed in Completed Structure: One of the following.

a. Tnemec Series 10 modified alkyd primer.
b. Society for Protective Coatings Specification SSPC Paint 25 lead and chromate free primer.

2. Primer for Exterior Exposed Steel Fabrications: Provide same primer as specified for AESS. Comply with Section 05 12 13.

D. Shop Priming:
1. Surface Preparation: After fabrication and shop assembly, clean off all loose rust, loose mill scale and weld spatter, slag or flux deposits in accordance with SSPC procedures as follows:
a. Surfaces to be Concealed in the Completed Structure: SP-3 power tool cleaning.
b. Surfaces to be Exposed in the Completed Structure: SP-6 commercial blast cleaning.
c. Surfaces to Receive High Performance Coating: Thoroughly clean surfaces in accordance with SSPC-SP10/NACE No. 2.
2. Paint Application: Shop coat fabricated items with shop paint in accordance with SSPC-PA-1.
a. Omit shop paint on surfaces to be enclosed in concrete and surfaces to be field welded.
b. Standard Shop Paint Thickness: 2.5 dry film mils.
c. High Performance Coating Primer: 2.0 - 4.0 dry film mils.

E. Steel Plate Panels: Clear coated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Weld or bolt items securely in place or otherwise fasten as indicated on the Drawings or accepted shop drawings. Include items indicated, scheduled or listed in Article 1.01.

B. Install items square and level, accurately fitted and free from distortion or defects.

C. Field Welds: Perform field welding in accordance with AWS D1.1.
1. Painted Fabrications: Grind smooth and touch up with compatible primer.
2. Galvanized Fabrications: After installation, grind and touch-up field welds and scratched and damaged galvanized surfaces. Use a primer recommended for galvanized surfaces.

3.02 ADJUSTMENTS

A. Repair of Defective Work: Remove stained or otherwise defective work. Replace with new material.

END OF SECTION

SECTION 06 1053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roofing and flashing blocking.
   2. Partition blocking.
   3. Miscellaneous blocking and supports.
   4. Support for wood ceiling.
   5. Miscellaneous wood sheathing.
   6. Rough hardware.
   7. Preservative treatment.
   8. Fire-retardant treatment.

B. Products Furnished But Not Installed Under This Section:
   1. Anchors Cast into Concrete for Anchorage of Wood: Install under Section 03 10 00 Concrete Forming and Accessories.

C. Related Requirements:
   1. Sustainability Certification Project Procedures: Section 01 35 66.
   2. Low-Emitting Material Requirements: Section 01 61 65.
   3. Gypsum Sheathing: Section 06 16 43.
   4. Exterior Finish Carpentry: Section 06 20 13.
   5. Interior Finish Carpentry: Section 06 20 23.
   6. Architectural Woodwork: Section 06 40 00.
   7. Mechanical and Electrical Blockouts: Division 22 through Division 26.

1.02 REFERENCES

A. Reference Standards. See Section 01 42 00. Comply with the following:
   1. Wood Framing: Comply with requirements of the 2009 International Building Code and ANSI/AF&PA NDS-2012 National Design Specification for Wood Construction, as published by the American Wood Council of the American Forest and Paper Association.
   2. Lumber: Grading Rules for Lumber, latest edition, as published by Western Wood Products Association.
   3. Plywood: National Institute of Standards and Technology (NIST) – Voluntary Product Standard PS 1-09 - Structural Plywood.
   4. Performance Rated Wood Sheathing Panels:
      a. APA PRP-108 - Performance Standards and Policies for Structural-Use Panels.
      b. National Institute of Standards and Technology (NIST) – Voluntary Product Standard PS 2-10 – Performance Standard for Wood-Based Structural-Use Panels.
   5. Treatment:
      a. AWPA C2 – Lumber, Timber, Bridge Ties and Mine Ties – Preservative Treatment by Pressure Processes.
      b. AWPA C20 – Structural Lumber – Fire-Retardant Treatment by Pressure Process.
      c. AWPA C27- Plywood – Fire-Retardant Treatment by Pressure Process.
      d. AWPA P5 – Standard for Waterborne Preservatives.
      e. AWPA Standard P17 - Fire Retardant Formulations.
      f. AWPA Use Category System, Appendix H.

1.03 SUSTAINABLE DESIGN SUBMITTALS

A. Submittal Procedures: Submit the following for documentation in accordance with Section 01 35 66.

B. Indoor Environmental Quality Submittals:
   1. Letter of Certification for Pressure Treatment: Submit Certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards.

1.04 QUALITY ASSURANCE

A. Grade Stamps:
   1. Lumber: Each piece shall be WWPA or WCLIB grade stamped.
   2. Wood Sheathing: Each panel shall be identified with the grade trademark of the APA.
   3. Sill Plates and Other Lumber Specified to be Preservative Treated: Each piece shall be stamped to indicate compliance with AWPA pressure treatment standards.

B. Treatment Labels: Label each piece of treated lumber.
   1. Fire Treated Lumber: UL labels.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Storage: Stack all materials minimum of 6 inches above ground to ensure proper ventilation and cover with waterproofing covering.

PART 2 PRODUCTS

2.01 WOOD MATERIALS

A. General Requirements:
   1. Lumber: Sound, thoroughly seasoned, surfaced four sides, well manufactured and free from warp not correctable by bridging, blocking or nailing.
   2. Moisture Content: Provide dry lumber as defined by the American Softwood Lumber Standard PS 20, with moisture content limited to maximum 19 percent moisture content, graded S-DRY, KD or KD-HT, as documented by grade stamp.
   3. Dimension Lumber Noted on Drawings to be Non-Combustible: Fire retardant treated with chloride salts.

B. Blocking, Furring and Miscellaneous Dimension Lumber: Douglas Fir-Larch or Hem-Fir. Standard Grade or Better.
   1. Blocking in Contact with Roofing Membrane: Pressure treated with preservative.
   2. Interior Blocking: Fire retardant treated with chloride salts.

C. Sheathing: APA Rated Sheathing EXP 1.
   1. Thickness: As indicated.

D. Miscellaneous Panels for Interior Application: APA plywood BDX interior with exterior glue. ¾-inch thickness unless otherwise indicated.
   1. Electrical Component Mounting: Fire retardant treated.

2.02 TREATMENT

A. Preservative Treatment of Dimension Lumber: All blocking in contact with roof membrane, exterior plates, posts embedded in concrete, and blocking and plates in contract with concrete or masonry shall be pressure preservative treated.
   1. Acceptable Products: Osmose NatureWood Preservative or accepted substitute.
   2. Type: Waterborne, alkaline copper quaternary preservative system with co-biocide, registered by EPA as a non-restricted use pesticide.
   3. Minimum Preservative Retention:
      a. Plates and Blocking: 0.40 lbs of preservative per cubic foot of wood.
   4. Water Repellent Additive: Required.
   5. Treated Wood: Kiln-dried after treatment.

B. Fire Retardant Treated Plywood: All sheathing required to be fire retardant-treated shall be pressure-treated in accordance with AWPA Standard C27 with an approved low hygroscopic, high temperature Interior Type A-HT fire retardant.
   1. Each panel shall be labeled or marked by an approved independent testing agency.
   2. After treatment, plywood shall be dried to an average moisture content of 15 percent or less.

2.03 FASTENERS, ANCHORS AND HARDWARE

A. General: Provide necessary bolts, screws, nails, clips, plates, straps, hangers, etc. necessary for completion of rough carpentry. Provide correct material of proper size and strength for purpose intended conforming to specifications, drawings and applicable building codes. Supply anchors to be cast into concrete and masonry for anchorage of wood for installation under other Sections.

B. Anchor Bolts: ASTM A307.

C. Exterior Applications: Provide fasteners hot dip galvanized in accordance with ASTM A153.

D. Fasteners for Use in Pressure Treated Wood: One of the following:
   1. Stainless steel.
   2. Steel, hot-dip galvanized to G185 in accordance with ASTM A653.
   3. Steel, Batch/Post Hot-Dip Galvanized in accordance with ASTM A153.
   4. Steel, mechanically galvanized to Class 55 or greater in accordance with ASTM B695.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that surfaces to receive rough carpentry are prepared to required grades and dimensions.

3.02 INSTALLATION

A. General:
   1. Perform in substantial manner consistent with accepted standards of carpentry trade.
   2. Framing: Erect plumb, level and true and rigidly anchor in place. Cut framing square on bearings, closely fit, accurately set to required lines and levels.
   3. Nail or spike members in accordance with IBC and General Structural Notes on Drawings.
   4. Framing: 16 inches on center unless otherwise indicated.
   5. Shims: Do not use shims for leveling on wood or metal bearings. Use steel shims with full bearing on masonry or concrete.
   6. Metal Framing Anchors: Install where required for proper connections in accordance with manufacturer's recommendations.

B. Anchors: Unless otherwise indicated, bolt plates firmly to concrete or masonry with 3/8-inch by 12 inches (3-inch horizontal leg) anchor bolts, 2'-0" on center or use powder-actuated fastening system.
   1. Size and Spacing: Accepted by Architect.

C. Sheathing: Fasten in accordance with IBC and APA recommendations.

3.03 WOOD BLOCKING AND MISCELLANEOUS LUMBER REQUIRED FOR WORK OF OTHER SECTIONS

A. General: Cooperate with other trades. Provide required grounds, blocking, wood backing and framing. Perform necessary cutting and patching of rough carpentry work as required.

B. Interior Blocking: Install blocking of size required for support of handrails, toilet and bath accessories, wall-mounted door stops, wall cabinets and other wall-mounted accessory items. Set true to line, level or plumb well secured in stud wall and flush with back of drywall or other wall finish.

C. Exterior Blocking:
   1. Install blocking of size required for exterior wall finish materials, exterior handrails, exterior wall mounted equipment, roof edge details and other locations as indicated.
   2. Install blocking for wood board sidings as required to allow nailing of siding to studs, nailing strips or blocking at a maximum of 24 inches on center.
   3. Roof Blocking: Anchor at 3 feet on center to resist force of 75 lbs. per lineal foot.

D. Roof Curbs: Install blocking and framing as indicated for curbs at roof openings and rooftop mechanical units.

END OF SECTION

SECTION 06 1300
HEAVY TIMBER CONSTRUCTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Included:
   1. Heavy timber beams, purlins, rafters and posts.
   2. Timber trellises.
   3. Other heavy timber as indicated.
   4. Rough hardware and connections.

B. Products Furnished But Not Installed Under This Section:
   1. Anchors Built into Concrete for Support of Heavy Timber: Install under Section 03 30 00 Cast-In-Place Concrete.

C. Related Requirements:
   1. Sustainable Design Requirements for Wood:
      a. Section 01 35 66 Sustainability Certification Project Procedures.
   2. Exterior Finish Carpentry: Section 06 20 13.
   3. Finish: Section 09 90 00 Painting and Coating.

1.02 REFERENCES

A. Definitions:
   1. Heavy Timber: For purposes of this Specification, Heavy Timber is defined as solid wood framing members having a nominal dimension of 5 inches and over in both thickness and width.

B. Reference Standards: See Section 01 42 00. Comply with the following.
   1. Wood Framing: Comply with requirements of the 2009 International Building Code and ANSI/AF & PA ANSI/AF&PA NDS-2012 "National Design Specification for Wood Construction", as published by the American Forest Paper Association.
   2. Lumber and Measurement of Characteristics: Comply with Western Lumber Grading Rules, latest edition, as published by Western Wood Products Association.
   3. Timber Construction: Comply with AITC 108 – Standard for Heavy Timber Construction.

1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, action and return in accordance with Section 01 33 00.

B. Product Data:
   1. Preservative Treatment: Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
      a. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   2. Manufactured Connectors: Submit manufacturer's catalog data for all connectors manufactured to standardized designs. Indicate finish and required fasteners. Include manufacturer's installation instructions.

C. Shop Drawings:
   1. Submit shop drawings for all custom fabricated steel connections and supports.
   2. Submit shop drawings produced by framing subcontractor for all heavy timber trusses.
      a. Indicate truss framing plans, pitch, span and locations of trusses; gage thickness, nominal sizes and locations of connectors at joints; ICC-ES Evaluation Report for the brand and type of manufactured connectors used; bearing and anchorage details; permanent bracing and bridging and related items.

D. Samples:
   1. Architecturally Exposed Heavy Timber: Full width and depth, 24 inches long, showing the range of variation to be expected in appearance, including surface texture, of wood products.

a. For samples of timber to be installed with exterior exposure, apply a coat of penetrating sealer to samples.

1.04 INFORMATIONAL SUBMITTALS

A. Procedures: Submit for information and verification in accordance with Section 01 33 00.

B. Certificates: Submit two copies of the following:
   1. Certificates of Inspection: Issued by lumber grading agency for exposed timber not marked with grade stamp.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.
   1. Protect members from damage during shipment, storage and installation.

B. Storage and Handling Requirements:
   1. Stack all materials minimum of 6 inches above ground to ensure proper ventilation and cover with waterproofing covering.
   2. Store heavy timber trusses in a vertical direction, above ground and covered to prevent water staining.

PART 2 PRODUCTS

2.01 HEAVY TIMBER, GENERAL

A. General Requirements: Sound, thoroughly seasoned, and free from warp or significant surface defects.

B. Grade Stamps:
   1. Factory mark each item of timber with grade stamp of grading agency.
   2. For exposed timber indicated to receive a stained or natural finish, apply grade stamps to surfaces that will not be exposed to view or omit grade stamps and provide certificates of grade compliance issued by grading agency.

C. Moisture Content: Heavy timber shall be dry lumber as defined by the American Softwood Lumber Standard PS 20, with moisture content limited as follows, as documented by grade stamp or separately submitted certification:
   1. Architecturally Exposed Heavy Timber: Maximum 15 percent moisture content, graded MC-15 or KD-15.
   2. Other Heavy Timber: Maximum 19 percent moisture content, graded S-DRY, KD or KD-HT.

D. Species and Structural Grade: Douglas-Fir, No. 1 or No. 2 as indicated on Structural Drawings.
   1. Reclaimed Douglas-Fir shall be utilized as noted on Drawings.

E. Finish:
   1. Architecturally Exposed Members: Re-sawn.
   2. Concealed: S4S.

2.02 ARCHITECTURALLY EXPOSED HEAVY TIMBER

A. General: In addition to all requirements specified for heavy timber in general, architecturally exposed heavy timber shall meet the additional requirements of this article.
   1. Grade Specification: Architecturally exposed heavy timber shall meet all minimum requirements of grade specified; but grade specification shall not be taken to supersede or reduce level of quality specified by other requirements of this article.

B. Select and Finish Grade: C Select as defined by WWPA Western Lumber Grading Rules, meeting following characteristics and limiting provisions on exposed faces:
   1. Medium stained wood allowable in an occasional piece over not more than one third of the face, or a greater area of lighter stain when not in combination with other characteristics.
   2. Small, well scattered seasoning checks on the surface, each not over 1/32-inch wide and not over 4 inches long.
   3. Very light torn or raised grain, not more than 3 inches long.
   4. Light skip, not over 1/32-inch in depth and 12 inches in length on one edge.
   5. No more than one of the following characteristics:

a. Two small, sound, tight knots, not over ¾-inch in least dimension.
b. Light pitch over not more than one half the face.
c. Two very small pockets
d. Equivalent characteristics no more damaging than any one of the above.

C. Wane, Including Bark or Lack of Wood on Edge or Corner: Not allowed.

D. Holes: Holes larger than pin holes, 1/16-inch diameter, not allowed.

E. Decay, Rot and Unsound Wood: Not allowed.
1. Includes heart center decay and honeycomb.

F. Slope of Grain: Vertical grain.

G. Splits: Not allowed.

H. Warp Tolerances:
1. Cup: Very light, as defined in WWPA Grading Rules Cup Table for face width of timber member.
2. Bow and Crook: Very light, as defined in WWPA Grading Rules Crook Table for length of crook and width of timber member.
3. Twist: Maximum 25 percent of very light, as defined in WWPA Grading Rules Twist Table for length of timber member.

I. Surface Finish: Rough-sawn.

2.03 MANUFACTURED CONNECTORS AND SUPPORT

A. Acceptable Manufacturers:
1. Simpson Strong-Tie Company.
2. United Steel Products Co. (USP).
3. Substitution Requests: In accordance with Document 00 26 00 or Section 01 25 00.

B. Types: As indicated on Drawings.

C. Finish: Hot dip galvanized for exterior use.

D. Provide with nails and bolts according to manufacturer's requirements.

2.04 ROUGH HARDWARE

A. Nails: Common wire nail length and diameters. Do not use box nails. Threaded hardened steel nails may be substituted for common size nail of corresponding size.
1. Finish: Hot dip galvanized in accordance with ASTM A153.
2. Material: No. 304 stainless steel.

B. Bolts and Lag Screws: Common bolts and screws, ASTM A307. Exterior shall be hot dip galvanized.

C. Steel Plates and Straps: ASTM A36, size as indicated. Weld plates together with 3/16-inch fillet welds all sides and full length of contact surfaces unless noted. Use E70 welding electrodes.

2.05 FABRICATION

A. Connections: Fabricate all heavy timber connections with holes and all connection plates as indicated on Structural Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Existing Conditions: Verify that surfaces to receive rough timber framing are prepared to required grades and dimensions. Do not begin work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Scribe and cope timbers for accurate fit.

B. Discard timbers that are warped, twisted, bowed, crooked or otherwise defective.

3.03 HEAVY TIMBER INSTALLATION

A. General:
1. Nail or spike members in accordance with the International Building Code.

2. Cut framing square on bearings, closely fit, accurately set to required lines and levels. Secure rigidly in place at bearings and connections. Do not use shims for leveling on wood or metal bearings. Use steel shims with full bearing on masonry or concrete,
3. Do not cut, notch or bore framing members for passage of pipes or conduits without Architect's permission. Reinforce framing members as directed where damaged by cutting.

B. Rough Hardware and Fastening:
1. Provide and install rough hardware and metal fastenings as indicated, specified or required for proper installation. Nails, spikes, screws and bolts and similar items shall be sizes and types to properly secure members in place.
2. Where splitting is likely to occur causing a reduction in member or connection capacity, pre-bore nail holes 1/2 size of nail diameter and use threaded hardened steel nails.
3. Bolts: Bolt holes shall be 1/16-inch to 1/32-inch larger than the bolt diameter. Carefully center bolt hole between side plates and main members. Provide standard washers between wood and bolt heads or nuts.
4. Anchors, Connectors and Supports: Install as indicated on Drawings.

END OF SECTION

SECTION 06 1643
GYPSUM SHEATHING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Glass-mat faced gypsum sheathing on exterior walls where indicated.
   2. Weather resistant barrier over glass-mat faced gypsum wall sheathing if required by governing building code and Building Official.
   3. Glass-mat faced gypsum roof boards.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.

B. Scheduling:
   1. Sheathing Board: Do not leave exposed to weather for more than 6 months.
   2. Roof Boards: Roof boards shall be roofed the same day as installed. Roof boards shall be kept dry before, during and after application.

1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Product Data: Submit manufacturer's descriptive literature indicating material composition, thickness, sizes and fire resistance for all materials to be provided.

C. Shop Drawings:
   1. Roof Boards: Submit shop drawings indicating fastener and adhesive patterns for FM wind uplift resistance specified.

D. Calculations:
   1. Wall Sheathing Over Wood Stud Framing: If sheathing is not covered by siding or masonry veneer mechanically attached directly to studs, submit structural calculations, signed and sealed by a registered design professional, documenting that the sheathing and its fastening methods are adequate under wind loads of the governing building code.

1.04 INFORMATIONAL SUBMITTALS

A. Procedures: Submit for information and verification in accordance with Section 01 33 00.

B. ICC Evaluation Service, Inc. (ICC-ES) report for each gypsum sheathing product to be provided.

C. Certification: Submit manufacturer's written certification that product meets specified fire-resistance requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to the job site in manufacturer's original packaging, containers and bundles with manufacturer's brand name and identification intact and legible.
   1. Remove temporary factory-applied plastic shipping covers immediately upon receipt of delivery.

B. Storage and Handling Requirements: Store level and handle materials to protect against contact with damp and wet surfaces, exposure to weather, breakage and damage to edges.
   1. Storage: Store materials protected against damage from weather, direct sunlight, surface contamination, construction traffic, or other causes.
      a. Stack sheathing flat on leveled supports off the ground, under cover, and fully protected from weather by suitable, breathable weather protection.
      b. Provide air circulation under covering and around stacks of materials.
   2. Protect gypsum board panels to prevent damage to edges, ends, and surfaces.
   3. Keep products dry until installed. If boards have been exposed to elevated job site moisture, allow boards to dry before using.

1.06 WARRANTY

A. Manufacturer's standard warranty for product exposed to weather without failure, when installed in accordance with manufacturer's requirements, for period of not less than 6 months.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Basis of Design Wall Sheathing Manufacturer and Products: Georgia-Pacific; www.gp.com - DensGlass Gold Exterior Sheathing.

B. Other Acceptable Manufacturers and Products – Wall Sheathing:
   1. For Fire-Rated Assembly Applications:
      a. CertainTeed Gypsum, Inc.; www.certainteed.com – GlasRoc Sheathing Type X.
      b. National Gypsum Company; www.nationalgypsum.com – Gold Bond E2XP Fire-Shield Extended Exposure Gypsum Sheathing.
      c. Temple-Inland, Inc.; www.templeinland.com – GreenGlass Type X Sheathing.
   2. For Non-Rated Applications:
      a. 5/8-Inch Thick Sheathing:
         1) CertainTeed Gypsum, Inc.; www.certainteed.com – GlasRoc Sheathing Type X.
         2) Georgia-Pacific; www.gp.com - DensGlass Gold Fireguard Exterior Sheathing.
         3) National Gypsum Company; www.nationalgypsum.com – Gold Bond E2XP Fire-Shield Extended Exposure Gypsum Sheathing.
         4) Temple-Inland, Inc.; www.templeinland.com – GreenGlass Type X Sheathing.
      b. 1/2-Inch Thick Sheathing:
         1) CertainTeed Gypsum, Inc.; www.certainteed.com – GlasRoc Sheathing.
         2) National Gypsum Company; www.nationalgypsum.com – Gold Bond E2XP Extended Exposure Gypsum Sheathing.
         3) Temple-Inland, Inc.; www.templeinland.com –GreenGlass Sheathing.

C. Acceptable Manufacturers and Products – Roof Board:
   1. Georgia-Pacific; www.gp.com - DensDeck Prime Roof Board.

D. Substitution Requests: Required for all manufacturers and products not named as Basis of Design or as Acceptable Manufacturer and Product.
   1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
   2. During Construction Phase: Submit in accordance with Section 01 25 00.

2.02 REGULATORY REQUIREMENTS

A. Sheathing product shall have a current ICC-ES report finding product to be an acceptable alternative product to those specified in the 2009 (or later) International Building Code.

B. Sheathing and Roof Boards in Listed Fire-rated Assemblies: Where applicable, provide materials and construction that are identical to those of assemblies whose fire-resistance ratings are indicated. If products listed as acceptable products in this Section are not included in tested assembly, submit a product that is listed in the tested assembly as a request for substitution, with a notation identifying the fire-rated assembly requirement as the reason for the substitution request.

C. Roof Boards:
   1. Meet Factory Mutual 4450 criteria for Class 1 insulated steel roof decks.
   2. Have UL 790 Class A listing as a barrier board overlayment and UL 1256 as a thermal barrier underlayment over steel decks.
   3. As an overlayment, qualify in FM Class 1 assemblies.
   4. Acceptance by Miami-Dade County, Florida required.

2.03 GLASS-MAT-FACED GYPSUM SHEATHING

A. Glass-Mat-Faced Gypsum Sheathing Panels: Gypsum sheathing shall be manufactured in accordance with ASTM C1177 with water-resistant glass mats both sides and long edges, over gypsum core treated for moisture and mold resistance.

1. Classification: Sheathing in listed fire-rated assemblies shall be Type X when tested in accordance with ASTM E119.
2. Flame Spread: ASTM E84: 0 maximum.
3. Smoke Developed: ASTM E84: 0 maximum.

B. Thickness: 5/8 inch (15.9 mm) thick where indicated and as otherwise required to meet fire rating for specific element. [1/2 inch (12.7 mm) elsewhere.]

C. Size: 48 by not less than 96 inches (1219 by not less than 2438 mm); longer lengths as available to reduce number of joints.

2.04 ROOF BOARDS

A. Roof Board Composition: Glass mat faced gypsum with nonasphaltic, highly filled proprietary heat-cured coating on one side to enhance bonding of single-ply, torch-applied modified bituminous, and built-up roofing systems.

B. Size: Nominal 4-foot by 8-foot,

C. Edges: Square.

D. Thickness: 1/4-inch.

E. Thickness: 1/2-inch.

F. Thickness: 5/8-inch.

G. Fire Resistance:
1. Flame Spread 0, smoke developed 0, when tested in accordance with ASTM E84. Noncombustible when tested in accordance with ASTM E136.
2. Class A when tested to UL 790.
3. Code alternate to 15 minute thermal barrier as tested to UL 1256.

2.05 WEATHER RESISTANT BARRIER

A. Weather Barrier Over Wall Sheathing: Provide 30#, nonperforated, asphalt saturated felt complying with ASTM D226, Type 1 as indicated and meeting local building code requirements.

2.06 FASTENERS

A. Sheathing Fasteners:
1. Fasteners for Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion- protective coating having a saltspray resistance of more than 800 hours according to ASTM B11.
   a. Screws for Steel Framing From 0.033 to 0.112 Inch (0.84 to 2.84 mm) Thick: ASTM C954. Bugle or wafer head, self-tapping, rust-resistant, fine thread.
   b. Screws for Light-Gauge Metal Framing or Furring: ASTM C1002 Type S-12. Bugle-head, self-tapping, rust-resistant sharp point, fine thread.

B. Roof Board Fasteners:
1. FM-approved flat bottom plates and fasteners: Provide size and type in accordance with FM requirements and roof membrane manufacturer's written recommendations.
2. Adhesives: As recommended by roof system manufacturer.

2.07 JOINT FINISHING MATERIALS

A. Joint Finishing Materials, General: Provide materials complying with panel manufacturer's recommendations.

B. Glass-Fiber Mesh Sheathing Joint Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

C. Joint Compound: Manufacturer's standard setting-type joint compound for use with glass-fiber mesh sheathing tape and for covering exposed fasteners.

D. Silicone Sealant for Joints to Have Long-Term Exposure to Weather: Meeting ASTM C920, Type S, Grade NS, compatible with sheathing tape and sheathing, recommended by tape and sheathing manufacturers for use with glass-fiber mesh sheathing tape and for covering exposed fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Comply with Section 01 71 16:
   1. Existing Conditions: Examine framing to receive sheathing before beginning installation.
   2. Verify that surface of framing and furring members to receive sheathing does not vary more than 1/8-inch from the placement of faces of adjacent members.

B. Notification: Notify General Contractor of unsatisfactory conditions in writing with copy to Architect.

C. Acceptance: Beginning of work means acceptance of existing conditions by installer.

3.02 GYPSUM SHEATHING INSTALLATION

A. General: Install sheathing in accordance with manufacturer's instructions and applicable instructions in GA-253 and ASTM C1280. Comply with all conditions of use stipulations in ICC-ES report.
   1. Install sheathing with designated exterior side out.
   2. Use maximum lengths possible to minimize number of joints.
   3. Cut boards at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated and as follows.
      a. Install boards with a 3/8-inch (9 mm) setback where non-load-bearing construction abuts structural elements.
      b. Install boards with a 1/4-inch (6 mm) setback where they abut masonry or similar materials that might retain moisture, to prevent wicking.
      c. Allow no joints greater than 1/8 inch (3 mm).
   4. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
   5. Locate fasteners minimum 3/8-inch from edges and ends of sheathing panels, Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing. Do not countersink.

B. Gypsum Wall Sheathing: Apply gypsum sheathing panels of maximum practical length with long dimensions perpendicular to studs.
   1. Install sheathing with long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges, and stagger end joints of adjacent boards not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud.
      a. Edge and End Joints: Occur over supports.
      b. Properly support panels around cutouts and openings.
   2. Attaching Sheathing to Metal Framing: Space fasteners approximately 8 inches (200 mm) on center in the field of board and 8 inches on center along abutting edges, and set back a minimum of 3/8 inch (9 mm) from edges and ends of boards.
      a. A greater number of fasteners may be provided to obtain specific values and is allowed up to 4-inches on center. spacing.
   3. Sheathing Joint-and-Penetration Treatment: Seal sheathing joints according to sheathing manufacturer's written recommendations and as required to seal wall against air and weather.
      a. Short Term (6 Month Exposure): Apply elastomeric sealant on joints and trowel flat. Apply sufficient quantity of sealant to completely cover joints after troweling. Seal other penetrations and openings.
      b. Long Term as an Alternate to Separate Weather-Resistive Barrier, Subject to Acceptance by Building Official: Apply glass-fiber mesh sheathing tape to fiberglass reinforced gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape.
      c. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.03 ROOF BOARD INSTALLATION

A. General: Install roof boards in accordance with manufacturer's instructions.
   1. Adhered Systems: As recommended by roof system and adhesive manufacturers.
   2. Mechanically Attached Systems: Install per FM guidelines for wind uplift resistance.
   3. Use appropriate adhesives or corrosion-resistant fasteners.

B. Use maximum lengths possible to minimize number of joints.

C. Support edge joints with deck ribs.

D. Stagger end joints of adjacent lengths of roof boards.

E. Butt ends and edges.

3.04 WEATHER RESISTANT BARRIER INSTALLATION

A. Install weather resistant barrier over glass-mat faced gypsum wall sheathing Staple to sheathing behind wall finishes.

B. Apply to sheathing from bottom to top of wall.

C. Laps:
   1. Horizontal Joints: 2 inches minimum
   2. Vertical Joints: 6 inches minimum

END OF SECTION

SECTION 06 1753

SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated wood trusses for roof framing.

B. Bridging, bracing, and anchorage.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2003.

C. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2007 and errata.

D. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses; 2011.

E. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

F. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2018.

G. WWPA G-5 - Western Lumber Grading Rules; 2011.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.

C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Include identification of engineering software used for design.
   2. Provide shop drawings stamped or sealed by design engineer.
   3. Submit design calculations.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State in which the Project is located.

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle and erect trusses in accordance with TPI BCSI 1.

B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 TRUSSES

A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.

2.02 MATERIALS

A. Lumber:
   1. Moisture Content: Between 7 and 9 percent.
   2. Lumber fabricated from old growth timber is not permitted.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Architect.

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between trusses with lumber in accordance with Section 06 1000.

H. Coordinate placement of decking with work of this section.

END OF SECTION

SECTION 06 2013
EXTERIOR FINISH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior wood fascia and trim.
   2. Wood soffit.
   3. Other exterior finish carpentry as indicated.

B. Related Requirements:
   1. Blocking: Section 06 10 53 Miscellaneous Rough Carpentry.
   2. Exposed Beams and Rafters: Section 06 13 00 Heavy Timber Construction.
   3. Interior Finish Carpentry: Section 06 20 23.
   4. Finish: Section 09 90 00 Painting and Coating.

1.02 REFERENCES

A. General Requirements: Refer to Section 01 42 00.

B. Reference Standards: Comply with the following except as otherwise specified in this Project Manual.
   1. Cedar Lumber: Comply with Standard Grading Rules for Western Red Cedar Lumber published by the National Lumber Grading Authority (NLGA). Each piece of lumber shall be grade stamped.
   2. Soffit Boards: Western Wood Products Association Standard Patterns for Siding and Ceilings.
   3. Plywood: National Institute of Standards and Technology (NIST) – Voluntary Product Standard PS 1-09 - Structural Plywood.

1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Shop Drawings.

C. Samples: Submit samples of shop finished materials on each specified material. Remake and resubmit until approved.
   1. Include soffit boards.
   2. Include fascia and trim.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Section 01 60 00.

B. Delivery and Acceptance Requirements: Do not deliver material until building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content.

PART 2 PRODUCTS

2.01 LUMBER FOR EXTERIOR FINISH, GENERAL

A. Boards, Lumber and Timbers: Sound, thoroughly seasoned, and free from warp or significant surface defects.
   1. Moisture Content: Minimum 10 percent, maximum 15 percent at delivery.
      a. Boards 5/4 Inch and Thinner: Kiln-dried.

2.02 FASCIA AND TRIM

A. Trim Material: Species as noted on drawings, Grade 2 unless otherwise noted.

B. Finish: Stained under Section 09 90 00.

2.03 WOOD SOFFITS

A. Wood Soffit Boards:
   1. Material: Species as noted on drawings, Grade 2 unless otherwise noted..
   2. Lengths: 6-feet to 16 feet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Layout: Verify layout of work before beginning installation.
   2. Ensure proper support framing, furring, and blocking provided under Section 06 10 00.
   3. Existing Conditions: Examine substrate before beginning installation.

B. Notification: Notify General Contractor of unsatisfactory conditions in writing with a copy to Architect.

C. Acceptance: Beginning of work means acceptance of existing conditions by installer.

3.02 INSTALLATION

A. Exterior Fascia and Trim:
   1. Wherever possible, provide each length of finish in single piece.
   2. Face nail into framing using corrosion resistant casing nails. Drive flush but do not set.
   3. Install level, plumb and true.
   4. Finish showing hammer marks, splits, cracks, mars or defects may be ordered replaced.

B. Wood Soffits:
   1. Blind nail with finish nails driven flush.
   2. Layout so boards meet correctly at corners.
   3. Miter boards at corners.

END OF SECTION

SECTION 06 2023

INTERIOR FINISH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Standard pattern wood trim, sills, base, railings and other millwork.
   2. Profile board paneling.
   3. Wood board ceiling paneling.
   4. Other interior finish carpentry as indicated.

B. Related Requirements:
   1. Sustainability Certification Project Procedures: Section 01 35 66.
   2. Blocking: Section 06 10 53 Miscellaneous Rough Carpentry.
   3. Exposed Wood Beams: Section 06 13 00 Heavy Timber Construction.
   4. Exterior Finish Carpentry: Section 06 20 13.
   5. Custom Standing and Running Trim, Stile and Rail Wall Paneling, Wood Door and Window Frames, Cabinets and Casework: Section 06 40 00 Architectural Woodwork.
   6. Wood Stairs and Railings: Section 06 43 00.
   7. Wood Doors: Section 08 14 16 Flush Wood Doors.
   8. Painted and Stained Finishes: Section 09 90 00 Painting and Coating.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with following:
   1. Architectural Woodwork Institute (AWI) and the Woodwork Institute (WI) – Architectural Woodwork Standards (AWS), First Edition, October 1, 2009.
      a. Comply with Custom Grade if not otherwise specified.
   2. American National Standards Institute (ANSI);
      a. ANSI/NPA A208.1-2009 – Particleboard.
      b. ANSI A208.2-2009 - Medium Density Fiberboard (MDF) for Interior Applications.
   3. American Wood-Preservers' Association (AWPA):
      a. AWPA Standard C20 - Structural Lumber - Fire Retardant Treatment by Pressure Processes.
      b. AWPA Standard P17 - Fire Retardant Formulations.
      c. AWPA Use Category System, Appendix H.

1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Shop Drawings: Include conformance to required reference standard.

C. Samples:
   1. Samples for Selection: Submit melamine color charts for preliminary selection.
   2. Samples for Verification:
      a. Submit samples of each type of millwork and board paneling. Submit finish samples for Architect's approval using profiles of all trim utilized and each wood species where occurring.
         1) Provide samples to painting subcontractors to stain and finish.
      b. Remake samples until approved.
      c. Cut final approved samples into minimum 2 inch wide pieces and furnish to Architect, Owner, Contractor, Finish Carpenter, Painting Subcontractor, Wood Door Manufacturer and others as directed by Architect.

1.04 INFORMATIONAL SUBMITTALS

A. Procedures: Submit for information and verification in accordance with Section 01 33 00.

B. Certificates:
   1. Submit paneling fire rating certificates. Include certificates from each bundle of treated paneling boards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Section 01 60 00.

B. Delivery and Acceptance Requirements:
   1. Humidity: Do not deliver material until building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content. Maintain wood material storage area relative humidity at between 25 percent and 55 percent.

PART 2 PRODUCTS

2.01 SOLID STOCK WOOD MATERIALS

A. General Requirements for Interior Wood Materials:
   1. Solid Stock Lumber Grade: In accordance with AWI rules for Custom Grade construction with specified finish unless indicated otherwise.

B. Wood Trim, Base, Rail, Sills, Caps and Moulding Material:
   1. Species and Grade:
      a. Stained or Transparent Finished Material: Maple, AWI Grade I, select, kiln-dried, clear.
      b. Painted Finished Material: Poplar, Birch or Maple, AWI Grade II, select, kiln-dried.
   2. Finish: Smooth, unless indicated otherwise.

2.02 BOARD PANELING

A. Wood Plank Ceiling:
   1. Material: AWI Grade II, select, kiln-dried. Reclaimed Douglas Fir.
   2. Ceiling Boards
      a. Nominal Size: 1 x 6 and 1 x 8, random pattern.
      b. Style: T&G V-groove, with medium mechanical distressed finish; finger tight knots, dents and wormholes. Match Architect's sample.
   3. Finish: See Interior Finish Specifications.

B. Wood Wall Paneling:
   1. Types, Wood Species, Grain, Board Sizes and Edge Type: Reclaimed Douglas Fir.
      a. Edge: T&G Fineline square edge, 1/8-inch reveal.
      b. Nominal Size: 1x6.
   2. Select, kiln-dried, clear, face grain, smooth texture.
   3. Finish: Stained and lacquered under Section 09 90 00.
   4. Furring Strips: Section 06 10 53.

C. Fire Retardant Treatment:
   1. Wood board ceiling paneling and wall paneling shall be fire-retardant treated.
   2. Fire retardant chemical shall provide protection against termites and fungal decay, shall be registered for use as a wood preservative by the U.S. Environmental Protection Agency (EPA), shall comply with the current edition of AWPA Standard P17, and shall be free of halogens, sulfates and ammonium phosphate.
   3. Treated wood shall have a flamespread of less than 25 when tested in an extended 30 minute tunnel test in accordance with ASTM E84, NFPA 255 or UL 723.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Comply with Section 01 71 16:
   1. Layout: Verify layout of work before beginning installation.
   2. Blocking: Ensure proper blocking provided under Section 06 10 53.
   3. Existing Conditions: Examine substrate before beginning installation.
   4. Notification: Notify General Contractor of unsatisfactory conditions in writing with copy to Architect.

B. Acceptance: Beginning of work means acceptance of existing conditions by installer.

3.02 INSTALLATION

A. General: All installations AWI Custom Grade unless otherwise specified.
   1. Lengths: Wherever possible, provide single piece for each length of finish. Butt joints not allowed except for long pieces or room molds which may be in two or more sections. When butt joints are necessary, bevel joints.
   2. General; Install interior finish level, plumb and true.
   3. Securing: Tightly secure to bracing with nails, screws, glue, etc. Blind nail wherever possible. Where surface nailing is necessary, use finish nails carefully set with nail punch.
   4. Trim Finishing Against Walls or Ceiling: Mill with extra width and scribe to wall or ceiling at job.
   5. Edges: Except where molded, mill trim with perfectly square edges. After erection. slightly round exposed edges by sanding as directed.
   6. Interior Finish: Hand smooth ready for finish under Section 09 90 00 free from machine or tool marks or any roughness.
   7. Replacement: Replace any interior finish bearing hammer marks, splits, cracks, mars or defects of any nature.

B. Wood Ceiling: Install as indicated on the Drawings by blind nailing.

C. Wood Wall Paneling: Install as indicated on the Drawings:
   1. Comply with applicable requirements for interior finish.
   2. Blind nail through gypsum board into wood blocking.
   3. Install horizontally on walls.
   4. Install vertically on walls.

END OF SECTION

SECTION 06 4000
ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Custom standing and running trim, interior and exterior.
   2. Plastic Laminate Faced Casework:
      a. Coffee bar.
      b. Workstations.
   3. Premium Transparent Finish Wood Faced Casework and Related Items:
      a. Built-in shelving and bookcases.
      b. Restaurant bar and back bar.
   4. Other custom cabinets and countertops as indicated.
   5. Cabinet and shelf hardware.
   6. Custom wood door frames, with related windows, side lights and transoms.
   7. Custom wood railing and newel posts.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with following:
   1. Architectural Woodwork Institute (AWI) and the Woodwork Institute (WI) – Architectural Woodwork Standards (AWS), First Edition, October 1, 2009.
      a. Unless otherwise indicated, comply with AWS for grades of interior architectural woodwork, construction, finishes and other requirements.
         1) Comply with Custom Grade if not otherwise specified.
   2. American National Standards Institute (ANSI);
      a. ANSI A135.4-2004 – Basic Hardboard.
      b. ANSI/NPA A208.1-2009 – Particleboard.
      c. ANSI A208.2-2009 - Medium Density Fiberboard (MDF) for Interior Applications.
   3. American Wood-Preservers' Association (AWPA):
      a. AWPA Standard C20 - Structural Lumber - Fire Retardant Treatment by Pressure Processes.
      b. AWPA Standard P17 - Fire Retardant Formulations.
      c. AWPA Use Category System, Appendix H.
   4. Builders Hardware Manufacturers Association (BHMA):
      a. BHMA A156.9-2003 – Cabinet Hardware.

1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Product Data: Submit catalog data for all countertop surfacing materials, countertop setting materials, shelving and hardware.
   1. Low-Emitting Materials Submittals:
      a. Adhesives: Provide a cut sheet and/or Material Safety Data Sheet (MSDS) for every adhesive applied within the weatherproofing envelope of the building with VOC levels highlighted.
      b. Sealants: Provide a cut sheet and/or Material Safety Data Sheet (MSDS) for every sealant applied within the weatherproofing envelope of the building with VOC levels highlighted.
      c. Paints and Coatings: Provide a cut sheet and/or Material Safety Data Sheet (MSDS) for every paint, stain, and transparent finish applied within the building with VOC levels highlighted.
         1) Paint: Document VOC content below the limits established by GS-11 and as specified in Section 01 61 65.
         2) Other Coatings: Document VOC content below the limits established by SCAQMD Rule 1113 and as specified in Section 01 61 65.
      d. Urea-Formaldehyde:

1) Certify that composite wood and agrifiber products to be installed on the interior of the building contain no added urea-formaldehyde resins.
2) Certify that laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies contain no added urea-formaldehyde resins.

C. Shop Drawings: Prepare in accordance with AWS Section 1, Shop Drawing Rules. Include conformance to required reference standard.
1. Cabinets and Casework: Submit dimensioned plans, elevations, component profiles and large scale details for each casework item.
a. Indicate materials, assembly methods, joint details, fastening methods, accessory listings, location of hardware, and schedule of finishes for each casework item.

D. Samples:
1. Material Samples:
a. Submit sample of each type and finish of cabinet and shelf hardware for approval before ordering hardware.
b. Submit samples of plastic laminate for color selection or verification.
c. Submit samples of melamine for color selection or verification.
d. Wood Veneer: 24 inch by 24 inch stepped finish sample.
2. Casework Sample: Submit three (3) 12-inch by 12-inch finished sample panels of each type and species of finish for approval as indicated. Remake panel as required.
3. Paneling Samples: Submit finish samples of paneling for approval. Include full-size flitch samples from several places within selected log.

1.04 INFORMATIONAL SUBMITTALS

A. Procedures: Submit for information and verification in accordance with Section 01 33 00.

B. Certificates:
1. The manufacturer/fabricator shall furnish a certificate indicating that solid stock lumber used in architectural woodwork did not exceed 10 percent moisture content at time of fabrication.
2. Submit fire rating certificates for all plywood wall paneling.
3. Melamine Core Material:
a. Particleboard and MDF: Submit third-party certification that formaldehyde emissions comply with Phase 1 standards of CARB Air Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products, and with ANSI A208.1 or A208.2 as applicable, when tested in accordance with ASTM E1333.
4. Melamine Laminator's Facility: Submit CPA EPP (Environmentally Preferable Product) Downstream Licensed Facility certification.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Delivery and Acceptance Requirements:
1. Humidity: Do not deliver material until building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content. Maintain wood material storage area relative humidity at between 25 percent and 55 percent.

C. Storage and Handling Requirements: Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

PART 2 PRODUCTS

2.01 SOLID STOCK WOOD MATERIALS

A. General Requirements for Interior Wood Materials:
1. Solid Stock Lumber Grade: In accordance with AWI rules for Custom Grade construction with specified finish unless indicated otherwise.
2. Moisture Content: Minimum 5 percent, maximum 10 percent at delivery.

B. Standing and Running Trim, Crown Moulding, Casing and Interior Wood Column Cover Material: Hardwood, select, kiln-dried.
   1. Millwork Patterns: As indicated on Drawings.
      a. Profile Substitutions: Not allowed.
   2. Finish: Section 09 90 00.

2.02 WOOD-BASED COMPOSITE PANELS

A. Plywood:
   1. Veneer Faced Plywood: AWI Grade AA.
      a. Transparent Finish: AWI Grade A, plain sliced, book matched hardwood veneer over plywood core.
      b. Painted Finish: AWI Grade B poplar veneer over plywood core.
   2. Plywood to Receive Plastic-Laminate: Commercial Standard Good Grade, minimum 3/4-inch thick before lamination.
   3. Maximum Allowable Formaldehyde Emissions: 0.05 ppm.

B. Particleboard: ANSI A2.08.1, Grade M-2 or better. Matte formed wood particleboard, 40-45# density industrial grade with sealer and lacquer finish.
   1. Required Emissions Classification:
      a. No-Added Formaldehyde (NAF) and/or Ultra-Low Emitting Formaldehyde (ULEF) as approved by CARB.
      b. No added urea-formaldehyde (NAUF).
   2. Acceptable Manufacturers and Products:
      a. Flakeboard Company Limited; www.flakeboard.com.
         1) Duraflake.
         2) NAUF Panels: Terra Particleboard.
         3) ULEF Panels: Vesta Particleboard.
      b. SierraPine; www.sierrapine.com - Encore.
         1) Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
   3. Thickness: 3/4-inch.
   4. Cabinet Interiors: Acrylic coated 45-47 pound density industrial particleboard.
   5. Recycled Content: 100 percent pre-consumer recycled/recovered wood content.

C. Medium-Density Fiberboard (MDF): ANSI A2.08.2.
   1. Grade: Grade 130 or better.
   2. Required Emissions Classification:
      a. No-Added Formaldehyde (NAF) and/or Ultra-Low Emitting Formaldehyde (ULEF) as approved by CARB.
      b. No added urea-formaldehyde (NAUF).
   3. Acceptable Manufacturers and Products:
      a. Flakeboard Company Limited; www.flakeboard.com.
         1) Premier MDF.
         2) NAUF Panels: Terra MDF.
         3) ULEF Panels: Vesta MDF.
      b. SierraPine; www.sierrapine.com - Medite II.
      c. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
   4. Thickness: 3/4-inch unless indicated otherwise.

D. Fire-Rated Medium-Density Fiberboard (MDF): ANSI A2.08.2, UL approved, Class 1 fire rated panels. Use where Class 1 paneling is required by code.
   1. Grade: Grade 115 or better.
      a. Moisture-Resistant Panels: Grade 115 or better. Use for exposed MDF in kitchens, baths, laboratories, and similar high humidity applications.
   2. Required Emissions Classification:
      a. No-Added Formaldehyde (NAF) and/or Ultra-Low Emitting Formaldehyde (ULEF) as approved by CARB.
      b. No added urea-formaldehyde (NAUF).

3. Acceptable Manufacturers and Products:
   a. Flakeboard Company Limited; www.flakeboard.com. - Premier FR.
   b. SierraPine; www.sierrapine.com - Medite II.
   c. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
4. Thickness: 3/4-inch unless indicated otherwise.

E. Hardboard: ANSI A135.4. Tempered Grade.

2.03 THERMALLY FUSED LAMINATE (TFL) PANELS

A. Acceptable Laminators and Fabricators:
1. American Laminates, Incorporated, Riverbank, California, ph: 209/869-2536.
2. Flakeboard Company Limited; www.flakeboard.com.
3. Panolam Industries International, Inc.; www.panolam.com.
4. Roseburg Forest Products; www.roseburg.com.
5. Roucke, Inc., Denver, Colorado, www.roucke.com.
6. Timber Products Company; www.timberproducts.com.
7. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.

B. Thermally Fused Melamine (TFM) Panel Material and Fabrication: Thermoset Decorative Overlay (TDO) consisting of melamine resin-impregnated decorative paper thermally fused to particleboard, plywood, or MDF core.
1. Melamine-Impregnated Decorative Paper:
   a. Comply with NEMA LD3-2005 VGL Performance Standards except as follows:
      1) Scratch Resistance: EN438-1: 2.0-3.5 N.
      2) Wear Resistance:
         (a) Solid Colors: 400 cycles.
         (b) Wood Grains: 125 cycles.
   b. Color: As selected by Architect.
2. Core Material: Particleboard or MDF meeting requirements of Article "Wood-Based Composite Panels."

2.04 HIGH PRESSURE LAMINATES (HPL)

A. Acceptable HPL Overlay Manufacturers:
1. Arclin; www.arclin.com.
2. Formica Group; www.formica.com.
3. Panolam Industries International, Inc.; www.panolam.com. Nevamar and Pionite brands.
4. Wilsonart LLC; www.wilsonart.com.
5. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.

B. High Pressure Decorative Laminate: NEMA LD3, grades as indicated, or, if not indicated, as required by woodwork quality standards.
1. Horizontal Surfaces: General Purpose Grade 10/HGS.
2. Vertical Surfaces: May be Vertical Grade 55VGS.

C. Colors: As selected by Architect from manufacturer's standards.

2.05 ADHESIVES

A. Provide low VOC types as recommended by the manufacturer of the material being installed. Adhesives shall comply with SCAQMD Rule 1168 VOC limits.

2.06 CABINET HARDWARE

A. Cabinet Hardware Manufacturers:
1. Hinges:
   a. Blum, Inc.; www.blum.com.
   b. Grass America, Inc.; www.grassusa.com.
   c. Häfele America Co.
   d. Hettich America LP.
   e. Mepla, Inc.

f. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.

2. Pulls and Catches:
   a. Häfele America Co.
   b. Stanley Hardware.
   c. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
3. Drawer Slides:
   a. Accuride International, Inc., www.accuride.com.
   b. Knape and Vogt Manufacturing.
   c. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.
4. Adjustable Shelf Hardware:
   a. Knape and Vogt Manufacturing.
   b. Accepted substitute in accordance with Document 00 26 00 or Section 01 25 00.

B. Cabinet Hardware: Furnished and installed by the cabinet supplier:
   1. Schedule:

TYPE	MANUFACTURER	CATALOG NO.	FINISH
HINGES	BLUM	71T555 - 120 DEGREE CLIP TOP HINGE, STRAIGHT-ARM STYLE	NICKEL PLATED
PULLS	HÄFELE	137.98.320	BLACK
CATCHES	HÄFELE	244.20.102	28
DRAWER SLIDES FOR LIGHT AND MEDIUM DUTY DRAWERS, 16-INCH WIDE OR LESS	ACCURIDE	NO. 3832, ALL BALL BEARING, HANDED LEVER DISCONNECT, FULL EXTENSION SLIDES WITH A 100 POUNDS/PAIR LOAD RATING	ELECTRO-PLATE [CLEAR][BLACK] ZINC
DRAWER SLIDES FOR LIGHT AND MEDIUM DUTY DRAWERS, 16-INCH WIDE TO 24-INCH WIDE	ACCURIDE	NO. 7434, ALL BALL BEARING, RAIL-MOUNT, FULL EXTENSION PLUS 1-IN. OVER TRAVEL SLIDES, HOLD-IN DETENT, WITH A 100 POUNDS/PAIR LOAD RATING AND PROGRESSIVE MOVEMENT	ELECTRO-PLATE [CLEAR][BLACK] ZINC
DRAWER SLIDES FOR HEAVY DUTY DRAWERS, 42-INCHES WIDE OR LESS	ACCURIDE	NO. 3640, ALL BALL BEARING, RAIL/BRACKET-MOUNT, FULL EXTENSION PLUS 1-IN. OVER TRAVEL SLIDES, HOLD-IN DETENT, WITH A 200 POUNDS/PAIR LOAD RATING AND SEQUENTIAL MOVEMENT	ELECTRO-PLATE [CLEAR][BLACK] ZINC

DRAWER SLIDES FOR LIGHT DUTY SHALLOW PENCIL DRAWERS, RESIDENTIAL KITCHEN UTENSIL DRAWERS, 16-INCH WIDE OR LESS	**ACCURIDE**	**NO. 2132, STEEL BALL BEARING, LEVER DISCONNECT, HOLD-IN DETENT, ¾ EXTENSION SLIDES WITH A 75 POUNDS/PAIR LOAD RATING**	**ELECTRO-PLATE [CLEAR][BLACK] ZINC**
BRACKETS FOR SHELVES	**KNAPE & VOGT**	**256**	**ZINC**
STANDARDS FOR SHELVES	**KNAPE & VOGT**	**255**	**ZINC**

2. Door and Drawer Locks: Five (5) disc tumbler, cam type, keyed alike or differently and master keyed. Each lock shall be furnished with two keys. Fifty (50) lock changes available. Locks for sliding 3/4 inch doors shall be a disc type plunger lock, sliding door type, with strike. All locks in each room to be keyed alike.

3. Drawer Suspensions: Slides shall have a 100 pound load rating at full extension and a built-in, positive stop both directions and shall be self-closing. Slides shall have a lifetime warranty as offered by slide manufacturer.

   a. Slides for Commercial and Institutional Caseword: BHMA 156.9, Grade 1HD-100 or 1HD-200.

4. Paper storage drawers shall be equipped with Blum BS 230E with Epoxy finish.

5. Index Followers: Steel plate and rod or hanging type Pendaflex file racks as indicated.

6. Wire Access Grommets:
   a. Manufacturer: Doug Mockett & Co., Inc., PO Box 3333, Manhattan Beach, CA 90266, or accepted substitute.
   b. Color: Black.
   c. Size: As indicated.

2.07 WOOD DOOR FRAMES

A. Interior Frames and Jambs: Select, kiln-dried.
   1. Transparent Finish: AWI Grade I. Clear Maple.
   2. Paint Finish: Poplar, Birch or Maple. AWI Grade II.

B. Construction: AWI Premium Grade. Plant assembled with corners dadoed and glued. Finger jointing is not acceptable.

C. Provide temporary shipping braces.

2.08 COUNTER AND CABINET FABRICATION

A. AWI Grade:
   1. Construct plastic laminate counters and cabinets as indicated on Drawings and as required for AWI Custom Grade work.
   2. Wood-Faced Casework: Premium Grade.

B. Preparation: Obtain field measurements and verify dimensions are as indicated on shop drawings before fabricating casework.

C. Coordination: Coordinate with plumbing and electrical rough-in.

D. Countertop Construction: Frame counters in substantial manner with necessary blocking, braces, etc.
   1. Supports Under Countertops: Sufficiently heavy to carry weight of 200 pound man without sagging.
   2. Frames: Pinned, glued, or screwed together in accordance with AWI Custom Grade standards.

E. Countertops Covered with Plastic Laminate: Constructed of particleboard. Provide backsplashes and self-edge all exposed edges.

F. Subtops to Receive Stone Countertops: One layer of 3/4-inch plywood. Comply with Section 12 36 40.

G. Plastic Laminate Faced Cabinets: Comply with Section 10 of AWS, Custom Grade. Fabricate casework to dimensions, profiles and details shown. Assemble units in the shop in as large of components as practicable to minimize field cutting and jointing. All joints to be doweled and glued. All edge banding called for in this Section shall be 3mm PVC hot melt glue applied. Top edges of interior drawer boxes may be 1/2mm hot melt glue applied.
   1. Core Material: Fabricate panels with plastic laminate on both sides or balancing sheet on concealed faces.
   2. Provide and install hardware as indicated and specified.
   3. Construct plastic laminate faced shelving, counters, cabinets and casework with plastic laminate covered particleboard. Use TFM at interiors.
   4. Frame cabinets and casework in a substantial manner with necessary blocking, braces, bottoms, etc.
      a. Cross Supports Under Countertops: Sufficiently heavy to carry weight of 200 pound man without sagging.
      b. Cabinet Joinery: Tops and bottoms shall be joined to cabinet ends using a minimum of six (6) dowels for 24-inch deep cabinets and a minimum of four (4) dowels for 12-inch deep cabinets. All dowels are to be hardwood laterally fluted, with chamfered end and a minimum diameter of ten (10) millimeters. Dowels with less than 10mm diameter are not acceptable. Internal cabinet components such as fixed horizontals, rails and verticals are to be doweled in place. Dowels are to be securely glued and cabinets clamped under pressure during assembly to ensure secure joints and cabinet squareness.
   5. Construction Type: Flush overlay (not lipped).
   6. Cabinet Doors and Drawer Fronts: Particleboard, 3/4-inch thick, shall be laminated with vertical surface high pressure laminate on the exposed surface and colored high pressure laminate cabinet liner on the interior surface. Door and drawer edges to be banded with 3mm PVC edge banding, hot melt glue applied.
   7. Cabinet Back: Standard recessed cabinet back to be 1/4-inch thick prefinished hardboard. Color to match cabinet interior. All sink cabinets to have split back, removable from inside. Exposed exterior back on fixed or movable cabinets to be particleboard, 3/4-inch thick, laminated with high pressure laminate on the exterior surface and high pressure laminate cabinet liner on the interior surface. Interior back surface on open wall cabinets to be high pressure decorative laminate.
   8. Exposed Edges: Exposed cabinet body edges shall be covered with PVC edge-banding.
   9. Bases: All base and tall units shall have an integral base. Rubber or vinyl base covering will be furnished and applied under other sections.

H. Transparent Finish Wood Custom Casework: AWS Premium Grade.
   1. Cabinets: Flush Overlay.
   2. Door Front Style: Stile and rail, flat panel, solid stock, unless indicated otherwise.
   3. Veneer Faces: Glue spliced. Stitched faces not acceptable.
      a. Matching of Adjacent Veneer Leaves: Book matched and end matched as required.
      b. Matching Within Panel Face: Center, balance matched.
      c. Panel Matching Method: Sequence match panel sets.
      d. Veneer Matching: Continuous across doors, drawer fronts, and panels.
      e. Provide balancing veneer on concealed face of panel similar to face veneer.
   4. Provide and install hardware as specified.
      a. Provide silencers for all doors and drawers.
      b. Adjust for proper alignment and operation.
   5. Construct shelving, counters, cabinets and casework with cherry plywood.
      a. Exposed Edges: Band with cherry as indicated.
      b. Provide 3/4-inch cherry shelf cleats, supports, stiles, rails, etc. unless otherwise indicated.

6. Frame cabinets and casework in a substantial manner with necessary blocking, braces, bottoms, etc.
    a. Cross Supports Under Countertops: Sufficiently heavy to carry weight of 200 pound man without sagging.
    b. Frames: Pinned, glued or screwed together in accordance with AWS Custom Grade Standards.
7. Cabinet Doors: Types and sizes indicated. 3/4-inch thickness.
    a. Drawer Front Style: WI Style A unless indicated otherwise.
    b. Backs of doors shall be considered exposed.
8. Cabinet Backs Not Exposed to View: Hardboard.
9. Drawers:
    a. Sides, Backs and Subfronts: Wood or panel product, 1/2-inch thickness.
    b. Bottoms: Panel product, 1/4-inch.
    c. Fronts: Lumber or panel product, 3/4-inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Comply with Section 01 71 16:
    1. Layout: Verify layout of work before beginning installation.
    2. Existing Conditions: Examine before beginning installation.

B. Notification: Notify General Contractor of unsatisfactory conditions in writing with a copy to Architect.

C. Acceptance: Beginning of work means acceptance of existing conditions by installer.

3.02 PREPARATION

A. Openings for Wood Frames: All openings for wood frames shall be prepared by others to the proper size, plumb, square and level before installation of frames is started.

3.03 ARCHITECTURAL WOODWORK INSTALLATION

A. Lengths: Wherever possible, provide single piece for each length of finish. Butt joints not allowed except for long pieces or room length moldings which may be in two or more sections. When butt joints are necessary, bevel joints.

B. Install interior finish level, plumb and true.

C. Securing: Tightly secure to bracing with nails, screws, glue etc. Blind nail wherever possible. Where surface nailing is necessary, use finish nails carefully set with nail punch.

D. Trim Finishing Against Walls or Ceiling: Mill with extra width and scribe to wall or ceiling at job.

E. Edges: Except where molded, mill trim with square edges. After erection, slightly round exposed edges by sanding as directed.

F. Replacement: Replace any interior finish bearing hammer marks, splits, cracks, mars or defects of any nature.

G. Touch-up shop finish after installation.

3.04 COUNTER AND CABINET INSTALLATION

A. Counters: Construct supports for counters as indicated.
    1. Securely attach counters to walls plumb and level.
    2. Sinks and Trim: Provided and installed under Division 22.
    3. Simulated Stone Countertops: Installed under Section 12 36 61.
    4. Stone Countertops: Installed under Section 12 36 40.

B. Cabinets:
    1. Bases: Construct cabinet bases for cabinets as indicated and securely anchor to floor.
    2. Cabinets: Securely attach cabinets to bases and walls with cabinets plumb and level and hardware operating properly, ready for finish under Section 09 90 00.
    3. Base: Provided on base cabinets as scheduled after cabinets are set in place.

3.05 FRAME INSTALLATION

A. General: Comply with AWI Premium Grade.

B. Installation:
   1. Frames: Install square and plumb in the opening, wedge and nail with finish nails.
   2. Trim: See Section 06 20 23 for trim installation.

3.06 PROTECTION

A. Solid stock materials and fabrications specified under this Section shall be protected against excessive changes in moisture content during delivery, storage, handling and installation up to date of substantial completion of the project. Moisture content shall be maintained between 5 percent and 10 percent during this period and is subject to field checking by the Architect. Materials exceeding 10 percent moisture content are subject to rejection and replacement at the Contractor's expense.

END OF SECTION

SECTION 06 4300
WOOD STAIRS AND RAILINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Interior wood stair treads and rail for Atrium grand stair.

B. Related Requirements:
   1. Interior Standard Pattern Wood Trim and Base: Section 06 20 23 Interior Finish Carpentry.
   2. Wood Flooring: Section 09 64 00.
   3. Carpeting: Section 09 68 13.
   4. Site Finishing: Section 09 90 00 Painting and Coating.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with following:
   1. Architectural Woodwork Institute (AWI) and the Woodwork Institute (WI) – Architectural Woodwork Standards (AWS), First Edition, October 1, 2009.
      a. Unless otherwise indicated, comply with AWS for grades of interior architectural woodwork, construction, finishes and other requirements.
         1) Comply with Custom Grade if not otherwise specified.

1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Shop Drawings: Include conformance to required reference standard.

C. Samples:
   1. Material Samples:
      a. Wood stair treads.

1.04 INFORMATIONAL SUBMITTALS

A. Procedures: Submit for information and verification in accordance with Section 01 33 00.

B. Certificates:
   1. The manufacturer/fabricator shall furnish a certificate indicating that solid stock lumber used in architectural woodwork did not exceed 10percent moisture content at time of fabrication.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Delivery and Acceptance Requirements:
   1. Do not deliver material until building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content.

C. Storage and Handling Requirements:
   1. Maintain wood material storage area relative humidity at between 25 percent and 55 percent.

PART 2 PRODUCTS

2.01 SOLID STOCK WOOD AND PANEL MATERIALS

A. General Requirements for Interior Wood Materials:
   1. Solid Stock Lumber Grade: In accordance with AWI rules for Custom Grade construction with specified finish unless indicated otherwise.
   2. Moisture Content: Minimum 5 percent, maximum 10 percent at delivery.

2.02 WOOD STAIRS

A. Treads: Solid stock maple unless indicated otherwise on Drawings. Comply with AWI Custom Grade Rules.

2.03 WOOD STAIR RAILINGS

A. Grade: AWI Premium Grade.

B. Species: Maple.

C. Millwork Patterns: As indicated on Drawings.

D. Finish: Section 09 90 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Comply with Section 01 71 16:
   1. Layout: Verify layout of work before beginning installation.
   2. Existing Conditions: Examine before beginning installation.
   3. Notification: Notify General Contractor of unsatisfactory conditions in writing with a copy to Architect.
   4. Acceptance: Beginning of work means acceptance of existing conditions by installer.

3.02 INSTALLATION

A. General:
   1. Lengths: Wherever possible, provide single piece for each length of finish. Butt joints not allowed except for long pieces or room length moldings which may be in two or more sections. When butt joints are necessary, bevel joints.
   2. Install interior finish level, plumb and true.
   3. Securing: Tightly secure to bracing with nails, screws, glue etc. Blind nail wherever possible. Where surface nailing is necessary, use finish nails carefully set with nail punch.
   4. Trim Finishing Against Walls: Mill with extra width and scribe to wall.
   5. Edges: Except where molded, mill trim with square edges. After erection, slightly round exposed edges by sanding as directed.
   6. Replacement: Replace any interior finish bearing hammer marks, splits, cracks, mars or defects of any nature.
   7. Touch-up shop finish after installation.

B. Wood Railing Installation:
   1. Grade: AWI Premium Grade:
   2. Install wood railcap, volute, guardrails, etc. as detailed.

3.03 PROTECTION

A. Solid stock materials and fabrications specified under this Section shall be protected against excessive changes in moisture content during delivery, storage, handling and installation up to date of substantial completion of the project. Moisture content shall be maintained between 5 percent and 10 percent during this period and is subject to field checking by the Architect. Materials exceeding 10 percent moisture content are subject to rejection and replacement at the Contractor's expense.

3.04 SITE QUALITY CONTROL

A. Testing: Field testing and inspection will be made by accepted testing laboratory. See sections 01 4500 and 05 1200.
   1. Testing Agency: Field testing and inspection will be made by accepted testing laboratory.

END OF SECTION

SECTION 07 1113
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide properties of primer, bitumen, and mastics.

PART 2 PRODUCTS

2.01 COLD ASPHALTIC MATERIALS

A. Bitument: Asphalt emulsion, ASTM D3747
   1. Product: Tremproof 260 manufactured by Tremco, Inc.

B. Asphalt Primer: ASTM D41/D41M, compatible with substrate.

C. Sealing Mastic: Asphalt roof cement, ASTM D2822, Type I.

2.02 ACCESSORIES

A. Protection Board: 2-3/8 inch thick.
   1. Product: Tremdrain DPI manufacture by Tremco, Inc.

PART 3 EXECUTION

3.01 APPLICATION

A. Apply from 2 inches below finish grade elevation down to top of footings.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data for membrane.

B. Manufacturer's Qualification Statement.

C. Installer's Qualification Statement.

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

1.02 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing manual.

1.03 WARRANTY

PART 2 PRODUCTS

2.01 MEMBRANE MATERIALS

A. Self-Adhered Modified Bituminous Sheet Membrane:
   1. Thickness: 60 mil, 0.060 inch, minimum.

2.02 ACCESSORIES

A. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

B. Self-Adhered Flashing: Composite membrane with top layer consisting of ketone ethylene ester (KEE) reinforced membrane and backed by bottom layer of synthetic butyl adhesive covered with release paper.
   1. Overall Thickness: 35 to 45 mil, 0.035 to 0.045 inch, nominal.
   2. Width: 12 inches, nominal.

PART 3 EXECUTION

3.01 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.

C. Mechanically Fastened Membrane: Install mechanical fasteners in accordance with manufacturer's instructions, and bond sheet to membrane discs.

D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

END OF SECTION

SECTION 07 1900
WATER REPELLENTS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide product description, limitations, and chemical composition.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.02 MOCK-UP

A. Prepare representative surface 36 by 36 inches in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. See Section 01 4000 - Quality Requirements for additional requirements.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
   2. Number of Coats: Two.
   3. VOC Content: Less than 600 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
   4. Moisture Absorption When Applied to Concrete: Five percent, maximum, when tested in accordance with ASTM C642 concrete sample completely coated with water repellent.
   5. Maintains dry appearance when wetted.
   6. Products: Water-based siloxane, silane, or blend that reacts chemically with concrete and masonry; minimum 20 percent nonvolatile content.
      a. BASF Construction Chemicals; Enviroseal 20. [VOC <350 g/L]
      b. PROSOCO, Inc; Sure Klean Weather Seal H40.
      c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

B. Apply at rate recommended by manufacturer, continuously over entire surface.

C. Apply two coats, minimum.

D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SUBMITTALS

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

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
   4. Compressive Resistance: 15 psi.
   5. Board Density: 1.20 lb/cu ft.

2.03 BATT INSULATION MATERIALS

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
3. Facing: Aluminum foil, flame spread 25 rated; one side.

2.04 ACCESSORIES

A. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

B. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch thick.

PART 3 EXECUTION

3.01 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall, roof, ceiling, and raised floor spaces without gaps or voids. Do not compress insulation.

END OF SECTION

SECTION 07 2119

FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide product description, insulation properties, and preparation requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and overcoat limitations.
   2. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   4. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
   5. Closed Cell Content: At least 90 percent.
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.02 ACCESSORIES

A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.01 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data on material characteristics, performance criteria, and limitations.

B. Shop Drawings: Provide drawings of special joint conditions.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Air Barrier:
   1. On outside surface of sheathing of exterior walls use air barrier sheet, mechanically fastened type.

B. Interior Vapor Retarder:
   1. On inside face of studs of exterior walls, under cladding, use mechanically fastened vapor retarder sheet.
   2. On bottom face of roof structure, under cladding, use mechanically fastened vapor retarder sheet.
   3. On inside face of masonry and concrete walls use vapor retarder coating.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)

A. Building Paper: Two (2) ply asphalt-saturated kraft building paper complying with requirements of Federal Specification UU-B-790a, Type 1, Grade D, Style 2.

2.03 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
   3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
   5. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material; unless otherwise specified.

2.04 VAPOR RETARDER MATERIALS

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

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

END OF SECTION

SECTION 07 3113
ASPHALT SHINGLES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.

B. Shop Drawings: For metal flashings, indicate specially configured metal flashings, jointing methods and locations, fastening methods and locations, and installation details.

C. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.

1.02 QUALITY ASSURANCE

A. Perform Work in accordance with the recommendations of NRCA Steep Roofing Manual.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 ASPHALT SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462; Class A fire resistance.
   1. Weight: 320 lb/100 sq ft.
   2. Self-sealing type.
   3. Style: Square.
   4. Color: As selected by Architect.

2.03 SHEET MATERIALS

A. Ice & Water Shield: Self-adhering polymer-modified asphalt sheet complying with ASTM D 1970; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.

2.04 ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8 inch head diameter, 12 gauge, 0.109 inch nail shank diameter, 1-1/2 inch long and complying with ASTM F1667.

B. Nails: Standard round wire shingle type, of hot-dipped zinc coated steel, 10 wire gage, 0.1019 inch shank diameter, 3/8 inch head diameter, of sufficient length to penetrate through roof sheathing or 3/4 inch into roof sheathing or decking.

2.05 METAL FLASHINGS

A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, open valley flashing, chimney flashing, dormer flashing, and other flashing indicated.

B. Sheet Metal: Galvanized steel, as specified in Section 07 6200.

PART 3 EXECUTION

3.01 INSTALLATION - EAVE PROTECTION MEMBRANE

A. Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.

B. Install eave protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

3.02 INSTALLATION - UNDERLAYMENT

A. Underlayment At Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches over eave protection.

3.03 INSTALLATION - VALLEY PROTECTION

3.04 INSTALLATION - SHINGLES

A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions and NRCA (RM) applicable requirements.

B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.

END OF SECTION

SECTION 07 4213

METAL WALL PANELS

PART 2 PRODUCTS

1.01 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   7. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.

B. Exterior Wall Panels:
   1. Profile: Vertical; style as indicated.
   2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
   3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
   4. Color: As indicated on drawings.

C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

D. Expansion Joints: Same material, thickness and finish as exterior sheets; ___ gauge, ___ inch thick; manufacturer's standard brake formed type, of profile to suit system.

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

F. Anchors: Galvanized steel.

1.02 FINISHES

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

1.03 ACCESSORIES

A. Cladding Support Clips: Thermally-broken, galvanized steel clips for support of cladding z-girts, angles, channels and other framing.
   1. Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 galvanized coating.

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

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

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

PART 3 EXECUTION

2.01 INSTALLATION

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

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

END OF SECTION

SECTION 07 4623
WOOD SIDING

PART 1 GENERAL

1.01 SUBMITTALS

A. Samples: Submit two samples 12 inches by 12 inches in size to applicator of finish paint for use in preparation of finish samples.

PART 2 PRODUCTS

2.01 SIDING

A. Grade lumber in accordance with the following:
   1. Beetlekill Pine: Grading rules of SPIB (GR).

B. Board Siding: Flat, roughsawn, as indicated on drawings

2.02 ACCESSORIES

A. Nails: Corrosion resistant type; non-staining, of size and strength to securely and rigidly retain the work.

B. Flashing: 20 mil thick,black polyethylene behind butt joints.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Fasten siding in place, level and plumb.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SUBMITTALS

1.02 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gauge, (0.0239 inch) thick base metal.

B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gauge, 0.032 inch thick; plain finish shop pre-coated with modified silicone coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As indicated on drawings.

2.02 ACCESSORIES

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

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Plastic Cement: ASTM D4586, Type I.

2.03 FABRICATION

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

B. Form pieces in longest possible lengths.

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

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: SMACNA (ASMM), Semi-circular profile.

B. Downspouts: Round profile.

C. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

D. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

E. Downspout Boots: material and profile to match downspout.

F. Downspout Extenders: Same material and finish as downspouts.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Seal metal joints watertight.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SUBMITTALS

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

1.02 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 SNOW GUARDS

A. Fence Type Snow Guard: Continuous snow guard; manufacturer's standard pipe, bar, channel, or solid rod, set in brackets or posts, with optional plates and metal trim to match roof.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

END OF SECTION

SECTION 07 9200

JOINT SEALANTS

PART 2 PRODUCTS

1.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

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

C. Type I - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. Type I-2 - Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
   2. Type I-2 - Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
   3. Type I-2 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
   4. Type I - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
   5. Type I - Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
   6. Type I - Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.

D. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

1.02 NONSAG JOINT SEALANTS

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

B. Type I - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.

C. Type I-2 - Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
   1. Movement Capability: Plus and minus 35 percent, minimum.

1.03 SELF-LEVELING SEALANTS

1.04 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
   2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
   3. Open Cell: 40 to 50 percent larger in diameter than joint width.
   4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

2.01 EXAMINATION

A. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Notify Architect of date and time that tests will be performed, at least seven days in advance.
   2. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   3. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

2.02 INSTALLATION

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

B. Perform acoustical sealant application work in accordance with ASTM C919.

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

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

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUBMITTALS

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

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

C. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

1.02 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Door Edge Profile: Manufacturers standard for application indicated.
   4. Typical Door Face Sheets: Flush.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   7. Finish: Factory primed, for field finishing.

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

2.02 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Type E, Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inches, nominal.
   4. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   5. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   6. Door Face Sheets: Flush.
   7. Weatherstripping: Refer to Section 08 7100.

8. Door Finish: Factory primed and field finished.

C. Type I, Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inches, nominal.
   4. Texture: Smooth faces.
   5. Door Finish: Factory primed and field finished.

2.03 HOLLOW METAL FRAMES

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

B. General:
   1. Comply with the requirements of grade specified for corresponding door, except:
      a. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 - SDI-100, Level 1, 18 gage, 0.042 inch
   2. Finish: Same as for door.
   3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
   4. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

C. Exterior Door Frames: Knock-down type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Finish: Factory primed and field finished.
   3. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Knockdown type.
   1. Frame Finish: Factory primed and field finished.

E. Door Frames, Fire-Rated: Knock-down type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Finish: Factory primed and field finished.

F. Sound-Rated Door Frames: Knock-down type.
   1. Frame Finish: Factory primed and field finished.

G. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.04 FINISHES

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

2.05 ACCESSORIES

1. Style: Standard straight slat blade.
2. Fasteners: Exposed, tamper proof fasteners.

A. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

B. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

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

2.06 FINISH MATERIALS

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

B. Factory Finish: Complying with ANSI A250.3, manufacturer's standard coating.

C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Coordinate frame anchor placement with wall construction.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SUBMITTALS

A. Samples: Submit two samples of door construction, 8x10 inch in size cut from top corner of door.

B. Samples: Submit two samples of door veneer, 8x10 inch in size illustrating wood grain, stain color, and sheen.

1.02 QUALITY ASSURANCE

A. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.03 WARRANTY

A. Interior Doors: Provide manufacturer's warranty for the life of the installation.

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

PART 2 PRODUCTS

2.01 DOORS

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

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

2.02 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.03 DOOR CONSTRUCTION

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

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

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

PART 3 EXECUTION

3.01 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

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

END OF SECTION

SECTION 08 4313

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

1.02 WARRANTY

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

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Position: Centered (front to back).
   2. Finish: High performance organic coating.
   3. Finish Color: As selected by Architect from manufacturer's standard line.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

2.02 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.

B. Swing Doors: Glazed aluminum.
   1. Thickness: 2 inches.
   2. Top Rail: 6 inches wide.
   3. Vertical Stiles: 6 inches wide.
   4. Bottom Rail: 10 inches wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

2.04 FINISHES

2.05 HARDWARE

A. Other Door Hardware: As specified in Section 08 7100.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

2.06 FABRICATION

PART 3 EXECUTION

3.01 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

END OF SECTION

SECTION 08 5413
FIBERGLASS WINDOWS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.

PART 2 PRODUCTS

2.01 WINDOW UNITS

A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
   1. Manufacturer: Alpen High Performance Products, Niwot, Colorado (www.thinkalpen.com), or approved equal to meet ot exceed thermal performance specifications.
   2. Window Series: Zenith Series ZR-9 Fiberglass Windows, or approved equal to meet ot exceed thermal performance specifications.
   3. Configuration: As indicated on drawings.
   4. Color: as selected by Architect from manufacturer standard colors.
   5. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

2.02 COMPONENTS

2.03 GLASS AND GLAZING MATERIALS

2.04 HARDWARE

A. Per manufacturer standard or approved equal.

2.05 FABRICATION

A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.

B. Form sills and stools in one piece. Slope sills for wash.

C. Arrange fasteners to be concealed from view.

D. Factory glaze window units.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

3.02 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

END OF SECTION

SECTION 08 6223
TUBULAR SKYLIGHTS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.

B. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

1.02 WARRANTY

A. Skylights: Manufacturer's standard warranty for 10 years.

PART 2 PRODUCTS

2.01 TUBULAR SKYLIGHTS

A. Tubular Skylights: Transparent roof-mounted skylight dome and curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces.
   1. Thermal Movement: Fabricate to allow for thermal movement resulting from temperature differential from minus 30 to 180 degrees F without damage to components, fasteners, or substrates.

B. Roof Assemblies: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
   1. Glazing: Acrylic plastic, 1/8 inch minimum thickness.
   2. Low-Angled Sun Reflector: Concentric, light refracting etched lines, minimum 2 inches high, to improve light input when sun is low on horizon.
   3. Base: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube.

C. Reflective Tube: ASTM B209 (ASTM B209M) aluminum sheet, thickness between 0.015 inch and 0.020 inch.
   1. Interior Finish: Exposed interior surfaces of high reflectance specular finish; specular reflectance of 92, total reflectance 95 percent.
   2. Tube Configuration and Length: As indicated on the drawings.

D. Diffuser Assemblies: Supporting light transmitting surface at bottom termination of tube, with compression seal to minimize condensation and bug or dirt infiltration.
   1. Ceiling Ring: Edge trim for ceiling opening; injection molded high impact ABS.
   2. Diffuser Trim: Edge and attachment trim for diffuser lens; injection molded high impact ABS.
   3. Diffuser Shape at Solid Ceilings: Round, same diameter as tube.
   4. Lens: Flush frosted lens.
   5. Lens Material: Acrylic plastic.
   6. Lens Thickness: 0.038 inch, minimum.
   7. Visible Light Transmission (VLT): 90 percent, minimum.
   8. Seal: Closed cell EPDM foam rubber.

2.02 PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific tubular skylight:
   1. Product Type: Tubular Daylighting Device, Closed Ceiling (TDDCC).

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Conduct field test for water tightness; conduct water test in presence of Architect. Correct defective work and re-test until satisfactory.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 ADMINISTRATIVE REQUIREMENTS

A. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

1.02 WARRANTY

A. Provide five year warranty for door closers and components thereof.

PART 2 PRODUCTS

2.01 DOOR HARDWARE - GENERAL

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Bidders shall include an allowance for purchase of materials per section 01 2000; installation costs to be included in Base Bid. Detailed instructions for fulfillment of purchase allowance will be provided at a later time. Contractor shall give Owner and Architect adequate lead time to provide such information in order to maintain project schedule.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Do not install surface mounted items until finishes applied to substrate are complete.

3.02 ADJUSTING

A. Adjust hardware for smooth operation.

END OF SECTION

SECTION 08 8300
MIRRORS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass; Type ____: ASTM C1036, Type 1 - Transparent Flat, Class 1 - Clear, Quality - Q1 (high-quality mirrors); silvering, protective coating, and quality requirements in compliance with ASTM C1503.

1. Size: As indicated on drawings.

2.02 ACCESSORIES

A. Mirror Attachment Accessories: Stainless steel J-profile channels.

B. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

END OF SECTION

SECTION 08 9100

LOUVERS

PART 2 PRODUCTS

1.01 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.

1. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

END OF SECTION

SECTION 09 0100
FF&E SPECIFICATIONS

PART 1 GENERAL

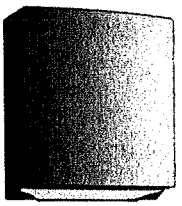
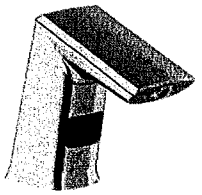
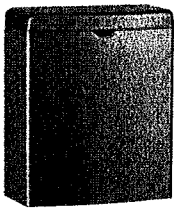
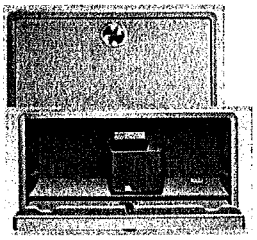
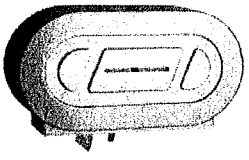
1.01 PRICE AND PAYMENT PROCEDURES

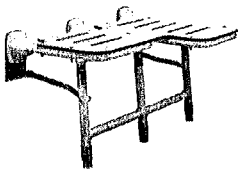
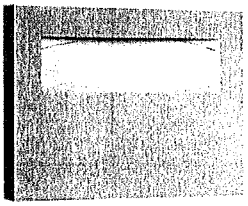
A. Per Division 1.

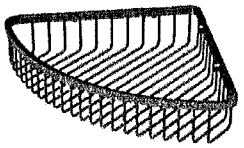
1.02 SUBMITTALS

A. Per Division 1.

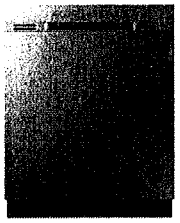
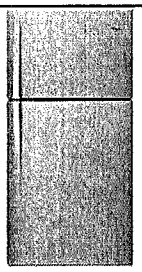
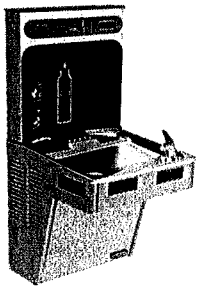
PART 2 PRODUCTS

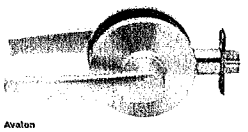
plan ref #	item	location	specifications		photo
accessories					
AC-1	paper towel	bathrooms	manf.: item: item no.: finish: size: installation:	bobrick surface mounted paper towel dispenser B-4262 stainless steel with satin finish 10 13/16"x 13 1/4" x 7 7/8" surface mount per drawings	
AC-2	soap dispenser	bathrooms	manf.: item: item no.: finish: size: installation:	sloan deck-mounted foam soap dispenser ESD-500 brushed stainless lavatory-mounted to left of sink	
AC-3	sanitary napkin disposal	bathrooms	manf.: item: item no.: finish: size: installation:	bobrick sanitary napkin disposal B-270 stainless steel with satin finish 10"h x 7 1/2"w x 3 13/16"d surface mount per drawings	
AC-4	baby changing station	bathrooms	manf.: item: item no.: finish: size: installation:	koala kare products horiztonal wall mounted changing table KB110-SSWM stainless steel 35.25"x20"x4" per drawings	
AC-5	hand dryer	bathrooms	manf.: item: item no.: finish: size: installation:	dyson airblade V HU02 sprayed nickel 15.5"h x 9.25'w x 4"d 40" high (per ADA req.)	
AC-6	toilet tissue	bathrooms	manf.: item: item no.: finish: size: installation:	bobrick twin jumbo roll toilet tissue dispenser B-2892 stainless steel with satin finish 12 1/4"h x 20 13/16"w x 5 5/16"d surface mount per drawings	

plan ref #	item	location	specifications		photo
AC-7	grab bars	bathrooms	manf.: item: item no.: finish: size: installation:	bobrick stainless steel grab bar with snap flange B-6806 series satin finish per ada requirements per ada requirements	
AC-9	ADA shower bench	bathrooms	manf.: item: item no.: finish: size: weight cap: installation:	bobrick bariatric folding shower seat with legs B-918116L white colored solid phenolic 31.5" x 22 5/8" 1102 lbs per ADA with adequete wall support	
AC-10	seat cover dispenser	bathrooms	manf.: item: series: item no.: finish: size: installation:	bobrick surface mounted seat-cover dispenser classic series B-221 stainless steel satin finish 15 3/4"w x 11"h x 2"d per ada	
AC-11	shelf	bathrooms	manf.: item: item no.: finish: size: installation:	bobrick stainless steel shelf B-298 x 24 stainless 24"l x 8"d over toilets - per drawings	
AC-12	coat hook	bathrooms	manf.: item: item no.: finish: size: installation:	bobrick coat hook B-6827 satin finished stainless steel 1"x6.5" back of door and by shower, per drawings	

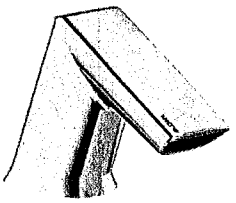
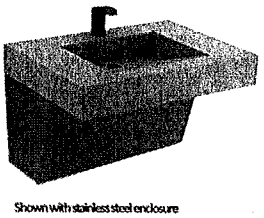
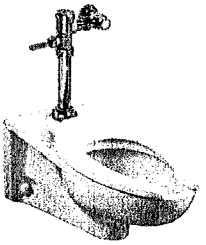
plan ref #	item	location	specifications		photo
AC-13	soap dispenser shower	bathrooms	manf.: item: item no.: finish: size: installation:	bobrick soap dispenser in shower B-2111 stainless 4 3/8" x 8 1/8" surface mounted in shower	
AC-14	shower baskets	bathrooms	manf.: item: item no.: finish: size: installation:	gatco corner shower basket 1571 satin nickel (stainless steel) 12" wide corner of showers - per drawings	
AC-15	trash	bathrooms	manf.: item: item no.: finish: size: installation:	bobrick floor standing dome top waste receptacle B-2300 satin finished stainless steel 15"dia 31"h	
base					
B-1	vinyl base	winter corridor offices BOH	supplier: manf.: item no.: item: color: material: size: installation:	 roppe PV4060 contours profiled wall base system candid 193 black brown vinyl 4" H x 1/8" thick	 193 black brown

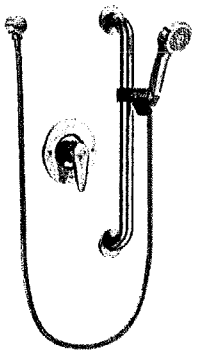
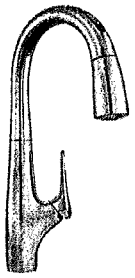
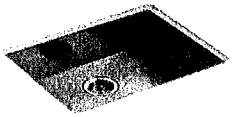
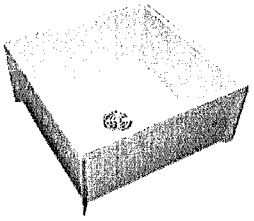
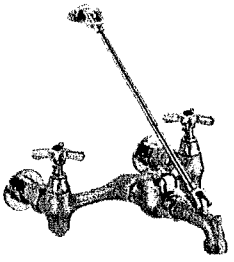
plan ref #	item	location	specifications		photo
concrete					
CONC-1	concrete	all floors	supplier:		
			manf.:	v-seal concrete sealers & coatings	
			item:	concrete with v-seal 101 - multi-surface sealer	
			finish:	smooth	
			color:	tbd	
			installation:	per manufacturer	
CONC-2	concrete	shower floors	supplier:		
			manf.:	v-seal concrete sealers & coatings	
			item:	concrete with v-seal 101 and topical sealer	
			finish:	nonslip floor coating	
			color:	tbd	
			installation:	per manufacturer	

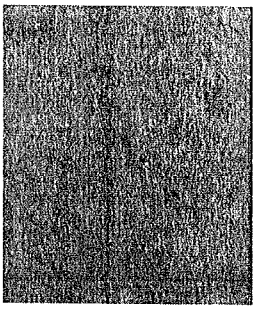
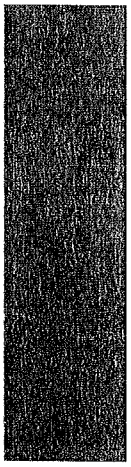
plan ref #	item	location	specifications		photo
equipment					
EQ-1	dishwasher	kitchenette	supplier:		
			manf.:	summit appliance	
			item no.:	DW2435SSADA	
			color:	stainless steel	
			size:	22.38"w x 22.38"d x 32.125"h	
			installation:	per drawings and manufacturer	
EQ-2	refrigerator	kitchenette	supplier:		
			manf.:	whirlpool	
			item:	top freezer refrigerator (ADA compliant)	
			item no.:	WRT549SZD	
			finish:	stainless steel	
			size:	65 7/8"h x 34 1/2"d x 29 3/4"w	
			installation:	per drawings and manufacturer	
EQ-3	microwave (built in)	kitchenette	supplier:		
			manf.:	GE	
			item no.:	PEB7227ANDD	
			item:	built in microwave	
			finish:	black	
			size:	19.75"d x 24"w x 14"h	
			installation:	undercounter	
EQ-4	drinking fountain w/ bottle filler	retail	supplier:		
			manf.:	elkay	
			item:	EZH20 bottle filling station with single ADA cooler, filtered non-refrigerated stainless	
			item no.:	LMABFDWSSK	
			size:	17 7/8"l x 18 1/2"d x 39 3/4"h	
			installation:	per ADA	
fiber reinforced plastic					
FRP-1	wall protection	jan	supplier:		
			manuf.:	nudo	
			finish:	fiberlite FRP wall panels	
			color:	white (151)	
			finish:	smooth	
			size:	4'x8'	
			installation:	janitor wet walls up to 4' AFF	

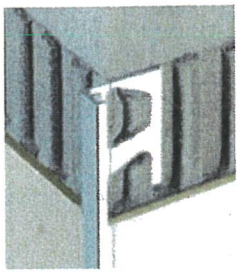
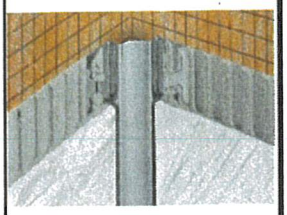
plan ref #	item	location	specifications		photo
glass					
GL-1	mirror	bathrooms	supplier:		
			contact:		
			finish:	mirrored	
			edges:	polished	
			size:	24"w x 36"h	
			installation:	above vanity per ADA 40" AFF	
hardware					
HW-1	door hardware	exterior doors	supplier:		
			manf.:		
			item no.:		
			series:		
			finish:		
			handle:		
			installation:		
HW-2	door hardware	interior doors	supplier:		
			manf.:	falcon	
			series:	K Series	
			item:	Grade 1 cylindrical lever locks	
			finish:	satin chrome	
			lever:	Avalon	
			installation:	per door schedule	
HW-3	cabinet hardware	kitchenette	supplier:		
			manf.:	amerock	
			series:	monument	
			finish:	chrome	
			size:	5" c to c	
			installation:	vertical on doors; center of drawers	
lighting					
LTG-1	sconce	bathroom vanity	supplier:		
			manf.:	hinkley	
			item no.:	51403CM	
			series:	alto collection	
			finish:	chrome	
			size:	24" wide	
			installation:	7'-6" AFF above mirror	

plan ref #	item	location	specifications		photo
millwork					
MW-1	wood ceiling accent	retail multipurpose	supplier: item.: material: finish: size: installation:	 tongue and grroove ceiling white cedar clear with natural finish 5.5" width submit sample to SAI for review	
MW-2	case trim	retail multipurpose	material: size: edge: finish: installation:	paint grade wood 1 x 3 square paint to match roppe 193 black brown submit sample to SAI for review	
paint					
PT-1	paint ceilings	all ceilings UNO	supplier: manf.: item no.: color: finish: installation:	sherwin williams sherwin williams 7004 snowbound eggshell all walls	
PT-2	paint walls	all walls UNO	supplier: manf.: item no.: color: finish: installation:	sherwin williams sherwin williams 7004 snowbound eggshell all walls	

plan ref #	item	location	specifications		photo
plastic laminate					
PL-1	melamine cabinets	kitchenette	manf.: item no.: color: finish: material: installation:	wilsonart 7992-38 pinnacle walnut fine velvet texture melamine vertical grain	
plumbing fixtures					
PF-1	faucet	public restrooms	supplier: manf.: item: item no.: series: color: size: installation:	 sloan hardwired-powered deck mounted faucet EFX-300 Basys brushed stainless low body faucet hardwired-verify electrical at locations	
PF-2	sink	public restrooms	supplier: manf.: item: item no.: series: color: size: installation:	 sloan 1-station wall mounted gradient sink ELGR-81000 SloanStone tbd 30"x22"x5" with Stainless Steel enclosure refer to plans; ADA compliant	 Shown with stainless steel enclosure
PF-3	toilet	public restrooms	supplier: manf.: item: item no.: color: material: size: installation:	 american standard afwall millenium flowise wall-mount 2257.101 white vitreous china 26"x14"x13 1/8" with zurn narrow wall carrier system ZN1202-N4	

plan ref #	item	location	specifications		photo
PF-4	shower	restroom showers	supplier: manf.: item: item no.: series: color: size: installation:	 moen 1.5GPM handshower includes handshower, valve trim, grab bar, hose, elbow supply T9346GBM15 M-Dura Collection chrome 24" vertical slide bar refer to plans; ADA compliant	
PF-5	faucet	kitchenette	supplier: manf.: item: item no.: series: color: size: installation:	 american standard pull down spray kitchen faucet with re-trax 4901300.075 standard kitchen avery collection chrome 18"h x 8.5"d refer to plans; ADA compliant	
PF-6	sink	kitchenette	supplier: manf.: item: item no.: color: size: installation:	 kohler undermount single basin kitchen sink K-3894-NA stainless steel 24"x19"x6.25" per drawings, ADA compliant provide insinkerator disposal	
PF-7	sink	janitor rooms BSR	supplier: manf.: item: item no.: color: size: installation:	 proflo mop sink PFMB2424 white 24" x 24" refer to plans	
PF-8	faucet	janitor rooms BSR	supplier: manf.: item: item no.: finish: material: installation:	 delta wall mount service sink faucet 28T9 chrome vitreous china refer to plans	

plan ref #	item	location	specifications		photo
solid surface					
SS-1	solid surface	kitchenette	supplier:		
			manf.:	caesarstone	
			item no.:	6134	
			color:	georgian bluffs	
			material:	quartz solid surface	
			size:	slab 2 cm	
			edge profile:	straight	
			finish:	polished	
			installation:	per manufacturer	
tile					
TL-1	wall tile	bathrooms	supplier:		
			manf.:	crossville	
			item no.:	AV282.10636UPS	
			series:	speakeasy	
			color:	zoot suit	
			material:	porcelain	
			size:	6"x36"	
			grout color:	match field color	
			grout joints:	1/3rd running bond, 1/16"	
			installation:	horizontal to 5' at wet walls, to 8' in shower (re: plans and elevations) tile base 6" ht capped with TS-1 sanitary cove base at floor	
TL-2	wall tile accent	bathrooms	supplier:		
			manf.:	crossville	
			item no.:	LWT22,10624G	
			series:	simpatico	
			color:	kinship	
			material:	ceramic	
			size:	6"x24"	
			grout color:	match TL-1 grout	
			grout joints:	straight stack, 1/16"	
			installation:	horizontal to 8' back wall of shower sanitary cove base at floor	

plan ref #	item	location	specifications		photo
transition strip					
TS-1	transition strip	tile edges	supplier: manf.: item no.: series: color: size: installation:	 schluter systems A125AT jolly satin nickel anodized aluminum length 8' 2 1/2" install at tile edges	
TS-2	transition strip	sanitary cove all restrooms	supplier: manf.: item no.: color: size: installation:	 schluter systems dilex-EHK satin nickel anodized aluminum 23/32"(18.5 mm)-wide radius install where tile floor meets tile wall	
TS-3	corner guard	outside corners drywall	supplier: manf.: item: item no: color: size: edge: installation:	koffler sales company koffler guards aluminum corner guards #A675 1 1/2" x 1 1/2" x 8' 90 degree adhesive attached	

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SUBMITTALS

A. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

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

2.02 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Thickness:
      a. Thickness: as indicated on drawings.

B. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings.
   2. Application: Horizontal surfaces behind tile in wet areas including countertops, floors, and bath fixtures.
   3. ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with ASTM C1288.

2.03 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 2100.

B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
   1. Product: AC-20 manufactured by Pecora Corporation.

C. Water-Resistive Barrier: No. 15 asphalt felt.

D. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
   2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
   3. Ready-mixed vinyl-based joint compound.
   4. Chemical hardening type compound.
   5. Joint Compound: Setting type, field-mixed.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

H. Nails for Attachment to Wood Members: ASTM C514.

I. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

J. Adhesive for Attachment to Wood, ASTM C557 and Metal:

PART 3 EXECUTION

3.01 FRAMING INSTALLATION

3.02 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

F. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.

G. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

H. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.03 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

3.04 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

SECTION 09 3000

TILING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

PART 2 PRODUCTS

2.01 SETTING MATERIALS

2.02 GROUTS

A. Provide setting and grout materials from same manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

END OF SECTION

SECTION 09 9113
EXTERIOR PAINTING

PART 2 PRODUCTS

1.01 MANUFACTURERS

A. Refer to drawings for products.

B. Provide paints and finishes from the same manufacturer to the greatest extent possible.

1.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

PART 3 EXECUTION

2.01 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

2.02 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 2 PRODUCTS

1.01 MANUFACTURERS

A. Refer to section 09 0100 for products.

B. Provide paints and finishes from the same manufacturer to the greatest extent possible.

1.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

PART 3 EXECUTION

2.01 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

2.02 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SUBMITTALS

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

2.02 ACCESSORIES

A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

END OF SECTION

SECTION 11 3013

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

B. Verify all aplliances are ADA compliant prior to ordering.

1.02 QUALITY ASSURANCE

A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Provide equipment noted in section 09 0100, FF&E Specifications.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 12 3530
MANUFACTURED CASEWORK

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide component dimensions, configurations, construction details, and joint details.

B. Shop Drawings: Indicate casework locations, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.

C. Manufacturer's Qualification Statement.

D. Samples: Submit two, 4" x 4" inch in size, illustrating each color of finish.

1.02 QUALITY ASSURANCE

A. Products: Complying with KCMA A161.1 and KCMA Certified.

1.03 MOCK-UP

A. Provide full size mock-up of casework base unit, upper cabinet, and counter top.

B. Locate as indicated on drawings.

C. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Cabinet Construction: Softwood lumber framing and particle board, as specified in section 09 0100, FF&E Specifications.

B. Countertops: As specified in section 09 0100, FF&E Specifications.

C. Door and Drawer Fronts: Solid wood, as specified on drawings.

2.02 HARDWARE

A. Hardware: Furnished and installed by the cabinet supplier; selection per owner.

2.03 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fabricate corners and joints without gaps.

C. Fabricate each unit to be rigid and not dependent on adjacent units for rigidity.

D. Form smooth edges. Form material for countertops, shelves, and drain boards from continuous sheets.

E. Provide cutouts for plumbing fixtures and appliances. Prime paint contact surfaces of cut edges.

2.04 FINISHES

PART 3 EXECUTION

3.01 INSTALLATION

A. Install casework, components and accessories in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered.

C. Set casework items plumb and square, securely anchored to building structure.

3.02 ADJUSTING

A. Adjust doors, drawers, hardware, and other moving or operating parts to function smoothly.

END OF SECTION

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

B. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

C. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
   1. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.

2.02 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
   1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

END OF SECTION

SECTION 22 0513

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

1.02 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.

C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

D. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

B. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.

C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.

D. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.

E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

F. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.

G. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

H. Motors located outdoors and in draw through cooling towers: Totally enclosed weatherproof epoxy-sealed type.

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

2.06 ELECTRONICALLY COMMUTATED MOTORS (ECM)

A. Manufacturers:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 22 0517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.02 QUALITY ASSURANCE

1.03 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.

B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

E. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.

F. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

A. Modular/Mechanical Seal:
   1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
   2. Provide watertight seal between pipe and wall/casing opening.
   3. Elastomer element size and material in accordance with manufacturer's recommendations.
   4. Glass reinforced plastic pressure end plates.

PART 3 EXECUTION

3.01 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Structural Considerations:
   1. Do not penetrate building structural members unless indicated.

END OF SECTION

SECTION 22 0519

METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

PART 2 PRODUCTS

2.01 POSITIVE DISPLACEMENT METERS (LIQUID)

A. AWWA C700, positive displacement disc type suitable for fluid with bronze case and cast iron frost-proof, breakaway bottom cap, hermetically sealed register, remote reading.

B. Meter: Brass body turbine meter with magnetic drive register.

2.02 HEAT CONSUMPTION METERS

A. Meter: Brass body turbine meter with magnetic drive register, platinum temperature sensors.

2.03 LIQUID FLOW METERS

A. Calibrated ASME MFC-3M venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gauge in case.

B. Annular element flow stations with meter set.
   1. Measuring Station: Type 316 stainless steel pitot type flow element inserted through welded threaded couplet, with safety shut-off valves and quick coupling connections, and permanent metal tag indicating design flow rate, reading for design flow rate, metered fluid, line size, station or location number.
   2. Portable Meter Set: Dry single diaphragm type pressure gauge with 6 inch dial pointer, stainless steel wetted metal parts, variable pulsation damper, equalizing valve, two bleed valves, and master chart for direct conversion of meter readings to flow rate, mounted in rust-proof carrying case with two ten foot long rubber test hoses with brass valves or quick connections for measuring stations.

2.04 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi and kPa.

2.05 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.06 STEM TYPE THERMOMETERS

A. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Accuracy: 2 percent, per ASTM E77.
   4. Calibration: Degrees F.

B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Stem: 3/4 inch NPT brass.
   4. Accuracy: 2 percent, per ASTM E77.
   5. Calibration: Degrees F.

2.07 DIAL THERMOMETERS

A. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
   1. Size: 5 inch diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

B. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
   1. Size: 5 inch diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

C. Thermometers: Dial type vapor or liquid actuated; ASTM E1; stainless steel case, with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer, glass lens.
   1. Size: 4-1/2 inch diameter dial.
   2. Lens: Clear glass.
   3. Length of Capillary: Minimum 5 feet.
   4. Accuracy: 2 percent.
   5. Calibration: Degrees F.

2.08 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.09 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

B. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

C. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Viton core for temperatures up to 400 degrees F.

D. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauges, one gauge adapters with 1/8 inch probes, two 1 inch dial thermometers.

2.10 STATIC PRESSURE GAUGES

A. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

B. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Extend nipples and siphons to allow clearance from insulation. Provide siphon on gauges in steam systems.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Install thermometers in air duct systems on flanges.

F. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Section 230943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

G. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

H. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

END OF SECTION

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
   1. See Section 016000 - Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball, butterfly, ??.
   2. Dead-End: Single-flange butterfly (lug) type.
   3. Throttling: Provide ??.
   4. Swing Check (Pump Outlet):
      a. ?2 NPS? and Smaller: Bronze swing check valves with ?? disc.
      b. ?2-1/2 NPS? and Larger for Domestic Water: Iron swing check valves with ?closure control?, ?? seat check valves.
      c. 2-1/2 NPS and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

C. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.

D. Required Valve End Connections for Non-Wafer Types:
   1. Steel Pipe:
      a. 2 NPS and Smaller: Threaded ends.
      b. 2-1/2 NPS to 4 NPS: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
      c. 5 NPS and Larger: Grooved or flanged ends.
      d. Grooved-End ??: Grooved.
   2. Copper Tube:
      a. 2 NPS and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
      b. 2-1/2 NPS to 4 NPS: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
      c. 5 NPS and Larger: Grooved or flanged ends.

E. Low Pressure, Compressed Air Valves 150 psig or Less:
   1. 2 NPS and Smaller:
      a. Bronze??: Provide with ?? ends.
      b. Ball: ?One? piece, ?full? port, ?? with ?brass? trim.
      c. Bronze Lift Check: Class 125, bronze disc.
      d. Bronze Swing Check: Class 125, bronze disc.
      e. Bronze Gate: Class 125, NRS.
   2. 2-1/2 NPS and Larger:
      a. Iron, ?2-1/2 NPS? to ?4 NPS?: Provide with ?? ends.
      b. Iron Single-Flange Butterfly: 200 CWP, NBR Seat, aluminum-bronze disc.
      c. Iron Grooved-End Butterfly: 175 CWP.
      d. Iron Swing Check: Class 125, metal seats.
      e. Iron Grooved-End Swing Check: 300 CWP.
      f. Iron Center-Guided Check: Class 125, compact-wafer, metal seat.

g. Iron Plate-Type Check: Class 125; single plate; metal seat.
h. Iron Gate: Class 125, NRS.

F. Domestic, Hot and Cold Water Valves:
1. 2 NPS and Smaller:
a. Bronze? and Brass?: Provide with ?? ends.
b. Bronze Angle: Class 125, bronze disc.
c. Ball: ?One? piece, ?full? port, ?? with ?brass? trim.
d. Bronze Swing Check: Class 125, bronze disc.
e. Bronze Gate: Class 125, NRS.
f. Bronze Globe: Class 125, bronze disc.
2. 2-1/2 NPS and Larger:
a. Iron, ?2-1/2 NPS? to ?4 NPS?: Provide with ?? ends.
b. Iron Ball: Class 150.
c. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.
d. Iron Grooved-End Butterfly: 175 CWP.
e. Iron Swing Check: Class 125, metal seats.
f. Iron Swing Check with Closure Control: Class 125, lever and spring.
g. Iron Grooved-End Swing Check: 300 CWP.
h. Iron Center-Guided Check: Class 125, compact-wafer, metal seat.
i. Iron Plate-Type Check: Class 125; single plate; metal seat.
j. Iron Gate: Class 125, NRS.
k. Iron Globe: Class 125.

G. Sanitary Waste Water Valves:
1. 2-1/2 NPS and Larger:
a. Iron, ?2-1/2 NPS? to ?4 NPS?: Provide with ?? ends.
b. Iron Ball: Class 150.
c. Iron Swing Check: Class 125, metal seats.
d. Iron Swing Check with Closure Control: Class 125, lever and spring.
e. Iron Grooved-End Swing Check: 300 CWP.
f. Iron Gate: Class 125, NRS.
g. Iron Globe: Class 125.
h. Lubricated Plug: Class 125, regular gland.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
1. Gear Actuator: Quarter-turn valves 8 NPS and larger.
2. Handwheel: Valves other than quarter-turn types.
3. Hand Lever: Quarter-turn valves 6 NPS and smaller except plug valves.
4. Wrench: Plug valves with square heads.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator, of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

D. Valves in Insulated Piping: With 2 NPS stem extensions and the following features:
1. Gate Valves: Rising stem.
2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: Extended neck.
4. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.

3. Pipe Flanges and Flanged Fittings 1/2 NPS through 24 NPS: ASME B16.5.
4. Solder Joint Connections: ASME B16.18.
5. Grooved End Connections: AWWA C606.

F. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Solder-joint Connections: ASME B16.18.
3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Valve Bypass and Drain Connections: MSS SP-45.

I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, ANGLE VALVES

A. Class 125: CWP Rating: 200 psig.
1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. Ends: Threaded.
4. Stem: Bronze.
5. Disc: Bronze.
6. Packing: Asbestos free.
7. Handwheel: Bronze or aluminum.

2.04 BRASS, BALL VALVES

A. One-Piece, Reduced-Port with Brass Trim:
1. Comply with MSS SP-110.
2. Body: Forged brass.
3. Ends: Threaded.
4. Seats: PTFE.
5. Stem: Brass.
6. Ball: Chrome-plated brass.

B. Two Piece, Full Port with Brass Trim and Threaded Connections:
1. Comply with MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig, WOG.
4. Body: Forged brass.
5. Seats: PTFE.
6. Stem: Brass.
7. Ball: Chrome-plated brass.

C. Three Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig.
4. Body: Forged brass.
5. Ends: Threaded.
6. Seats: PTFE.
7. Stem: Stainless steel.
8. Ball: Stainless steel, vented.

2.05 BRONZE, BALL VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. One Piece, Reduced Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 400 psig.
   3. CWP Rating: 600 psig.
   4. Body: Bronze.
   5. Ends: Press.
   6. Seats: PTFE.
   7. Stem: Bronze.
   8. Ball: Chrome plated brass.

C. Two Piece, Full Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 150 psig.
   3. CWP Rating: 600 psig.
   4. Body: Forged bronze or dezincified-brass alloy.
   5. Ends: Threaded.
   6. Seats: PTFE.
   7. Stem: Bronze.
   8. Ball: Chrome plated brass.

D. Three Piece, Full Port with Stainless Steel Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 150 psig.
   3. CWP Rating: 600 psig.
   4. Body: Bronze.
   5. Ends: Threaded or press.
   6. Seats: PTFE.
   7. Stem: Stainless steel.
   8. Ball: Stainless steel, vented.

2.06 IRON, BALL VALVES

A. Class 125, Full Port, Stainless Steel Trim:
   1. Comply with MSS SP-72.
   2. CWP Rating: 200 psig.
   3. Body: ASTM A536 Grade 65-45-12, ductile iron.
   4. Ends: Flanged.
   5. Seats: PTFE.
   6. Stem: Stainless steel.
   7. Ball: Stainless steel.
   8. Operator: Lever, with locking handle.

2.07 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Lug Style: Bi-directional dead-end service without use of downstream flange.
   1. Comply with MSS SP-67, Type I.
   2. CWP Rating: 200 psig.
   3. Body: ASTM A126, cast iron or ASTM A536, ductile iron.
   4. Stem: One or two-piece stainless steel.
   5. Seat: EPDM.
   6. Disc: Stainless steel.

2.08 IRON, GROOVED-END BUTTERFLY VALVES

A. CWP Rating: 175 psig (1200 kPa).
   1. Comply with MSS SP-67, Type I.
   2. Body: Coated ductile iron.
   3. Stem: Two-piece stainless steel.
   4. Disc: Coated ductile iron.

5. Disc Seal: EPDM.

2.09 BRONZE, LIFT CHECK VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
   1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.
   2. CWP Rating: 200 psig.
   3. Design: Vertical flow.
   4. Body: Comply with ASTM B61 or ASTM B62, bronze.
   5. Ends: Threaded as indicated.
   6. Disc (Type 1): Bronze.

2.10 BRONZE, SWING CHECK VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125 CWP Rating; 200 psig (1,380 kPa) WOG:
   1. Comply with MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow.
   3. Body: Bronze, ASTM B62.
   4. Ends: Threaded.
   5. Disc: Bronze.

2.11 IRON, HORIZONTAL SWING CHECK VALVES

A. Class 125:
   1. Comply with MSS SP-71, Type I.
   2. CWP Rating: 200 psig.
   3. Design: Clear or full waterway.
   4. Body: ASTM A126, gray cast iron with bolted bonnet.
   5. Ends: Flanged.
   6. Trim: Composition.
   7. Seat Ring and Disc Holder: Bronze.
   8. Disc: PTFE.
   9. Gasket: Asbestos free.

2.12 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125 with Lever and Spring-Closure Control.
   1. Comply with MSS SP-71, Type I.
   2. Description:
      a. CWP Rating: 200 psig.
      b. Design: Clear or full waterway.
      c. Body: ASTM A126, gray iron with bolted bonnet.
      d. Ends: Flanged as indicated.
      e. Trim: Bronze.
      f. Gasket: Asbestos free.
      g. Closer Control: Factory installed, exterior lever, and weight.

2.13 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP:
   1. CWP Rating: 300 psig.
   2. Body: ASTM A536, Grade 65-45-12 ductile iron.
   3. Seal: EPDM.

4. Disc: Ductile iron.
5. Coating: Black, non-lead paint.

2.14 BRONZE, GATE VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. NRS (Non-rising Stem) or OS & Y (Rising Stem):
1. Comply with MSS SP-80, Type I.
2. Class 125: CWP Rating 200 psig.
3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
4. Ends: Threaded or solder joint joint.
5. Stem: Bronze.
6. Disc: Solid wedge; bronze.
7. Packing: Asbestos free.
8. Handwheel: Malleable iron, bronze, or aluminum.

2.15 IRON, GATE VALVES

A. Bolted Bonnet: OS&Y (Rising Stem):
1. Comply with MSS SP-70, Type I.
2. Class 125: CWP Rating: 200 psig.
3. Body: ASTM A126, gray iron with bolted bonnet.
4. Ends: Flanged.
5. Trim: Bronze.
6. Disc: Solid wedge.
7. Packing and Gasket: Asbestos free.

2.16 BRONZE, GLOBE VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125: CWP Rating 200 psig:
1. Comply with MSS SP-80, Type 1.
2. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
3. Ends: Threaded joint.
4. Stem: Bronze.
5. Disc: PTFE.
6. Packing: Asbestos free.
7. Handwheel: Malleable Iron.

2.17 IRON, GLOBE VALVES

A. Class 125: CWP Rating: 200 psig:.
1. Comply with MSS SP-85, Type I.
2. Body: Gray iron; ASTM A126, with bolted bonnet.
3. Ends: Flanged.
4. Trim: Bronze.
5. Packing and Gasket: Asbestos free.
6. Operator: Handwheel or chainwheel.

2.18 LUBRICATED PLUG VALVES

A. Regular Gland with Flanged Ends:
1. Comply with MSS SP-78, Type II.
2. Body: ASTM A48/A48M or ASTM A126, cast iron with lubrication sealing system.
3. Pattern: Regular or short.
4. Plug: Cast iron or bronze with sealant groove.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Lift Check: Install with stem plumb and vertical.
   2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
   1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with MSS SP-58.
   2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported? with a minimum safety factor of 4?. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems:
   1. Comply with MFMA-4.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch diameter.
      b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
      c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

D. Thermal Insulated Pipe Supports:
   1. General Construction and Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
      d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.

2. PVC Jacket:
    a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
    b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
    c. Thickness: 60 mil.
3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

E. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Tags.

C. Automatic Controls: Tags. Key to control schematic.

D. Control Panels: Nameplates.

E. Dampers: Ceiling tacks, where located above lay-in ceiling.

F. Ductwork: Nameplates.

G. Heat Transfer Equipment: Nameplates.

H. Instrumentation: Tags.

I. Major Control Components: Nameplates.

J. Piping: Tags.

K. Pumps: Nameplates.

L. Relays: Tags.

M. Small-sized Equipment: Tags.

N. Tanks: Nameplates.

O. Thermostats: Nameplates.

P. Valves: Tags and ceiling tacks where located above lay-in ceiling.

Q. Water Treatment Devices: Nameplates.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

E. Color code as follows:

1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
2. Fire Quenching Fluids: Red with white letters.
3. Toxic and Corrosive Fluids: Orange with black letters.
4. Flammable Fluids: Yellow with black letters.
5. Combustible Fluids: Brown with white letters.
6. Compressed Air: Blue with white letters.

2.05 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.
   3. Plumbing Valves: Green.
   4. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

END OF SECTION

SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

C. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.
   3. Weave: 5 by 5.

D. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

E. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 CELLULAR GLASS

A. Insulation: ASTM C552, Type II, Grade 6.
   1. K Value: 0.35 at 100 degrees F.
   2. Service Temperature Range: From 250 degrees F to 800 degrees F.
   3. Water Vapor Permeability: 0.005 perm inch maximum per inch.
   4. Water Absorption: 0.5 percent by volume, maximum.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

2.05 JACKETS

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.
   2. Covering Adhesive Mastic: Compatible with insulation.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
   1. Thickness: 0.016 inch sheet.

2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Exposed Piping: Locate insulation and cover seams in least visible locations.

B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

D. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

F. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

G. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.

I. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

J. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

K. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

END OF SECTION

SECTION 22 1005
PLUMBING PIPING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.02 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper.
   2. Joints: ASTM B32, alloy Sn50 solder.

D. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.
   1. Fittings: PVC.
   2. Joints: Push-on, using ASTM F477 elastomeric gaskets.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Pipe: ASTM B42.
   1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper.
   2. Joints: ASTM B32, alloy Sn50 solder.

D. Aluminum DWV Pipe:
   1. Fittings: Cast iron.
   2. Joints: ASTM C564, thermoplastic rubber coupling and stainless steel clamps.

E. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized, using one of the following joint types:
   1. Threaded Joints: ASME B16.4 cast iron fittings.
   2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

F. PVC Pipe: ASTM D2729.
   1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 CHEMICAL RESISTANT SEWER PIPING

A. PVC Pipe: ASTM D2729 or ASTM D2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.05 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

B. Ductile Iron Pipe: AWWA C151/A21.51.
   1. Fittings: Ductile or gray iron, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.

2.06 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

2.07 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper.

D. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.08 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 extra heavy weight.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper.
   2. Joints: ASTM B32, alloy Sn50 solder.

D. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.09 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.10 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

2. Joints: Threaded or welded to ASME B31.1.

2.11 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Housing Material: Provide ?ASTM A47/A47M malleable iron or ductile iron??, galvanized?.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.12 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   2. Trapeze Hangers: Welded steel channel frames attached to structure.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   4. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   4. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   6. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

2.13 MANUFACTURED SLEEVE-SEAL SYSTEMS

A. Modular/Mechanical Seal:
   1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
   2. Provide watertight seal between pipe and wall/casing opening.
   3. Elastomer element size and material in accordance with manufacturer's recommendations.
   4. Glass reinforced plastic pressure end plates.

2.14 BALL VALVES

A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.15 BUTTERFLY VALVES

A. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

B. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.16 WATER PRESSURE REDUCING VALVES

A. Up to 2 Inches:
   1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

B. Over 2 Inches:
   1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.17 RELIEF VALVES

A. Pressure:
   1. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure:
   1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

2.18 STRAINERS

A. Size 2 Inches and Under:
   1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 1-1/2 inch to 4 inches:
   1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

C. Size 5 inch and Larger:
   1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Install water piping to ASME B31.9.

J. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

K. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

L. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.

3.02 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

END OF SECTION

SECTION 22 1006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Roof Drains:
   1. Assembly: ASME A112.6.4.
   2. Body: Lacquered cast iron with sump.
   3. Strainer: Removable polyethylene dome with vandal proof screws.
   4. Accessories: Coordinate with roofing type, refer to Section ??:
      a. Membrane flange and membrane clamp with integral gravel stop.
      b. Adjustable under deck clamp.
      c. Roof sump receiver.
      d. Waterproofing flange.
      e. Controlled flow weir.
      f. Leveling frame.
      g. Adjustable extension sleeve for roof insulation.
      h. Perforated or slotted ballast guard extension for inverted roof.
      i. Perforated stainless steel ballast guard extension.

B. Parapet Drains:
   1. Lacquered cast iron body with aluminum flashing clamp collar and epoxy coated sloping grate.

C. Canopy and Cornice Drains:
   1. Lacquered cast iron body with aluminum flashing clamp collar and epoxy coated flat strainer.

D. Roof Overflow Drains:
   1. ?Lacquered? cast iron body and clamp collar? and bottom clamp ring?; pipe extended to ?2 inches? above flood elevation.

E. Downspout Nozzles:
   1. Bronze round with straight bottom section.

F. Area Drains:
   1. Assembly: ASME A112.6.4.
   2. Body: Lacquered cast iron with sump.
   3. Strainer: Round nickel-bronze.
   4. Accessories: Membrane flange and membrane clamp with integral gravel stop, with adjustable under deck clamp.

G. Linear Drains:
   1. Body: Provide PVC, ABS, or stainless-steel with sloped channel to vertical waste pipe.
   2. Clamping Ring: Stainless steel mechanism to clamp waterproof membrane to linear drain body.
   3. Strainer: Removable brushed stainless steel or tile top strainer furnished by manufacturer or others.
   4. Grate: Cross-hatch.
   5. Additional Components: Manufacturer's standard membrane, sealant, fasteners, and anchors.

H. Floor Drain (FD-1):
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

I. Floor Drain (FD-2):
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.

J. Floor Drain (FD-3):
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer with polished bronze funnel or anti-splash rim.

K. Floor Drain (FD-4):
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer.

L. Floor Drain (FD-5):
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer with hinged grate and sediment bucket.

M. Floor Drain (FD-6):
   1. Lacquered cast iron or stainless steel, two piece body with drainage flange, heavy duty grate 6 inches wide, 12 inches long, dome strainer, end plates with gaskets.

N. Shower Channel Drain (SCD-1): Factory fabricated channel and grate with built in outlet pipe.

O. Precast Trench Drain (TD-1): Trench drain system assembled from factory fabricated, polymer concrete castings in standard lengths and variable depths, with integral joint flanges and integral grating support rails; includes joint gaskets and grating.

P. Floor Trough (FT-1):
   1. Comply with NSF 2 construction.
   2. Construction: 16 gauge, 0.0598 inch stainless steel.
   3. Number of Grates: 1.
   4. Grating: Fiberglass, green.

Q. Planter Drains:
   1. ASME A112.6.4; lacquered cast iron body with sump.
   2. Strainer: Removable polyethylene dome with stainless steel screen.
   3. Accessories: Membrane flange and membrane clamp with integral gravel stop.

2.03 CLEANOUTS

A. Cleanouts at Exterior Surfaced Areas (CO-1):
   1. Round cast nickel bronze access frame and non-skid cover.

B. Cleanouts at Exterior Unsurfaced Areas (CO-2):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

C. Cleanouts at Interior Finished Floor Areas (CO-3):
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

D. Cleanouts at Interior Finished Wall Areas (CO-4):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

E. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS

A. Interior Hose Bibbs:

1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

B. Interior Mixing Type Hose Bibbs:
1. Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome plated where exposed with handwheels, and vacuum breaker in compliance with ASSE 1011.

2.05 REFRIGERATOR VALVE AND RECESSED BOX

2.06 BACK WATER VALVES

A. Cast Iron Back Water Valves: ASME A112.6.4; lacquered cast iron body and cover, brass valve, extension sleeve, and access cover.

B. Plastic Back Water Valves: ABS body and valve, extension sleeve, and access cover.

2.07 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventers:
1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.08 DOUBLE CHECK VALVE ASSEMBLIES

A. Double Check Valve Assemblies:
1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.09 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

2.10 MIXING VALVES

A. Thermostatic Mixing Valves:
1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
2. Accessories:
a. Check valve on inlets.
b. Volume control shut-off valve on outlet.
c. Stem thermometer on outlet.
d. Strainer stop checks on inlets.
3. Cabinet: 16 gauge, 0.0598 inch prime coated steel, for recessed mounting with keyed lock.

B. Pressure Balanced Mixing Valves:
1. Valve: Chrome plated cast brass body, stainless steel cylinder, integral temperature adjustment.
2. Accessories:
a. Volume control shut-off valve on outlet.
b. Stem thermometer on outlet.
c. Strainer stop checks on inlets.
d. Cabinet: 16 gauge, 0.0598 inch prime coated steel, for recessed mounting with keyed lock.

2.11 FLOOR DRAIN TRAP SEALS

A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

3.01 INSTALLATION

A. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

B. Encase exterior cleanouts in concrete flush with grade.

C. Install floor cleanouts at elevation to accommodate finished floor.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

E. Pipe relief from backflow preventer to nearest drain.

F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to ?lavatory sinks, washing machine outlets, or ice maker boxes.?.

G. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

END OF SECTION

SECTION 22 3000
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data:
   1. Indicate pump type, capacity, power requirements.
   2. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   3. Provide electrical characteristics and connection requirements.

1.02 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Commercial Electric:
   1. Type: Factory-assembled and wired, electric, vertical storage.
   2. Performance:
   3. Electrical Characteristics:
   4. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
   5. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
   6. Accessories:
   7. Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gauges.
   8. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.03 ACID NEUTRALIZERS

2.04 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling.

2.05 ELECTRICAL WORK

A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.

B. Electrical characteristics to be as specified or indicated.

C. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.

D. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Domestic Water Storage Tanks:
   1. Provide steel pipe support, independent of building structural framing members.
   2. Clean and flush prior to delivery to site. Seal until pipe connections are made.

D. Pumps:
   1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
   1. Flush Valve: Exposed (top spud).
   2. Flush Operation: Sensor operated.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
   1. Sensor-Operated Type: Solenoid or motor-driven operator, low voltage hard-wired, infrared sensor with mechanical over-ride or over-ride push button.
   2. Concealed Type: Rough brass, exposed parts chrome plated, wall escutcheon, wheel handle stop.
   3. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.

C. Seats:

D. Water Closet Carriers:

2.03 TANK TYPE WATER CLOSETS

A. Bowl: ASME A112.19.2; floor mounted, vitreous china reverse trap, close-coupled closet combination with regular rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps.

2.04 DUAL FLUSH WATER CLOSETS

A. Dual Flush Water Closets: ASME A112.19.14; high efficiency and low consumption, vitreous china, dual flush, tank type.
   1. Flush System: Pressure-assisted, wash down with a half-flush consumption of 1.1 GPF.
   2. Bowl: Elongated.
   3. Rough In: 12 inch.
   4. Seat: Manufacturer's standard or recommended elongated closed front seat with lid.
   5. Color: White.

2.05 LAVATORIES

A. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, ?? minimum, with ?4 inch? high back, rectangular basin with splash lip, front overflow, and soap depression.

B. Cast Iron Wall Hung Basin: ASME A112.19.1; porcelain enamelled cast iron wall-hung lavatory, ?? minimum, with ?4 inch ? high back, drillings on ?4 inch? centers, rectangular basin with splash lip, front overflow, and soap depression.

C. Vitreous China Counter Top Basin: ASME A112.19.2; vitreous china self-rimming counter top lavatory, ?? with drillings on ?4 inch? centers, front overflow,? soap depression,? seal of putty, calking, or concealed vinyl gasket.

D. Pedestal Basin: ASME A112.19.2; vitreous china pedestal lavatory with integral rear splash rim, ?? with drillings on ?8 inch? centers, front overflow, steel hanger.

E. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gallons per minute, indexed handles.

F. Metered Faucet: ASME A112.18.1; chrome plated metered mixing faucet with low voltage operated solenoid operator and infrared sensor, aerator and cover plate, open grid strainer.

G. Sensor Operated Faucet: Cast brass, chrome plated, wall mounted with sensor located on neck of spout.
   1. Spout Style: Standard.
   2. Power Supply: Battery, easily replaceable, alkaline or lithium, minimum 200,000 cycles.
      a. Low battery indicator warning light at 30 days remaining life and continuous light a 2 weeks.
   3. Mixing Valve: None, single line for tempered water.
   4. Water Supply: 3/8 inch compression connections.
   5. Aerator: Vandal resistant, 0.5 GPM, laminar flow device.
   6. Finish: Polished chrome.

2.06 SINKS

2.07 UNDER-LAVATORY PIPE SUPPLY COVERS

2.08 SHOWER RECEPTORS

2.09 SHOWERS

2.10 DRINKING FOUNTAINS

A. Fountain: Molded white reinforced glass fiber with underside vandal proof cowling, hooded elevated anti-squirt bubbler with stream guard, automatic stream regulator, cross handle, mounting bracket, screwdriver stop.

2.11 ELECTRIC WATER COOLERS

A. Water Cooler: Electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gallons per hour of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 V, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

2.12 SERVICE SINKS

A. Bowl: 36 by 24 by 10 inch high white molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.

B. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

C. Accessories:
   1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
   2. Hose clamp hanger.
   3. Mop hanger.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

END OF SECTION

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

B. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

1.02 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.03 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 260583 for required electrical characteristics.

B. Electrical Service:
   1. Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz.
   2. Motors Larger than 1/2 Horsepower: three phase, 60 Hz. Voltage as shown on contract drawings.

C. Nominal Efficiency:
   1. Open Motor with Two Poles: 82.5.
   2. Open Motor with Four Poles: 82.5.
   3. Open Motor with Six Poles: 50.0.
   4. Enclosed Motor with Two Poles: 75.5.
   5. Enclosed Motor with Four Poles: 82.5.
   6. Enclosed Motor with Six Poles: 50.0.

D. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
   4. Motors with frame sizes 254T and larger: Energy efficient type.

E. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.

F. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

G. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

B. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.

C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.

D. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.

E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

F. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.

G. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

H. Motors located outdoors and in draw through cooling towers: Totally enclosed weatherproof epoxy-sealed type.

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

D. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

2.06 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

G. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

H. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

2.07 ELECTRONICALLY COMMUTATED MOTORS (ECM)

A. Manufacturers:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
   1. Fiberglass Channel (Strut) Framing Systems: Include requirements for strength derating according to ambient temperature.

B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
   1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.

C. Derating Calculations for Fiberglass Channel (Strut) Framing Systems: Indicate load ratings adjusted for applicable service conditions.

1.02 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with MSS SP-58.
   2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported??. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   2. Comply with MFMA-4.
   3. Channel Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
   5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.

C. Fiberglass Channel (Strut) Framing Systems: Factory-fabricated continuous-slot fiberglass channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Channel Material: Use polyester resin or vinyl ester resin.
2. Minimum Channel Dimensions: 1-5/8 inch width by 1 inch height.
3. Flammability: Fire retardant with NFPA 101, Class A flame spread index (maximum of 25) when tested in accordance with ASTM E84; self-extinguishing in accordance with ASTM D635.

D. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch diameter.
      b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
      c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

E. Steel Cable:

F. Thermal Insulated Pipe Supports:
   1. General Construction and Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
      d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
   2. PVC Jacket:
      a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
      b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
      c. Thickness: 60 mil.
   3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

G. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
   1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
   2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
   4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

H. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Hollow Stud Walls: Use toggle bolts.
   6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
   7. Sheet Metal: Use sheet metal screws.
   8. Wood: Use wood screws.
   9. Plastic and lead anchors are not permitted.
   10. Powder-actuated fasteners are ?permitted only as follows:?
      a. Where approved by Architect.
   11. Hammer-driven anchors and fasteners are ?permitted only as follows:?
      a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction (when specified).

b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction (when specified).

12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
    d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:
    1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
    2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 033000.
    5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Tags.

C. Control Panels: Nameplates.

D. Dampers: Ceiling tacks, where located above lay-in ceiling.

E. Ductwork: Nameplates.

F. Heat Transfer Equipment: Nameplates.

G. Piping: Tags.

H. Pumps: Nameplates.

I. Tanks: Nameplates.

J. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

A. Manufacturers:

B. Letter Color: White.

C. Letter Height: 1/4 inch.

D. Background Color: Black.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 ADHESIVE-BACKED DUCT MARKERS

2.05 STENCILS

A. Stencils: With clean cut symbols and letters of following size:

1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.

B. Stencil Paint: As specified in Section 099123, semi-gloss enamel, colors complying with ASME A13.1.

2.06 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

D. Color code as follows:

1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
2. Toxic and Corrosive Fluids: Orange with black letters.
3. Compressed Air: Blue with white letters.

2.07 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.
   3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

C. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

END OF SECTION

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1200 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Outdoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent.
   4. Maximum Density: 8.0 lb/cu ft.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 JACKETS

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.

C. Aluminum Jacket: ASTM B209 (ASTM B209M).
   1. Thickness: 0.016 inch sheet.
   2. Finish: ?Embossed?.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

2.05 DUCT LINER

A. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
   1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
   2. Service Temperature: Up to 250 degrees F.
   3. Minimum Noise Reduction Coefficients:
      a. 1/2 inch Thickness: 0.30.
      b. 1 inch Thickness: 0.45.
      c. 1-1/2 inches Thickness: 0.60.
      d. 2 inch Thickness: 0.70.

B. Adhesive: Waterproof, fire-retardant type, ASTM C916.

C. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 INSTALLATION

END OF SECTION

SECTION 23 0913

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

END OF SECTION

SECTION 23 0993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SUBMITTALS

A. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.

B. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.

C. Points List: Submit list of all control points indicating at least the following for each point.

D. Designer's Qualification Statement.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data for ?duct materials, duct liner, and duct connections?.

B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for ?half inch pressure class and higher? systems.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Low Pressure Supply (Heating Systems): ?1/2 inch w.g.? pressure class?, galvanized steel?.

B. Low Pressure Supply (System with Cooling Coils): 1/2 inch wg pressure class, galvanized steel.

C. Buried Supply or Return: ?1/2 inch w.g.? pressure class?fiber glass reinforced plastic HDPE?.

D. Medium and High Pressure Supply: 1/2 inch wg pressure class, galvanized steel.

E. Return and Relief: 1/2 inch wg pressure class, galvanized steel.

F. General Exhaust: 1/2 inch wg pressure class, galvanized steel.

G. Kitchen Cooking Hood Exhaust: ?1/2 inch w.g.? pressure class?, un-galvanized steel?.

H. Dishwasher Exhaust: ?1/2 inch w.g.? pressure class?, stainless steel?.

I. Grease Exhaust: ?1/2 inch w.g.? pressure class?, un-galvanized steel?.

J. Fume Hood Exhaust: 1/2 inch wg pressure class, galvanized steel.

K. Outside Air Intake: 1/2 inch wg pressure class, galvanized steel.

L. Combustion Air: 1/2 inch wg pressure class, galvanized steel.

M. Transfer Air and Sound Boots: 1/2 inch wg pressure class, fibrous glass.

2.02 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

C. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.03 MANUFACTURED DUCTWORK AND FITTINGS

A. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gauge, 0.0478 inch expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors, fire dampers, and smoke dampers.

C. Project Record Drawings: Record actual locations of ?access doors?.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; ?steel or aluminum? construction; with individually adjustable blades, mounting straps.

2.02 BACKDRAFT DAMPERS - METAL

A. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 BACKDRAFT DAMPERS - FABRIC

2.04 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

B. Provide factory sleeve and collar for each damper.

C. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

D. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz.? Provide end switches to indicate damper position.? Locate damper operator on ?exterior? of duct and link to damper operating shaft.

E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.

F. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.05 DUCT ACCESS DOORS

A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
   1. Less Than 12 inches Square: Secure with sash locks.
   2. Up to 18 inches Square: Provide two hinges and two sash locks.
   3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
   4. Larger Sizes: Provide an additional hinge.
   5. High Temperature Duct Access Doors:

B. Access doors with sheet metal screw fasteners are not acceptable.

2.06 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Ceiling (Radiation) Dampers: Galvanized steel, 22 gauge, 0.0299 inch frame and 16 gauge, 0.0598 inch flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
   1. Rated for three hour service in compliance with UL 555C.

C. Horizontal Dampers: Galvanized steel, 22 gauge, 0.0299 inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

D. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

E. Multiple Blade Dampers: 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

F. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.07 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

D. Maximum Installed Length: 14 inch.

2.08 SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

B. Dampers: UL Class 1 ?airfoil blade? type smoke damper, normally ?open? automatically operated by ?electric? actuator.

C. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.09 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Splitter Dampers:
   1. Material: Same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
   2. Blade: Fabricate of ?double? thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.

C. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch.
   2. Blade: 24 gauge, 0.0239 inch, minimum.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   1. Blade: 18 gauge, 0.0478 inch, minimum.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

F. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

E. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

H. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 3416
CENTRIFUGAL HVAC FANS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

B. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

1.02 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Comply with AMCA 99.

D. Performance Base: ?5000 foot elevation? conditions.

E. Temperature Limit: Maximum 300 degrees F.

F. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

2.02 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

B. Forward Curved: ?Galvanized? steel construction with inlet flange, back plate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; steel hub swaged to back plate and keyed to shaft with set screw.

C. Airfoil Wheel: Steel construction with smooth curved inlet flange, heavy back plate die formed hollow airfoil shaped blades continuously welded at tip flange, and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

2.03 HOUSING

A. Heavy gauge steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut.

B. Factory finish before assembly to manufacturer's standard. For fans handling air downstream of humidifiers, provide two additional coats of paint. Prime coating on aluminum parts is not required.

C. Provide bolted construction with horizontal flanged split housing, where indicated.

D. Fabricate plug fans without volute housing, in lined steel cabinet. Refer to Section 230713.

2.04 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, selfgreasing ?ball bearings, with ABMA STD 9 life at 100,000 hours?.

B. Shafts: Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.

C. Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp and under, selected so required rpm is obtained with sheaves set at mid Fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

D. Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.05 ACCESSORIES

A. Fixed Inlet Vanes: Steel construction with fixed cantilevered inlet guide vanes welded to inlet bell.

B. Adjustable Inlet Vanes: Steel construction with blades supported at both ends with two permanently lubricated bearings, variable mechanism out of air stream terminating in single control lever with control shaft for double width fans and locking quadrant.

C. Discharge Dampers: Parallel blade heavy duty steel damper assembly with blades constructed of two plates formed around and welded to shaft, channel frame, sealed ball bearings, with blades linked out of air stream to single control lever.

D. Inlet/Outlet Screens: Galvanized steel welded grid.

E. Access Doors: Shaped to fit scroll, with quick opening latches and gaskets.

F. Scroll Drain: 1/2 inch steel pipe coupling welded to low point of fan scroll.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fans with resilient mountings and flexible electrical leads. Refer to Section 230548.

C. Install flexible connections between fan inlet and discharge ductwork; refer to Section 233300. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

B. Project Record Documents: Record actual locations of air outlets and inlets.

1.02 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 PRODUCTS

2.01 ROUND CEILING DIFFUSERS

A. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Diffuser collar shall project not more than 1 inch above ceiling. In plaster ceilings, provide plaster ring and ceiling plaque.

B. Fabrication: Steel with baked enamel finish.

C. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide ?square and rectangular, adjustable pattern? diffuser to discharge air in ?four way? pattern? with sectorizing baffles where indicated?.

B. Frame: Provide ?surface mount, snap-in, inverted T-bar, and spline? type.? In plaster ceilings, provide plaster frame and ceiling frame.?

C. Fabrication: Steel with baked enamel finish.

D. Accessories: Provide ?radial opposed blade, butterfly, and combination splitter? volume control damper; ?removable core? with damper adjustable from diffuser face.

2.03 CEILING SLOT DIFFUSERS

A. Type: Continuous ?1/2 inch? wide slot, ?1? slots wide, with adjustable vanes for left, right, or vertical discharge??.

B. Fabrication: Aluminum extrusions with factory clear lacquer finish.

C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket, mitered end border.

D. Plenum: Integral, galvanized steel, insulated.

2.04 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.

B. Material: 22 gauge, 0.0299 inch.
   1. Provide crossing spiral fitting-body of matching duct diameter.

2.05 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, ?two-way? deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Construction: Made of aluminum extrusions with factory enamel finish.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.06 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.07 CEILING LINEAR EXHAUST AND RETURN GRILLES

A. Type: Streamlined blades with 90 degree one-way deflection, 1/8 by 3/4 inch on 1/4 inch centers.

B. Frame: 1-1/4 inch margin, extra heavy for floor mounting, with countersunk screw mounting.

C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.08 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of ?1/2 by 1/2 by 1 inch? grid core.

B. Fabrication: Grid core consists of aluminum with mill aluminum finish.

C. Frame: 1-1/4 inch margin with countersunk screw mounting.

D. Frame: Channel lay-in frame for suspended grid ceilings.

E. Accessories: Provide ?45 degree angled eggcrate or other similar provisions for visual blocking such as angled louver, 90 degree duct elbow, etc.?.

2.09 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, ?3/4 inch? minimum depth, ?3/4 inch? maximum spacing with spring or other device to set blades, ?vertical? face, ?double? deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.10 LINEAR WALL REGISTERS/GRILLES

A. Type: Streamlined blades with 0 degree deflection, 1/8 by 3/4 inch on 1/4 inch centers.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions, with factory baked enamel finish.

D. Damper: Integral gang-operated opposed blade damper with removable key operator, operable from face.

2.11 LINEAR FLOOR SUPPLY REGISTERS/GRILLES

A. Type: Streamlined blades with ?15? degree deflection, ?1/8 by 3/4 inch? on ?1/4 inch? centers?, assembled on expanded tubes mandrel construction?.

B. Frame: 1-1/4 inch heavy margin frame with countersunk screw mounting, and mounting frame.

C. Fabrication: Aluminum extrusions with factory baked enamel finish.

D. Damper: Integral gang-operated opposed blade damper with removable key operator, operable from face.

2.12 CRITICAL ENVIRONMENTS DIFFUSERS

A. General Requirements:
   1. Diffuser material to comply with ASTM E84, UL 723, UL 2518, NFPA 90A, and NFPA 90B.

B. Laminar Flow Diffusers:
   1. Construction: Stainless steel.
   2. Frame: Provide framing per manufacturer's recommendations.
   3. Dimensions: As indicated.
   4. Color: As indicated on drawings.
   5. Damper: Provide volume control per manufacturer's recommendations.

2.13 FABRIC AIR DISTRIBUTION DEVICES

A. General Requirements:
   1. Diffuser material to comply with ASTM E84, UL 723, UL 2518, NFPA 90A, and NFPA 90B.
   2. Fabrics to comply with ISO 14644-1 for ISO Class 4 application (clean room, non-shedding material).
   3. Provide fabric air distribution devices made of 100 percent post-consumer recycled content polyester verified by a third party.
   4. Fabric air distribution devices must be designed in software which documents, calculates and provides pressure loss, inlet velocity, turbulent condition warnings, throw capability, entrainment, deflection, flow models, sizing, installation methods, sound generated and temperature corrections.
   5. Textile material must be documented to have the ability to dissipate static electricity (anti-static properties).

B. Continuous Diffusers:
   1. Fabric: 100 percent flame retardant polyester treated with an antimicrobial agent from manufacturer.
   2. Shape: Round.
   3. Frame: Provide framing per manufacturer's recommendations.
   4. Dimensions: As indicated.
   5. Color: As indicated.

2.14 FLOOR SUPPLY REGISTERS/GRILLES

A. Individually adjustable blades, wide stamped border, single or double blade damper with set screw adjustment.

B. Fabricate of steel, welded construction, with factory baked enamel finish.

2.15 DOOR GRILLES

2.16 LOUVERS

A. Type: ?6 inch? deep with blades on 45 degree slope? with center baffle and return bend?, heavy channel frame, ?1/2 inch? square mesh screen over exhaust and ?1/2 inch? square mesh screen over intake.

B. Fabrication: 16 gauge, 0.0598 inch (1.52 mm) thick galvanized steel thick galvanized steel welded assembly, with factory prime coat finish.

C. Color: As indicated on the drawings.

D. Mounting: Furnish with ?exterior angle flange? for installation.

2.17 LOUVERED PENTHOUSES

2.18 ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA (DCS).

B. Fabricate of galvanized steel, minimum 16 gauge, 0.0598 inch base and 20 gauge, 0.0359 inch hood, or aluminum, minimum 16 gauge, 0.0598 inch base and 18 gauge, 0.0598 inch hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory prime coat finish.

C. Fabricate louver penthouses with mitered corners and reinforce with structural angles.

D. Mount unit on minimum 12 inch high curb base with insulation between duct and curb.

E. Make hood outlet area minimum of twice throat area.

2.19 GOOSENECKS

A. Fabricate in accordance with of minimum 18 gauge, 0.0598 inch galvanized steel.

B. Mount on minimum 12 inch high curb base where size exceeds 9 by 9 inch.

2.20 GRAVITY VENTILATORS

A. Hood Intake and Relief Gravity Ventilator:
   1. General:
      a. Low silhouette for intake applications with natural gravity or negative pressure system(s).
      b. Performance ratings and factory testing to be in accordance with AMCA 511 and AMCA 550.
      c. Suitable for non-ducted applications.
   2. Hood and Base:
      a. Material: ?Galvanized steel?.
      b. Hood Construction: Precision formed, arched panels with interlocking seams.
      c. Vertical End Panels: Fully locked into hood end panels.
      d. Curb Cap: Pre-punched mounting holes for installation.
   3. Birdscreen:
      a. Fabricate in accordance with ASTM B221 (ASTM B221M).
      b. Construction: 1/2 inch Galvanized mesh.
      c. Horizontally mounted across hood intake area.
   4. Hood Support: Galvanized steel construction and fastened so hood can be removed completely from the base or hinged open.
   5. Options/Accessories:
      a. Roof Curbs:
         1) Flat Roofs:
            (a) Welded, straight side curb with flashing flange and wood nailer.
            (b) Tabbed and riveted curb with 45 degree cant and wood nailer.
            (c) Welded curb with 45 degree cant and wood nailer.
         2) Pitched Roofs: Welded, straight side curb with flashing flange and wood nailer.
         3) Material: ?Galvanized?.
         4) Insulation Thickness: 1 inch.
      b. Provide extended base minimum 7 inch extension to base height making overall base 12 inches in height to prevent snow or moisture intake.
      c. Curb Seal: Rubber seal between fan and roof curb.
      d. Dampers:
         1) Type: ?Motorized?.
         2) Factory designed to prevents outside air from entering back into building when fan is off.
         3) Balanced for minimal resistance to flow.
         4) Galvanized frames with pre-punched mounting holes.
      e. Factory Finish: ?Factory primed for field application of final finish?.
      f. Hood Insulation or Coating: Provide 1/2 inch fiberglass insulation lining or anti-condensate coating to prevent condensation and reduce sound levels.
      g. Insect Screen:
         1) Fabricate in accordance with ASTM B221 (ASTM B221M).
         2) Construct of fine mesh aluminum.
         3) Fitted to top of the throat to prevent entry of insects.

4) Coating: Thermo-setting polyester urethane.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION

SECTION 23 4000

HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

B. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 FILTER MANUFACTURERS

2.02 ACTIVATED CARBON FILTERS

A. Assembly: Galvanized steel unit incorporating extruded aluminum tracks to accommodate filter servicing trays in deep V arrangement arranged for upstream servicing with disposable panel pre-filter.

B. Media:
   1. Activated Carbon Density: 34 lb/cu ft, pelletized or granular to 6 by 10 Tyler mesh screen.
   2. Carbon Tetrachloride Activity: Minimum 60 percent; in thin bed.

2.03 DISPOSABLE, EXTENDED AREA PANEL FILTERS

A. Media: ?UL 900 Class 1?, pleated, ?fine, glass fiber laminated to synthetic backing?; supported? and bonded to welded wire grid?? by corrugated aluminum separators?.

B. Minimum Efficiency Reporting Value (MERV): 8, when tested in accordance with ASHRAE Std 52.2.

C. Rating, per ASHRAE Std 52.2:

2.04 HIGH EFFICIENCY PARTICULATE AIR (HEPA) FILTERS

A. Media: UL 586, pleated, water-resistant glass fiber with separators of aluminum:

B. Minimum Efficiency Reporting Value (MERV): 15, when tested in accordance with ASHRAE Std 52.2.

C. Performance Rating:
   1. MIL-STD-282 Test 0.3 Micron Dioctyl Phthalate Smoke (DOP) Efficiency: 99.97 percent.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION

SECTION 23 5400
FURNACES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

1.02 WARRANTY

A. Provide three year manufacturers warranty for solid state ignition modules.

B. Provide five year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.02 GAS FIRED FURNACES

A. Annual Fuel Utilization Efficiency (AFUE): 0.95 ("condensing") in accordance with ASHRAE Std 103.

B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, humidifier, and accessories; wired for single power connection with control transformer.
   1. Safety certified by CSA in accordance with ANSI Z21.47.
   2. Venting System: Direct.
   3. Combustion: Sealed.
   4. Air Flow Configuration: ?Upflow?.
   5. Heating: Natural gas fired.

C. Performance:
   1. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.

D. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner. If not certified for combustible flooring, please provide additional steel base.

E. Primary Heat Exchanger:
   1. Material: Hot-rolled steel.
   2. Shape: Tubular type.

F. Secondary Heat Exchanger:
   1. Material: Aluminized steel.
   2. Shape: [_____].

G. Gas Burner:
   1. Atmospheric type with adjustable combustion air supply.
   2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   3. Electronic pilot ignition, with electric spark igniter.

H. Supply Fan: Centrifugal type rubber mounted with direct drive with adjustable variable pitch motor pulley.

I. Motor:
   1. 1750 rpm single-speed, permanently lubricated, hinge mounted.

J. Air Filters: ?1 inch? thick ?glass fiber, disposable? type arranged for easy replacement.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NFPA 90A.

B. Install gas fired furnaces in accordance with NFPA 54.

C. Provide vent connections in accordance with NFPA 211.

END OF SECTION

SECTION 23 7223

PACKAGED AIR-TO-AIR ENERGY RECOVERY UNITS

PART 1 GENERAL

1.01 SUBMITTALS

1.02 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Firm regularly engaged in manufacturing energy recovery units.
   2. Products in satisfactory use in similar service for not less than five years.

1.03 WARRANTY

A. Warranty ventilator to be free from defects in material and workmanship and of all parts for period of 1-1/2 years from date of Substantial Completion.

B. Warranty energy recovery wheel to be free from defects in material and workmanship for 3 years under circumstances of normal use.

C. Warranty motor to be free from defects in material and workmanship for 7 years under circumstances of normal use.

D. Warranty dessicant core to be free from defects in material and workmanship for 5 years under circumstances of normal use.

PART 2 PRODUCTS

2.01 ENERGY RECOVERY UNITS

A. Energy Recovery Units: Provide dessicant wheel type or stationary core air-to-air exchanger; prefabricated packaged system designed by manufacturer.
   1. Access: Hinged and/or screwed access panels on front.
   2. Framing: Welded extruded aluminum tubular frame capable of supporting components and casings.

B. Energy Recovery Units for Spot Ventilation or Whole House Ventilation: Prefabricated packaged system designed by manufacturer with exchange capillary core.
   1. Access: Hinged and/or screwed access panels on front.
   2. Suspension brackets at the unit base.
   3. Framing: Galvanized steel body.
   4. Provide a ceiling grille or access panel.
   5. Provide with MERV 8 filters on supply and exhaust air ducts.
   6. Provide exterior wall cap.

C. ---- Select a Make-up Air Option -----

2.02 CASING

A. Wall, Floor, and Roof Panels:
   1. Construction: 1 inch thick, double wall box construction, with formed edges of exterior wall overlapping formed edges of interior wall.
   2. Exterior Wall: Galvanized steel sheet.
      a. 0.040 inches thick aluminum.
   3. Interior Wall: Galvanized sheet metal.
      a. 22 gauge, 0.0299 inch galvanized sheet metal.
   4. Insulation:
      a. 1/2 inch insulated fiberglass.
      b. Panel Cores: Mineral wool board.
      c. Include antimicrobial protection.
      d. Mold Resistance: "Pass" when tested according to ASTM C1338.
      e. Fungal Resistance: No growth when tested according to ASTM G21.
      f. Bacteria Resistance: No growth when tested according to UL 181.

g. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.
h. Smoke Developed Index (SDI): 50, maximum, when tested in accordance with ASTM E84 or UL 723.
i. Secure insulation to unit with waterproof adhesive and permanent mechanical fasteners.

5. Roof Panel: Weatherproof.
6. Seams: Sealed, requiring no caulking at job site.
7. Coating: Polyurethane enamel.

B. Access Panels: Provide access to components through a large, tightly sealed and easily removable panel.

C. Doors:
1. Construct doors of same construction and thickness as wall panels.
2. Height: 80 inches.
3. Hardware:
a. Hinges: Aluminum.
b. Corrosion-resistant.
c. Wind Restraint: Door chain with spring to absorb force of door swinging open.

D. Duct Connection Collars: 0.08 inches aluminum, continuously welded.

2.03 FANS

A. Provide separate fans for exhaust and supply blowers.

B. Fans:
1. Individually driven with a dedicated motor.
2. Backward inclined.
3. Single width, single inlet.
4. Class 1 aluminum wheels.
5. AMCA-rated.
6. Provide with non-overloading characteristics.

C. Bearings:
1. Bearings: Permanently lubricated sealed ball bearings.

D. Housings: 12 gauge, 0.1046 inch aluminized steel with plenums integral to general housing and constructed to Class 1 fan standards.

E. Motors:
1. Motors: Open drip proof.
2. Efficiency: High.
3. Speed: Single.
4. Fan Motor: UL listed and labeled.

F. Drives:
1. Horsepower: 7.5 HP.

G. Belt Guards: Full sized, hinged, painted with high-visibility safety color, and accessible with standard tools.

2.04 TOTAL ENERGY WHEEL

A. Wheel: Transfer heat and humidity from one air stream to the other with minimum carryover of the exhaust air into the supply air stream.

B. Sensible Recovery Efficiency: [_____].

C. Latent Recovery Efficiency: [_____].

D. Wheel Effectiveness: Rated in accordance with ASHRAE Std 84 and AHRI 1060 I-P.

E. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.

F. Smoke Developed Index (SDI): 50 or less, when tested in accordance with ASTM E84 or UL 723.

G. Energy Recovery Wheel Media Face:

1. Comply with NFPA 90A.

H. Wheel Cassette: Easily removable from the unit.

I. Rotor:
   1. Type: Non-segmented hygroscopic aluminum wheel.
   2. Mounted on permanently lubricated bearings.
   3. Rotor Matrix: Corrosion resistant aluminum alloy composed of alternating corrugated and flat, continuously wound layers of uniform widths.
   4. Rotor Wheel: Reinforce with spokes, welded at the hub and perimeter to prevent any uneven run out during normal operations.

J. Desiccant:
   1. Type: 3A.
   2. Performance:
      a. Desiccant: Non-dissolving, permanent, and resistant to damage from compressed air, low temperature steam, hot water or by vacuum cleaning.
   3. Ventilation Factor: 1.00.

K. Pneumatic Seals: Extruded adjustable brush seals.

L. Drive:
   1. Drive: Tensioned drive with full perimeter link style belt.
   2. Inertial Shock Absorber: Absorb start and stop inertial shock to gear reducer.

M. Purge Angle:
   1. Purge Angle: Field adjustable from zero to six degrees of rotor circumference arc to suit the prevailing pressure conditions.

2.05 FILTERS

A. Thickness: [___] inch.

B. Efficiency: [____] MERV.

C. Filter Racks: Bolt-on rack constructed of 0.08 inches, minimum, thick aluminum with hinged side access door and snap fasteners.

D. Mount 1/2 inches thick permanent aluminum washable type filter in the outside air hood and in the return plenum air.

2.06 DAMPERS

A. Exhaust Back-Draft Damper: Factory installed, galvanized steel.
   1. High performance, backdraft dampers suitable for application in HVAC systems with velocities to 3000 feet per minute.
   2. Louvers, Dampers, and Shutters: AMCA 500-D and AMCA 500-L.
   3. Damper Capacity: Demonstrate damper capacity to withstand HVAC system operating conditions.
   4. Fabrication:
      a. Frame: 20 gauge, 0.0359 inch, 3 inch roll formed galvanized steel channel with rear flange, prepunched mounting holes, and welded corner clips for maximum rigidity.
      b. Blades:
         1) Material: Roll formed 28 gauge, 0.0149 inch galvanized steel.
      c. Linkage: Galvanized steel tie bar with stainless steel pivot pins mounted on blades.
      d. Axles: Stainless steel.
      e. Mounting: ?CH#159542?.

B. Return Air Damper:
   1. Factory installed, adjustable volume control, opposed blade damper for regulating airflow, based on external static pressure.
   2. Return Air Damper: Structural hat channels, reinforced at corners.
   3. Bearings: Corrosion resistant, molded synthetic sleeve type turning in extruded hole in damper frame.

C. Return Air Inlets: Provide expanded metal grating in welded frame to prevent items larger than 1/2 inch in diameter from falling into ducts below.

D. Motorized Dampers: Provide motorized dampers at outside air inlet, exhaust air outlet, and supply air outlet.
   1. Type: Motorized two position parallel blade damper with blade seals.
   2. Motorized Damper: Roll-formed structural hat channels, reinforced at the corners,
   3. Blades: Single skin, 16 gauge, 0.0598 inch.
   4. Bearings: Corrosion resistant, molded synthetic sleeve type turning in extruded hole in damper frame.

E. Motorized Louvers:
   1. Type: Motorized two position parallel blade louver with drainable blades, blade seals, and jamb seals
   2. Adjustable louver:
      a. Fabrication: Mullion style.

2.07 VIBRATION ISOLATION

A. Vibration Isolation: Provide whole unit vibration isolation with the energy recovery unit assembly.

B. Construct with appropriately-sized, seismic-rated, corrosion-resistant captive-spring isolators.

2.08 ROOF CURBS

A. Curbs: Provide full perimeter roof curb fabricated from 10 gauge, 0.1345 inch aluminized steel.

PART 3 EXECUTION

END OF SECTION

SECTION 23 8200
CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

B. Shop Drawings:

C. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.

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

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.02 QUALITY ASSURANCE

1.03 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 HYDRONIC BASEBOARD RADIATION

A. Perform factory run test under normal operating conditions, water, and steam flow rates.

B. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum or aluminum/copper fins.

C. Enclosure:
   1. Steel material with high back and top, of one piece construction.
   2. Removable front panel, end panel, end caps, corners, and joiner pieces.
   3. Full length control damper.
   4. Provisions for return piping.

D. Finish:
   1. Factory applied, baked enamel finish.
   2. Color: As selected from color chart.

E. Element Brackets: Galvanized or pre-painted steel supported from panel with non-metal element cradles or shoes, that allow for noise free expansion and contraction.

2.02 HYDRONIC FINNED TUBE RADIATION

A. Required Directory Listing: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.

B. Heating Elements: 1 inch ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized 4 by 4 inches, suitable for soldered fittings.

C. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

D. Enclosures: ?18 gage, 0.0478 inch? sheet steel up to ?18 inches? in height, ?16 gage, 0.0598 inch? sheet steel over ?18 inches? in height??, with easily jointed components for wall to wall installation.
   1. Support rigidly, on wall or floor mounted brackets at least 3 feet on center maximum.

E. Finish: Factory applied baked ?enamel of color as selected?.

F. Damper: Where not thermostatically controlled, provide knob-operated internal damper at enclosure air outlet.

G. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 by 7 inch minimum size, integral with cabinet.

2.03 HYDRONIC CONVECTORS

A. Perform factory run test under normal operating conditions, water, and steam flow rates.

B. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and cast iron headers, steel side plates and supports, factory air pressure tested at 100 psi under water, with means of adjusting pitch of element.

C. Cabinet: 16 gauge, 0.0598 inch sheet steel front and top, 18 gauge, 0.0478 inch sheet steel back and ends; exposed corners rounded; easily secured removable front panels, adequately braced and reinforced for stiffness.

D. Finish: Factory applied baked ?enamel of color as selected?.

E. Damper: Where not thermostatically controlled, provide knob-operated internal damper at enclosure air outlet.

F. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 by 7 inch minimum size, integral with cabinet.

2.04 HYDRONIC UNIT HEATERS

A. Coils: Seamless copper tubing, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

B. Perform factory run test under normal operating conditions, water, and steam flow rates.

C. Casing: Minimum 18 gauge, 0.0478 inch thick sheet steel casing with threaded pipe connections for hanger rods for horizontal models and minimum 18 gauge, 0.0478 inch thick sheet steel top and bottom plates for vertical projection models.

D. Finish: Factory applied baked ?enamel of color as selected?.

E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

F. Air Outlet: Adjustable pattern diffuser on vertical projection models and ?two or four? way louvers on horizontal projection models.

G. Totally Enclosed Motors: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models. Refer to Section 23 0513.

H. Explosion-Proof Motors:
   1. Comply with UL 674 for use in hazardous (classified) locations.
   2. Comply with NFPA 70 (National Electric Code) classification as follows:
      a. Class I, Group D; all sizes.
      b. Class II, Group F; all sizes.
      c. Class II, Group G; all sizes.
      d. Division I & II Installations.

I. Control: Local solid state disconnect switch.

J. Electrical Characteristics:

2.05 HYDRONIC CABINET UNIT HEATERS

A. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

B. Coils:
   1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
   2. Heating Hot Water: Suitable for working temperatures up to a maximum not less than 200 degrees F.

C. Cabinet: Minimum 16 gauge, 0.0598 inch thick sheet steel front panel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles.

D. Finish: Factory applied baked ?enamel of color as selected? on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

G. Control: Factory wired, solid state, infinite speed control, located in cabinet.

H. Filter: Easily removed, 1 inch thick glass fiber throw-away type, located to filter air before coil.

I. Electrical Characteristics:

2.06 FAN-COIL UNITS

A. Performance Data and Safety Requirements:
   1. Unit capacities certified in accordance with AHRI 440.
   2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
   3. Insulation to comply with NFPA 90A requirements for flame spread and smoke generation.
   4. Equipment wiring to comply with requirements of NFPA 70.

B. Required Directory Listings: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

C. Coils:
   1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
   2. Water Coil: Suitable for working temperatures not less than 200 degrees F.
   3. Provide drain pan under cooling coil easily removable for cleaning.

D. Coil Piping Packages:
   1. Hoses:
      a. Provide hoses for all units for connection to main water supply and return headers.
      b. Length: 2 feet.

E. Vertical Cabinet and Horizontal Exposed Units: Minimum 18 gauge, 0.0478 inch thick sheet steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles.
   1. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.
   2. Automatic Balancing Valves:
      a. Brass body for shutoff and hydronic balancing.
   3. Ball Valves:
      a. Brass body for shutoff and hydronic balancing.
      b. Provide pressure/temperature ports.
   4. Y Strainers:
      a. Bronze body.
      b. "Y" type configuration with brass cap.
      c. Maximum Operating Pressure: Minimum 450 psi.
      d. Screen: Stainless steel.

F. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

G. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

H. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

I. Controls:
   1. Provide units with control valves furnished by the fan coil unit manufacturer.
   2. Fan Coil Unit Manufacturer's Controls:
      a. Fan speed switch for unit mounting.
      b. Disconnect switch.
      c. Thermostats and controllers.

J. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

K. Electrical Characteristics:

2.07 UNIT VENTILATORS

A. Performance Data and Safety Requirements:
   1. Unit capacities certified and tested in accordance with AHRI 840 and AHRI 350.
   2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

B. Required Directory Listings: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

C. Hydronic Coils:
   1. Copper tubes mechanically expanded or bonded into evenly spaced aluminum fins.
   2. Factory pressure tested, hydrostatically, to not less than 350 psi.
   3. Provide insulated drain pan under chilled water coils, to prevent sweating, with field convertible left or right hand drain connections.

D. Refrigerant Coils:
   1. Provide factory installed thermal expansion valves, properly sized to accommodate the selected condensing unit.
   2. Factory proof and leak tested to ensure leak tight operation.
   3. Provide insulated drain pan, to prevent condensation, with field convertible left or right hand connections.

E. Cabinet: 14 gauge, 0.0747 inch sheet steel on solid base pan with exposed edges rounded. Provide removable front panels with quick-acting, key-operated cam locks. Provide removable die-cast or fabricated steel discharge grilles. For units having cooling coils, insulate internal parts and surfaces exposed to conditioned air stream with moisture resistant insulation.

F. Cabinet Accessories: Matching steel construction, reinforced, for use with unit ventilators or finned radiation, with steel alignment pins, adjustable kick plates with leveling bolts, shelves and sliding doors with locks as indicated, sinks, bubbler faucets and bowls, corner, end, and wall filler sections as required.

G. Finish: Factory applied baked ?enamel of color as selected? on visible surfaces of enclosure or cabinet.

H. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven, arranged to draw air through coil.

I. Wall Louvers: Anodized aluminum wall intake box and louvers removable from frame with 1/2 inch square mesh galvanized screen in back of louver.

J. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

K. Controls:
   1. Provide units with control valves furnished by the unit ventilator manufacturer.
   2. Unit Ventilator Manufacturer's Controls:
      a. Fan speed switch for unit mounting.
      b. Disconnect switch.
      c. Thermostats and controllers.
   3. Provide ?ASHRAE Cycle II? as defined in ASHRAE (HVACA) Handbook - HVAC Applications.

L. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

M. Mixing Dampers: Multi-blade with compressible seal, capable of varying proportion of mixed air from 100 percent room air to 100 percent outside air.

N. Electrical Characteristics:

2.08 ELECTRIC BASEBOARD

A. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

B. Assembly: Suitable for flush mounting on any floor surface with built-in controls, wire raceway, thermal safety cut-out, and electric terminal box.

C. Heating Elements:
   1. Enclosed ?nickel chromium? wire in ?steel, stainless steel, or aluminum? sheathing or tubing.
   2. Mechanically bonded, aluminum finned, heating elements.
   3. Heating element securely anchored and free-floating for noise free operation.

D. Enclosure:
   1. Minimum 24 gauge, 0.0239 inch thick back panel and 20 gauge, 0.0359 inch thick sheet steel, exposed front panels, end caps, corners, and joiner pieces.
   2. All joints to snap together without fasteners.
   3. Provide easily removable front panel.

E. Finish:
   1. ?Factory? applied, ?baked enamel? finish.
   2. Color: As selected from color chart.

F. Controls: Built-in bi-metal heating thermostat, factory wired.

G. Electrical Characteristics:

2.09 ELECTRIC UNIT HEATERS

A. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

B. Assembly: Suitable for mounting from ceiling or structure above with built-in controls, thermal safety cut-out, and electric terminal box.

C. Acceptable Heating Element Assemblies:
   1. Horizontal Projection Units:
      a. Steel fins copper brazed to steel sheath and epoxy sealed for moisture resistance.
      b. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.
      c. High-mass, all steel tubular type, copper brazed, centrally located and installed in fixed element banks.
   2. Vertical Projection Units:
      a. Finned tubular.
      b. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.
      c. High-mass, all steel tubular type, copper brazed, centrally located and installed in fixed element banks.

D. Housing:
   1. Horizontal Projection Units:
      a. Construction materials to consist of heavy gage steel with ?galvanized, polyester powder coat, or high gloss baked enamel? finish.
      b. Provide with ?threaded holes for threaded rod suspension?.
      c. Provisions for access to internal components for maintenance, adjustments, and repair.
   2. Vertical Projection Units:
      a. Construction materials to consist of heavy gage steel with ?polyester powder coat or high gloss baked enamel?.
      b. Provide with mounting support brackets or provisions for mounting from ceiling or structure above.
      c. Provisions for access to internal components for maintenance, adjustments, and repair.

E. Air Inlets and Outlets:
   1. Inlets: Provide ?stamped louvers or protective grilles with fan blade guard?.
   2. Outlets: Provide ?diffuser cones, directional louvers, or radial diffusers?.

F. Fan: Factory balanced, direct drive, axial type with fan guard.

G. Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.

H. Controls:
   1. Disconnect.
   2. Control transformer.
   3. Fan speed switch.
   4. Built-in thermostat.

I. Electrical Characteristics:

2.10 BLOWER-COIL UNITS

A. Performance Data and Safety Requirements:
   1. Coils rated and tested in accordance with AHRI 410.
   2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
   3. Comply with NFPA 90A for unit construction, including filters and related equipment, for protection of life and property from fire, smoke, and gases resulting from conditions having manifestations similar to fire.

B. Unit Casing:
   1. Fabricate from heavy gauge galvanized steel sheet.
   2. Insulate inside walls with 1 inch thick, fiberglass insulation for thermal and acoustical control.
   3. Provide access panels allowing servicing of coils, drain pan, fan, motor, and drive.
   4. Provide knockouts or hanger rod holes at all four corners for suspended units.

C. Air Coils:
   1. Aluminum fins mechanically expanded or bonded to copper tubes having standard sweat connections.
      a. Water: Manual, automatic or self-venting, designed to a working pressure and temperature of not less than 250 psig and 200 degrees F.
      b. Direct Expansion (DX): Thermal expansion valve and distributor, dehydrated, sealed with dry charge, and factory proof tested for leaks.

D. Fans: Forward curved, centrifugal blower, dynamically balanced, adjustable speed V-belt drive with fan shaft supported by heavy-duty, permanently sealed ball bearings.

E. Drain Pan: Cleanable, one-piece construction of ?polymer or stainless steel?; with drain connection and sloped for positive drainage.

F. Filters: Fully accessible, flat filter rack with throw-away filters.

G. Motors: Single speed with sleeve or ball bearings, 1750 rpm, wired to unit junction box, and mounted on a resilient motor base.

H. Mixing Box: Factory assembled fresh air and return air dampers including linkage and ready for field installation of damper actuator.

I. Electrical Controls:
   1. Fan contactor.
   2. Terminal strip for connection of field wiring.
   3. Disconnecting means for main incoming power.

J. Electrical Characteristics:

2.11 AIR COILS

A. Water Coils:
   1. Coils rated and tested in accordance with AHRI 410.
   2. Tubes: Material to consist of ?seamless copper or brass?, mechanically ?expanded or tension wound? to fins; appropriate tube joining methods based on tube material.
   3. Fins: Material to consist of aluminum? or copper?, ?continuous plate type with full fin collars or individual helical finned tube type wound under tension?.

4. Casing: Heavy gauge galvanized steel with mounting holes, including intermediate tube supports if required by coil design and length.
5. Headers (Manifolds): Construct of ?seamless copper pipe, cast iron, or nonferrous? material with tube connection appropriate to header material provided.
6. Acceptable Factory Testing Methods:
   a. Proof test at 1.5 times the maximum operating pressure and leak test at the maximum operating temperature.
   b. Leak test at minimum 300 psig air pressure under water.
   c. Perform hydrostatic testing for coils with removable headers in accordance with approved shop drawings and normally accepted means and methods.

B. Refrigerant Coils:
1. Coils rated and tested in accordance with AHRI 410.
2. Tubes: Material to consist of ?seamless copper or brass?, mechanically ?expanded or tension wound? to fins; appropriate tube joining methods based on tube material.
3. Fins: Material to consist of aluminum? or copper?, ?continuous plate type with full fin collars or individual helical finned tube type wound under tension?.
4. Casing: Heavy gauge, galvanized steel with mounting holes, including intermediate tube supports if required by coil design and length.
5. Suction Header: Construct of nonferrous material with tube connection appropriate to header material provided.
6. Liquid distributor: Brass or copper venture type with seamless copper distribution tubes; maximum ?12 or 18? circuits per distributor.
7. Configuration: Down feed with bottom suction to prevent oil trapping.
8. Acceptable Factory Testing Methods:
   a. Proof test at 1.5 times the maximum operating pressure and leak test at the maximum operating temperature.
   b. Leak test at minimum 300 psig air pressure under water.
   c. Perform hydrostatic testing for coils with removable headers in accordance with approved shop drawings and normally accepted means and methods.

2.12 HOSE KITS AND VALVES

A. Hoses:
1. Provide hoses for all units for connection to main water supply and return headers.
2. Length: 2 feet.

2.13 CHILLED BEAMS

A. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

B. Passive Beams:
1. Factory tested in accordance with DIN EN 14518.
2. Provide equipment with integral hanging brackets suitable for ceiling installation.
3. Fabricate of galvanized sheet metal.
4. Finish: Factory applied white paint.
5. Hydronic Coil Assembly:
   a. Chilled water type with aluminum fins and copper tubes.
   b. Factory tested at 150 psig minimum working pressure.

C. Active Beams:
1. Factory tested in accordance with DIN EN 15116.
2. Provide equipment with integral hanging brackets.
3. Factory Insulated Casing:
   a. Fabricate with galvanized 24 gauge, 0.0239 inch, minimum, sheet metal.
   b. Round primary air inlet(s) with integrated pressure port to read plenum pressure and corresponding supply air volume.
   c. Configure air plenum and fixed size air nozzles to provide optimum air performance with low noise levels at all nozzles.

4. Hydronic Coil Assembly:
    a. Copper tubing with sweated or threaded connections, mechanically expanded into aluminum plate fins.
    b. Factory leak tested at minimum 150 psig under water.
    c. Coil removable for servicing or replacement.
5. Finish:
    a. Interior Casing Components: Factory applied black, white, or [_____] paint.
    b. Exterior Face and Frame Elements: Factory applied polyester epoxy powder coat, white color.
6. Accessories:
    a. ?12 inch (305 mm)? stainless steel braided hose with isolation ball valves for ?supply and return? connections.
    b. Integral balancing damper with locking handle as indicated on the drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Manufactured wiring systems are permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. For branch circuits where concealed under raised floors, where concealed above accessible ceilings for lighting, and in open ceiling areas for lighting.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:
   1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.
   4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

H. Minimum Conductor Size:? 12 AWG.?

I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

J. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
   3. Color Code:
      a. 480Y/277 V, 3 Phase, 4 Wire System:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral/Grounded: Gray.
      b. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.

2) Phase B: Red.
3) Phase C: Blue.
4) Neutral/Grounded: White.

c. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:
1) Phase A: Black.
2) Phase B (High-Leg): Orange.
3) Phase C: Blue.
4) Neutral/Grounded: White.

d. Equipment Ground, All Systems: Green.

e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
1. Feeders and Branch Circuits:??
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
a. Size 4 AWG and Larger: Type XHHW-2.
b. Installed Underground: Type XHHW-2.

2.04 NONMETALLIC-SHEATHED CABLE

A. Description: NFPA 70, Type NM multiple-conductor cable listed and labeled as complying with UL 719, Type NM-B.

B. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

2.05 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.

B. Provide equipment grounding conductor unless otherwise indicated.

C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Cable Jacket: Listed and labeled as sunlight resistant.

2.06 SERVICE ENTRANCE CABLE

A. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.

B. Conductor Stranding: Stranded.

C. Insulation Voltage Rating: 600 V.

2.07 POWER AND CONTROL TRAY CABLE

A. Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.

B. Conductor Stranding: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type XHHW or XHHW-2.

E. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.08 MANUFACTURED WIRING SYSTEMS

A. Description: Manufactured wiring assemblies complying with NFPA 70 Article 604, and listed and labeled as complying with UL 183.

B. Provide components necessary to transition between manufactured wiring system and other wiring methods.

C. Branch Circuit Cables:
   1. Conductor Stranding (Size 10 AWG and Smaller): Solid.
   2. Insulation Voltage Rating: 600 V.
   3. Insulation: Type THHN.
   4. Grounding: Full-size integral equipment grounding conductor.
   5. Armor: Steel, interlocked tape.

D. Connectors: Keyed and color-coded to prevent interconnection of different voltages.

E. Fixture Leads: Type TFN insulation.

2.09 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   5. Aluminum Conductors: Use compression connectors for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide ?bolted type or set-screw type?.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.10 ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Circuiting Requirements:
1. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
2. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
3. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
   a. Increase size of conductors as required to account for ampacity derating.
4. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install aluminum conductors in accordance with NECA 104.

E. Install nonmetallic-sheathed cable (Type NM-B) in accordance with NECA 121.

F. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.

G. Install metal-clad cable (Type MC) in accordance with NECA 120.

H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

I. Terminate cables using suitable fittings.

J. Install conductors with a minimum of 12 inches of slack at each outlet.

K. Make wiring connections using specified wiring connectors.
1. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than ?5 ohms? to ground, when tested according to IEEE 81 using "fall-of-potential" method??.

F. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   3. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
   4. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
      a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
      b. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

G. Separately Derived System Grounding:
   1. Separately derived systems include, but are not limited to:
      a. Transformers (except autotransformers such as buck-boost transformers).
      b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
      c. Generators, when neutral is switched in the transfer switch.

2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for metal building frame.
8. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.

I. Isolated Ground System:
1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.
2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.
3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.

J. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.

K. Lightning Protection Systems, in Addition to Requirements of Section 264113:
1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

L. Cable Tray Systems: Also comply with Section 260536.

M. Photovoltaic Systems: Also comply with Section 263100.

N. Pole-Mounted Luminaires: Also comply with Section 265600.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
   1. Description: Copper rectangular ground bars with mounting brackets and insulators.
   2. Size: As indicated.
   3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
   1. Comply with NEMA GR 1.
   2. Material: Copper-bonded (copper-clad) steel.
   3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Make grounding and bonding connections using specified connectors.
   1. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

1.02 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported??. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

END OF SECTION

SECTION 26 0533.13

CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use ?rigid PVC conduit?.
   2. Exterior, Direct-Buried: Use ?PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit?.
   3. Exterior, Embedded Within Concrete: Use ?PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit?.

D. Concealed Within Masonry Walls: Use ?electrical metallic tubing (EMT)?.

E. Concealed Within Hollow Stud Walls: Use ?electrical metallic tubing (EMT)?.

F. Interior, Damp or Wet Locations: Use ?electrical metallic tubing (EMT)?.

G. Exposed, Interior, Not Subject to Physical Damage: Use ?electrical metallic tubing (EMT)?.

H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

I. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.

J. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet.

K. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet unless otherwise indicated.

2.02 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.

B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 1/2 inch (16 mm) trade size.
   2. Branch Circuit Homeruns: ?1/2 inch (16 mm)? trade size.
   3. Control Circuits: 1/2 inch (16 mm) trade size.
   4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.

5. Underground, Interior: 3/4 inch (21 mm) trade size.
6. Underground, Exterior: 1 inch (27 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 ALUMINUM RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.

B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
3. Material: Use aluminum.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.06 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.

C. PVC-Coated Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel or malleable iron.
5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

2.07 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.

2.09 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.
   3. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.
   4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.11 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660??.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.

E. Install intermediate metal conduit (IMC) in accordance with NECA 101.

F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

H. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

I. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
   7. Use of wire for support of conduits is not permitted.

J. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
   4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.

K. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   3. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
   4. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
   5. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
   6. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings?? to prevent damage to enclosed conductors or connected equipment.? This includes, but is not limited to:?
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where conduits are subject to earth movement by settlement or frost.

M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
   1. Where conduits pass from outdoors into conditioned interior spaces.
   2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

END OF SECTION

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use suitable concrete type boxes where flush-mounted in concrete.
   4. Use suitable masonry type boxes where flush-mounted in masonry walls.
   5. Use raised covers suitable for the type of wall construction and device configuration where required.
   6. Use shallow boxes where required by the type of wall construction.
   7. Do not use "through-wall" boxes designed for access from both sides of wall.
   8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
   9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
   10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
   11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
   12. Minimum Box Size, Unless Otherwise Indicated:
      a. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
   1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
   2. Junction and Pull Boxes Larger Than 100 cubic inches:
      a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.

E. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.

F. Floor Boxes:
   1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.

2. Use sheet-steel or cast iron floor boxes within slab above grade.
3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
4. Manufacturer: Same as manufacturer of floor box service fittings.

G. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Applications:
   a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

E. Install boxes as required to preserve insulation integrity.

F. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

G. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

H. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchgear:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      b. Switchboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      c. Panelboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      d. Transformers:
         1) Identify kVA rating.
         2) Identify voltage and phase for primary and secondary.
      e. Enclosed switches, circuit breakers, and motor controllers:
         1) Identify voltage and phase.
      f. Enclosed Contactors:
         1) Identify ampere rating.
         2) Identify voltage and phase.
      g. Centralized Emergency Lighting Inverters:
         1) Identify input and output voltage and phase.
      h. Transfer Switches:
         1) Identify voltage and phase.
         2) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
   2. Service Equipment:
      a. Use identification nameplate to identify each service disconnecting means.

3. Emergency System Equipment:
    a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
    b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
4. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
    c. Motor control centers.
    d. Elevator control panels.
    e. Industrial machinery.
5. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    a. Minimum Size: 3.5 by 5 inches.
    b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
    c. Service Equipment: Include the following information in accordance with NFPA 70.
        1) Nominal system voltage.
        2) Available fault current.
        3) Date label applied.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
    a. Indoor Clean, Dry Locations: Use plastic nameplates.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Minimum Size:
   1. Markers for Equipment: 1 1/8 by 4 1/2 inches.

B. Legend:

C. Color: Black text on orange background unless otherwise indicated.

2.05 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
   2. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

END OF SECTION

SECTION 26 0583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

2.02 EQUIPMENT CONNECTIONS

A. Electrical Connection: Flexible conduit.

B. Electrical Connection: Cord and plug (NEMA 6-20R).

C. Provide field-installed disconnect switch.

PART 3 EXECUTION

3.01 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

B. Field Quality Control Reports.

C. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.03 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
   3. Sensitivity: Field adjustable.
   4. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
   5. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
   6. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
   7. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
   8. Wireless Sensors:
      a. RF Range: 30 feet through typical construction materials.
      b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
      c. Power: Battery-operated with minimum ten-year battery life.

B. Wall Switch Occupancy Sensors:
   1. All Wall Switch Occupancy Sensors:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
   2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet.
4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

C. Wall Dimmer Occupancy Sensors:
1. General Requirements:
   a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
   b. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
   a. Description: Low profile occupancy sensors designed for ceiling installation.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
   b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
   c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet.

E. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
   a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
2. Passive Infrared (PIR) Directional Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.
   b. Long Range Sensors: Capable of detecting motion within a distance of 80 feet at a mounting height of 10 feet.
   c. High Bay Sensors: Capable of detecting motion within a distance of 50 feet at a mounting height of 30 feet.
3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

F. Luminaire Mounted Occupancy Sensors: Designed for direct luminaire installation and control, suitable for use with specified luminaires.

G. Power Packs for Low Voltage Occupancy Sensors:
   1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
   2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
   3. Input Supply Voltage: Dual rated for 120/277 V ac.

H. Power Packs for Wireless Occupancy Sensors:
   1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
   2. Input Supply Voltage: Dual rated for 120/277 V ac.
   3. Load Rating: As required to control the load indicated on drawings.

2.03 OUTDOOR MOTION SENSORS

A. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.

B. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.

C. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.

D. Integral Photocell: For dusk to dawn operation.

E. Manual Override: Activated by switching power off to unit and then back on.

F. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.

G. Coverage: Capable of detecting motion within a distance of 50 feet at a mounting height of 8 feet, with a field of view of 270 degrees.

2.04 TIME SWITCHES

A. Digital Electronic Time Switches:
   1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
   2. Program Capability:
   3. Schedule Capacity: Not less than 16 programmable on/off operations.
   4. Provide power outage backup to retain programming and maintain clock.
   5. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
   6. Input Supply Voltage: As indicated on the drawings.

B. Electromechanical Time Switches:
   1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.
   2. Program Capability:
      a. Astronomic Time Switches: With same schedule for each day of the week and skip-a-day feature to omit selected days with automatic adjustment for seasonal changes in sunrise and sunset times.
   3. Schedule Capacity:
      a. Astronomic Time Switches: Capable of turning load on at sunset and off at either sunrise or selected fixed time.
   4. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
   5. Input Supply Voltage: As indicated on the drawings.

2.05 OUTDOOR PHOTO CONTROLS

A. Stem-Mounted Outdoor Photo Controls:

1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Load Rating: As required to control the load indicated on the drawings.

B. Locking Receptacle-Mounted Outdoor Photo Controls
1. Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.
2. Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.
3. Photo Sensor: Cadmium sulfide.
4. Light Level Activation: 1 to 3 footcandles turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.
8. Surge Protection: 160 joule metal oxide varistor.

C. Button Type Outdoor Photo Controls
1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
2. Housing: Weather resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Light Level Activation: 1 to 3 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Load Rating: As required to control the load indicated on the drawings.

2.06 DAYLIGHTING CONTROLS

A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

B. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
1. Sensor Type: Filtered silicon photo diode.
2. Sensor Range:
3. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
4. Wireless Daylighting Control Photo Sensors:
   a. RF Range: 30 feet through typical construction materials.
   b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
   c. Power: Battery-operated with minimum ten-year battery life.

C. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.

D. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.

3. Control Capability:
   a. Multi-Zone Switching Modules: Capable of controlling up to three separately programmable channels.

E. Daylighting Control Switching Modules for Wireless Sensors:
   1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
   2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
   3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
   4. Control Capability: Capable of controlling one programmable channel.
   5. Input Supply Voltage: Dual rated for 120/277 V ac.
   6. Load Rating: As required to control the load indicated on drawings.

F. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
   1. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
   2. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
   3. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.

G. Daylighting Control Dimming Modules for Wireless Sensors:
   1. Description: Plenum rated control unit compatible with specified wireless photo sensors and with specified dimming ballasts, for continuous dimming of compatible dimming ballasts in response to changes in measured light levels according to selected settings.
   2. Control Capability: Capable of controlling up to 32 ballasts with up to two separately programmable daylighting zones.

H. Power Packs for Low Voltage Daylighting Control Modules:
   1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
   2. Input Supply Voltage: Dual rated for 120/277 V ac.

2.07 LIGHTING CONTACTORS

A. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

B. Short Circuit Current Rating:
   1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

C. Enclosures:
   1. Comply with NEMA ICS 6.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of lighting control devices provided under this section.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.

F. Provide required supports in accordance with Section 260529.

G. Occupancy Sensor Locations:
   1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

H. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

I. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

J. Daylighting Control Photo Sensor Locations:
   1. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
   2. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

K. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

END OF SECTION

SECTION 26 2100

LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

B. Project Record Documents: Record actual locations of equipment and installed service routing.

1.02 QUALITY ASSURANCE

A. Comply with the following:
   1. IEEE C2 (National Electrical Safety Code).
   2. NFPA 70 (National Electrical Code).
   3. The requirements of the Utility Company.
   4. The requirements of the local authorities having jurisdiction.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: As indicated on drawings.

D. Division of Responsibility: As indicated on drawings.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling in accordance with Section 312316.13.

E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 033000.

F. Provide required protective bollards in accordance with Utility Company requirements.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

C. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

D. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   2. Fronts:
   3. Lockable Doors: All locks keyed alike unless otherwise indicated.

G. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.02 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum.
   2. Ground Bus Material: Aluminum.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.
   2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum.
   2. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

B. Bussing:
   1. Bus Material: Aluminum or copper.

C. Circuit Breakers: Thermal magnetic plug-in type.

D. Enclosures:
   1. Provide flush-mounted enclosures unless otherwise indicated.
   2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   5. Provide the following circuit breaker types where indicated:
      a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
      b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
      c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

G. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

H. Provide grounding and bonding in accordance with Section 260526.

I. Provide filler plates to cover unused spaces in panelboards.

END OF SECTION

SECTION 26 2713
ELECTRICITY METERING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories. Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.

PART 2 PRODUCTS

2.01 EQUIPMENT FOR OWNER ELECTRICITY METERING

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Service Conditions: Provide electricity meters suitable for operation under the service conditions at the installed location.

C. Enclosures:
   1. Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 260533.16.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

D. Instrument Transformers:
   1. Comply with IEEE C57.13, where applicable.
   2. Current Transformers: Compatible with connected meters; replace meters damaged by connection of incompatible current transformers. Provide shorting terminal blocks for connection of secondaries where applicable.
   3. Potential Transformers: Include primary and secondary fuses with disconnecting means.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment components in accordance with Section 260529.

D. Provide fuses complying with Section 262813 as required.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed in dwelling units.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. Unless noted otherwise, do not use combination switch/receptacle devices.

I. For flush floor service fittings, use tile rings for installations in tile floors.

J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Isolated Ground Convenience Receptacles: ?Orange???.

C. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.

2.03 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Control: Slide control type with separate on/off switch.

2.05 FAN SPEED CONTROLLERS

A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.

1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

2.06 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: ?Industrial specification grade?, ?20A, 125V, NEMA 5-20R???; single or duplex as indicated? on the drawings?.
   2. Isolated Ground Convenience Receptacles: ?Industrial specification grade?, ?20A, 125V, NEMA 5-20R???, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated? on the drawings?.
   3. Weather Resistant Convenience Receptacles: ?Industrial specification grade?, ?20A, 125V, NEMA 5-20R???, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated? on the drawings?.
   4. Tamper Resistant Convenience Receptacles: ?Industrial specification grade?, ?20A, 125V, NEMA 5-20R???, listed and labeled as tamper resistant type; single or duplex as indicated? on the drawings?.

C. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
   3. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

D. USB Charging Devices:
   1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.

2.07 WALL PLATES

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: ?Standard???.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Weatherproof Covers for Wet?? Locations: Gasketed, ?cast aluminum?, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.08 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.

2.09 POKE-THROUGH ASSEMBLIES

A. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

2.10 ACCESS FLOOR BOXES

A. Description: Metallic multi-service box suitable for mounting in access floor system.

B. Configuration:

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

G. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

H. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

I. Do not share neutral conductor on branch circuits utilizing wall dimmers.

J. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class J Fuses: Comply with UL 248-8.

I. Class L Fuses: Comply with UL 248-10.

J. Class T Fuses: Comply with UL 248-15.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26 2816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Short Circuit Current Rating:
   1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.

D. Conductor Terminations: Suitable for use with the conductors to be installed.

E. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

F. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

G. Provide externally operable handle with means for locking in the OFF position.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Provide mechanical lugs unless otherwise indicated.
   2. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

F. Provide grounding and bonding in accordance with Section 260526.

END OF SECTION

SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Horsepower Rating: Suitable for connected load.

D. Voltage Rating: Suitable for circuit voltage.

E. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

I. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

J. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

F. Provide grounding and bonding in accordance with Section 260526.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.

1.02 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

H. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
   1. LED Tape - General Requirements:
      a. Listed.
      b. Designed for field cutting in accordance with listing.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

2.05 BALLASTS AND DRIVERS

A. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Recessed Luminaires:
   1. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

G. Suspended Luminaires:
   1. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Emergency Lighting Units:

J. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

K. Install lamps in each luminaire.

END OF SECTION

SECTION 26 5140
LUMINAIRES

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings:

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, and installed accessories; include model number nomenclature clearly marked with all proposed features.

1.02 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.03 WARRANTY

A. Ballasts/Drivers:
   1. Without Qualified Manufacturer System On-Site Start-Up: Three years 100 percent parts coverage, no manufacturer labor coverage.
   2. With Qualified Manufacturer System On-Site Start-Up: Five years 100 percent parts coverage, no manufacturer labor coverage.

B. LED Luminaires: Five years 100 percent parts coverage, no manufacturer labor coverage.

C. Fluorescent Luminaires:
   1. Without Qualified Manufacturer System On-Site Start-Up: Three years 100 percent parts coverage, no manufacturer labor coverage.
   2. With Qualified Manufacturer System On-Site Start-Up: Five years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dimming Ballasts and Drivers:
   1. Where possible provide ballasts/drivers produced by a single manufacturer.
      a. Manufacturer Limitations: Where possible, provide ballasts/drivers produced by a single manufacturer.

2.02 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.03 LUMINAIRE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

H. Fluorescent Luminaires:
   1. Provide ballast disconnecting means complying with NFPA 70 where required.

I. LED Luminaire Components: UL 8750 recognized or listed as applicable.

J. Emergency Power Supply Units: Suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

2.04 LED DRIVERS

A. General Requirements:
   1. Operate for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.
   2. Provide thermal protection by automatically reducing power output to protect LED driver and LED light engine/fixture from damage due to over-temperature conditions that exceed the LED driver's maximum operating temperature at the calibration point (tc).
   3. Provide integral recording of operating hours and maximum operating temperature to aid in troubleshooting and warranty claims.
   4. Designed and tested to withstand electrostatic discharges incurred during manufacturing, installation, or field troubleshooting without impairment of performance when tested according to IEC 61000-4-2.
   5. Manufactured in a facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
   6. UL 8750 recognized or listed as applicable.
   7. UL Type TL rated or UL Class P listed where possible to allow for easier fixture evaluation and listing of different driver series.
   8. Suitable for field replacement as applicable; listed in accordance with UL 1598C or UL 8750, Class P as indicated.
   9. Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
   10. Class A sound rating; inaudible in a 27 dBA ambient.
   11. Demonstrate no visible change in light output with a variation of plus or minus 10 percent change in line-voltage input.
   12. LED drivers of the same family/series to track evenly across multiple fixtures at all light levels.
   13. Offer programmable output currents in 10 mA or smaller increments within designed driver operating ranges for custom fixture length and lumen output configurations, while meeting a low-end dimming range of 100 to 0.1 percent, 100 to 1 percent or 100 to 5 percent as applicable.
   14. Meet NEMA 410 inrush requirements for mitigating inrush currents with solid state lighting sources.
   15. Employ integral fault protection up to 277 V to prevent LED driver damage or failure in the event of incorrect application of line-voltage to communication link inputs.
   16. LED driver may be remote located up to 100 feet from LED light engine depending on power outputs required and wire gauge utilized by installer.

B. Digital Control :
   1. Employ power failure memory; LED driver to automatically return to the previous state/light level upon restoration of utility power.
   2. Operate from input voltage of 120 V through 277 V at 50/60 Hz.
   3. Automatically go to 100 percent light output upon loss of control link voltage and lock out system commands until digital control link voltage is restored. Manufacturer to offer UL 924 compliance.
   4. Each driver responds independently per system maximum:
      a. Up to 32 occupant sensors.
      b. Up to 16 daylight sensors.
   5. Responds to digital load shed command. (Example: If light output is at 30 percent and a load shed command of 10 percent is received, the driver automatically sets the maximum light output at 90 percent and lowers current light output by three percent to 27 percent).
   6. Digital low-voltage control wiring capable of being wired as either Class 1 or Class 2.

C. Product(s):

1. Digital Control, 0.1 Percent Dimming with Soft-On and Fade-to-Black Low End Performance;
   a. Dimming Range: 100 to 0.1 percent measured output current.
   b. Features smooth fade-to-on and fade-to-black?? low end dimming performance for an incandescent-like dimming experience.
   c. Typically dissipates 0.25 W standby power at 120 V and 0.40 W standby power at 277 V.
   d. Complies with FCC requirements of 47 CFR 15, for commercial applications at 120-277 V and residential applications at 120 V.
   e. Total Harmonic Distortion (THD): Less than 20 percent at maximum power; complies with ANSI C82.11.
   f. Class 2 output designed to withstand hot swap of LED loads; meets UL 1310 and CSA C22.2 No. 223.
   g. Driver outputs to be short circuit protected, open circuit protected, and overload protected.
   h. Constant Voltage Drivers:
      1) Support for cove and under-cabinet fixtures at 24 V.
         (a) Support LED arrays from 2 W to 96 W.
         (b) Pulse Width Modulation (PWM) dimming frequency meets IEEE 1789.
         (c) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in Energy Star for Luminaires Version 2.0.
         (d) UL listed.

2.05 POWER INTERFACES

A. Provide power interfaces as indicated or as required to control the loads as indicated.

B. General Requirements:
   1. Phase independent of control input.
   2. Rated for use in air-handling spaces as defined in UL 2043.
   3. Utilize air gap off to disconnect the load from line supply.
   4. Diagnostics and Service: Replacing power interface does not require re-programming of system or processor.

C. Product(s):
   1. Phase-Adaptive Power Module??: Provides interface for phase control input to provide full 16 A circuit output of forward/reverse phase control for compatible loads.
   2. Switching Power Module??: Provides interface for phase control or switched input to provide full 16 A circuit output of switching for compatible non-dim loads.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Perform work in a neat and workmanlike manner in accordance with NECA 1.

D. Install luminaires in accordance with NECA/IESNA 500 (commercial lighting).

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

G. Recessed Luminaires:
   1. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Install lamps in each luminaire.

L. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

END OF SECTION

SECTION 31 0513
SOILS FOR EARTHWORK

GENERAL

1.01 SUMMARY

A. This Section includes range of soil and subsoil materials intended to be referenced by other sections, generally for fill and grading purposes. Materials are indicated by "Type" to assist in referencing from other sections and on Drawing notes.

B. Section includes:
   1. Subsoil materials

1.02 RELATED SECTIONS

A. Section 31 05 16 – Aggregates for Earthwork

B. Section 31 10 00 – Site Clearing

C. Section 31 22 13 – Rough Grading

D. Section 31 23 16 – Excavation

E. Section 31 23 18 – Rock Removal

F. Section 31 23 23 – Fill

G. Section 31 37 00 – Riprap

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

B. ASTM International (ASTM):
   1. ASTM D698 test methods correspond with AASHTO T99,
   2. ASTM D1557 test methods correspond with AASHTO T180.
   3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
   4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
   5. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
   6. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

C. Colorado Department of Transportation (CDOT):
   1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.04 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported material's source.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Furnish materials of each type from same source throughout the Work.

B. Soil Testing:
   1. Soil sampling and testing to be completed by an independent laboratory approved by the Engineer.
   2. Frequency of testing shall be determined by the Engineer.
   3. All soil testing shall be paid for by the Contractor.

C. Compaction Tests:
   1. Maximum density at optimum moisture content determined by T180.
   2. In-place density in accordance with Nuclear Testing Method, ASTM D6938.
   3. Compaction testing shall be paid for by the Contractor.

D. Soil Classification: All imported materials shall be classified in accordance with ASTM D2487.

PRODUCTS

2.01 SUBSOIL MATERIALS

A. Subsoil Type S1, Select Native Material:
   1. Class 2 material in accordance with Standard Specifications Section 703.08.

B. Subsoil Type S2, Imported Fill Material:
   1. Class 1 material in accordance with Standard Specifications Section 703.08.

2.02 SPOILS

A. All excess material not suitable or not required for backfill and grading shall be hauled off site and disposed of at a location provided by the Contractor and approved by the Engineer.

B. Make arrangements for disposal of the material at no additional cost to the Owner.

C. Landfill permit to be obtained by the Contractor and provided to Engineer prior to commencement of disposal.

2.03 SOURCE QUALITY CONTROL

A. When tests indicate materials do not meet specified requirements, change material or vary compaction methods and retest. Additional testing shall be completed and paid for by the Contractor with no reimbursement by the Owner.

B. Furnish materials of each type from same source throughout the Work.

EXECUTION

3.01 EXCAVATION

A. Excavate material of every nature and description to the lines and grades as indicated on the Drawings and/or as required for construction of facilities.

B. Site within clearing limits shall be stripped of topsoil as required to obtain additional topsoil necessary to complete Work indicated in the Drawings or as specified.

C. When practical, do not excavate wet topsoil.

D. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

E. Remove excess excavated subsoil and topsoil not intended for reuse from Site.

F. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from Site.

3.02 STOCKPILING

A. Stockpile soils at locations shown in the Drawings or at locations as approved by Engineer for redistribution as specified.
   1. Site may not have sufficient area to stockpile excavated material that will be required for fill later in the project. If additional stockpile area is required to complete the Project on schedule, arrange off-site stockpile areas.
   2. No additional payments will be made for stockpiling excavated materials off-site.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
   1. Grade surface of stockpiles to prevent ponding of water
   2. Cover stockpiles to minimize the infiltration of water.

F. Stockpile unsuitable and/or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.03 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 0516
AGGREGATES FOR EARTHWORK

GENERAL

1.01 SUMMARY

A. This Section includes a range of coarse and fine aggregate materials intended to be referenced by other Sections, generally for fill and grading purposes. Materials are indicated by "Type" to assist in referencing from other Sections and in Drawing notes.

B. Section Includes:
   1. Coarse aggregate materials
   2. Fine aggregate materials

1.02 RELATED SECTIONS

A. Section 31 05 13 - Soils for Earthwork

B. Section 31 22 13 - Rough Grading

C. Section 31 23 19 - Dewatering

D. Section 31 23 23 - Fill

E. Section 31 37 00 - Riprap

F. Section 32 11 23 - Aggregate Base Courses

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses
   2. AASHTO T27 - Sieve Analysis of Fine and Coarse Aggregates
   3. Instructions: For #3, select appropriate AASHTO standard based upon input/standards of client.
   4. If no preference is standard, Murraysmith standard is T99.
   5. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
   6. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
   7. AASHTO TP61 - Standard Method of Test for Determining the Percentage of Fracture in Coarse Aggregate

B. ASTM International (ASTM):
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
   2. Instructions: For #2; select appropriate ASTM standard based upon input/standards of client.
   3. ASTM D698 test methods correspond with AASHTO T99
   4. ASTM D1557 test methods correspond with AASHTO T180.
   5. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
   6. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
   7. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
   8. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
   9. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

C. Colorado Department of Transportation (CDOT):
   1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be

revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.04 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Results of aggregate sieve analysis and standard proctor tests for all granular material.

1.05 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Aggregate Testing:
   1. Aggregate sampling and testing to be completed by an independent laboratory approved by the Engineer.
   2. The frequency of testing shall be determined by the Engineer.
   3. All aggregate testing shall be paid for by the Contractor.

C. Compaction Tests:
   1. Maximum density at optimum moisture content determined by AASHTO T180.
   2. In-place density in accordance with Nuclear Testing Method, ASTM D6938.
   3. The frequency of testing shall be determined by the Engineer.
   4. All compaction testing shall be paid for by the Contractor.

D. Aggregate Classification: All imported materials shall be classified in accordance with ASTM D2487.

PRODUCTS

2.01 COARSE AGGREGATE MATERIALS

A. In accordance with Standard Specifications Section 703.

2.02 FINE AGGREGATE MATERIALS

A. In accordance with Standard Specifications Section 703.

2.03 STRUCTURAL FILL

A. Class 1 or Class 2 structure backfill material in accordance with Standard Specifications Section 703.08.

2.04 FILTER MATERIAL

A. Class B material in accordance with Standard Specifications Section 703.09.

EXECUTION

3.01 STOCKPILING

A. Stockpile materials imported to site as shown in the Drawings or at locations as approved by Engineer for redistribution as specified.

B. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

C. Prevent intermixing of aggregate types or contamination.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
   1. Grade surface of stockpiles to prevent ponding of water.
   2. Cover stockpiles to minimize the infiltration of water.

3.02 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 1000
SITE CLEARING

GENERAL

1.01 SUMMARY

A. This Section includes clearing site of incidental paving and curbs, debris, grass, trees, and other plant life in preparation for site or building excavation work.

1.02 RELATED SECTIONS:

A. Section 02 41 00 - Demolition

B. Section 31 22 13 - Rough Grading

C. Section 31 23 18 - Rock Removal

1.03 DEFINITIONS

A. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.

B. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2-inch caliper to a depth of 12 inches below subgrade.

C. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.

D. Limits of Disturbance: Work area boundary as shown on the Plans.

E. Root Wad: Tree stump and root mass including all roots greater than 1-inch diameter.

F. Stripping: Removal of topsoil remaining after applicable scalping is completed.

1.04 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Clearing, Grubbing, and Stripping Plan: Drawings clearly showing proposed limits to clearing, grubbing, and stripping activities at Site.

C. Certification or disposal permit for landfill and/or waste disposal site.

D. A copy of written permission of private property owners, with copy of fill permit for said private property, as may be required for disposal of materials.

1.05 QUALITY ASSURANCE

A. Existing Conditions: Determine the extent of Work required and limitations before proceeding with Work.

B. Obtain Engineer's approval of staked clearing, grubbing, and stripping limits prior to commencing clearing, grubbing, and stripping.

C. Conform to applicable local, state, and federal codes for environmental requirements and disposal of debris,
   1. Burning on project site will not be permitted.
   2. Use of herbicides will not be permitted.

D. Permits: The Contractor is responsible for obtaining all necessary permits required for completion of the Work described in this Section.

E. Protection of Persons and Property: Meet all federal, state, and local safety requirements for the protection of laborers, other persons, and property in the vicinity of the work and requirements of the General Provisions.

PRODUCTS

2.01 MATERIALS

A. Existing Materials: All materials, equipment, miscellaneous items, and debris involved, occurring or resulting from demolition, clearing, and grubbing work shall become the property of the Contractor at the place of origin, except as otherwise indicated in the Drawings or specifications.

B. Wound Paint: Emulsified asphalt formulated for use on damaged plant tissues.

EXECUTION

3.01 GENERAL

A. Clear, grub, and strip areas needed for waste disposal, borrow, or Site improvements within limits shown in approved Clearing, Grubbing, and Stripping Plan.

B. Remain within the property lines at all times.

C. Do not injure or deface vegetation or structures that are not designated for removal.

3.02 EXAMINATION

A. Verify existing plant life designated to remain is tagged or identified.

B. Identify waste and salvage areas for placing removed materials.

3.03 PREPARATION

A. Call Local Utility Line Information service at 811, not less than three working days before performing Work.

B. Request underground utilities to be located and marked within and surrounding construction areas.
   1. Disconnect or arrange for disconnection of utilities (if any) affected by required work.
   2. Keep all active utilities intact and in continuous operations.

C. Prepare Site only after:
   1. Erosion and sediment controls are in place.
      a. Limit areas exposed uncontrolled to erosion during installation of temporary erosion and sediment controls and in compliance ESC Permits.
   2. Tree and vegetation protection is installed.
      a. Protect existing site improvements, trees, and shrubs to remain to preclude damage during construction.
      b. Follow the provisions set forth in 01 56 39, Temporary Tree and Plant Protection for all temporary tree and plant protection measures.
   3. Temporary fencing is installed along the Limits of Disturbance.
   4. Notification of utility agencies; disconnect or arrange for disconnection of utilities (if any) affected by required work. Keep all active utilities intact and in continuous operation.

3.04 PROTECTION

A. Utilities: Locate, identify, and protect utilities located by utilities and indicated in the Drawings to remain from damage.

B. Survey control: Protect benchmarks, survey control points, and existing structures from damage or displacement.

C. Preservation and Trimming of Trees, Shrubs, and Other Vegetation:
   1. Avoid injury to trees, shrubs, vines, plants, grasses, and other vegetation growing outside of the areas to be cleared and grubbed and those trees and shrubs designated to be preserved.
   2. Protect existing trees and shrubs against cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of roots by stockpiling construction materials, excavated materials, excess foot or vehicular traffic, and parking of vehicles within drip line.
   3. Provide temporary guards, as necessary, to protect trees and vegetation to be left standing.
   4. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
   5. Provide protection for roots and limbs over 1-1/2-inch diameter cut during construction operations. Coat cut faces with emulsified asphalt.
   6. Repairable damage to trees and shrubs designated to remain shall be made by a professional tree surgeon approved by the Engineer. Cost shall be borne by the Contractor.

D. Landscaped Areas:
   1. When any portion of the Work crosses private property or landscaped areas, excavate topsoil separately and pile it on the opposite side of the trench from the subsoil.

2. Conduct Work in a manner that will restore original conditions as nearly as practicable.
3. Remove and replace any trees, shrubs, plants, sod, or other vegetative material as needed to complete Work.
4. All shrubs or plants shall be balled by experienced workers, carefully handled and watered, and replaced in their original positions without damage. Sod shall be handled in a similar manner.
5. Wherever sod cannot be saved and restored, the ground must be reseeded and cared for until a stand of grass is reestablished.
6. Plants or shrubs killed or destroyed shall be replaced and paid for by the Contractor.
7. It is the intent of this paragraph that the Contractor shall leave the surface and plantings in substantially the same conditions as before the Work is undertaken.

E. Miscellaneous Site Features: Protect all existing miscellaneous site features from damage by excavating equipment and vehicular traffic, including but not limited to existing structures, fences, mailboxes, sidewalks, paving, and curbs.

F. Repair and Replacement:
1. Damaged items, including but not restricted to those noted above, shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this contract.
2. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.

3.05 LIMITS

A. As follows, but not to extend beyond Limits of Disturbance as shown on the plans:
1. Excavation: 5 feet beyond top of cut slopes.
2. Trench Excavation: 6 feet from trench centerline, regardless of actual trench width.
3. Fill:
   a. Clearing and Grubbing: 5 feet beyond toe of permanent fill.
   b. Stripping: 2 feet beyond toe of permanent fill.
4. Structures: 15 feet outside of new structures.
5. Roadways: Clearing, grubbing, scalping, and stripping 5 feet from roadway shoulders.
6. Other Areas: As shown.

B. Remove rubbish, trash, and junk from entire area within the Limits of Disturbance as material is generated. Stockpiling shall not be permitted without written approval of Owner.

3.06 CLEARING AND GRUBBING

A. Clear and grub areas within limits shown in approved Clearing, Grubbing, and Stripping Plan.

B. Except in areas to be excavated, all holes resulting from the clearing and grubbing operations shall be backfilled and compacted in accordance with the applicable sections of these Specifications.

C. Clearing:
1. Remove trees, saplings, snags, stumps, shrubs, brush, vines, grasses, weeds, and other vegetative growth within the clearing limits shown in the Drawings, except those trees and shrubs noted to remain in the Drawings or as directed by the Engineer.
2. Clearing shall be performed in such a manner as to remove all evidence of the presence of vegetative growth from the surface of the project site and shall be inclusive of sticks and branches of thickness or diameter greater than 3/8-inch and of grasses, weeds, exceeding 12 inches in height except as otherwise indicated.
3. Clear undergrowth and deadwood, without disturbing subsoil.

D. Grubbing: Clear areas required for access to site and execution of Work and remove all stumps, root wads, and roots over 1-inch diameter to the following depths:

1. Future Structures and Building Areas	24 Inches
2. Roads and Parking Areas	18 Inches
3. All other Areas	12 Inches

3.07 TREE REMOVAL

A. Exercise care in cutting, felling, trimming, and handling of those trees shown for removal to prevent damage to neighboring trees and structures to remain.

B. Tree Salvage: As shown on the Plans.

C. No trees may be removed unless approved and permitted by the Engineer.

D. Do not top trees unless otherwise specified or approved by Owner in writing.

3.08 REMOVAL AND DISPOSAL

A. Native vegetation may be mulched and used on Site.

B. Asphalt and Gravel Surfaces:
   1. Asphalt, concrete, and gravel surfaces designated for removal shall be done to full depth.
   2. Asphalt, concrete, and gravel removed at Site may be reused at Site where shown in the Drawings or following approval of the Engineer.
   3. Haul removed asphalt, concrete, and gravel which is unsuitable for reuse or that exceeds quantity required.

C. Remove debris, rock, abandoned piping, and extracted plant life from Site.

D. Remove from the Site all debris, materials, equipment, and items found thereon and materials and debris resulting from the Work, except as otherwise indicated.
   1. All existing improvements designated on the Drawings or specified to be removed including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing, and similar structures occurring above, at, or below existing ground surface shall be included in the Work.
   2. Unless otherwise specified, any resulting voids shall be thoroughly cracked out for drainage and backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.

E. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

F. Do not burn or bury materials on site. Leave site in clean condition.

G. Removal: All material resulting from demolition, clearing and grubbing, and trimming operations shall be removed from the Site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.

H. Cleanup: During and upon completion of work, promptly remove all unused tools and equipment, surplus materials, and debris.

I. Adjacent areas shall be returned to their existing condition prior to the start of Work.

3.09 CLEANUP

A. During the time Work is in progress, make every effort to maintain the Site in a neat and orderly condition.

B. All refuse, broken pipe, excess fill material, cribbing, and debris shall be removed as soon as practicable.

C. Should the Work not be maintained in a satisfactory condition, the Owner may cause the work to stop until the cleanup of the Work has been done to the satisfaction of the Engineer.

D. The Work will not be considered complete or the final payment certificate issued until all rubbish, unused material, or equipment shall have been removed and the premises left in a condition satisfactory to the Owner and the Engineer.

END OF SECTION

SECTION 31 2213
ROUGH GRADING

GENERAL

1.01 SUMMARY

A. This Section includes rough grading and filling associated with contouring of Site in preparation for building excavation and subsequent site work.

B. Section Includes:
   1. Excavating topsoil
   2. Excavating subsoil
   3. Cutting, grading, filling, and rough contouring of Site

1.02 RELATED SECTIONS:

A. Section 31 05 13 - Soils for Earthwork

B. Section 31 05 16 - Aggregates for Earthwork

C. Section 31 10 00 - Site Clearing

D. Section 31 23 16 - Excavation

E. Section 31 23 18 - Rock Removal

F. Section 31 23 23 - Fill

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

B. ASTM International (ASTM):
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
   4. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
   5. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)
   6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
   7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.04 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Soils for Earthwork: As specified in Section 31 05 13, Soils for Earthwork.

C. Aggregates for Earthwork: As specified in Section 31 05 16, Aggregates for Earthwork.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

PRODUCTS

2.01 MATERIALS

A. Subsoil Fill: Type S1 and S2 as specified in Section 31 05 13, Soils for Earthwork.

B. Structural Fill: Structural Fill as specified in Section 31 05 16, Aggregates for Earthwork.

C. Granular Fill: Filter material as specified in Section 31 05 16, Aggregates for Earthwork.

EXECUTION

3.01 EXAMINATION

A. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.02 PREPARATION

A. Call Local Utility Line Information service at 811 not less than 3 working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.
   2. Notify Engineer of any potential conflicts resulting from utility locations and the Drawings.
   3. Notify utility company to remove and relocate utilities, as may be necessary.

B. Identify required lines, levels, contours, and datum.

C. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life, and landscaped areas in coordination with the Work of this Section.

3.03 TOPSOIL EXCAVATION

A. Excavate and stockpile topsoil as specified in Section 31 05 13, Soils for Earthwork.

3.04 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded as shown in the Drawings.

B. When practical, do not excavate wet subsoil. When wet subsoil must be excavated and is to be reused on site for the Work, process wet material to obtain optimum moisture content.

C. Stockpile excavated material in area designated onsite in accordance with Section 31 05 13, Soils for Earthwork.

D. When excavating through roots, perform Work by hand and cut roots with sharp axe.

E. Benching Slopes: Horizontally bench existing slopes greater than 1:2 to key placed fill material to slope to provide firm bearing.

F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.05 FILLING

A. General:
   1. Grading and filling operations shall not take place when weather conditions and moisture content of fill materials prevent the attainment of specified density.
   2. Vertical curves or roundings at abrupt changes in slope shall be established as approved by Engineer.
   3. Bring all graded areas to a relatively smooth, even grade and slope by blading or dragging. Remove high spots and fill depressions.

B. Fill areas to contours and elevations shown in the Drawings with unfrozen materials.

C. Topsoil Fill:
   1. Scarify prepared subgrade to depth of 4 inches immediately prior to placing topsoil.
   2. Place topsoil in areas to be seeded to depths indicated in the Drawings, minimum depth of 6 inches.
   3. Place topsoil material loose; do not compact, do not place in wet or muddy conditions.

D. Place material in continuous layers as follows:
   1. Subsoil Fill: Maximum 8 inches compacted depth.

2. Structural Fill: Maximum 12 inches compacted depth.
3. Granular Fill: Maximum 12 inches compacted depth.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Slope grade away from building minimum 2 1/2 in first 10 feet in hardscaped areas and 6 inches in first 10 feet in landscaped areas, unless noted otherwise.

G. Make grade changes gradual. Blend slope into level areas.

H. Repair or replace items indicated in the Drawings to remain which are damaged by excavation or filling. All costs shall be borne by the Contractor.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.1 foot from required elevation.

3.07 FIELD QUALITY CONTROL

A. Perform laboratory material tests in accordance with section 31 05 16.

B. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D2922
2. Moisture Tests: ASTM D3017

C. Frequency and location of testing is dependent upon type of material placed. See Section 31 05 13 and 31 05 16, Quality Control Subsections for testing requirements.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest at the sole expense of the Contractor.

END OF SECTION

SECTION 31 2316
EXCAVATION

GENERAL

1.01 SUMMARY

A. This Section includes excavation required for building foundations, site structures, or under slabs-on-grade or paving.

B. Section Includes:
   1. Excavating for building foundations
   2. Excavating for paving, roads, and parking areas
   3. Excavating for slabs-on-grade
   4. Excavating for site structures
   5. Excavating for landscaping

1.02 RELATED SECTIONS

A. Instructions: Edit the following paragraph to fit your project.

B. Section 01 45 00 - Quality Control

C. Section 02 41 00 - Demolition

D. Section 31 05 13 - Soils for Earthwork

E. Section 31 05 16 - Aggregates for Earthwork

F. Section 31 10 00 - Site Clearing

G. Section 31 22 13 - Rough Grading

H. Section 31 23 18 - Rock Removal

I. Section 31 23 19 - Dewatering

J. Section 31 23 23 - Fill

K. Supplemental Information: Geotechnical report available from Owner upon request..

1.03 DEFINITIONS

A. Common Excavation: All excavation required for Work, regardless of the type, character, composition, or condition of the material encountered. Common Excavation shall further include all debris, junk, broken concrete, and all other material. All excavation shall be classified as Common Excavation, unless provided as Rock for under Section 31 23 18, Rock Removal below.

B. Common Material: All soils, aggregate, debris, junk, broken concrete, and miscellaneous material encountered in Common Excavation, excluding rock as defined below.

C. Concrete Excavation: The removal of pieces of concrete larger than 1 cubic yard in volume that requires drilling, splitting and breaking methods, or a necessitating a trench width increase of 18 inches or more than the width of the preceding 10 feet of trench. Concrete excavation includes materials composed of Portland cement that are not identified other than manholes, structures, sewer pipe, or other appurtenances.

D. Exploratory Excavation: The removal and replacement of material from locations shown on the Drawings, or as directed for the purpose of investigating underground conditions and identifying potential utility conflict between existing and proposed utilities.

E. Overbreak: Material beyond and outside of the slope limits established by the Owner's Representative, which becomes displaced or loosened during excavation and is excavated.

F. Pothole Excavation: Pothole excavation is the removal and replacement of all materials via coring, vacuum extraction, or similar method, not classified as exploratory excavation, for the purposes of locating an underground utility and to investigate underground conditions.

G. Rock Removal: As defined in Section 31 23 18, Rock Removal.

H. Spoils: Excavated materials from Site unsuitable for use as fill or not required for backfill and grading.

I. Unsuitable Materials: See Spoils.

1.04 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

B. Colorado Department of Transportation (CDOT):
   1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.05 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: At a minimum, to include the following:
   1. Methods and sequencing of mass excavation.
   2. Proposed onsite and off-site spoil disposal locations.
   3. Anticipated difficulties and proposed resolutions.
   4. Proposed routes for Owner's access to Owner's facilities impacted by excavation Work.
   5. Proposed haul routes.

C. Excavation support plan and utility protection plan as specified in Section 31 50 00, Excavation Support and Protection.

1.06 QUALITY ASSURANCE

A. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.

B. Provide adequate survey control to avoid unauthorized over-excavation.

C. Weather Limitations:
   1. Material excavated when frozen or when air temperature is less than 32 degrees Fahrenheit (F) shall not be used as fill or backfill until material completely thaws.
   2. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

PRODUCTS - NOT USED

EXECUTION

3.01 PREPARATION

A. Prior to commencing work in this Section, become familiar with site conditions. In the event discrepancies are found, notify the Engineer as to the nature and extent of the differing conditions.

B. Call Local Utility Line Information service at 811 not less than 3 working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.
   2. Coordinate with and notify utility companies should it be necessary to remove or relocate facilities.

C. Identify required lines, levels, contours, and datum.

D. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life, and landscaped areas in coordination with Work in this Section.

3.02 SITE CONDITIONS

A. Quantity Survey: The Contractor shall be responsible for calculations for quantities and volume of cut and fill from existing site grades to finish grades established under this contract as indicated in the Drawings or specified and shall include the cost for all earthwork in the total basic bid.

B. Dust Control: Must meet all federal, state, and local requirements. Protect persons and property from damage and discomfort caused by dust. Water surfaces as necessary and when directed by Engineer to quell dust.

C. Soil Control: Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers, dry wells, or drainageways.

3.03 EXISTING UNDERGROUND UTILITIES

A. Protect active utilities encountered, located or otherwise, and notify persons or agencies owning same.

B. Remove inactive or abandoned utilities from within the project grading limits as shown on the plans.

C. For sewer and other miscellaneous drainage facilities, fill and plug pipes as follows:
   1. General:
      a. Remove all structures to a minimum of 3 feet below subgrade, unless otherwise noted.
      b. Cover top surface of all abandoned structures with two sheets of nonwoven geotextile, extended at least 1-foot beyond the outside walls of the abandoned manhole, sump, or basin.
      c. Plug all abandoned pipes with permanent plugs as shown on the plans.
   2. Sumps:
      a. Remove existing sediment, soil, and water. Properly dispose of these materials in accordance with the requirements of these specifications.
      b. Remove top cone and first solid concrete section to a depth of approximately 8 to 10 feet below ground.
      c. Fill sump with Flow-Fill in accordance with Standard Specification Section 206.
      d. Backfill remaining voids for facilities within existing or proposed roadways with approved materials meeting the requirements of Section 32 11 23, Aggregate Base Courses.
   3. Salvaging Manhole Frames, Covers, and Grates:
      a. Remove manhole frames, covers, and grates scheduled for salvage and store in approved location.
      b. Frames, grates, and covers meeting Specifications may be salvaged from structures to be adjusted and may be reused in the Work if of suitable size and condition.
      c. Replace, at no additional cost to the Owner, all items damaged or lost by the Contractor with similar items that are comparable in all respects with those they are to replace, and which are adequate for the intended purpose.
      d. Clean salvaged components to be reused of foreign material by methods that will not harm the components.
   4. Existing Manhole Frames and Covers: Manhole frames and covers removed by the Contractor are the property of the Owner. Notify the Engineer a minimum of 48 hours before removal to arrange for pickup of the removed frames and covers, if not reused.

3.04 PRESERVATION OF EXISTING IMPROVEMENTS

A. Protect adjacent existing structures which may be damaged by excavation work.
   1. Conduct operations in such a manner that existing street facilities, utilities, railroad tracks, structures, and other improvements, which are to remain in place, will not be damaged. Furnish and install cribbing and shoring or whatever means necessary to support material around existing facilities, or to support the facilities themselves, and maintain such supports until no longer needed.
   2. Open slopes shall not be cut within 5 feet of any existing spread footings unless approved by the Engineer.
   3. Do not interfere with 45 degree bearing splay of foundations unless approved by the Engineer
   4. Excavated material shall not be placed adjacent to existing or proposed structures.

3.05 EXCAVATION

A. General:
   1. Method of excavation shall be the Contractor's option, but care shall be exercised as final grade is approached to leave it in undisturbed condition.

2. If the final grade for supporting structures is disturbed, it shall be restored to requirements of these Specifications and satisfaction of the Engineer at no additional cost to Owner.
3. The Contractor is advised that footings should be poured as soon as possible to minimize unfavorable final grade conditions from developing.
4. Provide all measures to ensure public safety.

B. Control of Water:
1. Provide and maintain equipment to remove and dispose of water during the course of the work of this Section and keep excavations dry and free of frost or ice.
2. Bearing surfaces that become softened by water or frost must be re-excavated to solid bearing at Contractor's expense and backfilled with compacted crushed rock at Contractor's expense.
3. Grade top perimeter of excavation to prevent surface water from draining into excavation.
4. See additional requirements in Section 31 23 19, Dewatering.

C. Frozen Ground: Frost protection shall be provided for all structural excavation work. Foundation work shall not be placed on frozen ground.

D. Excavate material of every nature and description to the lines and grades as indicated in the Drawings and/or as required for construction of the facility.
1. Allow for forms, shoring, working space, granular base, topsoil, and similar items, wherever applicable.
2. Trim excavations to neat lines. Remove loose matter and lumped subsoil.

E. Excavated Materials: Soils excavated at Site will be treated and used as one of two general categories of material as provided below.
1. Fill:
   a. Subsoil Type S1, Select Native Fill, as approved for use by Engineer.
2. Spoils:
   a. Ensure there is sufficient suitable material available to complete embankments and other required fillings prior to disposing of any excavated materials.
   b. Make arrangements for disposal of spoils and include as part of contract work in preparing of project bids.
   c. Landfill permit or written permission from private property owner to be obtained by the Contractor and provided to the Engineer.

F. Shoring:
1. The Contractor shall be solely responsible for excavation protection and worker safety and shall provide sheeting and shoring wherever required, all in accordance with current local, state, and federal laws, codes, and ordinances.
2. Where shoring, sheet piling, sheeting, bracing, lagging, or other supports are necessary to prevent cave-ins or damage to existing structures, it shall be the responsibility of the Contractor to design, furnish, place, maintain, and remove such supports in accordance with applicable ordinances and safety requirements.
3. The design, planning, installation, and removal of all sheeting accomplished in such a manner as to maintain the undisturbed state of the soil below and adjacent to the excavation.

G. Slope existing banks with machine to angle of repose or less until shored.
1. Shape, trim, and finish cut slopes to conform to lines, grades, and cross-sections shown, with proper allowance for topsoil or slope protection, where shown.
2. Protection of excavation side slopes:
   a. Use excavation methods that will not shatter or loosen excavation slopes.
   b. Where practical, excavate materials without previous loosening and in limited layers or thickness to avoid breaking the material back of the established slope line.
   c. Avoid overbreaks. Overbreak is incidental to the Work, except in cases where the Owner's Representative determines that such overbreak was unavoidable.
   d. Excavation in rock or rocky cuts:
      1) Once completed, thoroughly test the slopes with bars or other approved means to remove all loose, detached, broken, or otherwise unstable material.

2) Remove jutting points. Scale slopes using mine scaling rods or other approved methods to remove loose or overhanging materials and provide a safe, trim, neat, and stable condition.
3) Dispose of the materials removed under this subparagraph in the same manner as other excavated material.

e. Remove all exposed roots, debris, and all stones more than 3 inches in size which are loose or could become loosened.

3. Construct slopes free of all exposed roots.
4. Construct slopes free of unstable rock and loose stones exceeding 3 inches in diameter.
5. Round tops of cut slopes in soil to not less than a 6-foot radius, provided such rounding does not extend off-site, outside of easements, outside of rights-of-way, or adversely impacts existing facilities, adjacent property, or completed Work.
6. Trim all surfaces neatly and smoothly.

H. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 17, Trenching and Section 31 23 23, Fill.

I. Notify Engineer of unexpected subsurface conditions.

J. Over-excavation for Unsuitable Foundation Conditions:
1. Cross-sectional dimensions and depths of excavations shown in the Drawings shall be subject to such changes as may be found necessary by the Engineer to secure foundations free from soft, weathered, shattered, and loose material or other objectionable materials.
2. Unsuitable materials encountered shall be removed and replaced with Structural Fill as specified in Section 31 05 16, Aggregates for Earthwork. All material placed shall be compacted to 95 percent of maximum dry density.
3. Unsuitable materials shall be removed and replaced only as directed in writing by Engineer.

K. Rock Removal:
1. Remove boulders and rock up to 1/2 cubic yard measured by volume per the requirements of this Section.
2. Remove larger boulders and rock material as specified in Section 31 23 18, Rock Removal.
3. Concrete removal, as defined herein, shall be treated as Rock Removal.

L. Stockpile excavated material in area(s) designated on or off site in accordance with Section 31 05 13, Soils for Earthwork.

3.06 FIELD QUALITY CONTROL

A. Perform excavation and controlled fill operations in accordance with the requirements of this Section.

B. Coordinate the visual inspection and approval of all bearing surfaces by Engineer before installing subsequent work.

3.07 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability and store excavated materials at a distance from top of excavation.

B. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 31 2318
ROCK REMOVAL

GENERAL

1.01 SUMMARY

A. This Section includes removal of subsurface rock during excavation by mechanical method. The use of explosives for rock removal is not permitting for this project.

B. Section Includes:
   1. Removing identified and discovered rock during excavation.
   2. Expansive tools to assist rock removal.

C. Related Sections:
   1. Section 31 22 13 - Rough Grading
   2. Section 31 23 16 - Excavation
   3. Section 31 23 23 - Fill
   4. Section 31 37 00 - Riprap
   5. Supplemental Information: Geotechnical report available from Owner upon request.

1.02 DEFINITIONS

A. Common Excavation: All excavation required for Work, regardless of the type, character, composition, or condition of the material encountered. All excavation shall be classified as Common Excavation, unless provided for under Rock Removal below.

B. Common Material: All soils, aggregate, debris, junk, broken concrete, and miscellaneous material encountered in Common Excavation, excluding rock as defined below.

C. Rock: Solid mineral material, including boulders, solid bedrock, or ledge rock, with volume in excess of 1/2 cubic yard or solid material which, by actual demonstration, cannot be reasonably excavated with suitable machinery as defined herein. The Engineer may waive the requirements for actual demonstration if the material encountered is well-defined rock.

D. Rock Removal: Removal of rock as defined herein by systematic and continuous drilling, hammering, breaking, splitting, or other methods approved by the Engineer.

E. Suitable Machinery: A track-mounted hydraulic excavator of the 52,800- to 72,500-pound class equipped with a single shank ripper.

1.03 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Submittal procedures.

B. Equipment: Manufacturer information regarding pound class of machinery proposed for rock removal.

C. Survey Report: Submit survey report mapping extent and locations of rock encountered, to be used in calculating total volume of rock removal.

1.04 PROJECT CONDITIONS

A. Conduct survey of rock uncovered in excavation for structures prior to removal of material.

1.05 SCHEDULING – NOT USED

PRODUCTS - NOT USED

EXECUTION

3.01 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Engineer Approval for Rock Removal:
   1. Prior to commencement of rock removal, expose all material anticipated to be rock by removing the common material above it and then notify the Engineer.

2. The Engineer, in association with the Contactor or the Contractor's representative, will measure the amount of material to be removed in an effort to reach a mutually agreeable volume for anticipated rock removal.
3. Prior to commencing the proposed rock removal, the Contractor must receive written approval by the Engineer stating the approximate volume of excepted rock removal to receive payment.
4. During rock removal activities, should it become apparent the previously agreed upon volume of rock removal will be exceeded, notify the Engineer immediately. Should the Contractor proceed with rock removal in excess of the previously agreed upon volume, the Contractor will do so at their own risk and expense.

3.03 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.
   1. Use single shank ripper to fracture rock.
   2. Drill holes and use expansive tools and wedges to fracture rock.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for footings and foundations.

D. For vaults and other structures, excavate to the depth necessary to install the structure and to a maximum of 18 inches beyond the outside walls of the vault or structure.

E. Remove excavated materials from site.

F. Correct unauthorized rock removal associated with structural excavations in accordance with backfilling and compacting requirements of Section 31 23 16, Excavation and as directed by Engineer.

G. Correct unauthorized rock removal associated with utility work in accordance with backfilling and compacting requirements and as directed by Engineer.

H. If material which would be classified as rock as defined herein is mechanically removed with equipment of a larger size than specified as Suitable Machinery herein, it shall be understood that any added costs for the removal of rock by this method shall be included in the unit price for common excavation and not paid for under this pay item. If material which would be classified as rock as defined herein is mechanically removed without hammering, breaking, or splitting, it will be considered common excavation and not paid for under this pay item. If equipment larger than the suitable machinery as defined herein is brought on the project site for the sole purpose of rock removal without hammering, breaking or splitting, then such excavation will be considered rock removal.

3.04 FIELD QUALITY CONTROL – NOT USED

END OF SECTION

SECTION 31 2319
DEWATERING

GENERAL

1.01 SUMMARY

A. This Section includes temporary dewatering and surface water control systems for open excavations and utility trenches.

B. Section includes:
   1. Dewatering systems.
   2. Surface water control systems.
   3. System operation and maintenance.
   4. Water disposal.

1.02 RELATED SECTIONS

A. Section 02 30 00 - Subsurface Investigations

B. Section 31 05 16 - Aggregates for Earthwork

C. Section 31 23 16 - Excavation

1.03 SUBMITTALS

A. Dewatering Plan:
   1. Descriptions of proposed groundwater and surface water control facilities including, but not limited to, equipment; methods; standby equipment and power supply; pollution control facilities; discharge locations to be utilized; and provisions for immediate temporary water supply as required by this Section.
   2. Plan to be reviewed by the Engineer prior to the beginning of construction activities requiring dewatering. Review by the Engineer of the design shall not be construed as a detailed analysis of the adequacy of the dewatering system, nor shall any provisions of the above requirements be construed as relieving the Contractor of its overall responsibility and liability for the work.

1.04 DEFINITIONS

A. Dewatering includes the following:
   1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations, trenches, tunnels, and /or shafts.
   2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations, trenches, tunnels, and /or shafts.
   3. Disposing of removed water.

B. Surface Water Control: Removal of surface water within open excavations.

1.05 QUALITY CONTROL

A. All dewatering operations shall be adequate to ensure the integrity of the finished project and shall be the responsibility of the Contractor.

B. Provide all labor, materials, and equipment necessary to dewater trench and structure excavations, in accordance with the requirements of the Contract Documents.

C. Secure all necessary permits to complete the requirements of this Section including but not limited to a Colorado Department of Health and Environment (CDPHE) construction dewatering permit.

D. Control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

E. Where the critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop.
   1. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor.
   2. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

PRODUCTS

2.01 EQUIPMENT

A. Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the jobsite.

EXECUTION

3.01 DEWATERING

A. Provide all equipment necessary for dewatering.
   1. Have on hand, at all times, sufficient pumping equipment and machinery in good working condition.
   2. Have available, at all times, competent workers for the operation of the pumping equipment.
   3. Adequate standby equipment shall be kept available at all times to ensure efficient dewatering and maintenance of dewatering operation during power failure.

B. Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

C. Site Grading:
   1. At all times, site grading shall promote drainage.
   2. Surface runoff shall be diverted from excavations.
   3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock.

F. Maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.

G. Flotation shall be prevented by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

I. Dispose of water from the work in a suitable manner without damage to the environment or adjacent property. No water shall be drained into work built or under construction without prior consent of the Engineer. Water shall be filtered using an approved method to remove sand and fine sized soil particles before disposal into any drainage system.

J. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

K. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the work and all costs thereof shall be included in the various contract prices in the bid forms.

END OF SECTION

SECTION 31 2323
FILL

GENERAL

1.01 SUMMARY

A. This Section includes backfilling required at building perimeter and site structures to subgrade elevations, fill under interior and exterior slabs-on-grade or pavement, and fill under landscaped areas.

B. Section includes:
   1. Backfilling building perimeter to subgrade elevations.
   2. Backfilling site structures to subgrade elevations.
   3. Fill under slabs-on-grade.
   4. Fill under paving.
   5. Fill for over-excavation.

1.02 RELATED SECTIONS

A. Instructions: Edit the following paragraph per project requirements.

B. Section 31 05 13 - Soils for Earthwork

C. Section 31 05 16 - Aggregates for Earthwork

D. Section 31 22 13 - Rough Grading

E. Section 31 23 16 - Excavation

F. Section 31 37 00 - Riprap

G. Supplemental Information: Geotechnical report available from Owner upon request.

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. Instructions: Select only one AASHTO standard based upon input/standards of client. If no preference is standard, Murraysmith standard is T99.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International (ASTM):
   1. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. Colorado Department of Transportation (CDOT):
   1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.04 DEFINITIONS

A. Controlled Low Strength Material (CLSM): Also referred to as Flow-Fill elsewhere in these Specifications. A self-compacted, cementitious material. See Standard Specifications section 206.

B. Imported Material: Materials obtained from sources offsite, suitable for specified use.

C. Lift: Loose (uncompacted) layer of material.

D. Optimum Moisture Content:
   1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
   2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

1.05 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Imported Materials:
   1. Materials Source: Submit name and location of imported fill materials suppliers.
   2. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
   3. Submit results of aggregate sieve analysis and standard proctor test for granular material.

C. Flow-Fill: Mix designs in accordance with Standard Specifications section 206.

1.06 QUALITY ASSURANCE

A. Subsoil and topsoil fill materials: In accordance with Quality Assurance requirements stated in Section 31 05 13, Soils for Earthwork.

B. Aggregate fill materials: In accordance with Quality Assurance requirements stated in Section 31 05 16, Aggregates for Earthwork.

C. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.

PRODUCTS

2.01 FILL MATERIALS

A. Subsoil Fill: Type S2, Imported Fill Material, as specified in Section 31 05 13, Soils for Earthwork.

B. Imported Granular Fill: Coarse Aggregate Type A1, Dense-Graded Aggregate with gradation as shown in the Drawings and specified in Section 31 05 16, Aggregates for Earthwork.

C. Drain Rock: Filter material as specified in Section 31 05 16, Aggregates for Earthwork.

EXECUTION

3.01 EXAMINATION

A. Prior to Work in this Section, become familiar with Site conditions. In the event discrepancies are found, notify Engineer as to the nature and extent of the differing conditions.

B. Verify sub-drainage, damp-proofing, or waterproofing installation has been inspected.

C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.02 SITE CONDITIONS

A. Quantity Survey: The Contractor shall be responsible for calculations for quantities and volume of cut and fill from existing site grades to finish grades established under this contract as indicated in the Drawings or specified and shall include the cost for all earthwork in the total basic bid.

B. Dust Control: Must meet all federal, state, and local requirements. Protect persons and property from damage and discomfort caused by dust. Water surfaces as necessary and when directed by Engineer to quell dust.

C. Soil Control: Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers.

D. See provisions for Work in Section 31 25 00, Erosion and Sediment Controls.

3.03 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Control of Water:
   1. Excavated areas shall be kept free of water and frost.
   2. Bearing surfaces which become softened by water or frost shall be re-excavated to solid bearing at Contractor's expense and backfilled with compacted crushed rock at Contractor's expense.
   3. See Section 31 23 19, Dewatering for additional details.

C. Compact subgrade to density requirements for subsequent backfill materials.

D. Cut out soft areas of subgrade not capable of compaction in place and replace with specified granular fill material. See Article 3.5, Over-excavation for Unsuitable Foundation Conditions in Section 31 23 16, Excavation for additional details.

E. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

F. Subgrade to be approved by Engineer prior to placement of structures and commencement of backfill activities.

G. Do not allow or cause any work performed or installed to be covered up or enclosed prior to required tests and approvals. Should any Work be enclosed or covered up, uncover at Contractor's expense.

3.04 BACKFILLING

A. Backfill areas to contours and elevations shown in the Drawings with unfrozen materials.

B. Do not place materials when weather conditions and/or moisture content prevent attainment of specified density.

C. Maintain optimum moisture content of backfill materials to attain required compaction density.

D. Employ placement method that does not disturb or damage other work.

E. Mechanical tampers permitted in confined areas.

F. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

G. Foundation Base for Structures:
   1. Bring excavation to required subgrade elevation shown in the Drawings.
   2. Place foundation base material to required grade shown in the Drawings.
   3. Place foundation base material in 6-inch lifts and compact to 95 percent maximum dry density.

H. Backfill for Structures:
   1. Prior to placing backfill, remove forms, temporary construction, and debris below grade.
   2. Backfill shall not be placed against poured concrete until 28 days have passed from completion of original concrete pour, unless otherwise approved by Engineer.
   3. Heavy compactors and large pieces of construction equipment shall be kept away from any embedded wall a distance of a least 5 feet in order to avoid the build-up of excessive lateral pressures.
      a. Over-compaction of fill near walls should be avoided.
   4. Compaction within 5 feet of the walls shall be accomplished using hand-operated vibratory plate compactors or tamping units.
   5. The maximum particle size of granular material placed against buried structures shall be limited to no greater than 1-1/2-inch diameter.
   6. Structural fill backfill material shall be brought up on all sides of the walls and footings in such a manner as to avoid adverse differential lateral earth pressures on the vertical surfaces.
   7. Appropriate lift thickness will depend on the type of compaction equipment used and the type of material being placed. All material shall be compacted to at least 95 percent of the standard maximum dry density.
      a. For moderate- to heavy-weight compactors, a maximum loose lift thickness of 12 inches shall be used.
      b. For hand-operated or small compactors, a maximum loose lift thickness of 8 inches shall be used.
   8. Particular care must be taken to avoid damage to the pipe connections to the structure.
   9. Utility trench backfill within 10 feet of all structural perimeters shall meet the requirements for structural fill.

I. For areas receiving surface structures or existing paved areas to be constructed or replaced, such as parking lots, and sidewalks:
   1. Place fill material in accordance with Section 31 05 16, Aggregates for Earthwork.

J. Slope grade away from building minimum 2 1/2 in first 10 feet in hardscaped areas and 6 inches in first 10 feet in landscaped areas, unless noted.

K. Make gradual grade changes. Blend slope into level areas.

L. Remove surplus backfill materials from Site in accordance with Section 31 23 16, Excavation.

3.05 FIELD QUALITY CONTROL

A. All testing and reporting shall be conducted and completed by an independent laboratory provided by the Owner. Initial testing will be paid for by the Owner. Subsequent testing after failure of initial acceptance testing shall be paid by the Contractor.

B. Perform laboratory material tests in accordance with AASHTO T180

C. In-place compaction testing for structural fill material shall be performed at 2-foot elevation increments in the fill material with at a minimum of one test per each 2,500 square feet of material placed. The Engineer shall be provided with the results of each compaction test at the time of testing.

D. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D2922.
   2. Moisture Tests: ASTM D3017.

E. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest at the sole expense of the Contractor.

F. When testing of subgrade is not possible or feasible as detailed above, proof roll compacted fill surfaces under slabs-on-grade, pavers, paving, and as may be otherwise required by the Engineer.

3.06 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 31 3700

RIP RAP

GENERAL

1.01 SCOPE

A. This Section consists of furnishing and placing an erosion-resistant cover material for protecting slopes and basins at locations shown or as directed.

1.02 RELATED SECTIONS

A. Section 31 22 13 – Rough Grading

B. Section 31 23 18 – Rock Removal

1.03 REFERENCES

A. Mile High Flood District (MHFD) Construction Specifications

1.04 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Results of aggregate sieve analysis and standard proctor tests for all granular material.

MATERIALS

2.01 RIPRAP

A. In accordance with material requirements for riprap in section 31 37 00 of the Mile High Flood District Construction Specifications.

EXECUTION

3.01 PREPARATION

A. In accordance with preparation requirements for riprap in section 31 37 00 of the Mile High Flood District Construction Specifications.

3.02 RIPRAP

A. In accordance with placement requirements for riprap in section 31 37 00 of the Mile High Flood District Construction Specifications.

3.03 MAINTENANCE

A. Maintain the riprap protection until accepted. Replace any material displaced by any cause at no additional cost to the owner.

END OF SECTION

SECTION 32 1123
AGGREGATE BASE COURSES

GENERAL

1.01 SUMMARY

A. This Section includes construction of an aggregate subbase and base course for placement under asphalt or concrete paving, unit paving, or placed and left exposed.

B. Section Includes:
   1. Aggregate subbase
   2. Aggregate base course

1.02 RELATED REQUIREMENTS:

A. Section 31 22 13 - Rough Grading

B. Section 31 23 23 - Fill

C. Section 31 37 00 - Riprap

D. Section 31 05 16 - Aggregates for Earthwork

E. Section 32 12 16 - Asphalt Paving

1.03 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications
   2. T11, Standard Method of Test for Materials Finer Than 75mm (No. 200) Sieve in Mineral Aggregates by Washing
   3. T27, Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
   4. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

B. ASTM International (ASTM):
   1. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
   2. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
   3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
   4. ASTM D2940 - Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

C. Colorado Department of Transportations (CDOT):
   1. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.04 DEFINITIONS

A. Completed Course: Compacted, unyielding, free from irregularities and standing water, with smooth, tight, even surface, true to grade, line, and cross-section.

B. Completed Lift: Compacted with uniform cross-section thickness.

C. Keystone: Fine aggregate used to aid in binding of loose surface stone.

1.05 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data for geotextile fabric and herbicide.

C. Test Reports:
   1. Indicate supplier, sieve analysis, optimum moisture content and density in accordance with AASHTO T180 for all subbases and base courses to be incorporated into the work.

1.06 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

PRODUCTS

2.01 AGGREGATE BASE COURSE

A. Class 6 Aggregate Base Course in accordance with Standard Specifications Section 703.

2.02 SOURCE QUALITY CONTROL

A. Perform tests necessary to locate acceptable source of materials meeting specified requirements.

B. Final approval of aggregate material will be based on test results of installed materials.

C. Should separation of coarse from fine materials occur during processing or stockpiling, immediately change methods of handling materials to correct uniformity in grading.

2.03 EQUIPMENT

A. Compaction Equipment: Adequate in design and number to provide compaction and to obtain specified density for each layer.

EXECUTION

3.01 SUBGRADE PREPARATION

A. Obtain Engineer's acceptance of subgrade before placing base course or surfacing material.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.
   1. Proof roll substrate with equipment approved by the Engineer in minimum two perpendicular passes to identify soft spots.
   2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

3.02 AGGREGATE BASE COURSE

A. Place aggregate base course to the depth shown on the plans in accordance with section 304 of the standard specifications.

3.03 FIELD QUALITY CONTROL

A. Quality control testing shall be performed by an independent testing laboratory provided by the Owner.

B. Refer to table below for minimum sampling and testing requirements for aggregate base course and surfacing. The OWNER reserves the right to complete additional testing.

Property	Test Method	Frequency	Sampling Point
Gradation	AASHTO T11 and AASHTO T27	One sample every 500 tons but at least every 4 hours of production	Roadbed after processing
Moisture Density (Maximum Density)	AASHTO T180	One test for every aggregate grading produced	Production output or stockpile
In-Place Density and Moisture Content	AASHTO T310	One for each 500 ton but at least every 10,000 square feet of area	In-place completed, compacted area

3.04 CLEANING

A. Remove excess material from the Work area. Clean stockpile and staging areas of all excess aggregate. Restore per Specifications as applicable.

END OF SECTION

SECTION 32 1216
ASPHALT CONCRETE PAVEMENT

GENERAL

1.01 SCOPE

A. This section includes the construction of asphalt concrete pavement.

1.02 REFERENCE STANDARDS

A. References herein to "AASHTO" shall mean Association of American State Highway Transportation Officials.

B. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.03 SUBMITTALS

A. Subbase and Aggregate Base Course: In accordance with Section 32 11 23.

B. Aggregate Qualification Tests: In accordance with Standard Specifications Section 403 for aggregate used in asphalt concrete.

C. Asphalt Mix Design: In accordance with Standard Specifications Section 401.

1.04 QUALITY ASSURANCE

A. All testing to determine compliance with the specifications shall be performed by an independent testing laboratory contracted by the Contractor and approved by the Engineer. All testing costs shall be borne by the Contractor.

B. A minimum of five nuclear densometer readings shall be taken in random locations within every test area. Each test area shall not exceed 200 tons of asphalt; however, smaller areas may be designated by the Engineer.

C. The surface smoothness of the new asphalt concrete pavement shall be such that when a 10-foot straightedge is laid longitudinally across the paved area in any direction, the new pavement shall not deviate from the straightedge more than 1/8-inch. Surface drainage shall be maintained. Additionally, paving must conform to the design grade and crown and contain no abrupt edges, low or high areas or any other imperfections as determined by the Engineer. Pavement construction not meeting these requirements will be repaired to the satisfaction of the Engineer at no cost to the Owner.

1.05 PRE-PAVING CONFERENCE

A. Any supervisory personnel of the Contractor and any subcontractors who are to be involved in the paving work shall meet with the Engineer, at a time mutually agreed upon, to discuss methods of accomplishing all phases of the paving work.

B. The Contractor shall be prepared to review the size and type of equipment to be used and the anticipated rate of placement to determine equipment needs.

PRODUCTS

2.01 AGGREGATE MATERIAL

A. Aggregate Base for Asphalt Concrete: Class 6 Aggregate Base Course in accordance with Standard Specifications Section 703.

2.02 ASPHALT CONCRETE PAVEMENT

A. Hot Mix Asphalt Concrete
   1. Use CDOT SX mix (1/2-inch), PG 58-34 HMAC. Conform to the requirements of the Standard Specifications Section 702 and Section 703.

2. Asphaltic concrete pavement delivered to the site shall be accompanied by a ticket with the approved "job mix formula" number shown. Loads without tickets identifying the job mix formula will not be accepted.

B. Tack Coat
   1. Use CSS-1 In accordance with Standard Specifications.

C. Subgrade Geotextile
   1. In accordance with Standard Specifications Section 420.

D. Subgrade Stabilization
   1. In accordance with Standard Specifications Section 306.

2.03 PAVEMENT MARKINGS

A. Paint: Pavement marking paint shall be an acrylic waterborne paint in accordance with Standard Specifications Section 708.05.

B. Color: White

EXECUTION

3.01 AGGREGATE PAVEMENT BASE

A. Place pavement base to the depth shown on the plans in accordance with Section 304 of the Standard Specifications.

3.02 ASPHALT CONCRETE PAVEMENT

A. Construct asphalt concrete pavement in accordance with Section 403 of the Standard Specifications.

3.03 PAVEMENT MARKINGS

A. Stipe parking lot to the lines shown on the plans in accordance with Section 627.04 of the Standard Specifications.

3.04 FIELD QUALITY CONTROL

A. Field test Hot Mix Asphalt in accordance with Section 106.05 of the Standard Specifications.

3.05 ADJUSTMENT OF EXISTING MANHOLE COVERS AND VALVE BOXES

A. Prior to placing asphalt concrete pavement, the CONTRACTOR shall make all necessary adjustments to existing manhole frames and covers and valve box covers to ensure that the tops of the manhole covers or valve box lids are flush with the finished grade of the adjoining pavement or ground surface, and that valve boxes and PVC pipes are centered and plumb over operating nut valve.

END OF SECTION

SECTION 32 1610
CONCRETE CURB GUTTER AND SIDEWALK

GENERAL

1.01 SCOPE

A. This section includes the construction of concrete curb, gutter, and sidewalk.

1.02 REFERENCE STANDARDS

A. References herein to "AASHTO" shall mean Association of American State Highway Transportation Officials.

B. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. References within these standard specifications to "the Department" shall be revised to "the Owner". In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.03 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Requirements for submittals.

B. Subbase and Aggregate Base Course: In accordance with Section 32 11 23.

C. Concrete Mix Design: Submit concrete mix design in accordance with Standard Specifications Section 601.

D. Reinforcing Steel: Submit bar list and diagrams in accordance with Standard Specifications Section 602.

1.04 QUALITY ASSURANCE

A. All testing to determine compliance with the specifications shall be performed by an independent testing laboratory contracted by the Contractor and approved by the Engineer. All testing costs shall be borne by the Contractor.

B. Sampling and testing of concrete in accordance with Standard Specifications Section 106.06.

1.05 PRE-CONCRETE PLACEMENT MEETING

A. Schedule and attend a Concrete Placement meeting at least 1-week prior to placing concrete.

B. The meeting shall be attended by the OWNER, ENGINEER, CONTRACTOR, Testing Laboratory Representative, and the Concrete Supplier.

C. The following shall be discussed at the meeting: Safety, Batching and Delivery, Adjustments to Mix; Site Dosing, Placement Rates and Anticipated Schedule of Placing and Finishing, Site Layout –Holding Area; Pump Truck Location; Truck Wash-out Area; Parking area, Equipment – Pumps and Appurtenances; Vibrators; Spare Equipment, Concrete Testing Procedures, and Curing.

PRODUCTS

2.01 AGGREGATE MATERIAL

A. Aggregate Base for Concrete: Class 6 Aggregate Base Course in accordance with Standard Specifications Section 703.

2.02 CONCRETE

A. Concrete for sidewalks and curb ramps
   1. Use Class B concrete in accordance with Standard Specifications Section 601.
   2. Use reinforcing steel in accordance with Standard Specifications Section 602.

B. Concrete for curb and gutter
   1. Use Class B concrete in accordance with Standard Specifications Section 601.

EXECUTION

3.01 AGGREGATE PAVEMENT BASE

A. Place pavement base to the depth shown on the plans in accordance with Section 304 of the Standard Specifications.

3.02 CONCRETE SIDEWALK

A. Construct concrete sidewalks in accordance with Standard Specifications Section 608.

3.03 CONCRETE CURB AND GUTTER

A. Construct concrete curb and gutter in accordance with Standard Specifications Section 609.

3.04 FIELD QUALITY CONTROL

A. Field test concrete in accordance with Section 106.06 of the Standard Specifications.

END OF SECTION

SECTION 32 8005

DESIGN-BUILD IRRIGATION SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This section describes the expectations of the owner and provides provisions for the contract to design and install a proper irrigation system.
   1. Section Includes
      a. Water connections.
      b. Trenching, stockpiling excavation materials, refilling and compacting trenches.
      c. Complete irrigation system including but not limited to piping, backflow preventer assemblies, valves, fittings, heads, controllers and wiring, and final adjustments to ensure complete coverage.
      d. Replacement of unsatisfactory materials.
      e. Tests, Clean-up, inspections, and approval.
   2. Related Sections
      a. Examine all sections related to project work.

1.02 REFERENCES

A. Perform Work in accordance with requirements of Conditions of the Contract, as well as provisions of all applicable laws, codes, ordinances, rules, and regulations.

B. Conform to requirements of reference information listed below except where more stringent requirements are shown or specified in Contract Documents.
   1. American Society for Testing and Materials (ASTM) - Specifications and Test Methods specifically referenced in this Section.
   2. Underwriters Laboratories (UL) - UL Wires and Cables.

1.03 SUBMITTALS

A. Prepare and make submittals in accordance with conditions of the Contract.

B. Contractor shall prepare a complete irrigation system design providing 100% coverage to all landscaped areas. Final design shall be submitted to Owners Representative for review and approval prior to commencement of construction.

C. Contractor is responsible for obtaining and maintaining all permits associated with work in this section.

D. Design shall follow these specifications and shall be based on the following.
   1. Mainline shall be designed such that velocities within the piping do not exceed the manufacturer's recommendations or AWWA standards for any given pipe size or material.
   2. Design shall conform to all applicable standards, approvals and water restrictions of the municipality and water purveyor that has jurisdiction over the project location.
   3. Zones shall be separated by hydrozone and be matched precipitation rates. Drip, spray and specialty irrigation zones shall not be combined.
   4. Shrub bed areas (plant material one gallon in size and larger) shall be point source drip irrigated.
   5. Perennials, annual, and ground covers shall be irrigated by fixed riser spray irrigation.
   6. Turf areas shall be irrigated by pop-up type spray irrigation. Provide 100% head to head coverage and be matched precipitation rates by zone.
   7. Native or Dryland seed areas shall be irrigated with an automatic underground irrigation system.
      a. The purpose of the system is to facilitate germination and assist in establishment of the seeding.
      b. 100% overlapping coverage is not necessary when designing the irrigation system.
      c. This system is shall be designed for occasional use, after establishment.

E. Material List Submittal
   1. Prior to commencing construction of the irrigation system, provide material cut sheets of all equipment to be installed. Submittal shall include a cover sheet that itemizes all items within the submittal.

2. Substitution of any product, material, or equipment from approved plans without prior written approval of the Owner's Representative during installation will not be permitted.

F. Record Drawings (As-Builts)
   1. During installation of the irrigation system, the Contractor shall have on site a copy of the landscape plans and irrigation plans. At the end of every day the plans shall be marked up to represent the work performed that day and any deviations from plans.
   2. Indicate zone, wiring, and piping changes on these documents as well as the physical location (using a reference system) of each of the elements.
   3. Dimension, from two permanent points of reference (building corners, sidewalk, road inter-sections or permanent structures), location of following items.
      a. Connection to existing water lines.
      b. Routing of main irrigation supply line. Provide dimensions for each 100 L.F. along each routing, and for each change in direction.
      c. Isolation valves.
      d. Control valves.
      e. Quick coupling valves.
      f. Drain valves.
      g. Drip line blow-out stubs.
      h. Sleeves
      i. Controller location
      j. Control wire routing if not with pressure mainline.
      k. Splice Boxes
      l. Soil moisture or rain sensing devices
      m. Other related items as may be directed by Owner's Representative.
   4. Owners Representative will not certify any pay request submitted by the Contractor if the as-built drawings are not current, and processing of pay request will not occur until as-builts are up-dated.
   5. Initial acceptance will not be given until receipt of accurate record drawings.

G. Operation Instructions
   1. Submit operating instructions including winterization procedures and start-up, with cut sheets of products
   2. Coordinate controller/watering operation instruction with the Owner's maintenance personnel.

H. Controller Charts
   1. These are required to be completed, laminated, and a physical copy placed in each controller prior to initial acceptance.
   2. Provide one controller chart for each automatic controller installed.
   3. Chart may be reproduction of record drawing if scale permits fitting of controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.
   4. Chart shall cover area controlled by that controller.
   5. Identify area of coverage of each remote control valve, using a distinctly different color drawing over entire area of coverage.
   6. The controller charts shall be laminated.
   7. Charts shall be completed and reviewed prior to initial acceptance of the work.

1.04 QUALITY ASSURANCE

A. Installer Qualifications
   1. Installer shall have had considerable experience and demonstrate ability in the installation of irrigation system(s) of specific type(s) in a neat orderly, and responsible manner in accordance with recognized standards of workmanship.

B. Special Requirements
   1. Work involving substantial plumbing for installation of or connection to potable copper piping, backflow preventer(s), and related Work shall be executed by licensed and bonded plumber(s). Secure a permit at least 48 hours prior to start of installation.
   2. Work involving electrical connections shall be executed by licensed and bonded electrician(s). Secure a permit at least 48 hours prior to start of installation.

3. Specified depths of piping are minimums.
4. Settlement of trenches is cause for removal of finish grade treatment, refilling, compaction, and repair of finish grade treatment.
5. Protect, maintain, and coordinate Work with Work under other Sections.
6. Contractor shall replace or repair damage to grading, soil preparation, seeding, sodding, or planting done under other Sections during Work associated with installation of irrigation system at no additional cost to Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, unload, store, and handle materials, packaging, bundling, products in dry, weatherproof, condition in manner to prevent damage, breakage, deterioration, intrusion, ignition, and vandalism. Deliver in original unopened packaging containers prominently displaying manufacturer's name, volume, quantity, contents, instructions, and conformance to local, state, and federal law. Remove and replace cracked, broken, or contaminated items or elements prematurely exposed to moisture, inclement weather, snow, ice, temperature extremes, fire, or jobsite damage.

B. Exercise care in handling, loading and storing, of PVC pipe. All PVC pipe shall be transported in a vehicle which allows length of pipe to lie flat so as not to subject it to undue bending or concentrated external loads. All sections of pipe that have been dented or damaged shall be discarded, and if installed, shall be replaced with new piping.

1.06 PROJECT/SITE CONDITIONS

A. Protection of Property
   1. Preserve and protect all trees, plants, monuments, structures, and paved areas from damage due to Work of this Section. In the event damage does occur, all damage shall be completely repaired or replaced to satisfaction of Owner. All costs of such repairs shall be charged to and paid by Contractor.

B. Existing Trees
   1. All trenching or other Work under limb spread of all evergreens or low branching deciduous material shall be done by hand or by other methods to prevent damage to limbs or branches.
   2. Where it is necessary to excavate adjacent to existing trees use all possible care to avoid injury to trees and tree roots.
   3. Excavation, in areas where 2 inch and larger roots occur, shall be done by hand. Roots 2 inches or larger in diameter, except directly in the path of pipe of conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying.
   4. Where a trenching machine is operated close to trees having roots smaller than 2 inches in diameter, wall of trench adjacent to tree shall be hand trimmed, making clean cuts through roots.
   5. Trenches adjacent to trees shall be closed within 24 hours, and when this is not possible, side of trench adjacent to tree shall be kept shaded with moistened burlap or canvas.

C. Protection and Repair of Underground Lines
   1. Request proper utility company to stake exact location (including depth) of all underground electric, gas, or telephone lines. Take whatever precautions are necessary to protect these under-ground line from damage. If damage does occur, all damage shall be repaired by Utility Owner. All costs of such repairs shall be paid by Contractor.
   2. Request Owner, in writing, to locate all private on site utilities not located by utility location services (i.e., electrical service to outside lighting, water lines) before proceeding with excavation. If, after such request and necessary staking, private utilities which were not staked are encountered and damaged by Installer, they shall be repaired by Owner at no cost to Installer. If Contractor damages staked or located utilities, they shall be repaired at Contractor's expense.

D. Replacement of Paving and Curbs
   1. Where trenches and lines cross existing roadways, paths, curbing, etc., damage to these shall be kept to a minimum and shall be restored to original condition.

1.07 WARRANTY

A. Manufacturer shall warrant materials against defects for a period of one year from date of Initial Acceptance.

B. Installer(s) shall guarantee workmanship for similar period.

C. Settling of backfilled trenches which may occur during guarantee period shall be repaired at no expense to Owner, including complete restoration of damaged property.

D. Expenses due to vandalism before substantial completion shall be borne by Contractor.

E. Correct all problems which develop in the system due to faulty materials or workmanship during the warranty period.

F. Promptly repair or replace such work as directly by the Owner's Representative.

G. The Owner reserves the right to make temporary repairs during the warranty period to keep the irrigation systems in operating condition without voiding the warranty or responsibility.

H. Manufacturers' warranties shall not relieve the contractor of liability. Such warranties are intended only to supplement the Contractor's warranty.

1.08 MAINTENANCE

A. Furnish the following maintenance items to Owner at the time of Final Acceptance and end of Warranty Period.
   1. Two Sets of special tools required for removing, disassembling, and adjusting each type of sprinkler head and valve supplied on this Project.
   2. One 6-foot valve key for operation of gate valves or stop and waste valves (if applicable).
   3. Two keys for each automatic controller.
   4. Two quick coupler keys and 2 matching hose swivels for each type or size of quick coupling valve installed.
   5. Two aluminum drain valve keys of sufficient length for operation of drain valves.

B. Winterization and Spring Start Up
   1. Include cost to winterize the complete system at conclusion of sprinkling season (in which system received final acceptance) within 3 days notification by the Owner. System shall be voided of water using compressed air or similar method reviewed by Owners Representative.
   2. Include cost to reopen, operate, and adjust system malfunctions accordingly during April of following season (or as dictated by the weather).

PART 2 PRODUCTS

2.01 MATERIALS:

A. General Information
   1. Substitution of any product, material, or equipment without prior written approval of the Owner's Representative will not be permitted.
   2. Contractor shall be responsible for performance of substitutes to be equal to the original design in every respect.
   3. If substitutions are unsatisfactory in the opinion of the Owner's Representative, remove substituted work and replace with the originally specified equipment.

B. General Piping
   1. Pressure Supply Line (from point of connection through backflow prevention unit) - Type "K" Hard Copper.
   2. Pressure Supply Lines (downstream of backflow prevention units) - Class 200 PVC BE (1" - 2 ½")
   3. Non-pressure lines - Class 200 PVC BE
   4. PVC Sleeving - Class 160 PVC.
   5. Drip Tubing - Hardie Dura-Pol EHD 1645 3/4" with .050-inch wall thickness.
   6. Emitter Tubing – ¼" vinyl or polyethylene as recommended by emitter manufacturer.

C. Copper Pipe and Fittings
   1. Copper Pipe - Type K, hard tempered.
   2. Fittings - Wrought copper, solder joint type.
   3. Joints - Soldered with solder, 45% silver, 15% copper, 16% zinc, and 24% cadmium and solidus at 1125~F and liquids at 1145~F.

D. Brass Pipe and Fittings

1. Brass Pipe - 85% red brass, ANSI Schedule 40 screwed pipe.
2. Fittings - Medium brass, screwed 125-pound class.

E. Plastic Pipe and Fittings
   1. Identification Markings:
   2. Identify all pipe with following indelible markings.
      a. Manufacturer's name.
      b. Nominal pipe size.
      c. Schedule of class.
      d. Pressure rating.
      e. NSF (National Sanitation Foundation) seal of approval.
      f. Date of extrusion.

F. Solvent Weld Pipe
   1. Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 and ASTM D1784; cell classification 12454-B, Type 1, Grade 1.
   2. Fittings - Standard right, Schedule 40, injection molded PVC; complying with ASTM D1784 and D2466, cell classification 12454-B.
      a. Threads - Injection molded type (where required).
      b. Tees and ells - Side gated.
      c. Threaded Nipples - ASTM D2464, Schedule 80 with molded threads.
   3. Joint Cement and Primer - Type as recommended by manufacturer of pipe and fittings.

G. Low Pressure/Volume Systems
   1. Drip Tubing
      a. Highly resilient tubing as recommended by the drip emitter manufacturer. Manufactured from virgin polyethylene in accordance with ASTM D2239, with a hydrostatic design stress of 620 psi and designed as PE2306.
      b. Fittings: Manufactured in accordance with ASTM D2609, PVC type I, cell classification 12454-B.
      c. Clamps: Locking pinch clamps or all stainless-steel screw clamps. Use 2 clamps per joint on pipe.
   2. All systems shall be equipped with a preset (40 psi at the outlet) pressure reducing valve.
   3. All systems shall be equipped with an inline strainer on the downstream side of the control valve. Strainer shall have a 100-psi pressure rating, 150 mesh screen, a ½" outlet for flushing.
   4. Capillary tubing: ¼" i.d., flexible vinyl.
   5. Emitters:
      a. Single port or multi-port, barbed insert fitting
      b. pressure compensating type, with a flow variation of less than 10 percent.

H. Quick Coupling Valves
   1. Brass two-piece body designed for working pressure of 150 PSI: operable with quick coupler.
   2. Equip quick coupler with locking rubber cover.
   3. Provide swivel and key per section 1.8(a).

I. Valve Boxes
   1. All boxes shall be commercial grade with locking covers, color to be green.
   2. Gate Valves, Quick Coupler Valves, and Wire Stub Box – 10" Round box.
   3. Control valves, Master Valves, Flow Sensors -12" Rectangular box
   4. Drip flush caps – 6" Round box

J. Electrical Control Wiring
   1. Low Voltage:
      a. AWG UFUL approved No. 14 direct burial copper wire or larger, if required to operate system as designed.
      b. Wire Colors:
         1) Control Wires - Red.
         2) Common Wires - White.
         3) Master Valve Wires - Blue.

4) Spare Control Wires - Black.
5) Spare Common Wires - Yellow.

c. Each control valve shall have a single control wire.
d. If multiple controllers are utilized, and wire paths of different controllers cross each other, both common and control wires from each controller shall be different colors approved by Owners Representative.
e. Control Wire connections and splices shall be made with 3M direct bury splice, Rain Bird Pentite connectors, or similar dry splice method.
f. Provide spare wires to the end of each mainline branch. Provide 30 inches of spare wire in each valve box and in a 10" Round box at the end of the mainline.

2. High Voltage
   a. If required, by contract, type required by local codes and ordinances, of proper size to accommodate needs of equipment serviced.
   b. Irrigation controller shall have dedicated circuit from service panel and not be connected to other exterior GFCI circuits
   c. Unless noted otherwise, owner will provide 110vac/60Hz/15a electrical source to within 50 feet of the irrigation controller.
3. Conduit
   a. All below ground conduit shall be rigid Sch 80 PVC, grey in color for use with electrical wiring.
   b. All above ground conduit shall be metal EMT.
   c. Size all conduit for number of wires included.

K. Automatic Controller
1. Provide controller with two stage primary and secondary surge protection, non-volatile memory, self-diagnostic electronic circuit breaker, locking hinged cover, remote ready port, back up battery, rust resistant weather tight metal cabinet, quick disconnect cables, master valve and two sensor connections, and capable of operating the number of control valves indicated on the approved drawings.
2. Include the following operation features:
   a. Programmable
      1) Four programs
      2) Watering calendar up to 31 days
      3) Valve test up to 8 minutes
      4) Rain shut off for up to seven days
   b. Furnish each station capable of watering up to 24 hours in one-minute increments with timing accurate within one percent.
   c. Furnish controller with three cycle starts a day for three of the programs and with water budgeting through percentage scaling from 0% to 250%, with 100% as normal.

L. Electric Control Valves
1. Globe style, normally closed, spring-loaded, nylon reinforced rubber diaphragm, glass filled UV resistant nylon body, and 24 VAC encapsulated solenoid.
2. Provide self-cleaning stainless steel port screen and bleeder valve with internal bleed for field operation to permit operation in the field without power at the controller.

M. Backflow Preventer
1. Reduced pressure type shall be equipped with gate valves, field test cocks, and drain valves. Device must be USC approved.
2. Pressure vacuum breaker type shall be equipped with gate valves and field test cocks.
3. Device must be USC approved.
4. Provide properly sized powder coated steel security enclosure if located on exterior of the building.

N. Manual Drain Valves
1. Drain valve shall be a bronze body, resilient seat angle valve, with a rising stem for reverse flow.

O. Isolation Valves

1. Isolation valves shall be brass or bronze full port, non-rising stem gate valves.
2. Size per line size.

P. Turf Spray Heads
1. Fixed radius spray nozzles to be provided in areas less than 10 feet width.
2. Spacing shall not exceed manufacturer published radius.
3. Plastic body pop-up, minimum 6"
4. Spray body shall have manufacturer built in pressure regulating device and check valve, and a removable spray nozzle.
5. Provide full, half, third, or quarter circle patterns as required, with matched precipitation rates.
6. Use appropriate variable arc plastic nozzles in all locations where excessive over spray occurs with the standard arc nozzles.
7. The blow-by, when the stem pops up, should not exceed 0.05 gpm up to 8 psi and 0 gpm above 8 psi.

Q. Rotary Heads
1. Rotary nozzles to be provided in areas greater than 10 feet but less than 25 feet.
2. Plastic body pop-up, minimum 6"
3. Spray body shall have manufacturer built-in pressure regulator, check valve, and a removable nozzle.
4. Provide variable arc settings from 40 degrees to 270 degrees. Full circle shall be used in locations where 360 degrees of rotation are required.
5. Nozzles shall have matched precipitation rates.

R. Backfill material
1. Clean, fine granular soil as approved by the Owner's Representative.

S. Drainage backfill
1. Cleaned gravel or crushed stone, graded from 3" maximum to 0.75" minimum size.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which Work of this Section is to be performed. Do not proceed with Work until unsatisfactory conditions have been corrected.

B. Grading operations, except for final grading, shall be completed, and approved by Owner, before staking or installation of any irrigation system begins.

C. Notify owner's representative three calendar days prior to the following reviews.
1. Pressure test main line installation
2. System layout
3. Coverage tests prior to planting
4. Final review.

3.02 PREPARATION

A. Staking shall Occur as Follows:
1. Mark, routing of pressure supply line and flag control valve locations and at least one zone of spray head or drip line locations. Contact Owners Representative three days in advance and request review of staking.
2. Owners Representative will advise installer as to the amount of staking to be prepared. Owners Representative will review staking and direct changes if required.
3. Review does not relieve installer from coverage problems due to improper placement of equipment after staking.
4. If Project has significant topography, freeform planting beds, or other amenities which could require alteration of irrigation equipment layout as deemed necessary by Owners Representative, do not install irrigation equipment in these areas until Owners Representative has reviewed equipment staking.

B. Sleeving

1. Install sleeves under paving and walks for piping or control wiring that crosses walks or paving wider than 5 feet.
2. Each pipe shall be in separate sleeves. Wire shall be in separate sleeve
3. Install to correct locations and elevations.
4. Furnish at least 2 pipe sizes larger than the pipe to be accommodated.
5. Wire sleeves shall be minimum 2" size
6. If sleeves are missing, install them by boring, or jacking. Resort to cutting only where acceptable to Owner's representative.
7. Compact backfill around sleeves to 95% Modified Proctor Density within 2% of optimum moisture content in accordance with STM D1557.

C. Trenching
1. Trench excavation shall follow, as much as possible, layout shown on drawing. Dig trenches straight and support pipe continuously on bottom of trench. Trench bottom shall be clean and smooth with all rock and organic debris removed.
2. Clearances
   a. Piping Smaller than 3 Inches - Trenches shall have a minimum width of 7 inches.
   b. Line Clearance - Provide not less than 4 inches of clearance between each line, and not less than 12 inches of clearance between lines of other trades.
3. Pipe and Wire Depth
   a. Pressure Supply Piping - 24 inches from top of pipe.
   b. PVC Sleeving - 18 inches from top of pipe.
   c. Non-pressure Piping (rotor) - 18 inches from top of pipe.
   d. Non-pressure Piping (pop-up) - 12 inches from top of pipe.
   e. Control Wiring - Side of pressure main.
   f. Drip Tubing - 4 inches from top of pipe.
   g. Emitter Tubing (Micro-tubing) - 2 inches from top of pipe.
4. Boring will be permitted only where pipe must pass under obstruction(s) which cannot be removed. In backfilling bore, final density of backfill shall match that of surrounding soil. It is acceptable to use sleeves of suitable diameter installed first by jacking or boring, and pipe laid through sleeves. Observe same precautions as though pipe were installed in open trench.

3.03 INSTALLATION

A. Locate other equipment as near as possible to locations designated. Deviations shall be reviewed by Owners Representative prior to installation. Make minor adjustments to trench locations as necessary to avoid conflicts with landscape. Plant locations shall take precedence over irrigation lines.

B. PVC piping
1. Snake pipe in trench as much as possible to allow for expansion and contraction.
2. Do not install pipe when air temperature is below 40°F.
3. Place manual drain valves at low points and dead ends of pressure supply piping to insure complete drainage of system.
4. When pipe laying is not in progress, or at end of each day, close pipe ends with tight plug or cap.
5. Perform Work in accordance with good practices prevailing in piping trades.

C. Solvent weld PVC pipe
1. Lay pipe and make all plastic-to-plastic joints in accordance with manufacturer's recommendations.

D. Drip tubing and emitters
1. General
   a. Provide six (6), one (1) gallon per hour emission points for trees.
   b. Provide one (1), one (1) gallon per hour emission point for shrubs.
   c. Provide one (1), half (.5) gallon per hour emission point for ornamental grasses and smaller perennials.
   d. Fixed riser micro spray emitters shall be used for annual plantings and containers.
   e. Do not install drip tubing until 5 gallon and larger plant materials are placed and finish grade is established.

f. Drip lines shall be buried with soil. Depth of bury indicates amount of coverage by backfill, as measured below the weed fabric.

2. Protection
   a. Tape all open ends of drip tubing during installation to prevent entry of debris.
   b. Cut all drip tubing with pliers-type Victor pipe cutter to prevent entry of debris. Do not use a saw.
3. Tubing: Install drip tubing with 4" of soil cover in planting beds and 8" of cover under turf areas.
4. Capillary tubing: Install capillary tubing 2" below the soil surface with a bug cap on every outlet. Install tubing outlet ½" above soil surface on a plastic stake.
5. Make all fitting connections as per manufacturers recommendations.
6. Install drip line blow-out stubs in 6" round valve box at all dead ends of drip tubing.

E. Control wiring
1. Low Voltage Wiring
   a. Bury control wiring between controller and electric valves in pressure supply line trenches, strung as close as possible to main pipe lines with such wires to be consistently located below and to one side of pipe, or in separate trenches.
   b. Bundle all 24-volt wires at 10-foot intervals and lay with pressure supply line pipe to one side of the trench.
   c. Provide an expansion loop at every pressure pipe angle fitting, every electric control valve location (in valve box), and every 500 feet. Form expansion loop by wrapping wire at least 8 times around a 3/4-inch pipe and withdrawing pipe.
   d. Make all splices and connections using Rain Bird Pentite connectors or similar dry splice method.
   e. Install all control wire splices not occurring at control valve in a separate splice 10" round valve box.
   f. Install one continuous control wire for each control valve.
   g. Run two spare #14 AWG UFUL control wires and one common wire from controller pedestal to the end of each and every leg of mainline. Label spare wires at controller and wire stub box.
   h. Make electrical connection at valve to allow for pigtail so solenoid can be removed from valve with sufficient slack to allow ends to be pulled 12" above ground for examination and cleaning.
   i. Run wiring in EMT conduit between controller and beginning of underground wiring. Sleeve through foundation wall, asphalt, and concrete surfaces, and other materials as required.
2. High Voltage Wiring for Automatic Controller
   a. Provide 120-volt power connection to automatic controller.
   b. No pigtail or outlet connections are acceptable.
   c. All electric work shall conform to local codes, ordinances, and authorities having jurisdiction.
   d. All high voltage electrical work shall be performed by licensed electrician.

F. Automatic Controller:
1. Install controller in accordance with manufacturer's instructions as detailed and where shown on Drawings.
2. Install controller at eye level and allow clearance for access door to open fully.
3. Connect remote control valves to controller in numerical sequence as shown on Drawings.
4. Final location of controller shall be approved by Owners Representative prior to installation.
5. Each controller shall be a dedicated separate ground wire and grounding rod as detailed.

G. Electric Control Valves
1. Install cross-handle 3 inches below finished grade.
2. When grouped together, allow at least 12 inches between valve box sides.
3. Install each remote control valve in a separate valve box.
4. Install individual valve box flush with grade.

H. Quick Coupling Valves

1. Install quick couplers on double swing-joint assemblies of Schedule 80 PVC pipe; plumb and flush to grade. Angled nipple relative to pressure supply line shall be no more than 45 degrees and no less than 10 degrees. Install quick coupling valves as detailed. Quick couplers shall be located at intervals of 200' along the main line, for connecting temporary irrigation lines.

I. Drip Emitters
   1. Install all drip emitters directly to polyethylene lateral with barbed fitting. Use only manufacturer provided or recommended hole punch when making penetrations in drip tubing for insert fittings. Use of any other hole punch shall be cause for immediate removal and replacement of all installed drip tubing.
   2. Stake all ends of emitter tubing above grade as detailed and stake with acceptable tubing stakes.

J. Drain Valves
   1. Install at all low points in the pressure line. Grade piping to drains a minimum of 3" per 100 feet. Drain valves should have a three cubic foot gravel sump at each location.

K. Valve Boxes:
   1. Install one valve box for each type of valve installed as detailed.
   2. Valve box extensions are not acceptable except for master valves.
   3. Install gravel sump after compaction of all trenches. Place final portion of gravel inside valve box after valve box is backfilled and compacted.
   4. Brand each valve box lid or provide metal tag at each valve showing controller letter and station number. Depth of branding if used shall be no more than 1/8 inch into valve box lid.
   5. Letter and number size shall be no smaller than 1 inch and no greater in size than 1 ½ inches.
   6. Install valve boxes parallel to each other and parallel or perpendicular to pavement or other edges.
   7. Do not install valve boxes in low points of proposed or existing slopes or drainage swales.

L. Gate Valves
   1. Install at all branches of mainline, sleeve crossings at vehicle areas, at point of connection or requested by owner's representative.

M. Brass pipe and threaded plastic and brass fittings.
   1. Assemble using Teflon tape applied to the male threads only.
   2. Threads should contain three complete wraps of tape.

N. Sprinkler Heads
   1. Install sprinkler heads where required to cover seeded areas or sod.
   2. In no case shall the spacing exceed maximum recommended by manufacturer.
   3. Adjust part circle heads for proper coverage. Adjust heads as needed to provide adequate coverage to all areas.
   4. Plant placement shall not interfere with intended sprinkler head coverage, piping, or other equipment.
   5. Owners Representative may request nozzle changes or adjustments without additional cost to the Owner.

O. Backflow Preventer
   1. Install in accordance with state and local codes, and USC guidelines.
   2. Install powder coated steel security enclosure per manufacturer specifications.
   3. Contractor shall certify backflow preventer with municipality and provide documentation to Owner prior to final acceptance.

P. Backfilling
   1. Do not begin backfilling operations until required system pressure tests have been completed.
   2. Backfill shall not be done in freezing weather except with review by Owners Representative.
   3. Leave trenches slightly mounded to allow for settlement after backfilling is completed. Trenches shall be finish graded prior to walk-through of system by Owners Representative.
   4. Excavated material is generally considered satisfactory for backfill purposes. Backfill material shall be free of rubbish, vegetable matter, frozen materials, and stones larger than 1 inch in maximum dimension. Do not mix subsoil with topsoil. Material not suitable for backfill shall be

hauled away. Contractor shall be responsible for providing suitable backfill if excavated material is unacceptable or not sufficient to meet backfill, compaction, and final grade requirements.

5. Do not leave trenches open for a period of more than 48 hours. Open excavations shall be protected in accordance with OSHA regulations.
6. Compact backfill to 90% maximum density, determined in accordance with ASTM D155-7 utilizing the following methods.
   a. Mechanical tamping.
   b. Puddling or ponding. Puddling or ponding and/or jetting is prohibited within 20'-0" of building or foundation walls.

Q. Piping Under Paving
1. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete or concrete paving.
2. Piping located under areas where asphalt or concrete paving will be installed shall be bedded with sand (a layer 6" below pipe and 6" above pipe).
3. Compact backfill material in 6" lifts at 90% maximum density determined in accordance with ASTM D155-7 using manual or mechanical tamping devices.
4. Set in place, cap, and pressure test all piping under paving, in presence of Owner prior to backfilling and paving operations.
5. Piping under existing walks or concrete pavement shall be done by jacking, boring, or hydraulic driving, but where cutting or breaking of walks and/or concrete is necessary, it shall be done and replaced at no cost to Owner. Obtain permission to cut or break walks and/or concrete from Owner.
6. Mark concrete surfaces where sleeves cross paving by etching an "X" mark in curb, with permission of owner's representative.

R. Drain Sumps
1. Excavate to sizes indicated. Backfill with acceptable drainage material to 12" below grade. Cover drain material with filter fabric and backfill remainder with excavated material.

S. Water Supply and Point of Connection:
1. Water supply shall be extended from water supply lines.
2. Licensed and bonded Plumber shall provide connection to water supply lines

3.04 FIELD QUALITY CONTROL

A. Flushing
1. After piping, risers, and valves are in place and connected, but prior to installation of sprinkler heads, quick coupler assemblies, and hose valves, thoroughly flush piping system under full head of water pressure from dead end fittings. Maintain flushing for 5 minutes through furthermost valves. Cap risers after flushing.

B. Testing
1. Conduct tests in presence of Owners Representative. Arrange for presence of Owner's Representative 48 hours in advance of testing. Contractor shall supply force pump and all other test equipment.
   a. After backfilling, and installation of all control valves, fill pressure supply line with water, and pressurize to 40 PSI over the designated static pressure or 120 PSI, whichever is greater, for a period of 2 hours.
   b. Leakage, Pressure Loss - Test is acceptable if no more than 2 pounds of pressure loss is evident during the test period.
   c. Leaks - Detect and repair leaks.
   d. Retest system until test pressure can be maintained for duration of test.
   e. Before final acceptance, pressure supply line shall remain under pressure for a period of 48 hours.
   f. Do not backfill over pipe fittings or connections until inspected, tested and approved.
2. Coverage Test

a. Perform coverage tests after sprinkler system is completed, but prior to any planting, and perform testing in the presence of the Owner's Representative.
b. Test system to assure that all lawn and planting areas are watered completely and uniformly.
c. Make all necessary adjustments, including a realignment of heads to provide required coverage as directed by the Owner's Representative.
d. Correct areas which do not conform to designed operation requirements due to unauthorized changes or poor installation practices.

C. Walk-Through for Substantial Completion
1. Arrange for Owners Representative's presence three days in advance of walk-through.
2. Entire system shall be completely installed and operational prior to scheduling of walk-through.
3. Operate each zone in its entirety for Owners Representative at time of walk-through and additionally, open all valve boxes if directed.
4. Generate a list of items to be corrected prior to Final Completion.
5. Furnish all materials and perform all work required to correct all inadequacies of coverage due to deviations from Contract Documents.
6. During walk-through, expose all drip emitters under operations for observation by Owners Representative to demonstrate that they are performing and installed as designed, prior to placing of all mulch material. Schedule separate walk-through if necessary.

D. Walk-Through for Final Completion:
1. Arrange for Owners Representative's presence three days in advance of walk-through.
2. Show evidence to Owners Representative that Owner has received all accessories, charts, record drawings, and equipment as required before Final Completion walk-through is scheduled.
3. Operate each zone, in its entirety for Owners Representative at time of walk-through to insure correction of all incomplete items.
4. Items deemed not acceptable by Owners Representative shall be reworked to complete satisfaction of Owners Representative.
5. If after request to Owners Representative for walk-through for Final Completion of irrigation system, Owners Representative finds items during walk-through which have not been properly adjusted, reworked, or replaced as indicated on list of incomplete items from previous walk-through, Contractor shall be charged for all subsequent walk-throughs. Funds will be withheld from final payment and/or retainage to Contractor, in amount equal to additional time and expenses required by Owners Representative to conduct and document further walk-throughs as deemed necessary to ensure compliance with Contract Documents.

3.05 ADJUSTING

A. Upon completion of installation, "fine-tune" entire system by regulating valves, adjusting patterns and break-up arms, and setting pressure reducing valves at pro-per and similar pressure to provide optimum and efficient coverage. Flush and adjust all sprinkler heads for optimum performance and to prevent over spray onto walks, roadways, and buildings as much as possible. Heads of same type shall be operating at same pressure +/- 7%.

B. If it is determined that irrigation adjustments will provide proper coverage, and improved water distribution as determined by Owners Representative, contractor shall make such adjustments prior to Final Acceptance, as directed, at no additional cost to Owner. Adjustments may also include changes in nozzle sizes, degrees of arc, and control valve throttling.

C. All sprinkler heads shall be set perpendicular to finish grade unless otherwise designated.

D. Areas which do not conform to designated operation requirements due to unauthorized changes or poor installation practices shall be immediately corrected at no additional cost to the Owner.

E. CLEANING
1. Maintain continuous cleaning operation throughout duration of work. Dispose of, off-site at no additional cost to Owner, all trash or debris generated by installation of irrigation system.

END OF SECTION

SECTION 32 9000
GENERAL LANDSCAPE

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all trees, shrubs, and other plant materials, labor equipment, and non-plant materials required to complete installation of planting indicated on the landscape drawings and details. Furnish all soil preparation, fertilizer, soil mulching, trees, shrubs, groundcovers, sodding, bed mulching, labor and equipment required to landscape all areas as indicated on the landscape drawings.

B. Work in this Section includes, installation of trees, shrubs, perennials, annuals, ornamental grasses, installation of mulch materials and mitigation of areas damaged by construction activities performed under this contract.

C. Section Includes
   1. Installation of trees, shrubs, ornamental grasses, perennials, annuals, installation of mulch materials and mitigation of areas damaged by construction activities performed under this contract.

D. Owner Furnished Items
   1. None

E. Permits
   1. Contractor will be responsible for obtaining all necessary permits required for installation of landscape and irrigation.
   2. Contractor shall know, understand, and comply with all watering restrictions.
   3. Permits may be necessary if restrictions are in effect.

1.02 REFERENCES

A. Refer to Drawings

B. Refer to the Agreement between the Contractor and Owner

C. Refer to Section on High Altitude Soil Preparation

D. Refer to Section on Sodding

E. Refer to Section on Seeding

1.03 DEFINITIONS

A. Subgrade: The final elevation of material supporting additional material above it.

B. Finished Grade: The final elevation of the upper most surface material. (sod shall be top of thatch layer.)

1.04 SUBMITTALS

A. Product Data
   1. Submit product data sheets for each of the following items. Submittals must be made prior to commencing any activities.
      a. Compost
      b. Seed
      c. Sod
      d. Edger
      e. Shredded bark mulch
      f. Cobble
      g. Crusher fines
      h. Tree stakes
      i. Tree guy wires
      j. PVC warning pipe
      k. Tree straps
      l. Bike rack
      m. Trash and recycling receptacle

n. Bollard
o. Fold-down bollard

B. Samples
1. Submit physical samples of each of the following materials for approval. All samples shall be submitted in a one quart, clear, plastic bag (Ziploc type) or appropriate container. Submittals must be made prior to commencing any activities. All samples shall be clearly labeled with the following information.
a. Project Name
b. Material name as shown on plans and specifications
c. Supplier or distributor's name
d. Supplier or distributor's product name and/or order number
e. Required samples are as follows
1) Shredded bark mulch
2) Cobble
3) Crusher fines
4) Compost

C. Supplier list
1. A single list of all material suppliers for plant material, and all related landscape and irrigation materials to complete the work in this section and related sections. List must be submitted prior to commencing any activities.

D. Construction Schedule
1. Prior to beginning installation of the landscape, the Contractor is to submit a project construction schedule to the Owner's Representative for approval. The schedule should include the areas and types of construction to be undertaken and the sequence which will be used to accomplish the completion of the project. Schedule must be submitted prior to commencing any activities. This schedule shall clearly identify proposed timing for seeding, sodding, and planting.

E. Certificates for Inspections of Materials
1. All State, Federal, or other inspection certificates shall be submitted to the Owner's Representative prior to acceptance of the plant material along with other information showing the source or origin.
2. Current grower or nursery certifications indicating that all contractor supplied plant material is healthy, vigorous, and free from insect pests, plant diseases, and injuries.

F. Contract Closeout Submittals
1. Operation and Maintenance Manuals
2. At the completion of the work, furnish written maintenance instructions to the Owner's Representative for maintenance and care of the landscaping. Instructions shall include directions for irrigation, weeding, pruning, fertilization, and spraying, as required for continuance of proper maintenance through a full growing season and dormant period.
3. Contractor shall also furnish an operation manual for all equipment, provided by the contractor.
4. Guarantee and Warranty
5. At completion of work, furnish written guarantee, and warranty, to the Owner based on the requirements of this section.

1.05 QUALITY ASSURANCE

A. Reference Standards
1. U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act and equal in quality to standards for Certified Seed.
2. Requirements for measurements, grading, branching, quality, and the balling and burlapping of plants listed in the plant list shall follow the current issue of American Standard for Nursery Stock issued by the American Association of Nurserymen, Inc. (ANSI-Z 60.1-1990)
3. Plants shall equal or exceed the measurements specified in the plant list, which are minimum acceptable sizes. Plants shall be measured before pruning with branches in normal position. Any necessary pruning shall be done at the time of planting.

B. Quality of Materials
   1. All materials shall be subject to inspection and approval. The Owner's Representative reserves the right to reject at any time or place, prior to acceptance, the work and all materials which in the Owner's Representative's opinion fails to meet these specification requirements.
   2. Inspection is primarily for quality; however, other requirements are not waived even though visual inspection results in approval. Materials may be inspected where growing but inspection at the place of growth shall not preclude the right of rejection at the site. Inspection may be made periodically during installation of materials, at completion, and at the end of guarantee periods by the Owner's Representative. Plants shall have a habit of growth that is normal for the species. They shall be healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plant material shall be inspected stock conforming to all State and Federal Regulations.
   3. Plant material shall not exhibit signs of accelerated growth.

C. Vandalism
   1. The Contractor will not be responsible for malicious destruction of plantings after final acceptance of the project. He will, however, be responsible for replacement of vandalized materials stored but not yet installed, and vandalized material prior to final acceptance. All cases of vandalism shall be promptly reported to the Owner. The Contractor shall inform the Owner in writing if additional protection must be installed to protect the landscaping from damage after installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping
   1. Deliver fertilizer to site in original unopened containers bearing the manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance to State law. Notify Owner's Representative of delivery schedule in advance so material may be inspected upon arrival at the job site.
   2. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at the site. Provide copies of delivery receipts for materials to be incorporated into the construction to the Owner's Representative as the deliveries are made. Materials to be accounted for include: fertilizers, soil amendments, peat moss, manure, grass seed, plant tabs, and mulches.
   3. Plants shall be containerized with limbs bound, properly wrapped and prepared for shipping in accordance with recognized standard practice. The root system shall be kept moist and plants shall be protected from adverse conditions due to climate and transportation, between the time they are dug and actual planting.
   4. Each plant shall be identified by means of a grower's label affixed to the plant. The grower's label shall give the data necessary to indicate conformance to specifications. Use durable waterproof labels with water resistant ink which will remain legible for at least 60 days. Notify the Owner's Representative prior to delivery of plant materials to the site so that a pre-planting inspection may be made or indicate delivery schedule in advance so plant material may be inspected upon arrival at job site, whichever is more appropriate.
   5. Do not drop plants. Do not lift plants by the trunk, stems, or foliage. The ball of the plant shall be natural, and the plant shall be handled by the ball at all times. All plants shall be protected at all times from drying out or other injury. Minor broken and damaged roots shall be pruned before planting.

B. Acceptance at Site
   1. Remove unacceptable plant material immediately from job site.
   2. Major damage shall be cause for rejection.
   3. No balled or burlapped plant shall be accepted if the ball is broken or the trunk is loose in the ball, or trees are handled roughly.

C. Storage and Protection
   1. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than four (4) hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by setting balled stock on ground and cover ball with soil, peat moss, or other acceptable mulch material.
   2. Keep root balls moist at all times. Do not allow root balls to dry out.

3. Protect all existing and newly planted trees, shrubs, and groundcover within the areas of construction and related excavation as herein specified. Provide suitable barricades and/or fences as required.

1.07 PROJECT/SITE CONDITIONS

A. The Contractor must examine the subgrade upon which work is to be performed, verify subgrade elevations, observe the conditions under which work is to be performed, verify suitability of the soil and notify the Owner's Representative in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner's Representative. Commencement of work shall mean acceptance of the site conditions.

B. Existing Conditions
   1. The site will be provided to the contractor within ±0.1 foot of finish grades.
   2. Utilities
      a. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Do not permit heavy equipment such as trucks, rollers, or bulldozers to damage utilities. Hand excavate when called for to minimize the possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned. Any damage to utilities that may result in spite of protective measures must be completely corrected and repaired by the Contractor at no additional cost to the Owner.

1.08 SEQUENCING & SCHEDULING

A. Planting Schedule
   1. Schedule each type of landscape work required during the normal season for such work in the area of the site. Establish dates for each type of work and establish a completion date. Correlate work with specified maintenance periods to provide maintenance until accepted by the Owner. Do not depart from the accepted schedule, except with written authorization. Submit request to the Owner's Representative for changes in the planting schedule. When delays in the planting schedule are unavoidable, include documentation of the reason for delay.
   2. Plant trees and shrubs during normal season for such work in the location of the project.

B. Coordination with Lawns
   1. Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to the Owner's Representative. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

1.09 WARRANTY & GUARANTY

A. Guarantee trees, shrubs, groundcovers and all plant material for a period of two years from the date of substantial completion against defects not resulting from neglect of Owner, or abuse and damage by others.

B. For a period of one year after acceptance of work, at no additional cost to the Owner, the Contractor is to replace any plants that are dead, or that are in unhealthy or unsightly condition, or have lost their natural shape due to dead branches or excessive pruning. Inadequate maintenance by the Owner shall not be cause for replacement. All replacement planting is to be done no later than the succeeding season.

C. Replacement plants shall be of the same variety and size or larger as originally specified in the plant list. Plants shall be planted as originally specified. All areas damaged by planting or replacement operations shall be fully restored to their original condition as specified. Remove all dead or defective plant material from the site immediately.

D. A one year warranty shall also apply to the plants replaced at the first warranty walk-through (which occurs one year after substantial completion).

1.10 MAINTENANCE

A. Begin interim maintenance period immediately after planting of landscape materials, and after planting of lawn areas, and continue interim maintenance until landscape work is deemed substantially complete and accepted by the Owner or Owner's Representative.

B. The maintenance period, as specified on the bid form, will commence when all areas have received substantial completion. Large or phased projects may require adjustments to this date. This can be negotiated with the owner and Owner's Representative after installation has begun.

C. Meet with the Owner prior to final acceptance, and prior to the termination of the maintenance period, to go over maintenance requirements of the project. Note that information conveyed to the owner shall be consistent with the maintenance instructions provided by the contractor, as part of the contract close out submittals.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch
   1. Reference Landscape Plans

B. Stakes and Guys
   1. Stakes - 2' metal t-posts, 6' wood posts
   2. Guys - 12 gauge galvanized steel wire
   3. Nylon straps - 1 1/2", with metal grommet ends.
   4. ¾" White, PVC pipe, 24" lengths.

C. Tree Wrapping
   1. Not to be used.

D. Trees, Shrubs, Ornamental Grasses, and Flowers
   1. Provide nursery grown trees, shrubs, ornamental grasses, and flowers except as otherwise indicated, grown in a recognized nursery in accordance with good horticultural practice, with healthy root systems developed by transplanting or root pruning. Provide only healthy vigorous stock, free of diseases, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, or disfigurement. Plants grown in Hardiness Zones 2,3,4, and 5 only, will be accepted. Hardiness Zones are defined in U.S. Department of Agriculture publications. Grower's certificates may be required when doubt exists as to the origin of the plant material.
   2. Provide trees, shrubs, ornamental grasses, and flowers true to name and variety established by the American Joint Committee on Horticultural Nomenclature "Standardized Plant Names", Second Edition, 1942.
   3. Provide trees, shrubs, ornamental grasses, and flowers of the size shown or specified in the plant list and in accordance with the dimensional relationship requirements of ANSI Z60.1 for the kind and type of plant material required. Plant material of larger than specified size may be used, in which case the sizes of the root balls will be increased proportionately.
   4. Label each tree and shrub with a securely attached waterproof tag bearing legible designation of botanical and common name and size.
   5. Where formal arrangements or consecutive order of plants are shown, select stock for uniform height and spread, and label with numbers (if necessary) to assure symmetry in planting.
   6. Provide plant material complying with the recommendations and requirements of ANSI Z60.1 "Standard for Nursery Stock" and as further specified.

E. Deciduous Trees
   1. Provide trees of the height and caliper listed or shown.
   2. Where shade trees are required, provide single stem trees with straight trunk and intact leader, free of branches to a point.
   3. Where small trees of upright or spreading type are required, provide trees with single stem, branched or pruned naturally according to species and type, and with the relationship of caliper and branching recommended by ANSI Z60.1, unless otherwise shown.
   4. Where shown as "bush form" provide trees with 3 or more main stems starting close to the ground in the manner of a shrub.

5. Where shown as a "clump form" provide trees with 3 or more stem starting from the ground.
6. Provide balled and burlapped deciduous trees unless noted as container plants. Balled and burlapped plants shall be dug with firm, natural balls of earth of the diameter specified or larger, to encompass the fibrous and feeding root system necessary for full recovery of the plant. No balled or burlapped plant shall be accepted if the ball is broken or the trunk is loose in the ball.

F. Deciduous Shrubs and Groundcovers
1. Provide deciduous shrubs with not less than the minimum number of canes required by ANSI Z60.1 for the type and height of shrub specified.
2. Plants furnished in containers shall have been grown in pots, cans, or baskets long enough to have sufficient roots to hold earth together intact after removal from container, without being root bound.

G. Coniferous and Broadleaf Evergreens
1. Provide evergreens of the size shown. Dimension indicates minimum spread for spreading and semi-spreading type evergreens and height for all other types such as globe, dwarf, cone, pyramidal, broad- up-right, and columnar.
2. Provide evergreens with well-balanced form complying with requirements for other size relationships to the primary dimension shown.
3. Trees shall exhibit consistent growth periods and shall not exhibit signs of accelerated growth.
4. Provide balled and burlapped evergreen trees unless otherwise noted as container or collected stock.
5. Foliage shall have a good intense color.
6. Trees shall contain a central dominant leader with evenly spaced branches. Plants containing multiple central leaders will be rejected.

H. Requirements for Balled and Burlapped Stock:
1. Where shown or specified to be balled and burlapped, provide trees and shrubs dug with a firm, natural ball of earth in which they were grown.
2. Provide ball size of not less than the diameter and depth recommended by ANSI Z60.1 for the type and size of tree or shrub required. Increase ball size or modify ratio of depth to diameter as required to encompass the fibrous and feeding root system necessary for full recovery of trees or shrubs subject to unusual or atypical conditions of growth, soil conditions, or horticultural practice.
3. Wrap and tie earth ball as recommended by ANSI Z60.1 for the size of balls required. Drum-lace balls with a diameter of thirty inches (30") or greater.

I. Requirements for Container Grown Stock
1. Where specified as acceptable, provide healthy, vigorous well rooted shrubs or ornamental grasses established in the container in which they are sold.
2. No bare rooted or recently containerized stock will be accepted.
3. Established container stock is defined as a tree or shrub transplanted into a container and grown in the container for a length of time sufficient to develop new fibrous roots so that the root mass will retain its shape and hold together when removed from the container.
4. Use rigid container which will hold ball shape and protect root mass during shipment.
5. Provide trees and shrubs established in containers of not less than the minimum sizes recommended by ANSI Z60.1 for the kind, type, and size of trees and shrubs required.
6. Perennials and ornamental grasses provided in containers shall have well developed root masses (without being root bound) and should display an appropriate amount of foliage for the time of year in which they are being planted. Cutting back of perennials and grasses for fall planting is acceptable assuming a portion of the plant is visible and cutting does not damage the growing portions of the plant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall inspect the site with the owner and/or Owner's Representative prior to beginning any activities on site. The contractor shall provide a written report of any discrepancies that would interfere with their scope of work or would delay progress on the project.

3.02 INSTALLATION/APPLICATION/ERECTION

A. 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.

B. Cooperate with any other Contractors and trades which may be working in and adjacent to the landscape work areas. Examine drawings which show the development of the entire site and become familiar with the scope of all work required.

C. Final Plant Locations
   1. Stake location of individual trees, for approval by Owner's Representative, prior to planting or excavating.
   2. If a new tree or shrub relocation is necessary due to interference with underground piping or wiring, the Contractor shall notify the Owner's Representative and receive approval of a new location.
   3. The Owner's Representative must approve the precise location of all plants prior to pit excavation and installation.
   4. Make minor adjustments as requested by the Owner's Representative, or as necessary to avoid conflicts with sprinkler line locations.

D. Excavation for Planting
   1. Where rubble fill is encountered, notify Owner's Representative and prepare planting pits properly by removal of rubble or other acceptable methods.
   2. If rock, underground construction work, or other obstructions are encountered in excavation for planting of trees or shrubs, notify the Owner's Representative. If necessary, new locations may be selected by the Owner's Representative.
   3. If subsoil conditions indicate the retention of water in planting areas, as shown by seepage or other evidence indication the presence of underground water, notify the Owner's Representative before backfilling.
   4. Tree pits shall be dug with flat bottoms and vertical sides. Tree pits shall be dug with radius equal the diameter of the root ball. All tree pits shall have a minimum depth to accommodate root ball.
   5. The contractor will be responsible for demonstrating to the Owner's Representative's that planting pits will have adequate drainage. This shall be performed by digging sample holes throughout the site and filling them with water. Holes must drain with in twenty four hours to be acceptable. Pits that do not drain shall be provided with twelve inch (12") diameter X thirty six inch (36") deep auger holes (one per tree pit) to be filled with 1 1/2" gravel. A change order will be issued if the Owner's Representative determines drain holes shall be installed.

E. Setting and Backfilling
   1. Set container grown stock, excavate as specified for balled and burlapped stock except container width and depth shall govern. Pit shall be at least twice as wide as the container.
   2. Set tree ball, plumb and in the center of pit or trench with top of ball 2", minimum, above adjacent landscape grades. Remove burlap from sides and tops of balls, but do not remove from under balls. Remove platforms, if any, before setting. Do not use stock if ball is cracked or broken before or during planting operation. When setting place additional backfill around base and sides of ball and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.
   3. No burlap shall be pulled out from under balls.
   4. A minimum of three-quarters of the wire basket and surplus nylon or binding shall be completely removed, taking care not to damage the root ball. Any roots which are bruised or broken shall be pruned at the time of planting.
   5. After planting, the Contractor shall water each plant regularly until final acceptance.
   6. Set container grown stock as specified for balled and burlapped stock, except cut cans on 2 sides with a metal cutter and remove bottoms of wooden boxes before setting. Carefully remove cans and sides of wooden boxes after partial backfilling so as not to damage root balls.

7. For plantings in non-turf areas, provide berm around the edge of excavations to form shallow saucer to collect water and to hold mulch.

F. Mulching
   1. Fine grade all planting beds to be mulched allowing for full depth of specified mulch.
   2. Place specified mulch evenly over all areas at depth indicated on plans.
   3. Rake and feather finish grade of mulch level and 1/2" below adjacent edger surfaces.
   4. Make sure mulch is at full depth at adjacent walks and paved surfaces and that mulch doesn't protrude above these surfaces.
   5. Mulch a 36" diameter ring around all trees in turf areas with specified depth of wood mulch, after irrigation areas have been watered in.
   6. All trees and shrubs in native areas are to have a mulch ring equal to the diameter of the planting pit. Mulch shall be a uniform three inches in depth. Do not remove saucer (or berm) around plants in native areas when mulching.

G. Pruning
   1. Prune, thin out, and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread.
   2. Do not cut tree leaders and remove only injured or dead branches from flowering trees, if any.
   3. Prune shrubs to retain their natural character and shape, and to accomplish their use in the landscape design.
   4. Required shrub sizes are the size after pruning.
   5. Remove and replace excessively pruned or deformed stock resulting from improper pruning.

H. Guying and Staking
   1. Removal of all guying and staking should be performed prior to the final (warranty) inspection and the cost shall be included as part of the installation of the work.
   2. Deciduous guying system
      a. Pound stakes into undisturbed soil beyond the planting pit so that stake is secure (2' deep minimum). Secure wire through metal grommets on nylon strap and wrap above first branch or at mid-point of tree. Secure guy wire to stake so that it is taut but allows some movement and so that no sharp projections of wire are extending from post. Adjust tension on wire if needed. Flag guy wire with 3/4" PVC pipe for visibility.
   3. Conifer guying system
      a. Pound stakes into undisturbed soil beyond the planting pit sot that stake is secure (2' deep min.), angling away from planting pit and so that top is flush with finish grade. Secure wire through metal grommets on canvas strap and wrap at mid-point of tree. Secure guy wire to stake so that it is taut but not overly tight and so that no sharp projections of wire are extending from post. Adjust tension on wire if needed. Flag guy wire with 3/4" PVC for visibility.

3.03 FIELD QUALITY CONTROL

A. When all the landscape work is completed, the Owner's Representative, shall upon seven (7) calendar days advance notice, inspect the landscape work to determine if the work is complete. The Owner's Representative shall prepare a punch list of items improperly installed, inadequately sized or otherwise deficient based on the findings of his inspection. The punch list shall be completed not more than seven (7) working days after the field inspection. When the Contractor has remedied all deficiencies and completed all items on the punch list, the Contractor shall request another inspection by the Owner's Representative to determine whether the deficiencies have been adequately corrected. Once the punch list items have been corrected and re-inspected, the Owner's Representative shall issue a written certificate to the Owner who will then respond to the Contractor in writing formally accepting the work and beginning the warranty and guarantee period.

B. Additional landscape inspections shall be conducted upon request by the Owner's Representative, to determine the condition of the work at the completion of the guarantee period.

C. The required maintenance instructions shall be forwarded to the Owner's Representative prior to the final acceptance to inform the Owner of any maintenance responsibilities that would be required for the project.

3.04 ADJUSTING AND CLEANING

A. During landscape work, store materials and equipment where directed.

B. Keep pavements clean and work areas in an orderly condition.

C. Protect landscape work from loss, damage, and deterioration during storage, installation, and maintenance periods.

D. Protect from unauthorized persons (trespassers), as well as from operations by other Contractors and tradesmen and landscape operations.

E. At the time of the final inspection of the work and before the issuance of Final Acceptance, all paved areas shall be thoroughly cleaned by the Contractor by sweeping and washing. All construction equipment and excess materials shall have been removed and any debris or rubbish shall have been removed from the site.

END OF SECTION

SECTION 32 9010

LANDSCAPE MAINTENANCE

PART 1 GENERAL

1.01 SUMMARY

A. This section provides guidance on long term maintenance and care for landscape areas.

B. The contractor will accomplish irrigation management, fertilization, pruning, weeding, pesticide and herbicide applications, bed cultivation, mowing, edging and litter removal in landscape areas. Clean up of walkways, trails, and open space with in the project limits shall also be included.

C. Unit Prices
   1. The contractor will furnish all materials, equipment, supplies and personnel necessary to perform the services contained herein.

D. Project Communication
   1. The Contractor shall have one person designated as the Contract Manager. That person shall be available for a meeting and/or walk through of the property, at least once each month, upon the request of the Property Manager.
   2. It is expected that the Contractor will advise the Property Manager, the Owner, or it's representatives, of all actions the Contractor reasonably believes are prudent, necessary, or beneficial, to improve and maintain the appearance and health of the landscape at the property.

1.02 REFERENCES

A. GreenCO Best Management Practices

1.03 QUALITY ASSURANCE:

A. All work shall be performed to the highest standards of horticultural excellence and shall be in accordance with accepted standard practices. All work shall be performed in accordance with all applicable laws, codes, ordinances and regulations of all local, state and federal government agencies, and it will be the responsibility of the contractor to obtain at its cost all necessary certificates, permits and licenses required by such agencies.

B. Contractor shall maintain a weekly landscape maintenance log, indicating services performed. Submit reports weekly to the Owner's Representative using e-mail.

C. Contractor shall assume all responsibility for plant material or turf which is damaged or stressed in any way as a result of poor maintenance. Contractor will assume all cost associated with replacement of damaged plant material.

PART 2 PRODUCTS

2.01 MATERIALS USED FOR MAINTENANCE SHALL BE SUPPLIED BY CONTRACTOR UNLESS OTHERWISE SPECIFIED.

2.02 ANY REPLACEMENT PLANT MATERIALS SHALL CONFORM THE SIZES IDENTIFIED IN THE SUPPLEMENTAL UNIT PRICES.

2.03 ANY REPLACEMENT NON-ORGANIC LANDSCAPE MATERIALS SHALL CONFORM THE TYPE, SIZE AND CONDITION OF THE MATERIAL BEING REPLACED.

PART 3 EXECUTION

3.01 TREE MAINTENANCE

A. Pruning
   1. The following will be used as guidelines for pruning maintenance on trees. Pruning will be accomplished in the early spring and late winter. Pruning in this agreement will be initiated for the following.
      a. Plants too close to a building, walkway, fence, power line or any tree limiting visibility shall be pruned appropriately to reduce the obstructing branches.
      b. Removal of diseased or insect infested or weak growth portions of the tree.

c. Pruning to remove storm damage or other mechanical injury. Pruning to shape or remove excess unwanted growth or winter die back.
d. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or 48 inches and radial orientation so as not to overlay one another; to eliminate diseased or damaged growth; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain growth within space limitations; to maintain a natural appearance; to balance crown with roots. Under no circumstances will stripping of lower branches ("raising up") of young trees be permitted. Lower branches shall be retained in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk). Lower branches can be cut flush with the trunk only after the tree is able to stand erect without staking or other support.
e. The primary pruning of deciduous trees shall be done during the dormant season. Damaged trees or those that constitute health or safety hazards shall be pruned at any time of the year as required.
f. Coniferous trees shall be thinned out and shaped when necessary to prevent wind and storm damage.

2. Pruning for general clean-up of trees is required in the late winter or early spring prior to the activation of the irrigation system.
3. Pruning specified as "normal maintenance" will include trees or tree limbs, that are up to twelve (12) feet tall using conventional pruning tools.
4. The contractor must immediately contact the Owner concerning trees which may present a threat to the public safety. The Owner should be contacted so that the threat may be eliminated, and a price negotiated for the repair.
5. The contractor is not responsible to repair or replace any plant materials damaged or killed by vandalism or extreme conditions beyond the contractor's control, as reasonably determined by the Owner's Representative. Plant materials damaged or killed as the result of a contractor's actions or neglect will be replaced in kind at the contractor's expense.
6. All pruning will be performed by qualified personnel may require supervision by an arborist if requested by the Owner.
   a. Final cuts on branch removal must be made just outside the flare of the branch base, not flush with the tree trunk.
   b. Limbs removed from a tree must be cut near a crotch. Bracing, cabling and lip bolting may be required in special instances.
   c. Damaged, dead or dying trees and shrubs will be removed only upon approval of the Owner's Representative by June 10th, except damaged trees or those which constitute health or safety hazards will be pruned or removed at any time of the year as required. Cost to remove and dispose of dead plant material is the sole responsibility of the contractor.

B. Care of wounds
   1. The contractor must take prompt action to repair any injuries that occur to plants and immediately initiate the repair. Repairs will be completed only by competent employees trained and familiar with repair techniques.
   2. Storm or severe wind injury must be addressed immediately after any storm to determine the extent of any plant related injuries.
   3. Bark may also be destroyed by animals, sunscald, mowers or vandalism. The contractor shall treat bark injuries according to the current industry standards.
   4. Tree paint shall not be used to treat wounds.

C. Tree Wrap
   1. Not to be used.

D. Fertilization
   1. Fertilize trees with 18-7-10 formulation, slow release fertilizer. Apply 6 oz./100 s.f. Apply once in spring. Apply by spreading fertilizer evenly around the ball of the tree. Apply from the trunk out to the drip line.

2. If trees exhibit iron chlorosis, provide foliar fertilization with chelated iron. Cost of foliar fertilization is a part of this contract. Avoid contact with all stainable surfaces including concrete sidewalks, pavers, planter walls, rock mulch, project signage, and lights. Obtain written authorization of Owner's Representative prior to fertilization.

E. Insecticide application:
   1. All insecticide shall be applied by a licensed professional only.
   2. Any spray application shall be timed properly in order to minimize damage and maximize chemical effectiveness.
   3. Prior to any treatment the contractor shall submit manufacturer data sheets for each chemical (insecticide) intended for use. This submittal shall also include a statement about signs or symptoms identified thereby justifying spraying of trees. This submittal must be approved and must be submitted a minimum of five days prior to the intended date for treatment.
   4. All deciduous trees shall be inspected for signs of insect damage and treated with the appropriate chemical for insect species observed. Generally deciduous trees will require one treatment in late May.
   5. All evergreen trees shall be inspected for signs of insect damage and treated with the appropriate chemical for insect species observed. The contractor should pay careful attention to evergreens for signs of beetles, weevils, aphids, and bores
   6. All pine trees shall receive one application of approved insecticide to treat for and reduce the infestation of the Ips beetle.
   7. The cost for treatments shall be based off unit prices contained in bid documents.

F. Mulching
   1. Mulched tree rings will be well maintained. Additional mulch may be added to these only after the approval of the Owner, using the prices submitted in the supplementary bid schedule.

3.02 PLANTING BED CARE

A. Pruning
   1. Prune shrubs, and flowers to maintain a natural appearance. There are no plantings in which shearing is intended.
   2. Cut back ornamental grasses to ¼ of their mature height in the spring during March. Remove and dispose of cuttings.
   3. Cut back herbaceous perennials to the ground in March. Remove and dispose of cuttings.
   4. Prune all dead, diseased, and dying branches.
   5. Prune long uncharacteristic branches that detract from the shrub's overall form. Prune branches adjacent to bare spots to encourage full shrub growth.
   6. Prune flowering shrubs within two weeks after flowering has ended (to prevent pruning of future flower buds).
   7. Prune ground covers to maintain a natural appearance and to prevent ground covers from climbing shrubs.
   8. Cut back taller growing herbaceous perennials when they become rangy in appearance.
   9. Cut back bulbs after foliage has turned a 50-75% yellow and begun to fall off.
   10. Prune shrubs too close to a building, walkway, fence, power line or any tree limiting visibility to reduce the obstructing branches.
   11. Removal of diseased or insect infested or weak growth portions of the shrub.
   12. Pruning to remove storm damage or other mechanical injury. Pruning to shape or remove excess unwanted growth or winter die back.
   13. Shearing
      a. Never, unless a hazardous situation exists, and only after the approval by the Owner, will the contractor shear a shrub.
      b. Shearing is not a practice that helps maintain a native image and design.
      c. This shall exclude clump grasses, as shearing is the recommended method of pruning in the spring prior to re-growth.
   14. Renewal pruning: overgrown shrubs usually are leggy, lacking foliage in the lower one-half to two-thirds due to shading from the top or non-flowering. This pruning activity should be accomplished during the dormant season pruning. Height reduction may be accomplished at the

same time. This activity is accomplished by removing the oldest and weakest canes at or near ground line. All branches can be cut to the ground or one-third of the oldest branches can be removed every year.

15. Thinning shrubs: the contractor will remove the oldest canes each winter (canes over four (4) seasons old). Insignificant small shoots will be removed to the base or to the crotch of the plant.
16. Heading back: the contractor will head back isolated shoots which may cause the plants to become out of balance. Prune to the base of the branch or the crotch.

B. Fertilization
   1. In April, fertilize all planting beds with 18-7-10 formulation, slow release fertilizer at the rate of 6 oz/1,000 sq. ft. Use a broadcast method for application of fertilizer.

C. Bulb and Perennial Maintenance
   1. In the spring, divide perennials when they become too crowded. Relocate divisions to bare spots. Do not overly thin.

D. Mulching
   1. Shrub bed areas will be well maintained at a depth of three inches. Additional mulch may be added to these only after the approval of the Owner, using the prices submitted in the bid schedule.

E. Weeding
   1. Weeds represent the greatest threat to successful establishment of areas. Therefore, a vigorous, high level of weed control is necessary to maintain an attractive, healthy landscape.
   2. Spot control weeds bi-weekly using chemical and/or mechanical means. Do not spray in windy weather. Use extra caution in application of chemicals to prevent overspray onto desired plant material.
   3. Mechanical means are the preferred methods for removal of weeds.
   4. Planting beds shall be inspected bi-weekly for weeds.
   5. If spraying weeds, dead material shall be removed form planting beds immediately so as not to create tumbleweeds or unnecessary debris.

3.03 IRRIGATED MANICURED TURF CARE

A. Mowing and Edging
   1. Mowing shall occur on Thursdays with Friday being the alternate date in the event of rain.
   2. The frequency of mowing may vary in the spring and fall due to seasonal weather conditions and growth rate of turf.
   3. In the event the season is longer or shorter or if inclement weather prohibits safe operation of equipment on the regularly schedule mowing day, the mowing schedule shall be adjusted according to current conditions.
   4. All turf areas shall be mowed weekly during the growing season to a height of no shorter than 3 inches. All turf areas shall be cut to the same height and shall be cross cut when feasible.
   5. The mower blades or reels shall be sharpened and maintained to provide a smooth, even cut without tearing. The result shall be a uniform, level cut without ridges or depressions.
   6. Do not use heavy mower in areas prone to rutting.
   7. Do not leave tire marks on sidewalk.
   8. Mowing shall be performed so that no more than one-third (1/3) of the grass blade is removed during each mowing.
   9. Edging of walks and curbs will be performed every other mowing during the growing season using a steel bladed edger. All debris shall be removed from street and walks.
   10. Chemically edge and manually trim around trees monthly ensuring that turf grows no closer than eighteen inches (18") to the tree trunk– a three-foot diameter ring around each tree. This bare area should be a uniform circle using the trunk as a center point. This area should be mulched with the specified wood bark mulch.
   11. Mow and Trim around trees (keeping mulch in saucers and beds), walls, fences, etc.,
   12. All turf areas inaccessible to mowing equipment will be trimmed weekly as needed to maintain a neat, well-groomed appearance, (fence row areas, street lights, transformers, phone pedestals, etc.)

13. Trim growth around all lamp posts, drains and other permanent structures located on the turf on a weekly basis during the growing season.
14. Protect trees and shrubs from damage caused by trim lines. Replace all plant material killed or seriously injured by trim lines. Replace with plants of equal or better size and quality. Replace at no cost to Owner. Seriously injured is defined as when 30% or greater of the cambium layer of the trunk circumference has been removed by trim lines or when shrubs have been seriously deformed (in the opinion of the Owner's Representative).
15. Protect fences, buildings, and other structures from damage caused by mowers or trim lines.
16. Clippings on paved areas or crusher fine trails shall either be vacuumed or blown off and removed from walks and streets.
17. Excessive grass clippings should be removed as necessary.
18. Trash shall be picked up with each mowing.
19. If mowers cause damage or notice damage or over watering the area should be marked with marker flags or flagging tape. Observations should be reported to the site superintendent who will implement the necessary action.

B. Fertilization
1. In April, the turf shall be fertilized with quality slow release granular product intended to fertilize and control broad leaf weeds ("weed and feed"). Unless otherwise directed or the contractor has other suggestions use fertilizer with a (4-1-1) up to a (10-1-1) ratio of nitrogen to phosphorus to potassium with 25% to 50% slow-release nitrogen from sulfur coated urea (SCU) at a rate of two pounds of nitrogen per 1,000 square feet.
2. In late September, the turf shall be fertilized to stimulate root growth using a granular urea fertilizer with ratios between (10-1-3) and (10-1-7) at a rate of two pounds of nitrogen per 1,000 square feet, unless otherwise directed or the contractor has other suggestions.
3. Fertilizer shall immediately be removed from concrete walls, curbs and streets to prevent staining and runoff into waterways.
4. Fertilizer should be watered in thoroughly after application.
5. Iron may be required where soils are high in pH, or where visible deficiencies are noted.

C. Insect disease control - turf
1. Insect and disease treatment shall be by application of necessary insecticides and fungicides as conditions of turf requires. The cost of this will be covered under an extra to the agreement with price agreed upon by Contractor and Owner prior to initiating the work.

D. Aeration
1. The contractor shall aerate one time per year in September to improve water penetration, before the second fertilization. Contractor shall use only a hollow core tine aerator that pulls a 3" plug.
2. Prior to aeration the contractor shall tag all sprinkler heads and valve boxes to prevent damage. Plugs shall be left on the turf to assist in breaking down thatch.
3. Irrigation system will be checked out for damage by contractor immediately after aeration and any damage due to aeration will be the responsibility of the contractor to repair at his expense.
4. Damage to any other fixture will be repaired at contractor's expense.

3.04 NATIVE TYPE GRASS AREA MAINTENANCE

A. Mowing
1. Schedule mowing a four-foot-wide strip along all fence lines on a bi-weekly basis. Mowing will include string trimming around fence posts, under fence rails, and areas too wet for mowers to enter without risk of causing rutting.
2. Any irrigation damages observed or caused from mowing should be identified with marker flags immediately. Flagging shall remain in place until corrective actions have been performed.
3. When areas are too wet to mow without damage and this is caused by irrigation from a residential lot, the contractor shall tie flagging tape to the fence rail of the lot(s) impacting drainage.
4. The Owner will select areas to be mowed for control of annual grasses and weeds. A diagram of areas to be mowed will be provided by the Owner. The cost for mowing will be based on unit costs supplied with the bid documents.

5. Requests by the Owner for mowing shall be completed within 10 calendar days of the request, unless alternate agreements are reached or as weather allows.
6. The Contractor shall expect to perform a significant amount of mowing during the second week of May.
7. Drainage swales will only be mowed when directed by the Owner's Representative.

B. Weed Control
1. Where specified by the Owner, a complete broadleaf herbicide treatment shall be applied during the third week in May. The Owner shall provide a diagram and schedule for areas to be treated.
2. Throughout the growing season weed control of native areas shall be performed using a spot treatment method.
3. Herbicide shall be applied by a licensed applicator or under the direct supervision of a licensed applicator. Any collateral damage as a result of spraying will be the responsibility of the contractor.
4. Do not spray in windy weather. Use extra caution in application of chemicals to prevent overspray onto desired plant material.
5. The contractor shall use Chaparral™ brand herbicide (manufactured by Dow AgroSciences, LLC) for treatment in native areas. Apply and mix in accordance with the manufacturer's product specifications.
6. Chemical treatment of weeds within four feet of fence lines, occupied residential lots, or planting beds shall be performed using a hand sprayer or back pack sprayer to minimize the risk of overspray.

C. Overseeding and Re-Seeding
1. When directed by the Owner re-seeding areas shall be accomplished using a broadcast method.
2. The cost of seeding shall be determined using the unit costs supplied in the bid documents multiplied by area measurements.
3. Hydro mulching shall be required only when specifically requested by the Owner. Hydro mulch and tackifier shall be applied at a rate equal to 2,000 lbs. per acre.
4. Reseeding and overseeding shall begin to occur during the third week in June.
5. Broadcast seed rates
   a. Shortgrass – 36 pounds of pure live seed per acre
   b. Tallgrass – 30 pounds of pure live seed per acre

3.05 NOXIOUS WEED CONTROL

A. Remove noxious weeds, as defined by the State of Colorado, from the area within five feet of the perimeters of the landscaped areas by spraying with an approved broadleaf herbicide by May 15th and October 1 with spot application as required. Cost for spot applications, shall be done on a time and material basis per the contract documents.

3.06 REPLACEMENTS

A. The contractor shall note in maintenance logs all removed plant material. Replacements shall occur as directed by the Owner's Representative.

B. If replacement becomes necessary, conform to material and installation standards (including a two-year warranty) established in the original project specifications.

C. Replace plant material with size equal to that of the plant material being replaced unless otherwise directed by the Owner's Representative.

D. All replacements shall be affixed with an inconspicuous tag, to be removed after the warranty has expired. This tag shall indicate the date the plant material was installed.

3.07 DISEASE/INSECT CONTROL

A. Inspect all landscape areas weekly during growing season for signs of insect or disease infestation.

B. Apply seasonal applications as necessary to protect plant material.

C. Spot treat areas as needed to maintain healthy growing plant material. Spot treatment is included in the scope of this contract.

D. Do not apply airborne insecticides or pesticides when unprotected people or animals may be affected.

E. Protect all trees, shrubs, and ground covers from over spray that is detrimental to the health of ornamental plant material.

F. Notify Owner's Representative if extensive spraying is required. Pricing for maintenance work should include the costs of typical pesticide applications.

3.08 SOFT SURFACE TRAIL AND ROAD SIDE BAND (CRUSHER FINES) MAINTENANCE

A. The contractor shall stock pile 10 cubic yards of crusher fines material on the site annually to be used for trail and band maintenance. This stock piled material shall be protected in accordance with the Storm Water Management Plan.

B. During routine site inspections the Contractor shall report to the Owner's Representative any areas prone to erosion or that have eroded.

C. The Owner's Representative will provide direction on how to perform repairs.

D. Replenishing materials shall be done on a time and materials basis, as defined in the bid documents.

E. Measurement of the area of work will be performed by the Owner's Representative to compare against the amount of time required to repair work.

F. Trails and Roadside Bands shall remain compacted, free of puddling, and weed free.

G. Chemical methods for weed control are acceptable.

H. Desirable grasses shall be allowed to creep into these areas, creating a less formal edge. Do not create a crisp edge using chemical weed sprays. Generally, trails should be 36" wide and roadside bands should be 24" wide.

3.09 TRENCH DRAINS

A. The contractor should visually inspect area inlets and outlets for trench drains to ensure they are unimpeded during weekly inspections.

B. String trim around inlets and outlets when mowing at least bi-weekly to ensure surface drainage can flow freely.

C. When trench drains are blocked, notify the Owner's Representative for further direction. The contractor will likely be asked to provide a quote for repairing trench drains.

3.10 TRASH REMOVAL AND CLEAN UP

A. Clean all areas weekly to provide a neat, well-groomed site. Pick up all trash and debris, sweep walks, replace mulch in beds, reinstall weed barrier wherever it has risen above the mulch or pulled loose at the edges.

B. Adjust cleanup to match seasonal needs.

C. All landscaped areas (native and irrigated) will be policed for loose trash and debris on a weekly basis during the entire year, especially before each mowing.

D. Trash cans shall be emptied weekly

E. Dog Stations shall be emptied weekly. At this time the contractor will not be responsible for refilling stations with bags.

F. Provide weekly, complete policing and litter pickup to remove paper, glass, trash, undesirable materials, animal and bird droppings, siltation and other accumulated debris within the hard surfaces and landscape areas to be maintained, including but not limited to: walkways, between and around planted areas, drains, catch basins, and pond edges.

G. Litter pickup shall be completed as early in the day as possible, but in no case later than 10:00 A.M.

H. Contractor shall be responsible for off-site removal of all trash, litter and accumulated debris to an approved disposal site weekly.

I. Fallen leaves will be cleaned up twice per year from all turf and bed areas - once between April 1st and May 1st and the second time between November 15th and December 1st. In turf, the leaves can be mowed and left in place.

3.11 SWEEP/WASHING

A. Check paved areas bi-weekly for cracks, crevices and deterioration. Report any problems to Owner's Representative immediately. Walkways, trails, hard surface areas, shall be cleaned, including but not limited to: the removal of all foreign objects from surfaces, such as gum, grease, paint, graffiti, broken glass, etc. Methods of sweeping of designed areas can incorporate one or all of the following
   1. Power pack blowers
   2. Vacuums
   3. Brooms
   4. Push power blowers

B. In the event the Contractor elects to use power equipment to complete such operations, Contractor shall be subject to locate ordinances regarding noise levels. Further, any schedule of such operations may be modified by the Owner's Representative in order to ensure that the public is not unduly impacted by the noise created by such equipment.

C. Sweep all walkway and hard surface areas once per week following mowing.

3.12 GRAFFITI

A. Eradication and control shall include all surfaces throughout the site, including
   1. Walkways and hard surfaces
   2. Site furniture
   3. Boulders
   4. Retaining walls
   5. Monumentation
   6. Signage
   7. Lighting

B. All materials and processes used in graffiti eradication shall be non-injurious to surfaces and adjacent property and approved by Owner's Representative.

C. Appropriate surface preparation shall be made on painted surfaces. Paint applied shall be the exact shade of color as existing paint, unless otherwise specifically approved by the Owner's Representative.

D. Contractor shall use special care and attention when removing graffiti from treated or sealed surfaces. Such surfaces shall not be painted. Contractor shall use materials, and methods of application approved by Manufacturer and Owner's Representative.

E. Visually inspect all areas weekly. Remove graffiti the same day it is visually noted.

F. Graffiti is not part of the base maintenance contract and will be paid for on an hourly basis as approved by the Owner at the stipulated unit price.

3.13 PEST CONTROL

A. Contractor shall report to the Owner the existence of any pests damaging, interfering with, or with the potential to damage or interfere with, the landscaping or irrigation system, including but not limited to, prairie dogs, voles, and porcupines. Contractor shall remove pests as directed by the Owner, using only subcontractors approved by the Owner. This removal cost is "extra", and contractor will be paid using a supplementary pricing for pest removal equipment and labor. Removal may, include relocation of the pest.

3.14 STANDARD WINTER SERVICES

A. All landscaped areas should be patrolled weekly for loose trash and debris.

B. Remove leaves resulting from fall leaf drop only in areas having a heavy concentration of leaves that may cause damage to turf or to other landscape materials.

C. The contractor shall be responsible to monitor all landscape and plants to determine if there is need for winter watering, tree wrapping to prevent sunscald, special pruning due to storm damage, etc. A semi-monthly soil moisture assessment, on the contractor's report, shall be provided to the Owner.

D. When hand watering, use a water wand to break the water force. All trees and shrubs shall be winter watered using a needle type root feeder as required between irrigation system winterization and spring startup.

E. The irrigation system will not be used for winter watering.

END OF SECTION

SECTION 32 9113
HIGH ALTITUDE SOIL PREPARATION

PART 1 GENERAL

1.01 SUMMARY

A. Work in this Section includes, ripping, fertilizing, soil conditioning, and fine grading as shown on plans and details, included on construction drawings, as under this contract.

1.02 SUBMITTALS

A. Submit product data sheet for compost.

1.03 DELIVERY, STORAGE AND HANDLING

A. Comply with related sections

1.04 PROJECT/SITE CONDITIONS

A. Do not perform work when climate and existing site conditions will not provide satisfactory results.

B. Vehicular accessibility on site shall be as directed by the Owner's Representative. Repair damage to prepared ground and surface caused by vehicular movement during work under this section to original condition at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Compost
   1. A totally organic product that has been aerobically and naturally processed without the addition of coarse wood chips, in such a manner as to maintain a consistent temperature of 140 degrees Fahrenheit or greater for a period of time sufficient to create the following characteristics, measured by dry weight.
      a. Moisture content of 30%-35%
      b. Organic matter to nitrogen ratio: 25:1 to 30:1.
      c. pH: 6.0 to 8.0 pH.
      d. Salts: maximum of 10 mmhos/cm.
      e. Less than 1% soil, dirt or sand.
      f. Maximum particle size of ½ inch diameter.
      g. Eradication of all harmful weed seeds, pathogens and bacteria.
      h. A non-offensive, earth smell.
   2. Acceptable materials are as follows.
      a. A-1 Organics - Premium 3
      b. Front Range Materials (Arvada, Colorado, 303-425-9992)– Ground Compost (Item #18-126)
      c. Certified "Class I" compost product
      d. Or Approved Equal.

B. Topsoil
   1. Import topsoil in sufficient quantities to complete the work. Obtain independent soils test which will recommend amendments required to meet the following qualifications. Amend topsoil per soils laboratory recommendations.
      a. Composition: Use as a planting medium, only fertile, friable, well-drained soil, or uniform quality, free of stones over 1 in. diameter, sticks, oils, chemicals, plaster, concrete, and other deleterious materials, with an acidity range between pH 5.5 and 7.0. It shall contain sand and clay in approximately equal proportions and shall have some organic content by weight.

C. Plant Mix Backfill for Trees
   1. Plant mix shall be used to backfill around all tree plantings as indicated on the drawings. The plant mix shall consist of equal parts (a), (b), (c), plus (d) not accounted for in that ratio.
      a. Topsoil
      b. Compost
      c. Excavated soil

d. Myke Pro AN1 (www.usemyke.com) at the manufacturer's recommended rate for the tree's size/caliper:

Caliper / Height	Myke Pro Cups Each
1.5 in (40 mm)	2
2.0 in (50 mm)	3
2.5 in (65 mm)	4
3.0 in (75 mm)	5
4.0 in (100 mm)	6
4.5 in (115 mm)	7.5
4'	1.75
5'	2
6'	3
7'	3.5
8'	4
10'	5
12'	6
14'	7.5

2. The ingredients shall be thoroughly mixed to produce a mix as integrated as possible.

D. Bluegrass sod, turf-type fescue and irrigated bluegrass seed areas:
   1. Spread topsoil over area to be planted to the minimum depths indicated below and mix thoroughly into the soil surface by means of a rototiller or agricultural ripper with tines spaced at no greater than 18 inches.
      a. 4" depth topsoil.
   2. Spread uniform course sand to a depth of 2" on top of topsoil. Thoroughly mix sand with topsoil tilled to a depth of 8 inches.
   3. Thoroughly mix the following amendments tilled to a depth of 8 inches.
      a. Specified Compost 4.0 c.y. per 1,000 s.f.

E. Naturalized seed areas
   1. Spread topsoil over area to be planted to the minimum depths indicated below and mix thoroughly into the soil surface by means of a rototiller or agricultural ripper with tines spaced at no greater than 18 inches.
      a. 2" depth topsoil.
   2. All seed areas shall receive "Biosol 6-1-3" organic fertilizer at the time of seeding at a rate of 1,000 pounds per acre. If soils test identify more or less fertilizer required, the contractor will be expected to submit a change order to adjust the contract price for a credit or overage.
   3. Specified Compost 2.0 c.y. per 1,000 s.f.
   4. Thoroughly mix till the areas to a depth of six inches.

F. Perennial Planting Bed Amendments
   1. Spread plant mix over area to be planted to the minimum depths indicated below and mix thoroughly into the soil surface by means of a rototiller or agricultural ripper with tines spaced at no greater than 18 inches.
      a. 8" depth plant mix.
      b. Plant Mix shall consist of equal parts of the following:
         1) Topsoil
         2) Compost
         3) Sawdust, untreated, well-rotted
   2. Thoroughly mix the following amendments tilled to a depth of eight inches
      a. Diammonium Phosphate 5.0 lbs. per 1,000 s.f.

b. Pre-emergent Weed Controller use manufacturer's specified rate.

G. Shrub Planting Bed Amendments
1. Plant mix shall be used to backfill around all shrub plantings as indicated on the drawings. The plant mix shall consist of equal parts (a), (b), (c).
   a. Topsoil
   b. Compost
   c. Excavated soil.
2. Thoroughly mix the following amendments tilled to a depth of six inches
   a. Specified Compost 4.0 c.y. per 1,000 s.f.
   b. Diammonium Phosphate 5.0 lbs. per 1,000 s.f.

2.02 SOURCE QUALITY CONTROL

A. Verification of Performance
1. Compost and other soil amendments are typically identified by a rate of cubic yards per 1000 s.f. In order to accurately determine if amendments are applied at the correct rate, the following chart is supplied. This chart is intended to verify the cubic yards by allowing a method for measuring the depth of the material spread uniformly across the surface of the planting area, with no exposed soil, prior to mixing the amendments with the existing soils.
2. This method will be used during inspections to verify that adequate amendments are incorporated into the soil.

c.y./1000 s.f.	Depth (inches)
3.0 c.y./1000 s.f.	1 inch
4.0 c.y./1000 s.f.	1 ¼ inches
5.0 c.y./1000 s.f.	1 ½ inches

3. An inspection of soil preparation will be performed by the Owner's Representative before areas will be released for planting. The inspection shall consist taking a soil sample to determine
   a. Proper tilling of the soil. Soil will be judged on how easily a soil probe can be inserted into the ground.
   b. Proper depth of tilling, and homogeneity of the soil. The soil sample will be judged on uniformity of the soil profile in the top six to eight inches.
   c. A visual inspection for adequate compost will be conducted. An area that has similar soil structures, that has not received compost will be used as the basis of comparison. Should a disagreement exist, multiple soil samples will be sent to an independent testing laboratory to determine the amount of organic matter present. The cost of this testing will be absorbed by the Owner's Representative.

PART 3 EXECUTION

3.01 EXAMINATION

A. General
1. Verify that existing site conditions are as specified and indicated before beginning work under this Section.
2. Unknown soil conditions may exist on site. This specification is intended to be a standard specification for Soil Preparation for bid purposes only. The contractor shall be responsible for creating a suitable soil medium that ensures healthy plant growth. Immediately following rough grading operations, the contractor shall take multiple soil samples of the site to identify any chemical, structural, or other soil borne issues that would make the soil counterproductive to healthy plant growth. This analysis shall include recommendations for additional organic matter required for the soil. Should amendments or additional work be required to make these soils more conducive to healthy plant growth, the contractors shall submit a change order for the modification 30 days prior to start of landscape installation for Owner's Approval. The change order request shall clearly detail any additional work or amendments necessary for those unacceptable soils.

B. Grades

1. Inspect to verify rough grading is within +0.1 foot of grades indicated and specified.

C. Damaged Earth
   1. Inspect to verify that earth rendered unfit to receive planting due to concrete, water, mortar, limewater or any other contaminant dumped on it has been removed and replaced with clean earth from a source approved by the Owner's Representative.

D. Cleanliness
   1. Inspect to verify that site is clean of all trash and debris.

E. Equipment
   1. Inspect to verify other trades have removed all equipment and staging areas from areas of work.

F. Unsatisfactory Conditions
   1. Report in writing to General Contractor with copy to Owner.

G. Acceptance
   1. Beginning of installation means acceptance of existing conditions by installer.

3.02 PREPARATION

A. Protection
   1. Locate sewer, water, irrigation, gas, electric, phone and other pipelines or conduits and equipment prior to commencing work.
   2. Be responsible for proper repair to landscape, utilities, walls, pavements and other site improvements damaged by operations under this section.

B. Weed Control
   1. Remove weeds by applying herbicide 1 week before soil preparation and as needed, but no sooner than 3 months before beginning work.
   2. If the area to be developed is infested with noxious or invasive weeds, a chemical application will be required, at a rate recommended on the chemical's product label.
   3. The contractor shall remove all weeds prior to tilling or spreading any soil amendments. All dead plant material shall be removed from the site and not tilled into the soil.

C. Surface Grade
   1. Remove weeds, debris, clods and rocks larger than 1". Dispose of accumulated debris at direction of owner or Owner's Representative.

D. Runoff
   1. Take measures and furnish equipment and labor necessary to control the flow, drainage, and accumulation of water. Ensure that all water will run off the grades.

E. Erosion Control
   1. Take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited material on the site throughout duration of work.
   2. No areas of the site may remain unprotected for more than 30 days, or as directed by the storm water management plan.
   3. The contractor shall assume maintenance and management responsibilities for erosion control in an area upon commencement of activities in that area. Erosion control practices must be compliant with Douglas County, the GESC plan, and any Storm Water Management Plans/Programs in place.
   4. The contractor will be expected to begin repair to damaged erosion control devices, siltation, wash outs, etc. within twenty-four hours of a storm event or upon notification by the Owner's Representative.

3.03 INSTALLATION

A. Soil Amendment
   1. Evenly distribute topsoil, soil amendments, conditioners, and fertilizer, and first application of fertilizer in landscaped areas at the rates outlined in Part 2.01 of this Section.

B. Mixing
   1. After applying soil conditioner, fertilizers, and compost thoroughly till area to depth of 6" minimum by tilling, plowing, harrowing, or disking until soil is well pulverized and thoroughly mixed.

C. Fine Grading in all Landscape Areas:
   1. Do fine grading for areas prior to planting.
   2. For ground surface areas surrounding buildings to be landscaped, maintain required positive drainage away from buildings.
   3. Establish finish grades to within 0.04 foot of grades indicated.
   4. Fine grading must be inspected and approved by Owner's Representative.
   5. Any damage caused by inclement weather, to finish grades before inspection, will be repaired by the contractor, prior to acceptance by Owner's Representative.
   6. Sodded areas - Allow 1" for sod.

D. Noxious weeds or parts thereof shall not be present in the surface grade prior to landscaping.

E. Prior to acceptance of grades, hand rake to smooth, even surface free of debris, clods, rocks, and vegetable matter greater than 1".

3.04 FIELD QUALITY CONTROL

A. Inspection
   1. Provide notice to Owner's Representative requesting inspection at least seven (7) calendar days prior to anticipated date of completion.
   2. The following required inspections will be conducted to ensure proper preparation of soil, prior to planting.
      a. During, or after, the first cultivation
      b. After the application of specified soil amendments.
      c. During, or after, the second cultivation
      d. After the final grades have been established

B. Deficiencies
   1. Owner's Representative will specify deficiencies to Contractor who shall make satisfactory adjustments and shall again notify Owner's Representative for final inspection.

3.05 CLEANING

A. Remove debris and excess materials from site. Clean out drainage inlet structures. Clean paved and finished surfaces soiled as a result of work under this Section, in accordance with direction given by Owner's Representative.

3.06 PROTECTION

A. Provide and install barriers as required and as directed by Owner's Representative to protect completed areas against damage from pedestrian and vehicular traffic until acceptance by Owner. Contractor is not responsible for malicious destruction caused by others.

END OF SECTION

SECTION 32 9219
SEEDING

PART 1 GENERAL

1.01 SUMMARY

A. The contractor shall supply all material and labor necessary for seeding of irrigated seed mix, dryland grasses, non-irrigated seed mix, and wetland seeding, in areas shown on plans.

B. The contractor will be expected to produce a lush stand of grasses by the end of the second full growing season.

1.02 REFERENCES

A. Reference Standards: Comply with U.S. Department of Agriculture Rules and Regulations under Federal Seed Act and be equal in quality to standards for Certified Seed.

B. Refer to General Landscape Section

C. Refer to Landscape Maintenance Section

D. Refer to Fine Grading and Soil Preparation Section.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements

1. Irrigated Seed Areas
   a. This includes all areas within the limits of work that are recently planted and irrigated. Contractor should monitor these areas on a regular basis for the presence of weeds. Areas will require individual attention and separate maintenance schedules; thus, the contractor is responsible for developing and sustaining a weed-free, lush stand of specified grasses. Chemical, mechanical, or manual methods should be implemented to prevent the spread of weeds. Manual methods of weed removal are the preferred method to help establish newly seeded areas. Contractor will be expected to re-seed or over-seed areas as bare spots develop.
2. Non-irrigated Seeded Areas
   a. This includes all areas within the limits of work that are recently seeded, and do not receive supplemental watering. Contractor should monitor these areas on a regular basis for the presence of weeds. Areas will require individual attention and separate maintenance schedules; thus, the contractor is responsible for developing and sustaining a weed-free, lush stand of dryland grasses. Chemical, mechanical, or manual methods should be implemented to prevent the spread of weeds. Mowing is the preferred method to help establish newly seeded areas. Contractor will be expected to re-seed or over-seed areas as bare spots develop. Bare spots should not exceed 12" x 12" by the end of the first full growing season.
3. Bidders shall assume that all seed areas will require an initial seeding and a second overseeding. The second seeding may be drill seeded or overseeded depending on the amount of coverage achieved in the first attempt at seeding.
4. Seeding shall generally be completed in spring and fall. It may be necessary to alter the production schedule or installation practices to ensure the majority of the seed is installed at the optimal time. For instance, it may be necessary to eradicate weeds and seed prior to installing irrigation. Then install irrigation and repair the limited areas where lines were installed.
5. If seeding occurred in the early fall/late summer, it may be required to perform the second seeding during the following landscape season. The second seeding shall not be a condition of initial acceptance but will be required when reviewing the performance of areas as part of the warranty and final inspections.

B. The contractor will be required to furnish all tags from bags of seed to demonstrate the proper rate and species were installed.

1.04 SUBMITTALS

A. Refer to submittals in General Landscape Section.

1.05 PROJECT/SITE CONDITIONS

A. Existing Conditions
   1. Vehicular accessibility on site shall be as directed by Owner's representative. Repair damage to prepared ground and surfaces caused by vehicular movement during work under this section to original condition at no additional cost to Owner.

B. Environmental Conditions
   1. Do not drill or sow seed during windy weather or when ground is frozen or otherwise un-tillable.

1.06 WARRANTY

A. At completion of work, furnish written warranty to Owner based upon requirements as specified.

1.07 MAINTENANCE

A. The interim maintenance period shall begin immediately after each area is seeded and continue until substantial completion of entire project. Final acceptance of seeded areas will not be given until Owner's representative is satisfied with germination and a full stand of grass is in a vigorous growing condition, with consistency and completion of coverage. During this time, be responsible for watering, mowing, spraying, weeding, fertilizing, and all related work as necessary to ensure that seeded areas are in a vigorous growing condition. Provide all supervision, labor, material and equipment to maintain seeded areas.

B. Constant, proactive maintenance of seed areas and regular reviews of the performance are critical to the successful establishment of seeded areas. The contractor is expected to monitor the seeded areas before and after the contract maintenance period and keep these as weed free as reasonably possible. This means throughout the construction period the contractor may need to apply herbicides as frequently as a weekly basis on areas infested with weeds (or undesirable species) or areas where aggressive weeds are observed. Mowing may be a suitable method for weed management as long as it is done so as not to prevent the spread of weed seeds. The contractor will be expected to include a weed management program as part of their bid.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil
   1. Topsoil shall have an acidic reaction of 6.0 to 7.8 pH and shall not include any minerals or elements detrimental to plant growth. Soluble salts measured in saturation extract shall be 5 mmhos/cm or less.
   2. Topsoil preparation will be as described in Section 329110 Soil Preparation.

B. Booster Fertilizer
   1. All fertilizer requirements will meet the requirements of Section 329110 Soil Preparation.
   2. In all seeded areas, a booster fertilizer with the chemical analysis of having a fertilizer with a ratio of approximately 5-15-1, with a minimum acceptable nitrogen level of 15%, and minimum acceptable Phosphorus level of 45%, with four (4) percent iron and eight (8) percent sulfur applied on the prepared soil at the rate of five (5) pounds per one thousand (1,000) square feet immediately prior to seeding, unless other requirements are identified from soils testing.
   3. Seeded areas shall receive an application of 800 pounds per acre of Forte Biosol (or approved equal) following seeding and before mulching.

C. Bluegrass, Fine Fescue, Tall Fescue and Rhyzomatous Tall Fescue Seed
   1. Seed will be furnished in sealed, unopened, standard containers and labeled in accordance with the USDA Rules and Regulations and the Federal Seed Act. Seed will be fresh, clean, pure live seed equal in quality to the standards for "Certified Seed". It will be capable of passing the USDA test for germination of eighty-five (85) percent and for purity of ninety (90) percent. Seed will be free of Poa annua and all noxious or objectionable weed and shall have a maximum weed crop of one- tenth (0.1) percent. Seed shall have been prepared for seeding during the year of installation and shall have been stored away from high heat (over 100 degrees F). The Owner's Representative at the Contractor's expense may require tests of seed verification.

2. For turf areas, all seed varieties used shall be tested within the most recent National Turfgrass Evaluation Program (NTEP) list of varieties, preferably tested in the intermountain west at either Logan UT, Sheridan WY, or other approved testing site for regional adaptability and approved by the Owner's Representative.

D. Native Seed
   1. Seed shall have been prepared for seeding during the year of installation and shall have been stored away from high heat (over 100 degrees F).
   2. Seed will be furnished in sealed, unopened, standard containers and labeled in accordance with the USDA Rules and Regulations and the Federal Seed Act. Seed will be fresh, clean, pure live seed equal in quality to the standards for "Certified Seed".
   3. Seed tags must be supplied to the Owner's Representative for all seed mixtures, showing overall quantities and species. The Owner's Representative at the Contractor's expense may require tests of seed verification.

E. Top-dressing/Mulch
   1. Hydro-mulch: Hydro-mulch is only allowed for seeded areas that will have temporary or permanent irrigation. Hydro-mulch shall be a wood cellulose fiber type and shall be applied at the minimum rate of two thousand five hundred (2,500) pounds per acre with a minimum rate of one hundred and fifty (150) pounds per acre tackifier and shall be applied immediately after seed application.

F. Sterilized, wood fiber made from mechanically defibrated whole wood chips, colored green with a non-toxic dye.
   1. Straw: Straw consisting of 75% straws longer than 10 inches shall be used on seed area that are not irrigated. It shall be applied evenly over the seeded surface at the minimum rate of two tons per acre and partially embedded into the soil using a crimper or similar implement. Due to the potential for wind-blown straw, tackifier shall be sprayed on straw after crimping, for all non-irrigated seed areas.

G. Tackifier - Non-toxic, organic, starch based, tackifier agent. Approved manufacturers are as follows
   1. Rantec – "Supertac" or "R-Tack" products' www.ranteccorp.com
   2. Chemstar – "Star Tak 600" product; www.chemstar.com

H. Seed mixtures – refer to landscape plans for the rate and type.

2.02 SOURCE QUALITY CONTROL

A. Inspection
   1. Primarily for quality; however, other requirements are not waived even though visual inspection results in acceptance.
   2. Inspection will be made periodically during seeding, at completion and at end of warranty period by Owner's representative.
   3. Seed material is subject to inspection and acceptance. Owner's representative reserves the right to reject at any time or place prior to acceptance, any work and seed which in Owner's representative's opinion fails to meet specification requirements.
   4. Inspections on seeded areas will be for the following items.
      a. Proper weed management and control (mechanical, chemical, mowing)
      b. Germination and performance of desired grass species

2.03 UNIFORM COVERAGE OF DESIRED GRASSES

A. Performance of the irrigation system (if present)

B. Watering practices (if applicable)

C. Erosion control and management practices

2.04 TESTING REQUIREMENTS

A. Seed and seed labels shall conform to current State and Federal regulations and be subject to testing provisions of the Association of Official Seed Analysis.

B. The Owner's Representative may require tests of seed verification at the Contractor's expense.

C. All tags from seed bags shall be retained by the contractor and submitted to the Owner's Representative as a means to ensuring the proper seed rate and seed mixtures were applied to areas. If seed tags are not submitted, it will be assumed that the area was improperly seeded, and the contractor will apply a comprehensive herbicide to the space and reseed areas at their own expense.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions are as specified and indicated before beginning work under this section.

B. Layout
   1. Verify layout of seeding areas as indicated prior to starting seeding operations.

C. Grades
   1. Inspect to verify that rough grading is within 0.1 foot of grades specified and indicated.

D. Unsatisfactory Conditions
   1. Report in writing to General Contractor with a copy to the Owner's representative.

E. Acceptance
   1. Beginning of installation means acceptance of existing conditions by this Contractor.

3.02 PREPARATION

A. Protection
   1. Be responsible for proper repair to landscape, utilities, fences, pavements and other site improvements damaged by operations under this Section.
   2. Pay for repairs made by Contractor(s) designated by Owner.
   3. Identify prepared seeding areas requiring protection and erect barriers for proper protection and traffic control.

B. Erosion Control
   1. Take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited materials on the site throughout the duration of work.
   2. Existing BMPs for erosion control shall be maintained during construction and during the maintenance period. This is the responsibility of the landscape contractor once they begin work. Additional services will not be authorized for repairs to BMPs if failure is a result of the contractor's neglect or activities.

C. Seeding Areas
   1. Remove weeds, debris and rocks larger than ½" which may binder seeding or subsequent operations. Dispose of accumulated debris at direction of Owner's representative.

D. Fine Grading
   1. Perform as required to maintain positive drainage, prevent ponding and direct run-off into catch basins, drainage structures, etc. and as required to provide smooth well-contoured surface prior to proceeding. Tolerance: + 0.04 foot within 50' of walks, roads, and high visibility areas. In large areas of open space that are intended to be natural in appearance, a "rougher grade" is more desirable as it provides better soil stability and micro-climates for seed growth and diversity.

E. Soil Preparation
   1. Soil preparation in all native seed areas is critical to the success and establishment of the plant material. Contractor is to ensure that all areas receive proper and adequate soil preparation.
   2. If the area to be developed is infested with noxious or invasive weeds, a chemical application will be required, at a rate recommended on the chemical's product label.

3.03 SEEDING

A. Hydroseeding will not be allowed.

B. Native Seeding
   1. Seeding dates

a. Dormant native seeding with standard mixtures of cool season and warm season grasses must occur between October 30th and April 30th.
b. In order to extend the seeding window and minimize erosion on projects, seeding of warm-season grasses will be allowed between April 1st and June 15th without supplemental irrigation, and through July 31st if adequate supplemental irrigation is present, as determined by the Owner's Representative.
c. Mixtures containing cool-season grasses only will be allowed between August 1st and October 30th.
d. Dormant seeding shall still be required between October 30th and April 30th at prevailing rates to provide a full mixture of both cool and warm season grasses.
e. Permission for exceptions to this seeding time must be obtained prior to seeding from the Owner's Representative.
f. No seeding shall be done when the soil is frozen, snow covered or excessively wet.

2. Drill seeding
   a. Native seed shall be applied using a native grass drill seeder equipped with a seed box agitator and depth bands. Seed will be sown to a depth of one-quarter (¼) to one-half (½) inch into a properly prepared seedbed.
   b. On sloping land, the seed shall be applied following the general contour.
3. Broadcast seeding
   a. In areas where drill seeding is not possible such as corners, near fences, along walkways, or around posts or boxes associated with electric, gas, irrigation installations or other similar situations, broadcast seeding may be substituted.
   b. No hydro seeding shall be permitted, except in wetland seeding areas.
   c. When using the broadcast method, the seeding area must be uncompacted and harrowed after seeding, followed by mulching.
4. Mulch application
   a. Seeded areas will be mulched with twenty-five hundred (2,500) pounds per acre hydromulch immediately following seeding.
   b. Hydromulch must include one hundred and fifty (150) pounds per acre organic tackifier. At this rate soil coverage is 100%.
   c. Any thin areas in the mulch, where soil is visible, will be cause for a request to reapply mulch until the coverage is satisfactory, at the Contractor's expense.
   d. If weather conditions deteriorate, Contractor will delay work until conditions improve.
   e. Mulch must be applied in a separate operation on the same day as seeding.
   f. No hay will be permitted on the construction site for any purpose.
5. Cleanup
   a. Remove all hydromulch from all plant materials, fences, concrete and other areas except for seed bed.
   b. Overly dense applications of straw mulch, or windrows of loose straw mulch which may smother seedling grasses, must be collected and removed.
   c. Straw mulch blown offsite during the construction and warranty period onto any adjacent area must be collected and removed by the Landscape Contractor responsible for the project.

C. Erosion Control Blankets
   1. All erosion control blankets shall conform to the Erosion Control Technology Council's "Standard Specifications for Rolled Erosion Control Products" (see following chart, reprinted courtesy of Erosion Control Technology Council).
   2. Generally, 'short term' blankets shall have up to 12 month functional longevity.
   3. Other duration products and longevities may be required for specific projects.
   4. All erosion control blanket samples must be approved by the Owner's Representative prior to their use.

D. Apply erosion control netting to any area which is vulnerable to soil erosion such as swales or steep slopes. (3:1 or steeper slopes)

E. If Contractor fails to net such areas and soil erosion subsequently occurs, Contractor shall re-establish finish grade, soil preparation, seed bed, and apply jute netting at their own expense.
   1. Roll out in direction of flow after seeding and mulching.
   2. Apply material loosely and smoothly on soil surface without stretching and without tenting.
   3. Avoid walking directly on seed-bed either before or after material is applied.

3.04 RESEEDING

A. Areas shall be reseeded if they exhibit areas greater than the acceptable amounts noted in Part 1 of this Section. Reseeding shall occur continually during the establishment period.

3.05 ADDITIONAL SEED VARIETIES

A. Additional native and/or non-native seed varieties may be considered on a case-by-case basis. All varieties, mixtures, seed rates and dates of application not within plans or specifications must be approved by the Owner's Representative prior to seeding.

3.06 MAINTENANCE PROCEDURES

A. Maintenance Procedures for Native and Open Space Areas
   1. Maintenance period
      a. Contractor maintenance period minimum shall be the one (1) year warranty period or until acceptance of the site (Final Acceptance).
      b. Extended warranty period may be required as determined by the Owner's Representative.
      c. Seeded areas must be maintained in a weed free manner.
      d. Weed infestations must be mowed, or spot treated with approved herbicides starting during construction phase and during two-year post installation warranty period.
      e. It is recommended maintenance activities be reported regularly to the Owner's Representative, to assure a complete record of activities is on file in support of the Final Acceptance Inspection (at the closure of the two year warranty period).
   2. Signage
      a. The contractor is responsible for providing and installing barriers as required to protect seeded areas from pedestrian and vehicular damage.
      b. Provide signage and barricades as needed.
      c. Any traffic damage that may occur prior to final acceptance of the work will be repaired and reseeded at the Contractor's expense, unless such damage is proven to be the result of activities by others, outside of the Contractor's control.
   3. Litter removal
      a. All litter or trash from construction sites or other sources which may blow onto Open Space must be collected and removed from the area weekly, in order to prevent smothering of establishing vegetation.
   4. Access
      a. Vehicular traffic is not permitted on Open Space areas, except for approved maintenance vehicles on established trails and sidewalks.
      b. Mowing, re-seeding, and spray equipment are allowed off trails, but must avoid all access immediately following precipitation or irrigation events which may lead to rutting.
      c. All damage to irrigation installations must be repaired at the Contractor's expense, according to the original specifications.
   5. Weed Control Maintenance
      a. Annual weeds must be mowed when they exceed 12 inches in height.
      b. Rotary mowers must be used for mowing operations.
      c. Dense accumulations of mowed weeds must be collected to prevent smothering of desirable vegetation.
      d. At a minimum, this will require mowing at least twice (late May and late August) during normal years; and could require mowing more frequently in wet years or if the site is heavily irrigated.
      e. State listed noxious weeds or other problematic weedy species of concern (some of which are listed below) shall be spot treated with approved herbicides with approved application methods at approved times for effective control, at least twice each year.

f. For acceptable results, most of these species should be sprayed during late May/early June and again in late August/September.
g. Other non-native weedy species of concern include, but may not be limited to:
    1) Common (or great) mullein (Verbascum thapsus)
    2) Thistles (including Bull, Canada, Scotch and Musk Thistles)
    3) Purple Loosestrife (Lythrum salicaria)
    4) Field Bindweed (Convolvulus arvensis)
    5) Blue Mustard (Chorispora tenella)
    6) Diffuse Knapweed (Centaurea diffusa)
    7) Kochia (scoparia)
    8) Curly dock (Rumex crispus)
    9) For a full listing of problematic weeds which must be eradicated or controlled, refer to the most recent edition of 'Noxious Weeds of Colorado', using Lists A, B, and C.
h. Herbicide selection, concentration, and timing of application must be approved by the Owner's Representative prior to application.
i. Broadcast application of herbicides with boom sprayers will not be allowed unless approved by the Owner's Representative in writing.
j. Spot treatment of weeds with spray guns on 4 wheelers or back packs is acceptable.
k. Permission must be obtained from the Owner's Representative for exception to this regulation.

6. Irrigation
    a. The Contractor will be responsible for temporary irrigation (where shown on irrigation plans) on all native seed areas and for water usage until such time as the seeding is established and accepted.
    b. The Contractor will be responsible for initial watering the native seeded area and for keeping the area adequately moist until seed is established.
    c. Over watering can be detrimental to the success of native seeding. Failed seedling establishment due to over or under watering must be reseeded and re-mulched.
    d. Assistance in preparation of site specific irrigation schedule for native seeded areas is available from the Owner's Representative upon request.
    e. General recommended watering schedule for native seeded areas. Watering is generally unnecessary until May or June following winter or early spring seeding.

WEEKS AFTER SEEDING	FREQUENCY	DURATION	TIMING
first month, or until initial germination (May or June)	2 times per day	15 minutes or until soil is moist to 1 inch depth	10 AM, 10 PM (to provide extended period of soil moisture at night)
4-6 weeks	2 times per week	20 minutes or until soil is moist to 2 inch depth	10 PM (after evening winds subside)
7-10 weeks	1 time week	30 minutes or until soil is moist to 3 inch depth.	10 PM (after evening winds subside)
11 weeks to late September	every other week	30 minutes or until soil is moist to 3 inch depth	10 PM (after evening winds subside)

7. Standard of acceptable establishment for native seeding:
    a. Warrant seeded areas for consistency and completion of coverage.
    b. The standard of acceptable establishment shall be at least six (6) desirable seeded plant seedlings per square foot.
    c. All bare areas over 10 square feet in size shall be re-seeded and re-mulched.

8. One year warranty period seeding maintenance requirements

ACTIVITIES	SEASONAL FREQUENCY	APPROXIMATE DATES	COMMENTS
INSTALLATION PROTECTION	K E E P INITIAL INSTALL A T I O N REPAIRE D	AS REQUIRED	PLACE FENCING AND SIGNAGE TO PREVENT UNAUTHORIZED VEHICLE ACCESS AND DISTURBANCE TO SEEDED AND PLANTED AREAS. MAINTAIN FENCING AND SIGNAGE ON PRESERVED REMNANT AREAS AND TREES.
COLLECT WIND DRIFT OF STRAW MULCH	AFTER INITIAL INSTALLATIO N AND BEFORE GERMINATIO N	AS REQUIRED BEFORE GERMINATION	INCOMPLETELY CRIMPED STRAW MULCH MAY BLOW INTO DENSE DRIFTS WHICH CAN SMOTHER SEEDED AREAS. CHECK FOR THESE AND REMOVE EXCESS STRAW PRIOR TO GERMINATION.
LITTER COLLECTION	COLLECT LITTER TO PREVENT SMOTHERIN G	AS REQUIRED	COLLECT CONSTRUCTION OR OTHER LITTER WHICH BLOWS ONTO OPEN SPACE TO PREVENT SMOTHERED VEGETATION AND REPAIRS. PLACING AN ORANGE FENCE BETWEEN CONSTRUCTION SITE AND THE EDGE OF OPEN SPACE MAY HELP CONCENTRATE LITTER OFF THE VEGETATION AND REDUCE CLEAN UP TIME.
REPAIR SEEDED OR PLANTED AREAS DAMAGED BY IRRIGATION MALFUNCTION, TIRE RUTS, EROSION		AS REQUIRED	CONSTRUCTION DAMAGE TO OPEN SPACE VEGETATION SHOULD BE REPAIRED IMMEDIATELY.
ANNUAL WEED CONTROL	TWO OR MORE TIMES PER GROWING SEASON	LATE MAY TO EARLY JUNE AND AGAIN IN LATE AUGUST TO EARLY SEPTEMBER	ANNUAL WEEDS, INCLUDING ANNUAL RYEGRASS, RUSSIAN THISTLE, AND KOCHIA SHOULD BE MOWED WHEN THEY EXCEED 12 INCHES IN HEIGHT. GENERALLY MOWING IS NECESSARY AT LEAST TWICE A YEAR FOR A COUPLE YEARS. MORE FREQUENT MOWING COULD BE NEEDED IN WET YEARS. DO NOT MOW WHEN THE SITE IS MUDDY TO PREVENT RUTS AND REPAIRS.

NOXIOUS WEED CONTROL	TWO OR MORE TIMES PER GROWING SEASON	LATE MAY TO EARLY JUNE AND AGAIN IN LATE AUGUST TO EARLY SEPTEMBER	SEVERAL SPECIES OF NOXIOUS WEEDS OCCUR IN THE AREA: CANADA THISTLE*, MUSK THISTLE, SCOTCH THISTLE, DIFFUSE KNAPWEED*, BLUE MUSTARD. ALL NOXIOUS SPECIES (IF THEY OCCUR ON THE DEVELOPMENT SITE) MUST BE TREATED (*TREAT TWICE A YEAR) WITH THE PROPER CONCENTRATION OF EFFECTIVE CHEMICALS, WITH THE PROPER EQUIPMENT, AT THE CORRECT TIMES IN ORDER TO RECEIVE FULL CREDIT FOR THE WARRANTY PERIOD. CONSULT A CERTIFIED WEED CONTROL SPECIALIST FOR BEST RESULTS.
IRRIGATION	SEE IRRIGATION TABLE IN STANDARDS AND SPECIFICATIONS	MAY THROUGH SEPTEMBER OF FIRST YEAR FOLLOWING WINTER TO EARLY SPRING SEEDING	TEMPORARY IRRIGATION DURING ESTABLISHMENT IS REQUIRED FOR NATIVE SEEDING WHERE IRRIGATION IS PROVIDED.
REPORTING ACTIVITIES	REGULARLY	AS COMPLETED	TO ASSURE FULL CREDIT FOR PROPER WARRANTY PERIOD ACTIVITIES, IT IS RECOMMENDED THAT REGULAR REPORTS FOR ALL REQUIRED ONE YEAR WARRANTY MAINTENANCE ACTIVITIES BE FILED WITH THE OWNER'S REPRESENTATIVE TO PROVIDE A COMPLETE RECORD FOR CONSULTATION DURING THE FINAL ACCEPTANCE INSPECTION. (REGULARLY SUBMITTED REPORTS HELP PROVE DUE DILIGENCE.)

9. Inspections

10. The Contractor must notify the Owner's Representative for inspections of seed certification and germination.

11. Inspection of Seed Certifications

12. Seed certification tags shall be delivered to the Owner's Representative to verify compliance with these standards and specifications.

13. Germination Inspection
    A. When germination is complete and plants are visible, the Contractor will notify the Owner's Representative and request an initial germination inspection for approval in order to begin the guarantee period (warranty period, one year maintenance period).

14. Any areas deemed by the Owner's Representative to be thin, weak or dead will be replaced at this time.

15. All washouts will be reseeded immediately after the germination inspection.
    A. No partial acceptance will be made.

END OF SECTION

SECTION 32 9223
SODDING

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all supervision, labor, material, equipment, transportation, permits and fees, and perform all operations in connection with the installation of sod, where called for in plans and specifications.

1.02 REFERENCES

A. Reference Standards: U.S. Department of Agriculture Rules and Regulations under Federal Seed Act and equal in quality to standards for Certified Seed.

B. General Landscape Section

C. Fine Grading and Soil Preparation Section

1.03 SUBMITTALS

A. Refer to General Landscape Section.

1.04 QUALITY ASSURANCE

A. Sod Materials
   1. Subject to inspection and acceptance. Owner's representative reserves the right to reject at any time or place prior to acceptance, any work and sod which in the Owner's representative's opinion fails to meet these specification requirements. Promptly remove rejected sod from site.

B. Inspection
   1. Primarily for quality, however, other requirements are not waived even though visual inspection results in acceptance. Notify Owner's representative of intended sod farm prior to cutting for inspection. Inspection at growth site shall not preclude the right of rejection at project site.
   2. Inspection will be made periodically during sodding, at completion and at end of warranty period by Owner's representative.
   3. Inspection shall be scheduled prior to sodding. Owner's representative will inspect finish grades on which sod will be laid. This inspection does not dismiss the contractor's responsibility for creating positive drainage across the landscaped areas.

C. Sod Standards
   1. General - Healthy, thick turf having undergone a program of regular fertilization, mowing and weed control; free of objectionable weeds; uniform in green color, leaf texture and density; healthy, vigorous root system; inspected and found free of disease, nematodes, pests and pest larvae by the entomologist of the State Department of Agriculture.
   2. Each piece of Sod - Sandy-loam soil base that will not break, crumble or tear during sod installation.
   3. Thickness – 5/8" minimum root zone thickness.
   4. Thatch - Not to exceed ½" uncompressed.
   5. Size - Cut in strips 18" wide no more than 24 hours prior to delivery.

1.05 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping
   1. Deliver on sod on pallets properly loaded on vehicles and with root system protected from exposure to sun, wind, and heat in accordance with standard practice and labeled with botanical and common name of each grass species in accordance with Federal Seed Act.
   2. Protect sod from dehydration, contamination and heating at all times. Keep stored sod moist and under shade or covered with moistened burlap.
   3. Do not drop sod rolls from carts, trucks or pallets.

B. Acceptance at Site
   1. Material shall be inspected upon arrival at job site.
   2. Immediately remove unacceptable material from job site.

C. Storage and Protection

1. Do not stack sod more than 2 feet deep.
2. Do not deliver more sod than can be installed within 24 hours. Storage is not recommended.

1.06 PROJECT/SITE CONDITIONS

A. Environmental Requirements:
   1. Do not install sod on saturated or frozen soil unless otherwise directed by owner's representative.

B. Existing Conditions
   1. Import and place any fill material required to adjust the fine grade to meet drainage requirements or to match hard surface fine grades, or as indicated on plans (e.g., 1 inch lower than adjacent concrete trails).
   2. Vehicular accessibility on site shall be as directed by Owner's representative. Repair damage to prepared grounds and surfaces caused by vehicular movement during work under this section to original condition at no additional cost to Owner.

1.07 WARRANTY

A. Warranty sod for a period of one year from date of Substantial Completion be in a healthy, vigorous growing condition.

B. During the original warranty period, replace at once sod areas that die due to natural causes, etc., or which in Owner's representative's opinions are unhealthy.

C. Replacement will not be required in any season unfavorable for sodding.

D. Install replacements as originally specified and warranted.

1.08 MAINTENANCE

A. The maintenance shall begin immediately after each area is sodded and continue until final acceptance of entire project. During this time, the contractor shall, be responsible for watering, mowing, spraying, weeding, aerating, fertilizing, and all related work as necessary to ensure that sodded areas are in a vigorous growing condition. Furnish all supervision, labor, material and equipment to maintain turf areas.

1.09 WATERING

A. Initially water sod upon completion of convenient work areas until installation is complete and the irrigation system can be operated under full control. Water sod sufficiently to moisten subsoil at least 4" deep in a manner not to cause erosion or damage to adjacent finished surfaces. Water shall be free of substances harmful to plant growth. Be responsible for furnishing water from underground sprinkler system, quick couplers or other source.

B. Contractor shall know, understand, and abide by all local water restrictions, if in effect.

C. Contractor will be held responsible for any fines received for violating any watering restrictions in effect.

D. The contractor shall attempt to provide the minimum water necessary to maintain irrigated landscape areas, especially in times of drought and during summer months. The owner or owner's representative will determine what appropriate level of distress is acceptable on turf areas.

E. Re-sodding
   1. Re-sod spots larger than nine inches square and not having healthy, uniform stand of grass.

F. Insect and Disease Control:
   1. As required, using insecticides and fungicides approved by Owner or Owner's Representative.

PART 2 PRODUCTS

2.01 REFER TO THE GENERAL LANDSCAPE SECTION.

PART 3 EXECUTION

3.01 EXAMINATION

A. General
   1. Verify that existing site conditions are as specified and indicated before beginning work under this section.

B. Layout
   1. Verify layout of sodded areas as indicated prior to starting operations.

C. Grades
   1. The owner's representative must inspect finished grades prior to installing any sod.

D. Unsatisfactory Conditions
   1. Report in writing to General Contractor with copy to Owner's representative.
   2. Beginning of installation means acceptance of existing conditions by this Contractor.

3.02 PREPARATION

A. Protection
   1. Pay for repairs made by contractors designated by Owner.
   2. Identify prepared sod areas requiring protection and erect barriers for proper protection and traffic control.

B. Sodding Areas
   1. Remove weeds, debris and rocks larger than ½" which may hinder sodding. Dispose of accumulated debris off-site in approved legal dump site, or in a location pre-approved by the owner or owner's representative.

C. Repair
   1. Re-establish grade and specified conditions to damaged sod areas prior to placing sod.

D. Adjustment
   1. Adjust irrigation heads to proper watering height according to depth of sod material but lower than compacted blade height to enable lawn mowers to cut grass freely without damage to the sprinkler system.

E. Weeding
   1. If the area to be developed is infested with noxious or invasive weeds, a chemical application will be required, at a rate recommended on the chemical's product label.

F. Fine Grading
   1. Perform as required to maintain positive drainage, prevent ponding and direct run-off into catch basins, drainage structures, etc., and as required to provide smooth well-contoured surface prior to proceeding. Tolerance: ± 0.04 foot.
   2. Unless noted on plans, tree lawns, or areas between curb and sidewalk, shall exhibit positive drainage towards the street. "Crowning", berming, or anything other than straight grading between these surfaces shall be rejected, unless otherwise waived by owner or owner's representative.
   3. Fine grading must be approved by both contractor and owner's representative prior to sodding. Contractor should provide at least two (2) calendar days' notice for inspection. Sod shall be installed within 48 hours of inspection. The contractor will be responsible for repairing any grades damage by inclement weather, before or after finish grades are inspected.

3.03 SODDING

A. Sodding
   1. Soil on which sod is laid should be slightly moist.
   2. Lay with longest dimension parallel to contours and in continuous rows.
   3. Tightly butt ends and sides of sod together. Stagger and compact vertical joints between sod strips by rolling so sod will be incorporated with the ground surface, insuring tight joints between adjacent pieces.
   4. Where new sod meets existing, cut existing with sod cutter to insure a tight joint and smooth transition between new and existing turf cover.

B. Rolling
   1. When soil and sod are moist, roll sod lightly as soon as possible after it is laid. Delay rolling until just before the second watering.

C. Topsoil

1. Add along exposed edges to match adjacent grade. Feather topsoil out approximately 1 ft. from edge of sod.

D. Drainage
   1. Assure finished areas of sod are such that positive drainage of storm and irrigation water will occur and ponding of water does not occur.

3.04 REPAIR OF EXISTING SOD AREAS DISTURBED BY RENOVATION

A. Repair existing sod areas disturbed by renovation work (utilities, paving, etc.)., in accordance with these specifications to satisfaction of Owner.

B. Add topsoil and re-sod as necessary to eliminate tire ruts and other depressions.

3.05 NOTIFICATION OF INSPECTION

A. Notification
   1. Give notice requesting inspection by Owner's representative at least seven (7) calendar days prior to the anticipated date of completion. All sod must be healthy and significantly rooted in place in order to be considered complete.

B. Deficiencies
   1. If deficiencies exist, Owner's representative shall specify such deficiencies to the Contractor who shall make satisfactory adjustments and will again notify the Owner's representative for final inspection.

3.06 CLEANING

A. Remove pallets, unused sod, and other debris from site. Clean paved and finished surfaces soiled as a result of work under this Section in accordance with directions given by Owner's representative. Clean out drainage inlet structures.

3.07 PROTECTION

A. Provide and install barriers as required and as directed by Owner's representative, or as needed, to protect sodded areas against damage form pedestrian and vehicular traffic until acceptance by Owner. Contractor is responsible for malicious destruction of sodding caused by others until substantial completion.

END OF SECTION

SECTION 33 4924
BIORETENTION POND

GENERAL

1.01 SCOPE

A. This Section consists of construction of a bioretention pond for stormwater quality control.

1.02 RELATED SECTIONS

A. Section 31 10 00, Site Clearing

B. Section 31 22 13, Rough Grading

C. Section 31 23 16, Excavation

D. Section 31 23 18, Rock Removal

E. Section 31 37 00, Rip Rap

1.03 REFERENCES

A. Mile High Flood District (MHFD) Construction Specifications and Criteria Manual

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Results of aggregate sieve analysis and standard proctor tests for all granular material.

MATERIALS

2.01 BIO RETENTION POND

A. All materials to be incorporated into the bioretention pond shall be in accordance with Table B-1 of the Mile High Flood District's Treatment BMP Fact Sheets: T-3 Bioretention.

EXECUTION

3.01 PREPARATION

A. Preparation of the bioretention pond shall be in accordance with the Construction Considerations section of the Mile High Flood District's Treatment BMP Fact Sheets: T-3 Bioretention

3.02 UNDERDRAIN

A. In accordance with Section 33 46 00 of the Mile High Flood District Construction Specifications.

3.03 MAINTENANCE

A. Maintain the bioretention pond until accepted. Replace or repair any material displaced by any cause at no additional cost to the owner.

END OF SECTION

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT H

NOTICE OF AWARD

NOTICE OF AWARD

Date: April 13, 2021

David Sandlin, President
Saunders Heath, LLC
1212 Riverside Ave. Suite 130
Fort Collins, CO 80550

Re: FRISCO BAY MARINA OFFICE BUILDING & CIVIL CONSTRUCTION

Dear Mr. Sandlin:

Thank you for submitting a bid for the Town of Frisco's Frisco Bay Marina Office Building & Civil Construction project.

Your firm has been selected as the successful Bidder, and accordingly, this letter is your Notice of Award for the contract amount of $1,597,346.00 for the above mentioned project.

Enclosed please find an original and duplicate original Construction Agreement. Please review and sign both, then within ten (10) days return one copy to me along with your Payment Bond and Performance Bonds, each in the full amount of the Contract Price, as well as your Certificate of Insurance in the amounts required by the Agreement. When dating these documents, make sure all dates on all documents are the same. Return all the documents at the same time, in the same envelope.

Upon receipt of the fully executed copy of the Construction Agreement, as well as all bonding and insurance documents the Town will send you a Notice to Proceed.

Should you have any questions, please contact me at jeffg@townoffrisco.com

Sincerely,

Jeff Goble
Director of Public Works
Town of Frisco, CO

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT I

NOTICE TO PROCEED

NOTICE TO PROCEED

Date:

_____
_____
_____

Re: _____

Dear _____:

This letter is your Notice to Proceed, effective as of the date of this letter. This notice is in reference to the Construction Agreement between you and the Town of Frisco concerning _____ _____.

Please note that the Work shall commence within ten (10) days from the date of this letter, and that the Work shall be substantially completed within _____ days from the date of this letter.

Should you have any questions, please call me at (____) ___-____.

Sincerely,

_____
_____
_____

DRAFT

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT J

PAYMENT BOND

PAYMENT BOND

Bond No._____

KNOW ALL MEN BY THESE PRESENTS: that

(Firm)_____

(Address)_____
(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and

(Firm)_____

(Address)_____

hereinafter referred to as "the Surety", are held and firmly bond unto the Town of Frisco, Colorado, a municipal corporation, hereinafter referred to as "the Owner", in the amount of _____ Dollars in lawful money of the United States, whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, to the Owner to pay for labor, materials and equipment furnished for use in the performance of that Construction Agreement with the Owner, dated the ____ day of _____, 20___, for the performance of certain Work (the "Construction Contract"), which is by reference made a part hereof,

NOW, THEREFORE, if the Principal shall make payment to all persons, firms, subcontractors and corporations furnishing materials for or performing labor in the prosecution of the work provided for in the Construction Contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, repairs on machinery, equipment and tools, consumed, rented or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor performed in such work, whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER,

1. That Surety shall have no obligation to Claimants under this Bond until:

1.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

1.2 Claimants who do not have a direct contract with Contractor:

1.2.1 Have furnished written notice to Contractor and sent a copy, or notice thereof to Owner, up to and including the date of final settlement under the Construction Contract, stating with substantial accuracy the amount of the claim and the name of the party to whom materials were furnished or supplied or for whom labor was done or performed; and

1.2.2 Have either received a rejection in whole or in part from Contractor, or not

received within 30 days of furnishing the above notice any communication from Contractor by which Contractor has indicated the claim will be paid directly or indirectly; and

1.2.3 Not having been paid within the above 30 days, have sent a written notice to Surety and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.

2. If a notice required by Section 1 is given by Owner to Contractor or to Surety, that is sufficient compliance.

3. When a Claimant has satisfied the conditions of paragraph 1, Surety shall promptly and at Surety's expense take the following actions:

3.1 Send an answer to the Claimant, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

3.2 Pay or arrange for payment of any undisputed amounts.

4. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.

5. Amount owed by Owner to Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under the Construction Performance Bond. By Contractor's furnishing and Owner's accepting this Bond, they agree that all funds earned by Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

6. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

7. Surety hereby waives notice of any change, including changes to the Construction Contract or to related subcontracts, purchase orders and other obligations.

8. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Owner declares Contractor to be in default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to Sureties in the State of Colorado shall be applicable.

9. Any notice to the parties required under this Bond shall be in writing, delivered to the person designated below for the parties at the indicated address unless otherwise designated in writing. Only mailing by United States mail or hand-delivery shall be utilized. Facsimile and e-mail addresses may provided for convenience only.

OWNER: The Town of Frisco
Project Manager: Jeff Goble
P.O. Box 4100
Frisco, CO 80443

PRINCIPAL: _____
_____
_____
_____

SURETY: _____
_____
_____
_____

10. This Bond is to be governed by the laws of the State of Colorado.

11. Upon request by any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

12. Definitions.

12.1 Claimant: Any person, partnership, or corporation, or other entity that has furnished labor, materials, team hire, sustenance, provisions, provender, or other supplies used or consumed by Contractor or its Subcontractor in or about the performance of the Work under the Construction Contract, or that supplies laborers, rental machinery, tools, or equipment to the extent used in the prosecution of the Work, or architectural and engineering services required for performance of the Work of the Contractor and the Contractor's Subcontractors.

12.2 Default: Failure of the Contractor or Owner, as the case may be, that has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.

IN WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20_____.

PRINCIPAL

ATTEST:

By: _____

By: _____

Title: _____

Title: _____

Address: _____

_____

(Corporate Seal)

SURETY

ATTEST:

Surety: _____

By: _____

By: _____

Attorney-in-Fact: _____

Title: _____

Address: _____

_____

(Surety Seal)

NOTE: Date of Bond must not be prior to date of the Construction Contract and Surety must be authorized to transact business in the State of Colorado and be acceptable to the Owner.

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT K

PERFORMANCE BOND

PERFORMANCE BOND

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS: that

(Firm)_____

(Address)_____
(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and

(Firm)_____

(Address)_____

hereinafter referred to as "the Surety", are held and firmly bond unto the Town of Frisco, Colorado, a municipal corporation hereinafter referred to as "the Owner", in the amount of _____ Dollars in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION are such that whereas the Principal entered into a certain Construction Agreement with the Owner, dated the _____ day of _____, 20___, for the performance of certain Work (the "Construction Contract"), which is by reference made a part hereof,

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions and agreements of said Agreement during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without Notice to the Surety and during the life of the guaranty period, and if shall satisfy all claims and demands incurred under such Agreement, and shall fully indemnify and save harmless the Owner from all cost and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, and then this obligation shall be void;

Otherwise the Principal and Surety shall have the following obligations:

1. If Owner is not in Default under the Construction Contract, Surety's obligation under this Bond shall arise after:

1.1 Owner has notified Principal and Surety at its address listed herein that Owner by seven days' written notice intends to terminate the services of Principal or otherwise declare Principal to be in default of its obligations under the Construction Contract; and

1.2 Owner has declared Principal to be in Default and formally terminated Principal's right to complete the Construction Contract; and

1.3 Owner has agreed to pay the Unpaid Balance of the Contract Price to Surety in accordance with the terms of the Construction Contract or to a Principal selected to perform the Construction Contract in accordance with the terms of the Construction Contract with Owner.

2. When Owner has satisfied the conditions of paragraph 1, Surety shall promptly and at Surety's expense take one of the following actions:

2.1 Arrange for Principal, with consent of the Owner, to perform and complete the Construction Contract; or

2.2 Undertake to perform and complete the Construction Contract itself, through its agents or through independent Principals; or

2.3 Obtain bids or negotiated proposals from qualified Principals acceptable to Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by Owner and the Principal selected with Owner's concurrence, to be secured with the performance and payment bonds executed by a qualified Surety equivalent to the Bonds issued on the Construction Contract, and pay to Owner the amount of damages as described in paragraph 4 in excess of the Unpaid Balance of the Contract Price incurred by Owner resulting from the Principal's Default; or

2.4 Waive its right to perform and complete, arrange for completion, or obtain a new Principal and with reasonable promptness under the circumstances, after investigation, determine the amount for which it is liable to Owner and, as soon as practicable after the amount is determined and approved by Owner, tender payment therefor to Owner.

3. If Surety does not proceed as provided in paragraph 2 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in subparagraph 2.4 and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice, Owner shall be entitled to enforce any remedy available to Owner.

4. After Owner has terminated Principal's right to complete the Construction Contract, and if Surety elects to act under subparagraph 2.1, 2.2, or 2.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Principal under the Construction Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Construction Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the unpaid balance of the Contract Price and to mitigation of costs and damages on the Construction Contract, Surety is obligated without duplication for:

4.1 The responsibilities of Principal for correction of defective work and completion of the Construction Contract; and

4.2 Additional legal, design professional and delay costs resulting from

Principal's Default, and resulting from the actions or failure to act of Surety under paragraph 2; and

4.3 Liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of Principal.

5. Surety hereby waives notice of any change, including changes to the Construction Contract or to related subcontracts, purchase orders and other obligations.

6. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Owner declares Principal to be in default or within two years after Principal ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to Sureties in the State of Colorado shall be applicable.

7. Any notice to the parties required under this Bond shall be in writing, delivered to the person designated below for the parties at the indicated address unless otherwise designated in writing. Only mailing by United States mail or hand-delivery shall be utilized. Facsimile and e-mail addresses may be provided for convenience only.

OWNER: The Town of Frisco
Project Manager: Jeff Goble
P.O. Box 4100
Frisco, CO 80443

PRINCIPAL: _____
_____
_____
_____

SURETY: _____
_____
_____
_____

8. This Bond is to be governed by the laws of the State of Colorado.

9. Definitions.

9.1 Unpaid Balance of the Contract Price: The total amount payable by Owner to Principal under the Construction Contract after all proper adjustments have been made, including allowance to Principal of any amounts received or to be received by Owner in settlement of insurance or other claims for damages to which Principal is entitled, reduced by all valid and

proper payments made to or on behalf of Principal under the Construction Contract.

9.2 Default: Failure of the Principal or Owner, as the case may be, that has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.

IN WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20____.

PRINCIPAL

ATTEST:

By: _____ By: _____

Title: _____ Title: _____

Address: _____

_____

(Corporate Seal)

SURETY

ATTEST: Surety: _____

By: _____ By: _____

Attorney-in-Fact: _____ Title: _____

Address: _____

_____

(Surety Seal)

NOTE: Date of Bond must not be prior to date of Construction Contract and Surety must be authorized to transact business in the State of Colorado and be acceptable to the Owner.

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

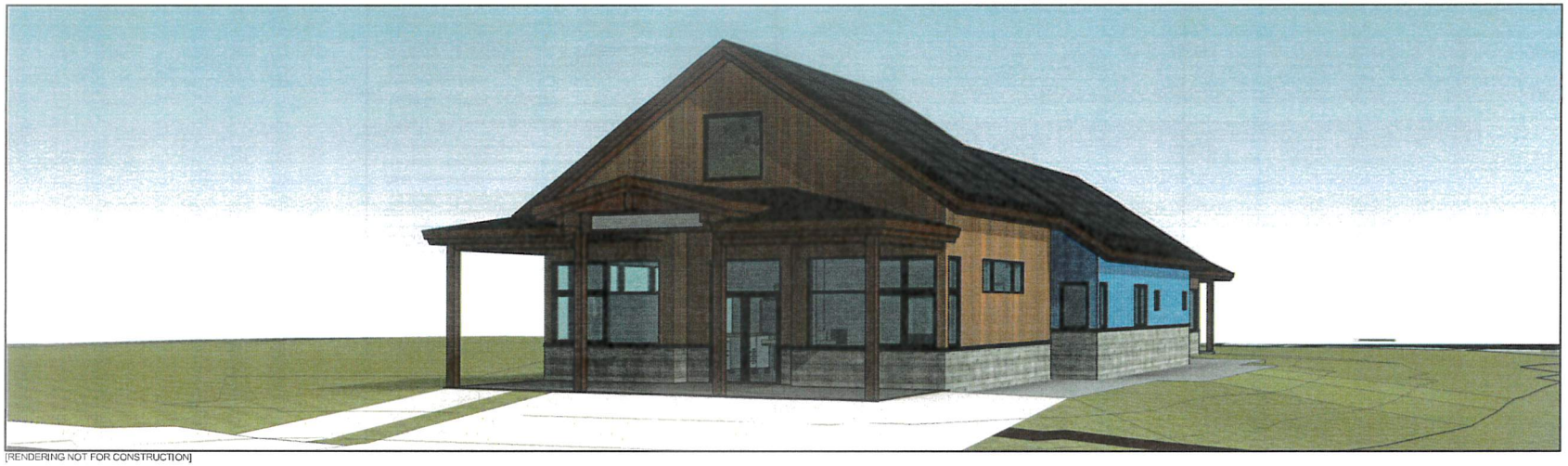
GENERAL CONDITIONS

ATTACHMENT L

CONSTRUCTION DRAWINGS

STAIS
ARCHITECTURE
& INTERIORS

409 east main street
p o box 4175
frisco , colorado 80443
970 453 0444



[RENDERING NOT FOR CONSTRUCTION]

FRISCO BAY MARINA
PHASE 2.1 SITE IMPROVEMENTS

277 MARINA ROAD
FRISCO . COLORADO

PRICING

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PROJECT TEAM

OWNER:
TOWN OF FRISCO
1 EAST MAIN ST
P.O. BOX 4100
FRISCO , CO , 80443
970.668.2599

SURVEYOR:
SCHMIDT LAND SURVEYING, INC.
P.O BOX 5761
FRISCO , CO , 80443
970-409-0663

CIVIL ENGINEER:
MURRAYSMITH
850 W SOUTH BOULDER ROAD SUITE 200
LOUISVILLE , CO , 80027
303.402.6984

LANDSCAPE ARCHITECT:
NORRIS DESIGN
409 E MAIN ST, SUITE 207
P.O. BOX 2320
FRISCO , CO , 80443
970.368.7068

STRUCTURAL ENGINEER:
ENGINEERING DESIGNWORKS, INC
PO BOX 775729
1855 SKI TIMES SQUARE, UNIT E2C
STEAMBOAT SPRINGS, CO 80477
970.879.4890

MECH/ELEC ENGINEER:
BIGHORN CONSULTING ENGINEERS
386 INDIAN ROAD
GRAND JUNCTION, CO 81506
970.241.8700

STAISARCHITECTS.COM

frisco bay marina
phase 2,1
site improvements

277 marina road
frisco , colorado

PROJECT # 1951

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ISSUE:

town planning	14 aug 2020
revised	14 sep 2020
25% const	30 nov 2020
50% const docs	15 dec 2020
pricing	15 jan 2021
revision 1	24 feb 2021

COVER SHEET

CS

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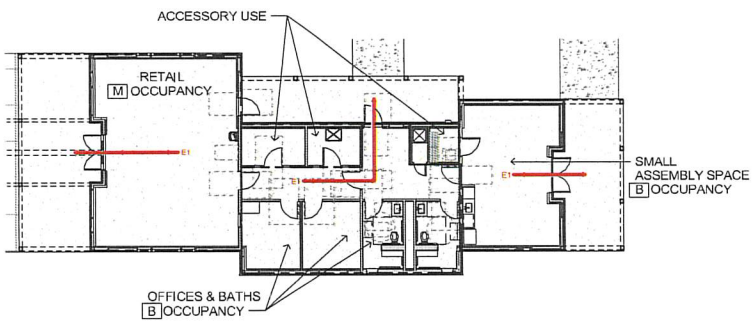


1 A001 OCCUPANCY & EGRESS DIAGRAM

SCALE: 1" = 1'-0"

BUILDING CODE DATA

1) This project is governed by the 2018 International Building Code, associated codes, accessibility codes and local code amendments as adopted by this municipality. All work performed under this contract shall conform to applicable codes, regulations, and restrictions, whether included in the text of this code study or not. The general contractor and subcontractors shall be responsible for obtaining required permits, licenses, inspections and approvals.

2) Occupancy (table 1004.5):
A, Retail: M (309.1), 600 sf / 60 sf per occupant = 15 occupants
B, Offices & Baths: B (304.1), 953 sf / 150 sf per occupant = 7 occupants
C, Small Assembly Space (unconcentrated area): B (303.1.1):
1, Base bid: 612 sf / 15 sf per occupant = 41 occupants
2, Alternate #1: 709 sf / 15 sf per occupant = 47 occupants

3) Type of Construction: Type VB construction (602.5), non-sprinklered,
A, Allowable Building Height (table 504.3):
1, B Occupancy: 40' maximum (25'-0" proposed)
2, M Occupancy: 40' maximum (25'-9" proposed)
B, Number of Stories (table 504.4):
1, B Occupancy: 2 maximum (1 proposed)
2, M Occupancy: 1 maximum (1 proposed)
C, Building Area (table 506.2):
1, B Occupancy: 9,000 sf maximum (1,653 sf proposed)
2, M Occupancy: 9,000 feet maximum (860 sf proposed)

4) Occupancy Separations (table 508.4): no separation required between B and M occupancies.

5) Number of Required Exits (per table 1006.2.1, based on occupant load):
A, Offices & Baths: 1 required (7 occupants)
B, Small Assembly Space (unconcentrated area): 1 required (41 or 47 occupants)
C, M Occupancy: 1 required (15 occupants)

6) Exit Access Travel Distance (per table 1017.2):
A, B Occupancy: 200' maximum (0' proposed),
B, M Occupancy: 200' maximum (0' proposed),

7) Means of Egress Illumination: shall be provided in accordance with Chapter 10 and all other applicable regulations.

8) Exit Signage: shall be provided in accordance with Chapter 10 and all other applicable regulations.

9) Accessibility: shall be provided in accordance with Chapter 11 and all other applicable regulations.

10) Energy Efficiency:
A, The project will be subject to 2018 IECC requirements, as amended and adopted by this municipality.
B, The project is located in climate zone 7.
C, Energy modeling has been performed for this project (see project manual). The project has been designed to follow the 'performance path' for code compliance.

11) Floodproofing Requirements:
A, Building is located in FEMA 'Flood Insurance Zone Map' (FIRM) Zone A.
B, Base Flood Elevation (BFE) = 9024.5 per Town Planning Dept 'best available data'.
C, Design Flood Elevation (DFE) = 9025.5 per Town Planning Dept.
D, Project shall comply with dry floodproofing requirements per FEMA Requirements for Floodproofing Non-Residential Buildings (FEMA P-936, 2013 edition).
E, Exterior doors shall be protected with 'Lift Out Flood Shields' in compliance with FEMA P-936/2013 requirements.
F, Owner has been advised that they must develop an 'Emergency Operations Plan' in compliance with FEMA P-936/2013 requirements.

GENERAL NOTES

1) THIS PROJECT IS GOVERNED BY THE INTERNATIONAL BUILDING CODE, ASSOCIATED CODES, ACCESSIBLE CODES AND LOCAL CODE AMENDMENTS, AS ADOPTED BY THIS MUNICIPALITY. ALL WORK PERFORMED UNDER THIS CONTRACT SHALL CONFORM TO APPLICABLE CODES, REGULATIONS, AND RESTRICTIONS. THE GENERAL CONTRACTOR AND SUBCONTRACTORS SHALL BE RESPONSIBLE FOR OBTAINING REQUIRED PERMITS, LICENSES, INSPECTIONS AND APPROVALS.

2) ALL ITEMS AND WORK SHOWN IN THESE CONSTRUCTION DOCUMENTS SHALL BE PROVIDED AND INSTALLED BY THE GENERAL CONTRACTOR OR HIS OR HER SUBCONTRACTORS UNLESS NOTED AS "EXISTING", "BY OWNER", OR "NOT IN CONTRACT" (N.I.C.) IN THESE DOCUMENTS.

3) IT IS THE INTENT AND MEANING OF THESE DOCUMENTS THAT THE GENERAL CONTRACTOR AND HIS OR HER SUBCONTRACTORS SHALL PROVIDE ALL LABOR, MATERIALS, TRANSPORTATION, EQUIPMENT, AND THE LIKE TO PROVIDE A COMPLETE AND WORKMANLIKE JOB PER THE USUAL AND CUSTOMARY STANDARDS OF THE INDUSTRY, AND SHALL BE RESPONSIBLE FOR ADHERENCE TO ALL MANUFACTURERS' INSTALLATION REQUIREMENTS, INSTRUCTIONS AND RECOMMENDATIONS.

4) THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF ALL WORK AND SCHEDULE PER STANDARD PRACTICES. COORDINATION OF ALL REQUIRED BLOCKOUTS, SEQUENCING, AND THE LIKE AMONG GENERAL AND SUBCONTRACTOR TRADES SHALL BE PERFORMED BY THE GENERAL CONTRACTOR.

5) THE GENERAL CONTRACTOR SHALL PROVIDE FOR THE JOBSITE SAFETY OF ALL PERSONNEL, WORK, MATERIALS, UTILITIES, AND ADJACENT PROPERTIES, IN ACCORDANCE WITH ACCEPTED CODES, REGULATIONS AND INDUSTRY PRACTICES. THESE DOCUMENTS DO NOT INCLUDE PROVISIONS FOR THIS, AND SHALL NOT RELIEVE THE GENERAL CONTRACTOR FROM HIS OR HER RESPONSIBILITIES.

6) THESE DESIGN DOCUMENTS HAVE BEEN ISSUED WITH AN EXPECTATION OF CONTINUING COMMUNICATION AND COOPERATION AMONG THE OWNER, ARCHITECT, AND CONTRACTOR. BUILDING DESIGN AND CONSTRUCTION ARE COMPLEX, ALTHOUGH THE ARCHITECT AND HIS CONSULTANTS HAVE PERFORMED THEIR SERVICES WITH DUE CARE AND DILIGENCE, THEY CANNOT GUARANTEE PERFECTION. COMMUNICATION IS OFTEN IMPERFECT, AND EVERY CONTINGENCY CAN NOT BE ANTICIPATED. ANY AMBIGUITY OR DISCREPANCY REQUIRING CLARIFICATION SHALL BE REPORTED PROMPTLY TO THE ARCHITECT. FAILURE TO DO SO MAY COMPOUND MISUNDERSTANDING AND AFFECT PROJECT BUDGET, SCHEDULE AND QUALITY. SUCH FAILURE TO COMMUNICATE SHALL RELIEVE THE ARCHITECT AND CONSULTANTS OF RESPONSIBILITY FOR CONSEQUENCES WHICH MAY ARISE.

7) THESE CONTRACT DOCUMENTS HAVE BEEN PREPARED USING AUTODESK REVIT 'BUILDING INFORMATION MODELING' APPLICATION AND ARE BASED ON AN ASSOCIATIVE 3D MODEL OF THE PROJECT. IN THE CASE OF QUESTIONS REGARDING SPECIFIC 2D VIEWS OF 3D PROJECT MODEL, CONTACT ARCHITECT FOR CLARIFICATION. MSA MAY HAVE THE ABILITY TO GENERATE SUPPLEMENTAL VIEWS OR DRAWINGS TO HELP THE CONTRACTORS BETTER UNDERSTAND THE DESIGN INTENT.

8) SUSTAINABLE DESIGN CONCEPTS ARE CENTRAL TO THE SUCCESSFUL DESIGN, CONSTRUCTION AND OPERATION OF THIS PROJECT, AND THE GENERAL CONTRACTOR AND ALL SUBCONTRACTORS ARE EXPECTED TO UNDERSTAND AND IMPLEMENT THESE CONCEPTS TO THE FULLEST EXTENT POSSIBLE. REFER TO CONSTRUCTION ASSEMBLY TYPES, NOTES AND DETAILS. CONTACT ARCHITECT WITH CONSTRUCTIVE INPUT OR IF MORE INFORMATION IS NEEDED TO UNDERSTAND AND IMPLEMENT THESE CONCEPTS MORE FULLY.

9) NOT USED

10) NOT USED

11) NOT USED

12) THE OWNER HAS BEEN ADVISED THAT ROOF AND DECK SURFACES MUST BE PERIODICALLY CLEARED OF SNOW AND ICE BUILDUP IN ORDER TO ENSURE MINIMAL PROBLEMS DURING HEAVY SNOW WINTERS.

13) SUBSTITUTION OF "OR EQUAL" PRODUCTS, REFER TO PROJECT MANUAL.

14) DOCUMENTATION OF EXISTING CONDITIONS IS BASED ON INFORMATION SUPPLIED BY THE OWNER. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS, DIMENSIONS (INCLUDING, BUT NOT LIMITED TO, PROPERTY BOUNDARIES, BUILDING SETBACKS, PROJECT BENCHMARK, AND SITE SLOPES), AND UTILITY LOCATIONS ON SITE PRIOR TO COMMENCEMENT OF WORK. NOTIFY ARCHITECT FOR INTERPRETATION OR CLARIFICATION OF ANY CONFLICTS OR DISCREPANCIES PER NOTE #4 ABOVE.

15) SOILS REPORT NOT AVAILABLE FOR THIS PROJECT.

16) WRITTEN DIMENSIONS ALWAYS TAKE PRECEDENCE OVER SCALED DIMENSIONS. PLAN DIMENSIONS ARE TAKEN FROM FACE OF WOOD FRAMING, FACE OF CONCRETE WALLS, AND CENTERLINE OF STEEL FRAMING MEMBERS UNLESS OTHERWISE NOTED. SECTION AND ELEVATION DIMENSIONS ARE TO TOP OF CONCRETE, TOP OF PLYWOOD SUBFLOOR, TOP OF WALL PLATES, AND TOP OF BEAMS UNLESS OTHERWISE NOTED. DOOR OPENINGS TO BE 4" FROM ADJACENT WALL @ WOOD FRAMING; 6" FROM ADJACENT WALL @ CONCRETE; OR CENTERED IN WALL AS INDICATED ON FLOOR PLANS.

17) MAJOR SITE DESIGN DIMENSIONS ARE NOTED IN THE DOCUMENTS. LAYOUT OF HARDSCAPE & LANDSCAPE AND THE LIKE SHALL BE STAKED IN THE FIELD BASED ON SITE PLAN INFORMATION. ARCHITECT AND/OR CONSULTANTS SHALL REVIEW AND APPROVE ALL LAYOUTS IN THE FIELD PRIOR TO COMMENCEMENT OF SAID WORK.

18) WHEN NECESSARY TO BORE STRUCTURAL MEMBERS FOR ELECTRICAL/MECHANICAL RUNS, SUCH HOLES SHALL BE IN ACCORDANCE WITH INTERNATIONAL BUILDING CODE REQUIREMENTS. MANUFACTURER'S INSTRUCTIONS, AND STRUCTURAL DOCUMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ARCHITECT/ENGINEER'S APPROVAL PRIOR TO ANY CUTTING, NOTCHING OR DRILLING WHICH MAY AFFECT THE INTEGRITY OF THE STRUCTURE.

19) NOT USED.

20) NOT ALL LIGHT FIXTURES ARE SHOWN ON EXTERIOR ELEVATIONS. REFER TO ELECTRICAL AND ARCHITECTURAL DWGS FOR MOUNTING HEIGHTS AND SETTING BLOCK DETAILS.

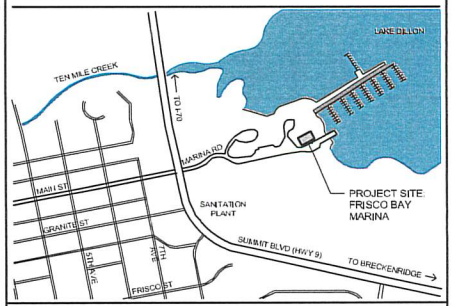
21) ALL INTERIOR WALLS SHALL EXTEND FROM FLOOR ELEVATION TO UNDERSIDE OF STRUCTURE ABOVE, UNLESS OTHERWISE NOTED.

22) INSTALL BLOCKING BEHIND ALL SURFACE APPLIED FIXTURES, TRIM, GRAB BARS, EQUIPMENT, AND ACCESSORIES WHEN MOUNTED ON STUD WALLS.

23) BUILDING AREAS ARE SHOWN FOR CODE PURPOSES ONLY AND SHALL BE RECALCULATED FOR ALL OTHER PURPOSES.

24) THIS SET HAS BEEN ISSUED AT THE REQUEST OF THE OWNER IN ORDER TO EXPEDITE THE COMMENCEMENT OF CONSTRUCTION. CERTAIN PORTIONS OF THESE CONTRACT DOCUMENTS ARE SUBJECT TO FURTHER REVISION PRIOR TO CONSTRUCTION; THEREFORE, ANY PRICING OR CONTRACTUAL AGREEMENTS BASED ON THIS SET MAY ALSO BE SUBJECT TO FURTHER REVISION. ACCEPTANCE AND USE OF THIS SET BY THE OWNER AND CONTRACTOR CONSTITUTES ACCEPTANCE OF THIS REALITY ON THE PART OF BOTH PARTIES.

VICINITY MAP



AREA CALCULATIONS

BUILDING CALCS:	BASE BID (SF)	BID ALT #1 (SF)
1, MAIN FLOOR	2,274	2,571

NOTES: 1, BUILDING AREAS CALC'D IN ACCORDANCE W/ BUILDING CODE REQMENTS.

2, UNCONDITIONED AREA INCLUDES GARAGE, MECHANICAL & STORAGE (WITH OVER 5'-0" HEADROOM).

3, STAIRS & LANDINGS NOT COUNTED WITH UPPERMOST FLOOR SQUARE FOOTAGES.

BID ALTERNATES

TO ENABLE THE OWNER TO COMPARE TOTAL COSTS WHERE ALTERNATE MATERIALS AND METHODS MIGHT BE USED, BID ALTERNATES HAVE BEEN ESTABLISHED AS DESCRIBED HEREIN. CERTAIN ALTERNATES MAY BE SELECTED ON THE BASIS OF PAY BACK PERIOD THROUGH LOWER OPERATING COSTS. ACCORDINGLY THESE ALTERNATES (AS WELL AS THE BASE BID FOR THESE ITEMS) MAY INCLUDE REQUIREMENTS FOR ANNUAL ENERGY USE AND/OR SAVINGS, AS NOTED BELOW. THE ARCHITECT SHALL BE RESPONSIBLE FOR COST ANALYSIS OF BASE BIDS AND ALTERNATES FOR OWNER REVIEW.

IF THE OWNER ELECTS TO PROCEED ON THE BASIS OF ONE OR MORE BID ALTERNATES, THE GENERAL CONTRACTOR SHALL MAKE ALL MODIFICATIONS TO THE WORK REQUIRED IN ORDER TO FURNISH AND INSTALL THE SELECTED ALTERNATE OR ALTERNATES TO THE APPROVAL OF THE OWNER AND THE ARCHITECT AND AT NO ADDITIONAL COST TO THE OWNER OTHER THAN AS PROPOSED ON THE BID FORM.

IMMEDIATELY AFTER THE OWNER HAS MADE DECISIONS ON WHICH ALTERNATES TO INCLUDE IN THE WORK, THE GENERAL CONTRACTOR SHALL THOROUGHLY AND CLEARLY ADVISE ALL NECESSARY PERSONNEL AND SUPPLIERS AS TO THE NATURE AND EXTENT OF SELECTED ALTERNATES.

PROVIDE CHANGE IN CONTRACT SUM FOR THE FOLLOWING ALTERNATES AS DESCRIBED BELOW:

BID ALTERNATE #1: LARGER MULTI-PURPOSE SPACE
PROVIDE CHANGE IN CONTRACT SUM TO ENLARGE BUILDING BY 297 SQ FT FOR LARGER MULTI-PURPOSE SPACE. AS INDICATED ON PLANS. THIS ALTERNATE PRICE SHALL INCLUDE THE COST DELTA FOR THE LARGER PV SYSTEM AS SHOWN ON SOUTH ELEVATION (ALT #1) 21.4KW VERSUS BASE BID PV SYSTEM.

STAIS ARCHITECTURE & INTERIORS
409 east main street
p o box 4175
frisco, colorado 80443
970 453 0444

STAISARCHITECTS.COM

frisco bay marina
phase 2,1
site improvements

277 marina road
frisco, colorado

PROJECT # 1951

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ISSUE:

pricing	15 jun 2021
revision 1	24 feb 2021

CODE STUDY

A001

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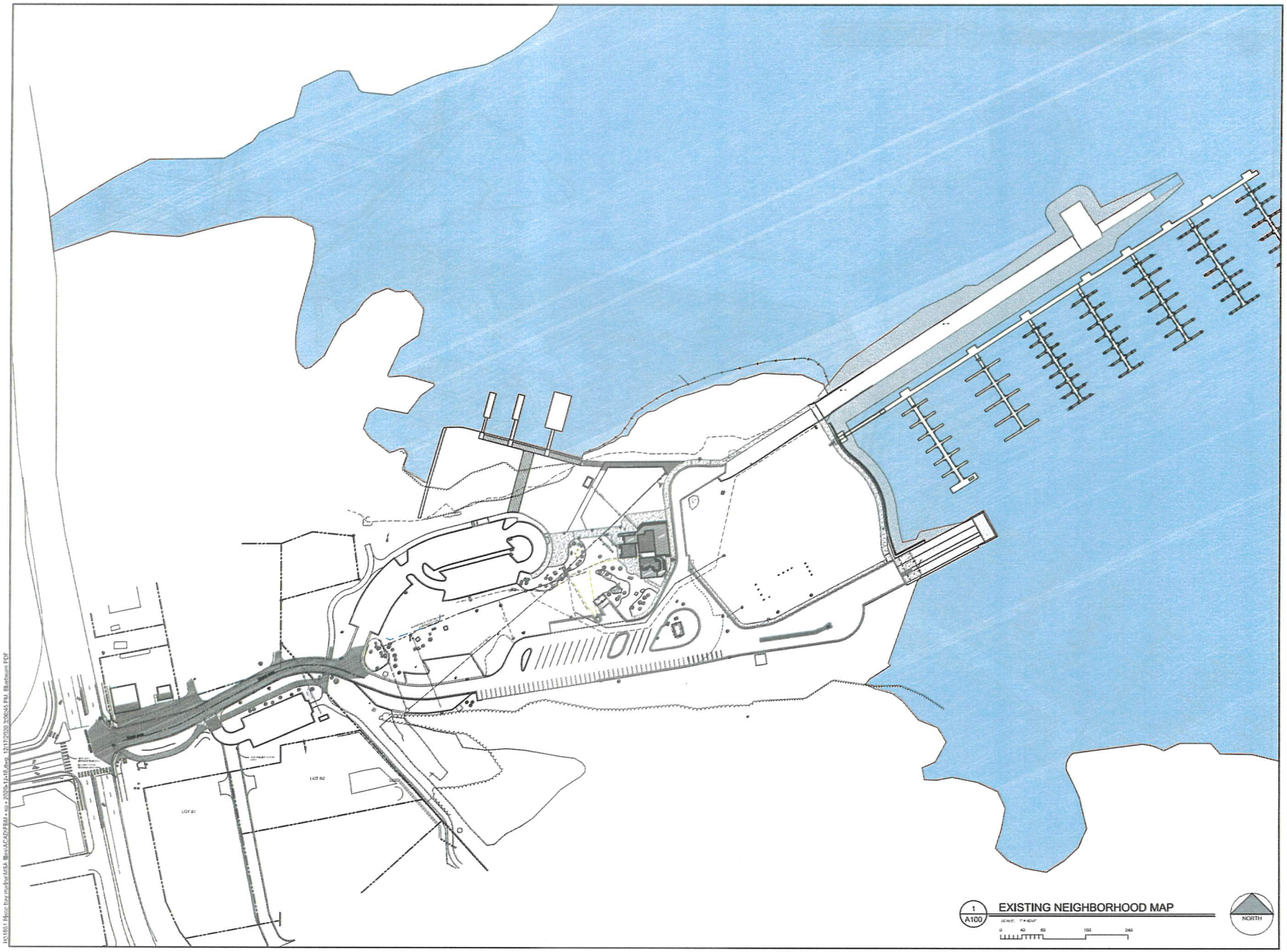

1 A100 EXISTING NEIGHBORHOOD MAP

NORTH

STAIS ARCHITECTURE & INTERIORS
409 east main street
p o box 417
frisco colorado 80443
970 453 0443

STAISARCHITECTS.COM

frisco bay marina
phase 2.1
site improvements

277 marina road
frisco, colorado

PROJECT # 1951

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ISSUE:

review	23 sep 2019
review	30 sep 2019
review	29 oct 2019
50% const docs	15 dec 2019
pricing	15 jan 2021

EXISTING NEIGHBORHOOD MAP

A100

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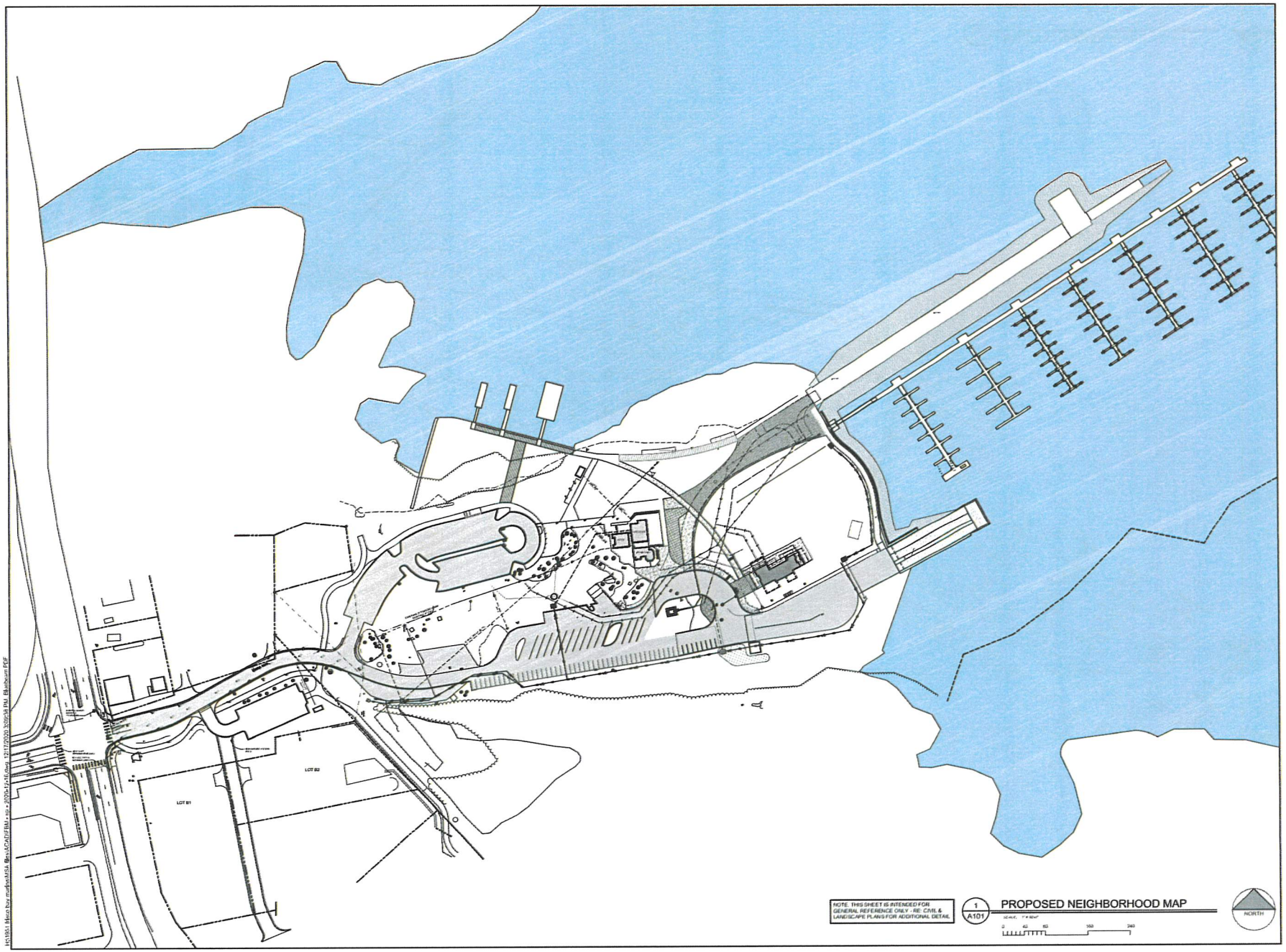

NOTE: THIS SHEET IS INTENDED FOR GENERAL REFERENCE ONLY - RE: CIVIL & LANDSCAPE PLANS FOR ADDITIONAL DETAIL

1 / A101 PROPOSED NEIGHBORHOOD MAP

SCALE: 1" = 80'-0"

0 40 80 160 240

NORTH

STAIS ARCHITECTURE & INTERIORS
409 east main street
p.o. box 417
frisco colorado 8044
970 453 0441

STAISARCHITECTS.COM

frisco bay marina phase 2.1 site improvements

277 marina road
frisco , colorado

PROJECT # 1951

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ISSUE:

review	23 sep 2019
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review	29 oct 2019
review	6 oct 2020
review	9 oct 2020
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pricing	15 jan 2021

PROPOSED NEIGHBORHOOD MAP

A101

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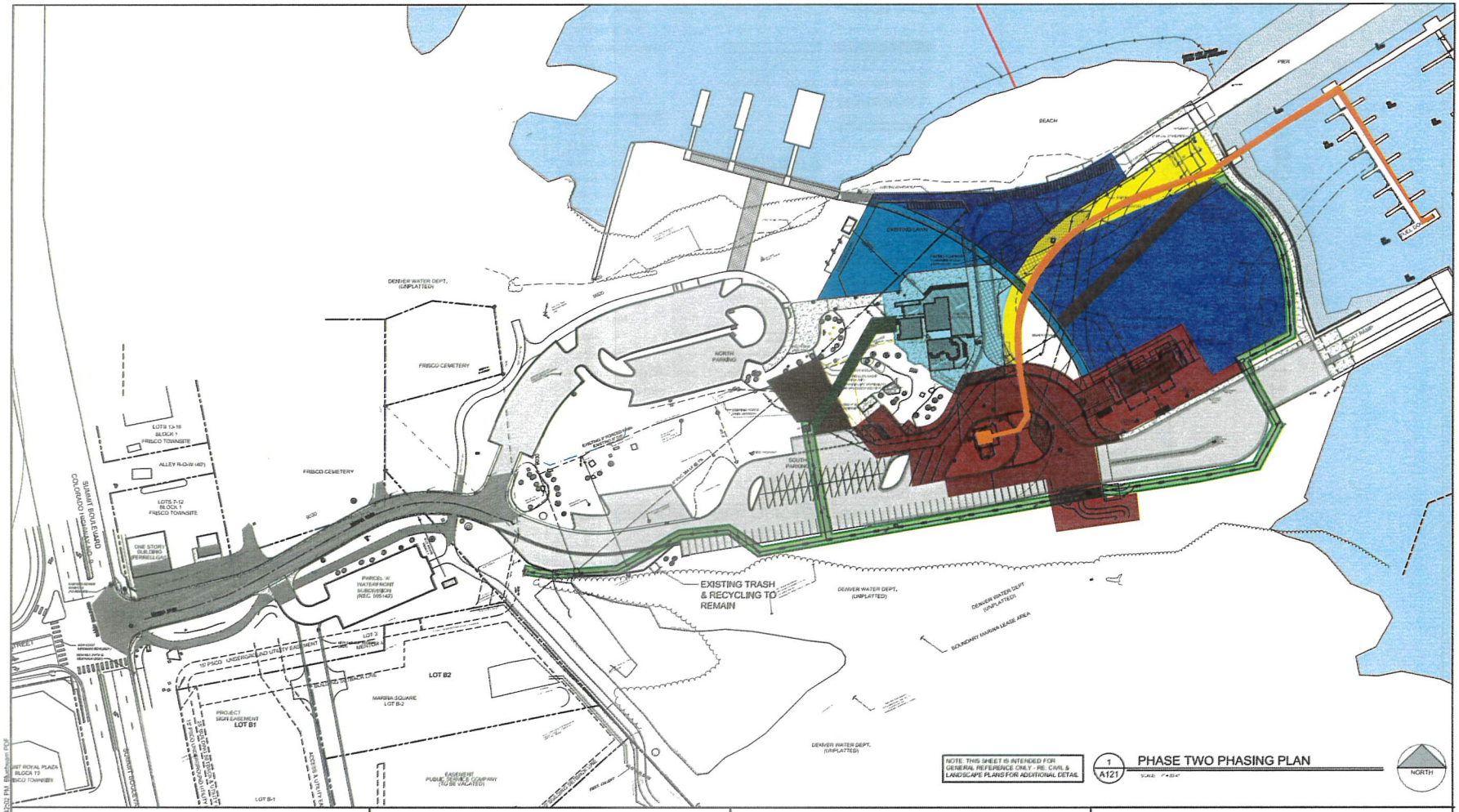

LEGEND

SCOPE	DATES	SYMBOL
ELECTRICAL INFRASTRUCTURE	2020	
SEWER INFRASTRUCTURE	2021-2	
COMMUNICATIONS/ IT INFRASTRUCTURE	2021-2	
FUEL SYSTEM	2021-2	
NEW RETAIL & OFFICE BUILDING & ASSOCIATED HARDSCAPE	2021-2	
NEW FIRE LANE	2021-2	
RENOVATE EXISTING BUILDING & ASSOCIATED HARDSCAPE	TBD	
PLAYGROUND	TBD	
LANDSCAPE	TBD	

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phase 2.1
site improvements

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PROJECT # 1951

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ISSUE:

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PHASE TWO
PHASING PLAN

A121

H:\1951 frisco bay marina\MSA files\ACAD\PSHM • xrefs: 1905x1x16.dwg, 2017-2020 12x24D2 PM, Barbara Pitt

GENERAL NOTES

1. ALL MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST ADDITION, AND THE TOWN OF FRISCO ENGINEERING STANDARDS, MATERIAL SPECIFICATIONS AND DRAWINGS.

2. THE CONTRACTOR SHALL POTHOLE AND VERIFY LOCATIONS, ELEVATIONS, TYPES AND SIZES OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTING NEW PIPING FAR ENOUGH IN ADVANCE TO ALLOW NECESSARY ADJUSTMENTS IN GRADE AND SHALL NOTIFY ENGINEER OF NEED TO ADJUST PIPING INSTALLATION ACCORDINGLY. POTHOLING SHALL SUFFICIENTLY PRECEDE LAYING OF PIPE TO ALLOW REQUIRED ELEVATION ADJUSTMENTS TO BE ACCOMPLISHED WITHOUT REWORK. ELEVATION ADJUSTMENTS SHALL BE EXPECTED AND ARE INCIDENTAL TO THE WORK. DEFLECT PIPE AS REQUIRED AND WITHIN SPECIFIED TOLERANCES TO AVOID EXISTING UTILITIES AND COMPLETE TIE-INS.

3. LOCATIONS OF EXISTING UTILITIES ARE BASED ON INFORMATION SUPPLIED BY THE UTILITIES AND CONSIDERED APPROXIMATE ONLY. AS REQUIRED BY STATE LAW, THE CONTRACTOR SHALL OBTAIN UTILITY LOCATES PRIOR TO COMMENCING CONSTRUCTION.

4. CONTRACTOR SHALL PROVIDE ENGINEER WITH MINIMUM 24 HOURS NOTICE WHEN POTHOLING WILL BE COMPLETE. COORDINATE WITH ENGINEER TO REVIEW UTILITY INVESTIGATIONS AND TO MAKE APPROPRIATE ADJUSTMENTS FOR ANY ALIGNMENT CONFLICTS WHERE CONNECTING TO EXISTING UTILITIES.

5. COLORADO LAW REQUIRES THE CONTRACTOR TO FOLLOW THE RULES ADOPTED BY THE COLORADO UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN THE 2017 PROCEDURES GUIDE, EXCAVATION HANDBOOK & TITLE 9 SAFETY- INDUSTRIAL AND COMMERCIAL ARTICLE 1.5 EXCAVATION REQUIREMENTS 9-1.5-101 THROUGH 9-1.5-107. THE CONTRACTOR MAY OBTAIN COPIES OF THE RULES BY DOWNLOADING FROM THE WEBSITE HTTP://COLORADO811.ORG/EDUCATION_CONSOLIDATED/ OR CALLING UTILITY NOTIFICATION CENTER.

6. PROVIDE "AS CONSTRUCTED" DRAWINGS INDICATING ALL CHANGES IN GRADE, ALIGNMENT, FITTINGS AND MATERIALS INSTALLED AND ANY OTHER UTILITIES OR OBSTACLES NOT SO INDICATED ON THESE PLANS.

7. AT THE END OF EACH WORK DAY ALL OPEN TRENCHES SHALL BE BACKFILLED AND ALL TRENCHES SHALL EITHER BE TEMPORARILY PAVED OR FILLED TO THE SATISFACTION OF THE ENGINEER.

8. CONTRACTOR SHALL PROTECT ALL PROPERTY CORNERS, SURVEY MONUMENTS AND CONTROL SURVEY MONUMENTS DISTURBED DURING CONSTRUCTION SHALL BE REPLACED AT CONTRACTOR'S EXPENSE, WITH APPROPRIATE SURVEY FILED WITH COUNTY SURVEYOR.

9. CONTRACTOR SHALL SUPPORT AND PROTECT AS NECESSARY ANY PIPE OR CONDUIT EXPOSED AS PART OF NEW PIPE TRENCH EXCAVATION. CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITIES IN SERVICE AT ALL TIMES AND SHALL COORDINATE WITH RESPECTIVE UTILITY COMPANIES TO MAINTAIN AND PROTECT SERVICES.

10. THE CONTRACTOR SHALL DISPOSE OF ALL REMOVED OR REPLACED MATERIAL AND EQUIPMENT IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS.

11. CONTRACTOR TO LEAVE ALL AREAS OF PROJECT FREE OF DEBRIS AND UNUSED CONSTRUCTION MATERIAL.

12. ALL EXISTING FEATURES INCLUDING, BUT NOT LIMITED TO, ROADWAYS, STRUCTURES, LOTS, CURBS, SIDEWALKS, FENCES, WALLS, TREES AND PLANTINGS, DITCHES, MAILBOXES, SIGNS, PIPING AND UTILITIES DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO AS GOOD OR BETTER THAN EXISTING CONDITION UNLESS OTHERWISE SPECIFIED. IF A UTILITY IS DAMAGED DURING CONSTRUCTION, THE CONTRACTOR SHALL CONTACT OWNER OF UTILITY FOR INSPECTION OF DAMAGE PRIOR TO REPAIRS. CONTRACTOR SHALL REPAIR ALL UTILITY SERVICES DAMAGED DURING CONSTRUCTION AND SUCH REPAIR SHALL BE CONSIDERED INCIDENTAL.

13. PRIOR TO BACKFILLING ANY UTILITY CONTRACTOR SHALL NOTIFY TOWN STAFF TO OBTAIN GEOGRAPHIC INFORMATION SYSTEM (GIS) INFORMATION ON ALL FITTINGS, CAPS, VALVES, METERS, AND CHANGES OF DIRECTION.

14. THE CONTRACTOR SHALL LIMIT ALL WORK, STAGING AND STORAGE AREAS TO THE PROJECT SITE WITHIN THE LIMITS OF DISTURBANCE AS SHOWN ON THE PLANS. (1)

15. PROVIDE THRUST BLOCKS AT ALL BENDS, VALVES, TEES, AND WYES.

TOPOGRAPHIC SURVEY NOTES:

1. SURVEY WAS COMPLETED BY SCHMIDT LAND SURVEYING, INC. ELEVATIONS ARE BASED ON DENVER WATER DEPARTMENT DATUM WHICH IS HIGHER BY 1.85' THAN U.S.G.S. SEA LEVEL DATUM (1929). CONTROL ELEVATIONS WERE HELD FROM RANGE WEST SURVEYOR'S ORIGINAL TOPOGRAPHY DONE OCTOBER 2012. HORIZONTAL COORDINATES ARE NAD 1983 DATUM.

2. UTILITY INFORMATION SHOWN HEREON IS COMPILED FROM FIELD OBSERVED SURFACE FEATURES, AND FIELD LOCATED PAINT MARK "LOCATES" PERFORMED BY OTHERS. SURVEYOR MAKES NO GUARANTEE THAT UTILITIES SHOWN HEREON COMPRISE ALL POSSIBLE UTILITIES IN THE AREA NOR WARRANTS THAT UTILITIES ARE IN THE EXACT LOCATIONS INDICATED.

3. TOPOGRAPHIC SURVEY INFORMATION IS PROVIDED ONLY. NO BOUNDARY, RIGHT OF WAY OR PARCEL LINE INFORMATION ARE INDICATED.

4. THIS TOPOGRAPHIC SURVEY WAS PERFORMED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT, AND THEREFORE DOES NOT PURPORT TO SHOW ALL EASEMENTS, ENCUMBRANCES, OR RESTRICTIONS OF RECORD, IF ANY.

5. CONTACT SURVEYOR FOR BASIS OF BEARING.

PROJECT CONTACTS

OWNER:
TOWN OF FRISCO, DEPT OF PUBLIC WORKS
P.O. BOX 4100 | FRISCO, CO 80443
CONTACT: JEFF GOBLE, CWP
E: JEFFG@TOWNOFFRISCO.COM
P: 970-668-9151

WATER UTILITY:
FRISCO WATER DEPARTMENT
0102 SCHOOL RD
FRISCO, COLORADO 80443
P: 970-668-0836

ELECTRIC UTILITY:
XCEL ENERGY
P.O. BOX 1819
SILVERTHORNE, CO 80498
CONTACT: AMY LAGACE
E: AMY.LAGACE@XCELENERGY.COM
P: 970-262-4033

SEWER UTILITY:
FRISCO SANITATION DISTRICT
P: 970-668-3723

EROSION CONTROL NOTES:

1. CONTRACTOR SHALL PREPARE, SUBMIT, AND ACQUIRE A COLORADO DEPARTMENT OF PUBLIC HEALTH AND THE ENVIRONMENT (CPDHE) CONSTRUCTION STORMWATER DISCHARGE PERMIT PRIOR TO BEGINNING ANY SITE DISTURBING ACTIVITY IF DISTURBING GREATER THAN ONE ACRE OF LAND AS PART OF THIS PROJECT. CONTRACTOR SHALL PROVIDE PAYMENT FOR ALL REQUIRED PERMIT FEES.

2. CONTRACTOR SHALL INSTALL AND MAINTAIN EROSION/SEDIMENTATION CONTROL DURING CONSTRUCTION (ANY TIME OF YEAR) IN ACCORDANCE WITH THE CDPHE EROSION PREVENTION AND SEDIMENT CONTROL REQUIREMENTS, THE STANDARD CONSTRUCTION SPECIFICATIONS FOR THIS PROJECT AND THE EROSION CONTROL NOTES INCLUDED BELOW AND WITHIN THESE PLANS. IF DISCREPANCIES BETWEEN STANDARDS OCCUR, THE MORE STRINGENT REGULATION SHALL APPLY.

3. APPROVAL OF THIS EROSION SEDIMENTATION CONTROL (ESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G.: SIZE AND LOCATION OF ROADS, PIPES, RESTRICTIONS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).

4. THE IMPLEMENTATION OF EROSION/SEDIMENTATION CONTROL (ESC) PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED AND VEGETATION/LANDSCAPING IS ESTABLISHED.

5. THE BOUNDARIES OF THE LIMITS OF WORK SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED LIMITS OF WORK SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.

6. ESC FACILITIES MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.

7. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONALITY.

8. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 24 HOURS FOLLOWING A STORM EVENT.

9. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

10. CONTRACTOR SHALL PROVIDE DUST CONTROL AS REQUIRED.

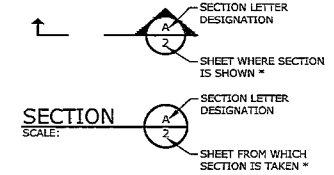
11. SEEDING SHALL BE PERFORMED NO LATER THAN SEPTEMBER 1 FOR EACH PHASE OF CONSTRUCTION. ROUGHEN AND SEED ALL DISTURBED SURFACES OUTSIDE OF CRUSHED ROCK SURFACING TOP DRESSING.

12. ESC MEASURES SHALL BE REMOVED BY THE CONTRACTOR WHEN VEGETATION IS FULLY ESTABLISHED.

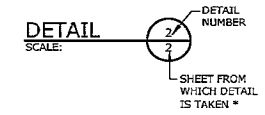
13. CONTRACTOR SHALL PROVIDE AND MAINTAIN A CONCRETE WASHOUT FACILITY.

SECTION AND DETAIL DESIGNATIONS

SECTION DESIGNATIONS



DETAIL DESIGNATIONS



* NOTE: IF PLAN AND SECTION FOR DETAIL CALL-OUT AND DETAIL ARE SHOWN ON THE SAME DRAWING, DRAWING NUMBER IS REPLACED WITH A DASH.

TOPOGRAPHIC LINEWORK LEGEND

	EXISTING	PROPOSED
WATERLINE	10"W	12"DI W
ELECTRICITY	E	E
GAS	4"G	4"G
TELEPHONE/TELEMETRY	T	T
CABLE TELEVISION	CATV	CATV
SANITARY SEWER LINE	8"SS	8"SS
SANITARY SEWER FORCE MAIN	6"FM	6"FM
STORM DRAIN	8"SD	8"SD
CULVERT		18"D
ABANDON PIPE		
DRAINAGE DITCH		
BARBWIRE FENCE		
CHAIN LINK FENCE		
SEDIMENT CONTROL LOG		
GUARDRAIL		
ROCK WALL		
TREE/BUSH LINE		
CENTERLINE		
BOULDER COUNTY SHADING		
EASEMENT/PROPERTY LINE		
RIGHT-OF-WAY		
EDGE OF PAVEMENT/AC		
EDGE OF GRAVEL		
CURB		
SIDEWALK	S/W	
STRUCTURE OR FACILITY		
CONTOUR MINOR		
CONTOUR MAJOR	200	200

TOPOGRAPHIC SYMBOL LEGEND

	EXISTING	PROPOSED
MANHOLE		
CLEAN-OUT		
CATCH BASIN/FIELD INLET		
THRUST BLOCK		
VALVE		
AIR INJECTION ASSEMBLY		
BLOW-OFF ASSEMBLY		
AIR RELEASE ASSEMBLY		
FIRE HYDRANT ASSEMBLY		
WATER METER		
PULL BOX/JUNCTION BOX		
UTILITY POLE		
GUY WIRE		
LIGHT POST		
MAILBOX		
SIGN		
BENCHMARK		
TREE DECIDUOUS		
TREE CONIFEROUS		
RESTRAINED JOINT PIPE		R
SURFACE ELEVATION	+ 176.63	+ 176.63

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LOUISVILLE, COLORADO 80027

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PROJECT # 1951

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ISSUE:

DRC review	24 june 2020
review	7 aug 2020
review	11 aug 2020
town planning	14 aug 2020
revised	14 sep 2020
50% const docs	15 dec 2020
pricing	15 jan 2021
revision 1	24 feb 2021

GENERAL NOTES AND LEGEND

C001

@	AT
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY & TRANSPORTATION OFFICIALS
AB	ANCHOR BOLT
ABAN(D)	ABANDON(ED)
ABS	ACRYLONITRILE BUTADIENE STYRENE
ABV	ABOVE / ALCOHOL BY VOLUME
AC	ASPHALTIC CONCRETE
ACP	ASPHALTIC CONCRETE PAVING
ADJ	ADJUSTABLE
ADJC	ADJACENT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHR	ANCHOR
AL	ALUMINUM
ALT	ALTERNATE
AMP	AMPERE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATE
APPVD	APPROVED
APWA	AMERICAN PUBLIC WORKS ASSOCIATION
ARCH	ARCHITECTURAL
ARV	AIR RELEASE VALVE
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASSN	ASSOCIATION
ASSY	ASSEMBLY
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS
ATM	ATMOSPHERE
AUTO	AUTOMATIC
AUX	AUXILIARY
AVE	AVENUE
AVG	AVERAGE
AWWA	AMERICAN WATER WORKS ASSOCIATION
B&S	BELL & SPIGOT
BC	BOLT CIRCLE
BD	BOARD
BETW	BETWEEN
BF	BOTH FACE
BFD	BACKFLOW PREVENTION DEVICE
BFILL	BACKFILL
BFV	BUTTERFLY VALVE
BHP	BRAKE HORSEPOWER
BKGD	BACKGROUND
BLDG	BUILDING
BLK	BLOCK
BLVD	BOULEVARD
BM	BENCHMARK / BEAM
BMP	BEST MANAGEMENT PRACTICES
BO	BLOW-OFF
BOC	BACK OF CURB
BS	BOTH SIDES
BSMT	BASEMENT
BTF	BOTTOM FACE
BTU	BRITISH THERMAL UNIT
BV	BALL VALVE
BW	BOTH WAYS
C	CELSIUS
C TO C	CENTER TO CENTER
CARV	COMBINATION AIR RELEASE VALVE
CATV	CABLE TELEVISION
CB	CATCH BASIN
CCP	CONCRETE CYLINDER PIPE
CCW	COUNTER CLOCKWISE
CDOT	COLORADO DEPARTMENT OF TRANSPORTATION
CF	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CHAN	CHANNEL
CHEM	CHEMICAL
CHFR	CHAMFER
CHKV	CHECK VALVE
CI	CAST IRON
CIP	CAST IRON PIPE
CIPC	CAST IN PLACE CONCRETE
CISP	CAST IRON SOIL PIPE
CJ	CONSTRUCTION JOINT
CL OR C/L	CENTER LINE
CL2	CHLORINE
CLG	CEILING
CLJ	CONTROL JOINT
CLR	CLEAR
CLSM	CONTROLLED LOW STRENGTH MATERIAL
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CND	CONDUIT
CO	CLEANOUT
COL	COLUMN
COMB	COMBINATION
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS / CONTINUATION
CONTR	CONTRACT(OR)
COORD	COORDINATE
COP	COPPER
CORP	CORPORATION
CORR	CORRUGATED
CP	CONTROL POINT
CPLG	COUPLING
CPVC	CHLORINATED POLYVINYL CHLORIDE
CR	CRUSHED ROCK
CS	COMBINED SEWER
CSP	CONCRETE SEWER PIPE
CT	COURT
CTR	CENTER
CU	CUBIC
CULV	CULVERT
CV	CONTROL VALVE
CW	CLOCKWISE / COLD WATER
CY	CUBIC YARDS
CYL	CYLINDER LOCK
D	DRAIN
DC	DIRECT CURRENT
DEFL	DEFLECTION
DET	DETAIL
DI	DUCTILE IRON
DIA	DIAMETER
DIM	DIMENSION
DIR	DIRECTION
DIST	DISTANCE
DN	DOWN
DR	DRIVE
DS	DOWNSPOUT
DWG	DRAWING
DWL	DOWEL
DWV	DRAIN WASTE AND VENT
DWY	DRIVEWAY
E OR ELEC	ELECTRICAL
EA	EACH
ECC	ECCENTRIC
EF	EACH FACE
EL	ELEVATION
ELB	ELBOW
ENCL	ENCLOSURE
EOP	EDGE OF PAVEMENT
EQ	EQUAL
EQL SP	EQUALLY SPACED
EQUIP	EQUIPMENT
ESMT	EASEMENT
EW	EACH WAY
EXC	EXCAVATE
EXIST	EXISTING
EXP	EXPANSION
EXP BT	EXPANSION BOLT
EXP JT	EXPANSION JOINT
EXT	EXTERIOR
F	FAHRENHEIT
F TO F	FACE TO FACE
FAB	FABRICATE
FB	FLAT BAR
FCA	FLANGED COUPLING ADAPTER
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FDN	FOUNDATION
FEXT	FIRE EXTINGUISHER
FF	FAR FACE
FGL	FIBERGLASS
FH	FIRE HYDRANT
FIN	FINISH(ED)
FIPT	FEMALE IRON PIPE THREAD
FITG	FITTING
FL	FLOOR LINE
FLEX	FLEXIBLE
FLG	FLANGE
FLL	FLOW LINE
FLR	FLOOR
FM	FORCE MAIN
FO	FIBER OPTIC
FOC	FACE OF CONCRETE
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET / FOOT
FTG	FOOTING
FUT	FUTURE
FXTR	FIXTURE
G	GAS
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GC	GROOVED COUPLING
GFA	GROOVED FLANGE ADAPTER
GI	GALVANIZED IRON
GIP	GALVANIZED IRON PIPE
GJ	GRIP JOINT
GL	GLASS
GLV	GLOBE VALVE
GND	GROUND
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPS	GALLONS PER SECOND
GR	GRADE
GR LN	GRADE LINE
GRTG	GRATING
GV	GATE VALVE
GRVL	GRAVEL
GYP	GYPSUM
HB	HOSE BIBB
HC	HOLLOW CORE
HDPE	HIGH DENSITY POLYETHYLENE
HDR	HEADER
HDWE	HARDWARE
HGR	HANGER
HGT	HEIGHT
HH	HANDHOLD
HM	HOLLOW METAL
HMAC	HOT MIX ASPHALT CONCRETE
HNDRL	HANDRAIL
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
HORIZ	HORIZONTAL
HP	HIGH PRESSURE / HORSEPOWER
HPG	HIGH PRESSURE GAS
HPT	HIGH POINT
HR	HOUR
HSB	HIGH STRENGTH BOLT
HV	HOSE VALVE
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HWL	HIGH WATER LINE
HWY	HIGHWAY
HYD	HYDRANT
HYDR	HYDRAULIC
I&C	INSTRUMENTATION & CONTROL
IAW	IN ACCORDANCE WITH
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IF	INSIDE FACE
IMPVT	IMPROVEMENT
IN	INCH
INCC	INCLUDE(D)(ING)
INFL	INFLUENT
INJ	INJECTION
INSTL	INSTALLATION / INSTALL
INSUL	INSULATION
INTER	INTERCEPTOR
INTR	INTERIOR
INV	INVERT
IP	IRON PIPE
IPT	IRON PIPE THREAD
IR	IRON ROD
IRRIG	IRRIGATION
JT	JOINT
JUNC	JUNCTION
KPL	KICK PLATE
KVA	KILOVOLT AMPERE
KW	KILOWATT
KWY	KEYWAY
L	LENGTH
LAB	LABORATORY
LAV	LAVATORY
LB	POUND
LF	LINEAR FOOT
LIN	LINEAL
LN	LANE
LOC	LOCATION
LONG	LONGITUDINAL
LP	LOW PRESSURE
LPT	LOW POINT
LRG	LARGE
LS	LONG SLEEVE / LUMP SUM
LT	LEFT
LVL	LEVEL
LWL	LOW WATER LINE
MAN	MANUAL
MAT	MATERIAL
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MCP	MASTER CONTROL PANEL
MECH	MECHANICAL
MET	METAL
MFR	MANUFACTURER
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MIN	MINIMUM
MIPT	MALE IRON PIPE THREAD
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MON	MONUMENT / MONOLITHIC
MOT	MOTOR
MP	MILEPOST
MSL	MEAN SEAL LEVEL
MTD	MOUNTED
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NF	NEAR FACE
NIC	NOT IN CONTRACT
NO / NO.	NORMALLY OPEN / NUMBER
NOM	NOMINAL
NORM	NORMAL
NRS	NON-RISING STEM
NTS	NOT TO SCALE
O TO O	OUT TO OUT
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OVERFLOW / OUTSIDE FACE
OPNG	OPENING
OPP	OPPOSITE
ORIG	ORIGINAL
OVHD	OVERHEAD
P&ID	PROCESS & INSTRUMENTATION DIAGRAM
PC	POINT OF CURVE
PCC	POINT OF COMPOUND CURVE
PCVC	POINT OF CURVATURE ON VERTICAL CURVE
PE	PLAIN END
PERF	PERFORATED
PERM	PERMANENT
PERP	PERPENDICULAR
PG	PRESSURE GAUGE
PH	PIPE HANGER
PI	POINT OF INTERSECTION
PIVC	POINT OF INTERSECTION ON VERTICAL CURVE
PL OR P/L	PROPERTY LINE / PLATE / PLASTIC
PLBG	PLUMBING
PNL	PANEL
POC	POINT OF CURVATURE
POLY	POLYETHYLENE
PP	POWER POLE
PRC	POINT OF REVERSE CURVATURE
PRCST	PRECAST
PREP	PREPARATION
PRESS	PRESSURE
PRKG	PARKING
PROP	PROPERTY / PROPOSED
PRV	PRESSURE REDUCING VALVE
PS	PUMP STATION
PSIG	POUNDS PER SQUARE INCH GAUGE
PSL	PIPE SLEEVE
PSPT	PIPE SUPPORT
PT	POINT OF TANGENCY
PTVC	POINT OF TANGENCY ON VERTICAL CURVE
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PWR	POWER
QTY	QUANTITY
RAD	RADIUS
RC	REINFORCED CONCRETE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD / ROOF DRAIN
RDCR	REDUCER
REF	REFERENCE
REINF	REINFORCE(D)(ING)(MENT)
REQ'D	REQUIRED
RESTR	RESTRAINED
RFCA	RESTRAINED FLANGE COUPLING ADAPTER
RM	ROOM
RND	ROUND
RO	ROUGH OPENING
R/W	RIGHT-OF-WAY
RPBPD	REDUCED PRESSURE BACKFLOW PREVENTION DEVICE
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RST	REINFORCED STEEL
RT	RIGHT
SALV	SALVAGE
SAN	SANITARY
SC	SOLID CORE
SCHED	SCHEDULE
SD	STORM DRAIN
SDL	SADDLE
SDR	STANDARD DIMENSION RATIO
SECT	SECTION
SHLDR	SHOULDER
SHT	SHEET
SIM	SIMILAR
SLP	SLOPE
SLV	SLEEVE
SOLN	SOLUTION
SP	SOIL PIPE / SEWER PIPE
SPCL	SPECIAL
SPEC(S)	SPECIFICATION(S)
SPG	SPACING
SPL	SPOOL
SPRT	SUPPORT
SQ	SQUARE
SQ FT	SQUARE FOOT
SQ IN	SQUARE INCH
SQ YD	SQUARE YARD
SS	SANITARY SEWER
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STL	STEEL
STOR	STORAGE
STR	STRAIGHT
STRUCT	STRUCTURE / STRUCTURAL
SUBMG	SUBMERGED
SUCT	SUCTION
SV	SOLENOID VALVE
S/W	SIDEWALK
SWD	SIDEWATER DEPTH
SWGR	SWITCH GEAR
SYMM	SYMMETRICAL
SYS	SYSTEM
T OR TEL	TELEPHONE
T&B	TOP & BOTTOM
TAN	TANGENCY
TB	THRUST BLOCK
TBM	TEMPORARY BENCHMARK
TC	TOP OF CONCRETE / TOP OF CURB
TCE	TEMPORARY CONSTRUCTION EASEMENT
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE / TEMPORARY
T&G	TONGUE & GROOVE
THK	THICK / THICKNESS
THRD	THREAD (ED)
THRU	THROUGH
TP	TEST PIT / TOP OF PAVEMENT / TURNING POINT
TRANS	TRANSITION
TSP	TRI-SODIUM PHOSPHATE
TST	TOP OF STEEL
TW	TOP OF WALL
TYP	TYPICAL
UG	UNDERGROUND
UH	UNIT HEATER
UN	UNION
UON	UNLESS OTHERWISE NOTED
USGS	UNITED STATES GEOLOGIC SURVEY
V	VENT / VOLT
VAC	VACUUM
VB	VACUUM BREAKER
VBOX	VALVE BOX
VC	VERTICAL CURVE
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
VOL	VOLUME
VCP	VITRIFIED CLAY PIPE
VTR	VENT THROUGH ROOF
W	WATER
W/	WITH
W/IN	WITHIN
W/O	WITHOUT
W/W	WALL TO WALL
WD	WOOD
WF	WIDE FLANGE
WH	WATER HEATER
WI	WROUGHT IRON
WM	WATER METER
WP	WORKING POINT / WATERPROOFING
WS	WATER SERVICE
WT	WEIGHT
WTP	WATER TREATMENT PLANT
WTRT	WATERTIGHT
WWF	WELDED WIRE FABRIC
WWTF	WASTEWATER TREATMENT FACILITY
WWTP	WASTEWATER TREATMENT PLANT
X SECT	CROSS SECTION
XFMR	TRANSFORMER
YD	YARD DRAIN / YARD
YH	YARD HYDRANT
YR	YEAR
ZN	ZINC

1

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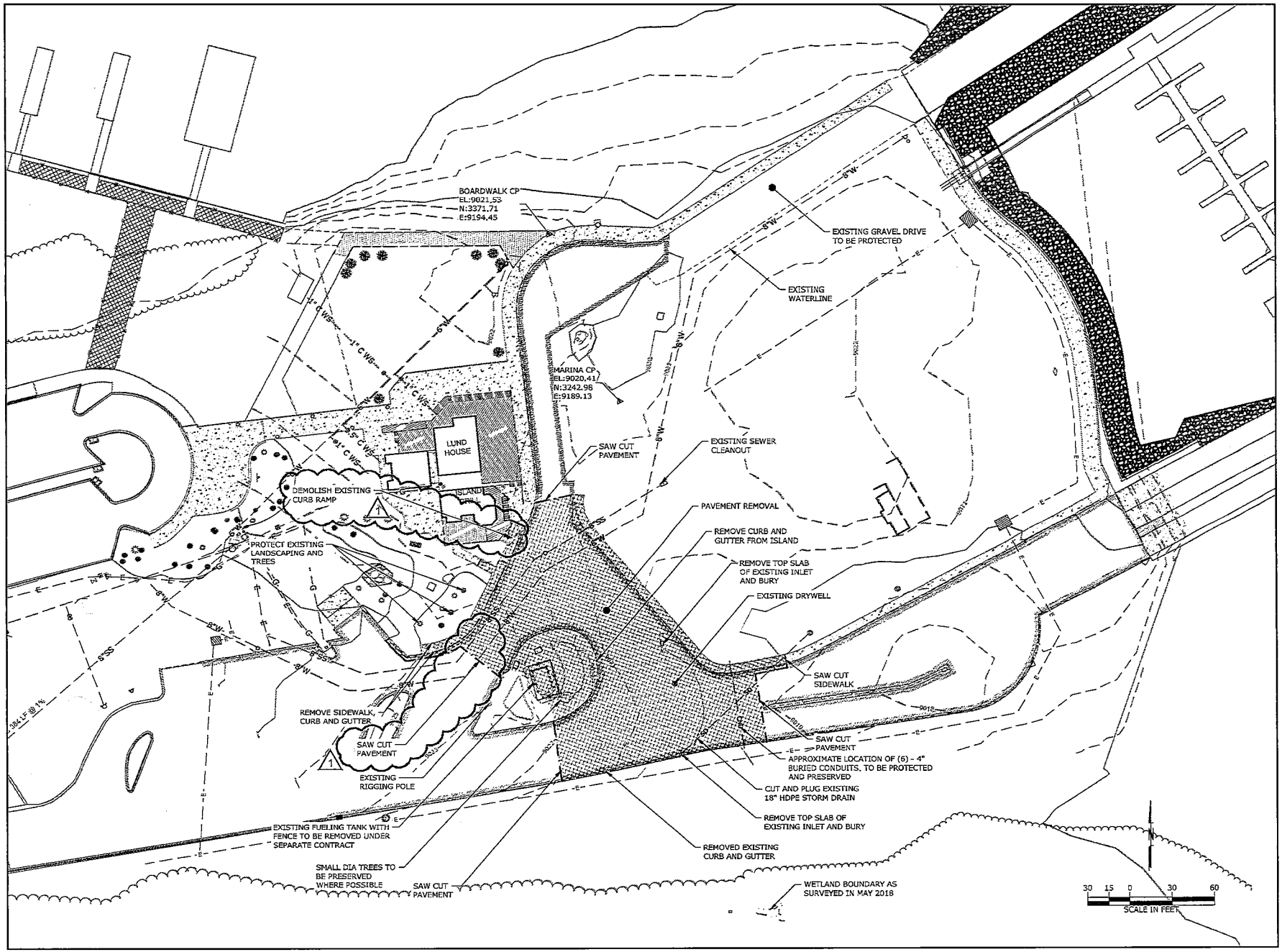
ABBREVIATIONS

C002



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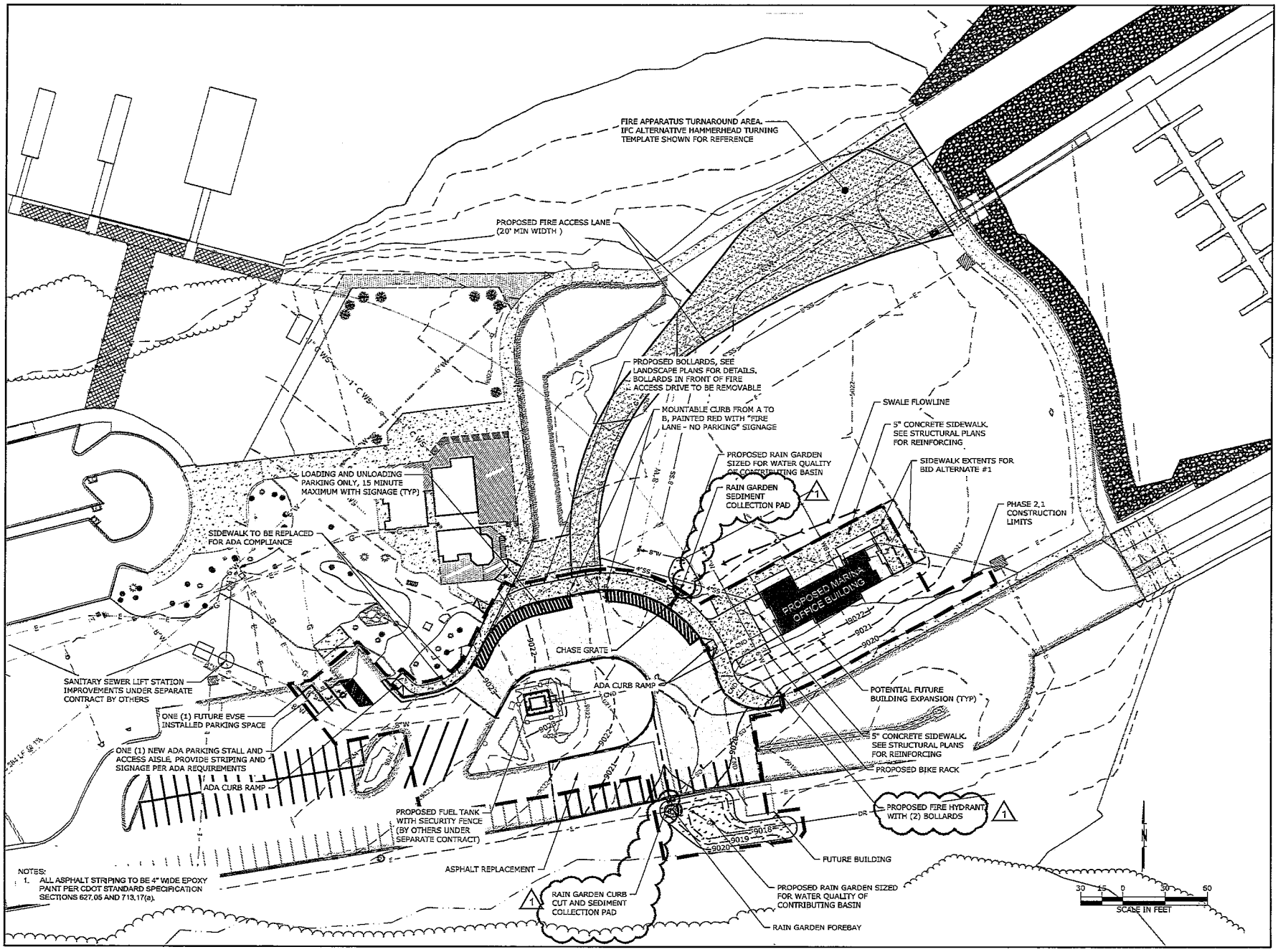
EXISTING CONDITIONS AND DEMO

C100



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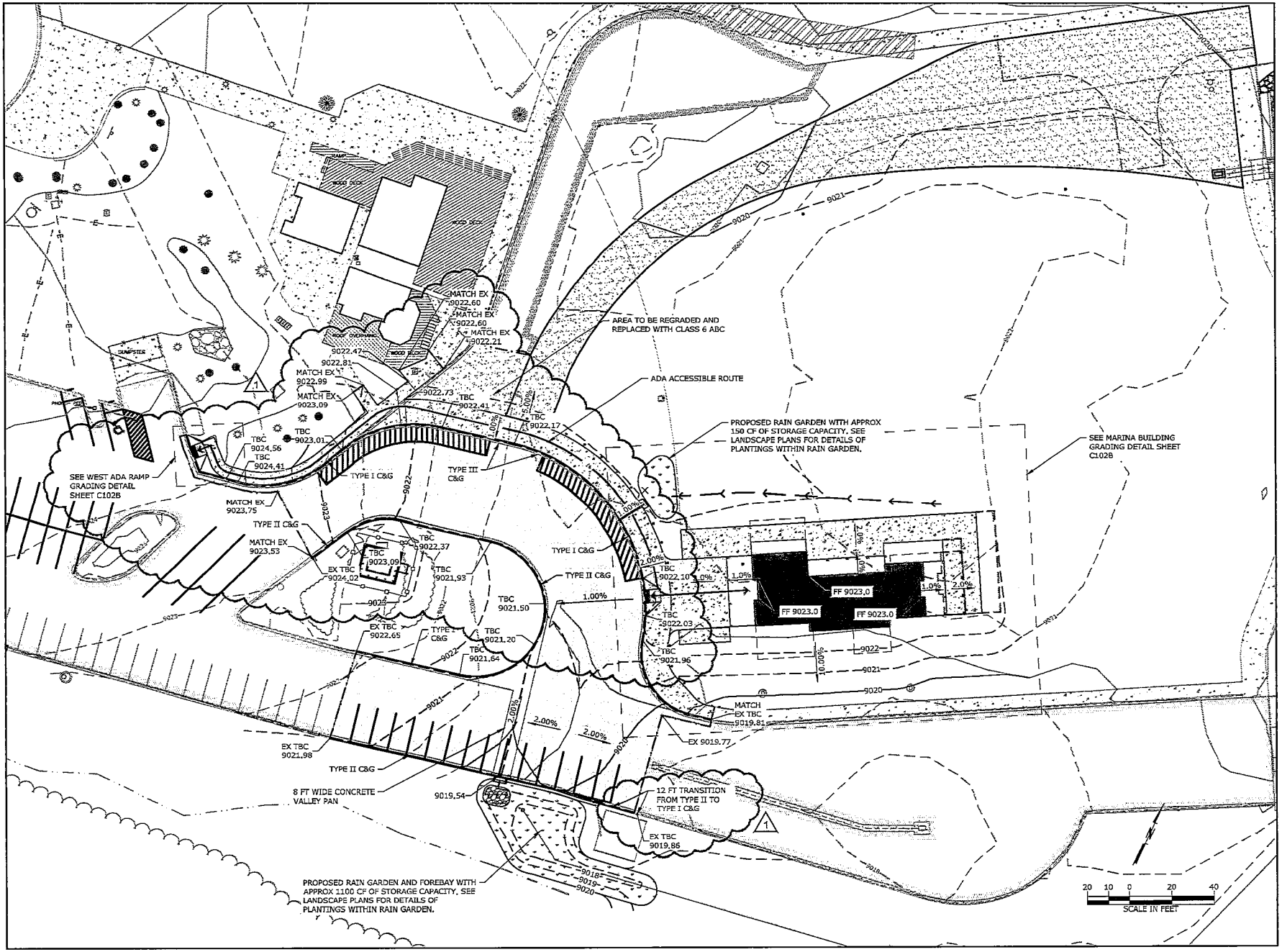
CIVIL SITE PLAN

C101



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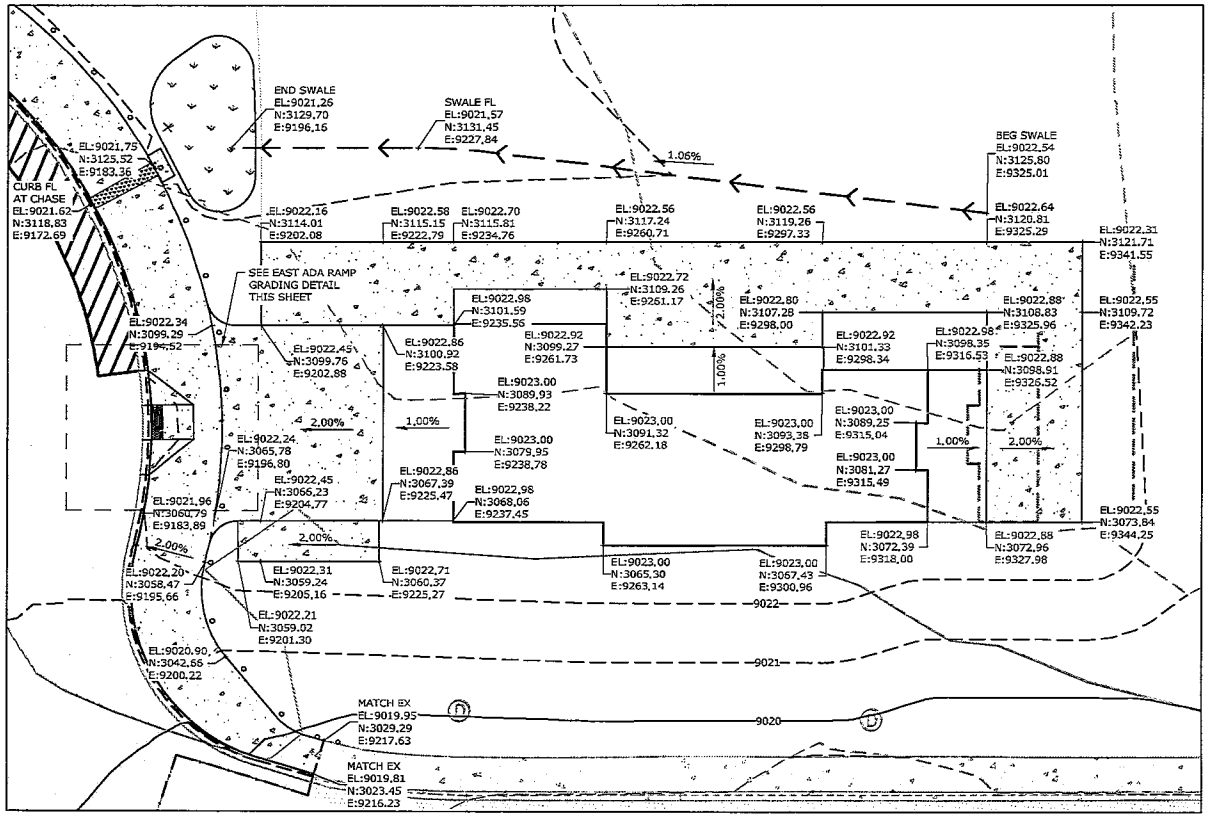
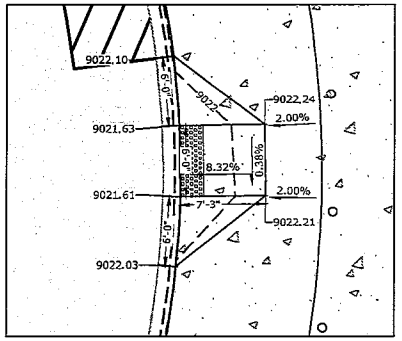
GRADING PLAN

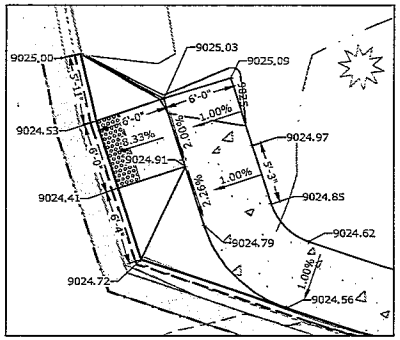
C102



MARINA BUILDING GRADING (1 / C102)
SCALE: 1" = 10'



EAST ADA RAMP GRADING (2 / C102)
SCALE: 1" = 5'



WEST ADA RAMP GRADING (3 / C102)
SCALE: 1" = 5'

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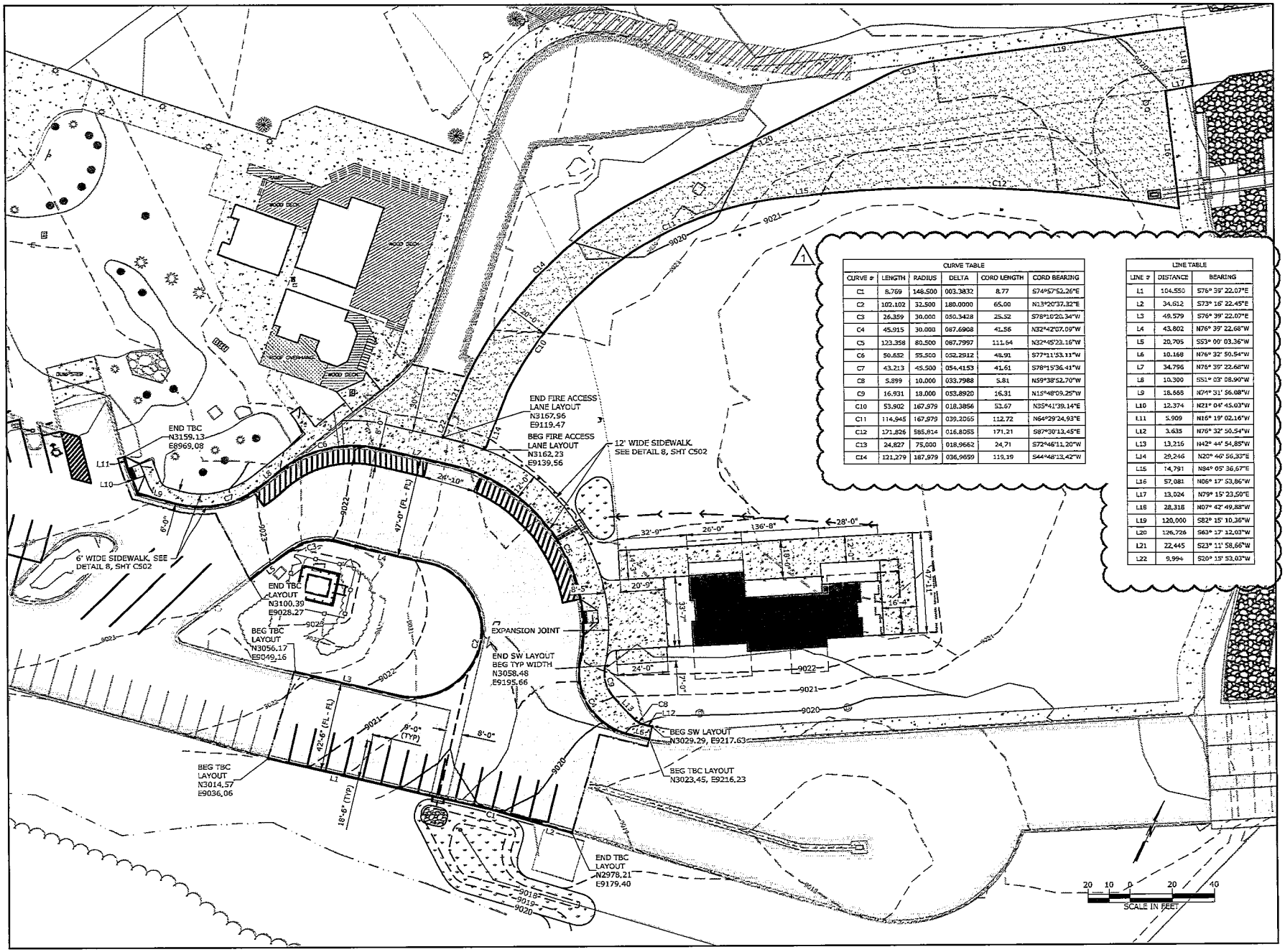
GRADING DETAILS (1)

C102A



1

CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CORD LENGTH	CORD BEARING
C1	8.769	146.500	003.3832	8.77	S74°57'52.26"E
C2	102.102	32.500	180.0000	65.00	N13°20'37.32"E
C3	26.359	30.000	050.3428	25.52	S78°10'20.34"W
C4	45.915	30.000	087.6908	41.56	N32°42'07.09"W
C5	123.358	80.500	087.7997	111.64	N32°45'23.16"W
C6	50.652	55.500	052.2912	48.91	S77°11'53.13"W
C7	43.213	45.500	054.4153	41.61	S78°15'36.41"W
C8	5.899	10.000	033.7988	5.81	N59°38'52.70"W
C9	16.931	18.000	053.8920	16.31	N15°48'09.25"W
C10	53.902	167.979	018.3856	53.67	N35°41'38.14"E
C11	114.945	167.979	039.2065	112.72	N64°29'24.93"E
C12	171.826	585.814	016.8055	171.21	S87°30'13.45"E
C13	24.827	75.000	018.9662	24.71	S72°46'11.20"W
C14	121.279	187.979	036.9659	119.19	S44°48'13.42"W

LINE TABLE		
LINE #	DISTANCE	BEARING
L1	104.550	S76° 39' 22.07"E
L2	34.612	S73° 16' 22.45"E
L3	48.579	S76° 39' 22.07"E
L4	43.802	N76° 39' 22.68"W
L5	20.705	S53° 00' 03.36"W
L6	10.168	N76° 32' 50.54"W
L7	34.796	N76° 39' 22.68"W
L8	10.300	S51° 03' 08.90"W
L9	18.565	N71° 31' 56.08"W
L10	12.374	N21° 04' 45.03"W
L11	5.909	N16° 19' 02.16"W
L12	3.635	N76° 32' 50.54"W
L13	13.216	N42° 44' 54.85"W
L14	29.246	N20° 46' 56.33"E
L15	14.791	N84° 05' 36.67"E
L16	57.081	N06° 17' 53.86"W
L17	13.024	N79° 15' 23.50"E
L18	28.318	N07° 42' 49.88"W
L19	120.000	S82° 15' 10.36"W
L20	126.726	S63° 17' 12.03"W
L21	22.445	S23° 11' 58.66"W
L22	9.994	S20° 15' 53.03"W

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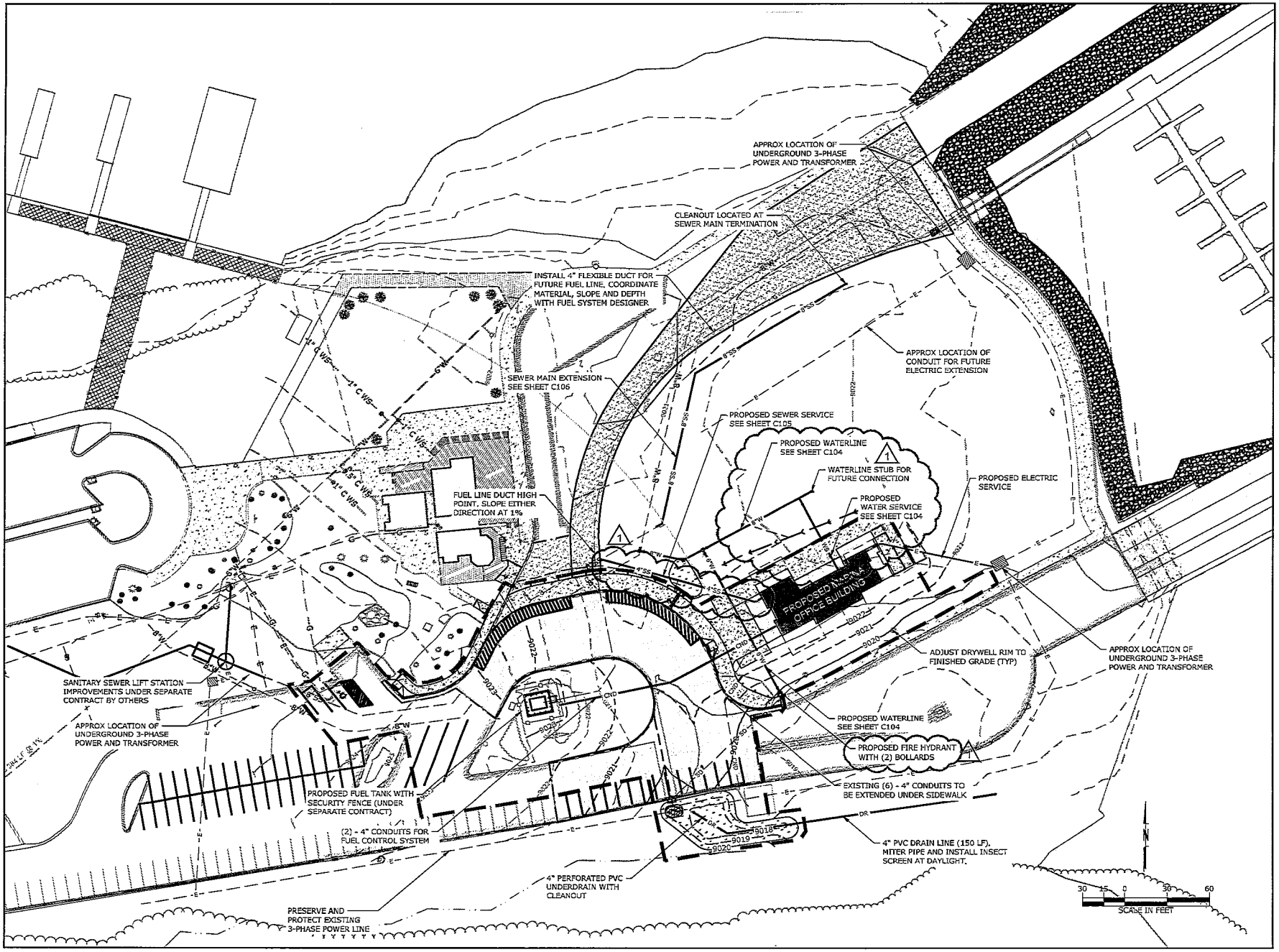
LAYOUT PLAN

C103



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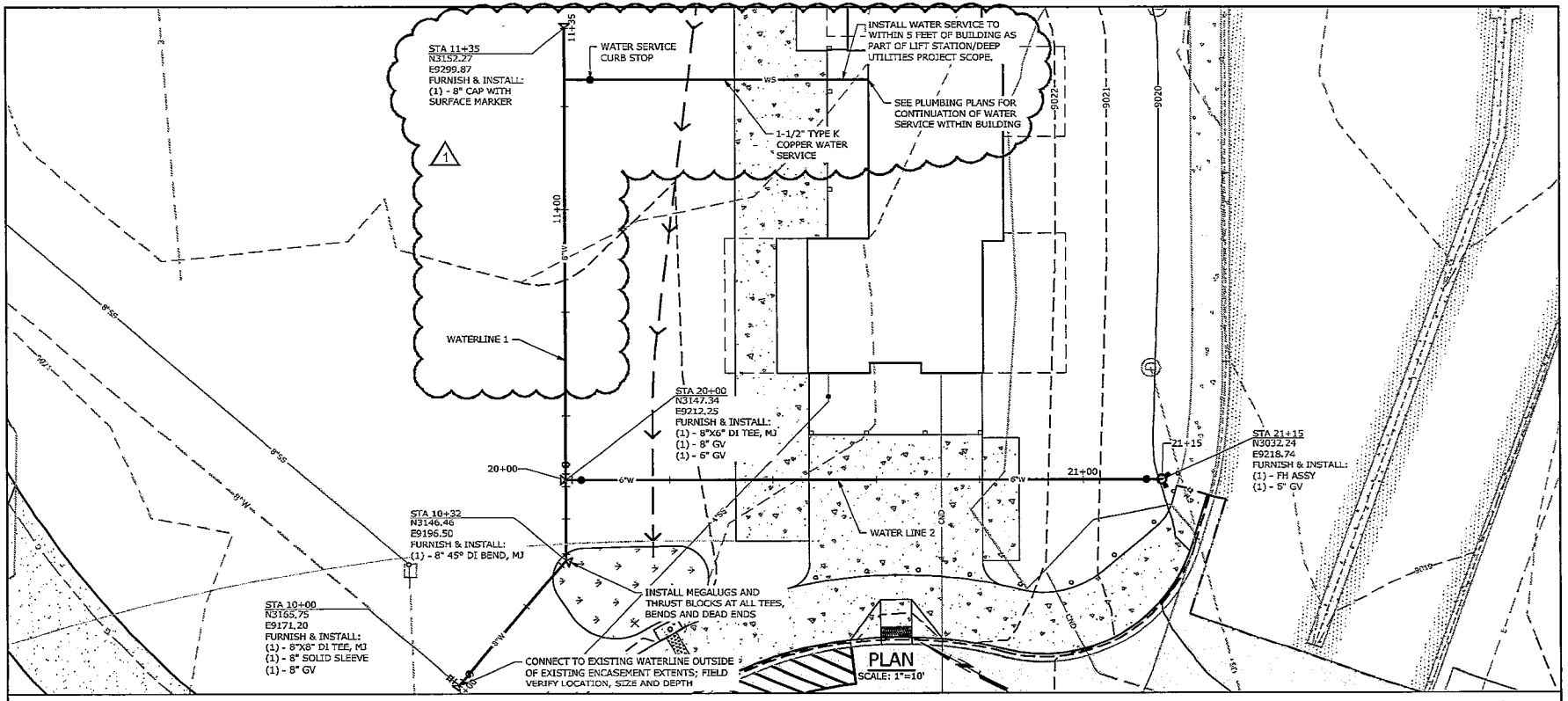
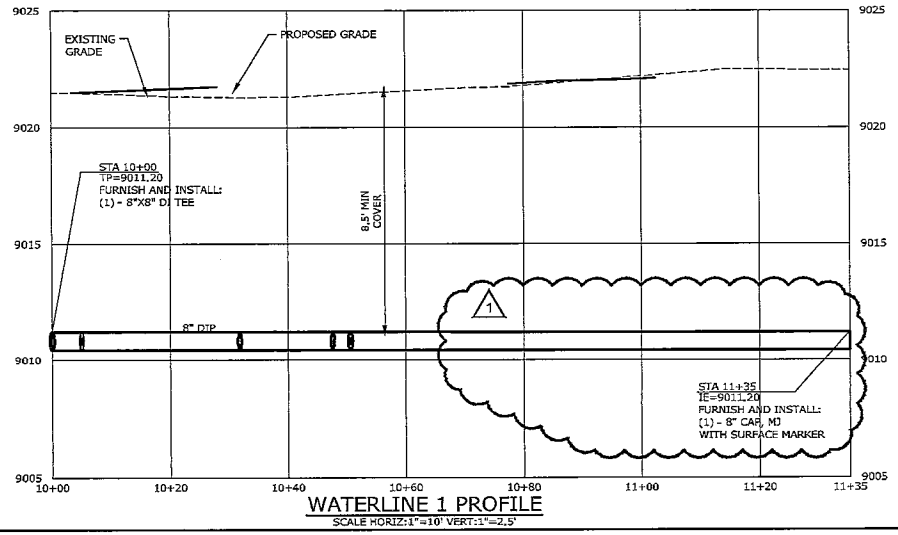
OVERALL UTILITY PLAN

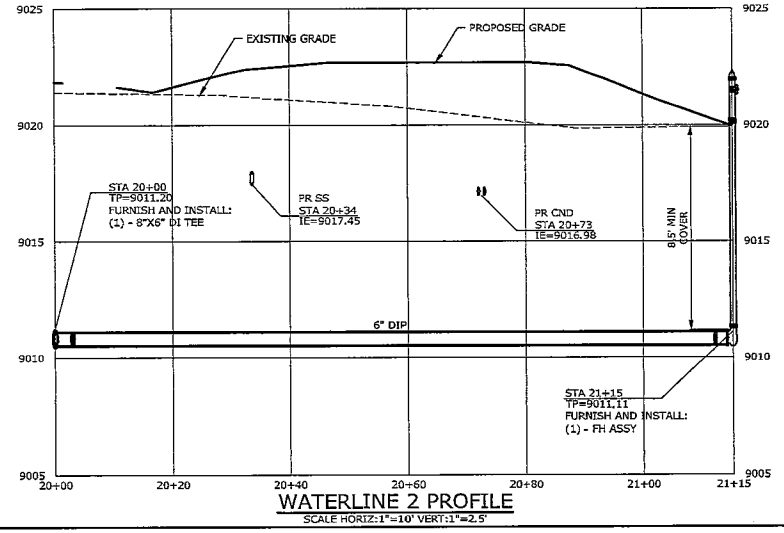
C104





WATERLINE 1 PROFILE

SCALE HORIZ:1"=10' VERT:1"=2.5'



WATERLINE 2 PROFILE

SCALE HORIZ:1"=10' VERT:1"=2.5'

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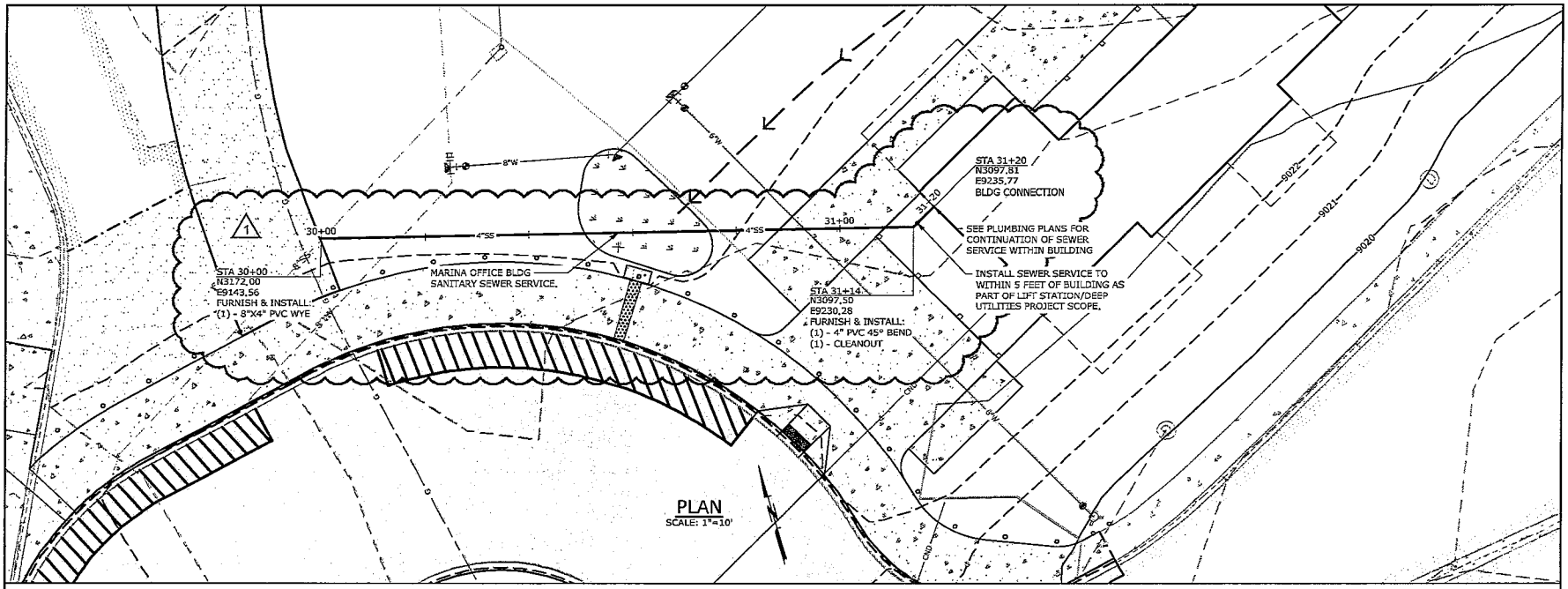
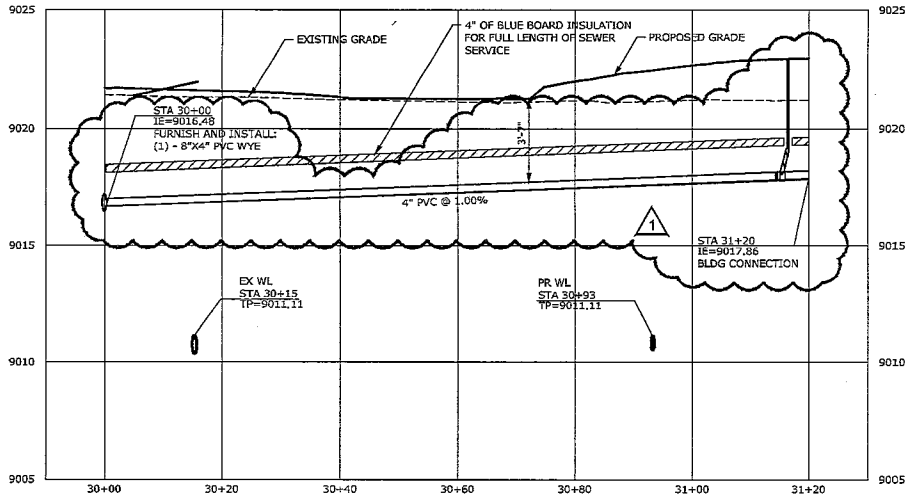
WATERLINE P&P

C105



PLAN
SCALE: 1"=10'



SEWER SERVICE PROFILE
SCALE HORIZ:1"=10' VERT:1"=2.5'

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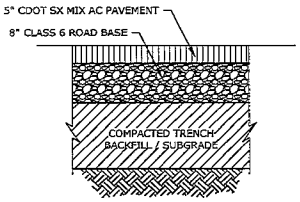
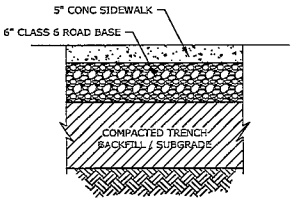
SEWER SERVICE P&P

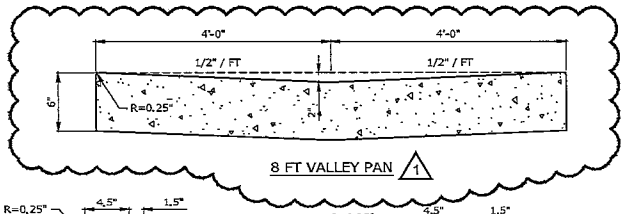
C106



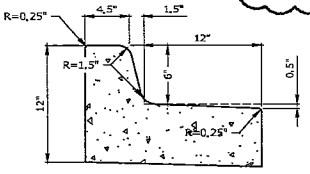
PAVEMENT SECTION 7
SCALE: NTS



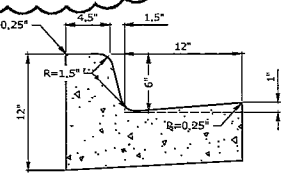
SIDEWALK SECTION 8
SCALE: NTS



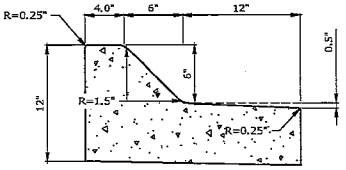
8 FT VALLEY PAN 1



C&G TYPE I - SPILL

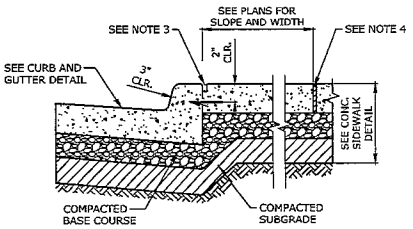


C&G TYPE II - CATCH

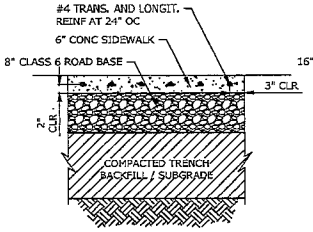


C&G TYPE III - MOUNTABLE SPILL

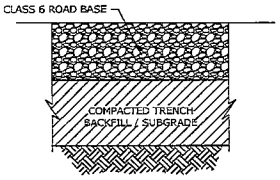
NOTES:
1. CONCRETE FOR CURB AND GUTTER SHALL BE CDOT CLASS B
2. SEE ATTACHED SIDEWALK DETAIL FOR JOINT REQUIREMENTS AGAINST SIDEWALK



NOTES:
1. FOR CONCRETE REINFORCEMENT, SEE SPECIFICATIONS.
2. FOR CURB & GUTTER DIMENSIONS, SEE DETAIL, THIS SHEET
3. A TOOLED JOINT IS REQUIRED. ADD 12" #4 DOWEL, 5' O.C. IF NOT POURED MONOLITHICALLY.
4. EXPANSION JOINTS SHALL BE INSTALLED WHEN ABUTTING EXISTING CONCRETE OR FIXED STRUCTURES. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK AND SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE



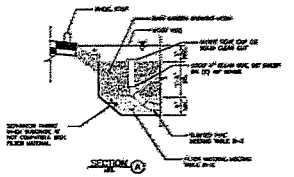
FIRE ACCESS CONC SECTION 9
SCALE: NTS



FIRE ACCESS ROAD BASE SECTION 10
SCALE: NTS

CURB AND GUTTER 11
SCALE: NTS

ATTACHED SIDEWALK 12
SCALE: NTS



PARTIAL INFILTRATION SECTIONS

Table 10.2. Gradation Specifications for CDOT Class C Filter Material (Source: CDOT Table 703-7)

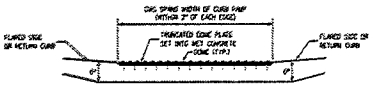
Sieve Size	Mass Percent Passing Square Mesh Sieves
1 1/2 inch (2x2")	100
4.75 mm (No. 4)	80 - 100
600 µm (No. 30)	30 - 70
150 µm (No. 100)	0 - 10
75 µm (No. 200)	0 - 5

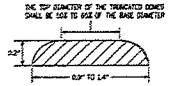
Table 10.3. Dimensions for Slotted Pipe

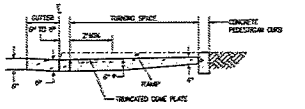
Pipe Diameter	Slot Length	Minimum Slot Width	Slot Centers	Open Area (per foot)
4"	1-1/16"	0.032"	0.422"	1.90 in²
6"	1-3/8"	0.032"	0.516"	1.98 in²

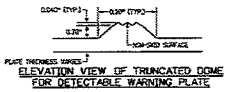
* Some variations in slot width is acceptable and is expected from various pipe manufacturers. Be aware that both increased slot length and increased slot width will be beneficial to hydraulics but detrimental to the structure of the pipe.

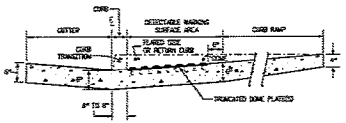
RAIN GARDEN SECTIONS 13
SCALE: NTS

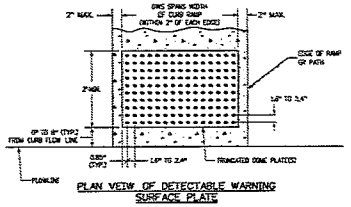












DETECTABLE WARNING SURFACE DETAILS 14
SCALE: NTS

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frisco , colorado
PROJECT # 1961

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ISSUE:

DRC review	24 june 2020
review	7 aug 2020
review	11 aug 2020
town planning	14 aug 2020
revised	14 sep 2020
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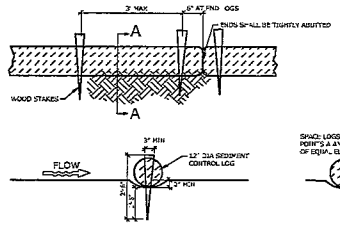
pricing	15 jan 2021
revision 1	24 feb 2021

CIVIL DETAILS - 2

C502



SECTION A-A

SEDIMENT CONTROL LOG MAINTENANCE NOTES:

1. THE SEDIMENT CONTROL LOGS SHALL BE INSPECTED DAILY, DURING AND AFTER ANY STORM EVENT, AND REPAIRED OR HAVE ANY UPSTREAM SEDIMENT REMOVED.

2. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOGS SHALL BE REMOVED WHEN THE UPSTREAM SEDIMENT DEPTH IS WITHIN 1/2 THE HEIGHT OF THE CREST OF LOG.

3. ALL SEDIMENT CONTROL LOGS SHALL BE REMOVED AT THE END OF CONSTRUCTION. IF ANY DISTURBED AREA EXISTS AFTER REMOVAL, IT SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE ACCEPTABLY STABILIZED.

SEDIMENT CONTROL LOG INSTALLATION NOTES:

1. SEE PLAN VIEW FOR LOCATION AND EXTENT OF SEDIMENT CONTROL LOGS.

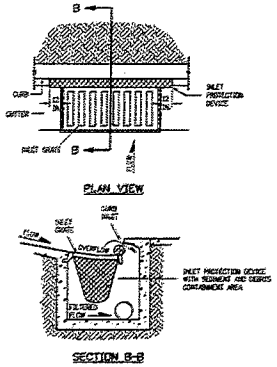
2. SEDIMENT CONTROL LOGS SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES AND AS REQUIRED DURING CONSTRUCTION.

3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR, OR COCONUT FIBER.

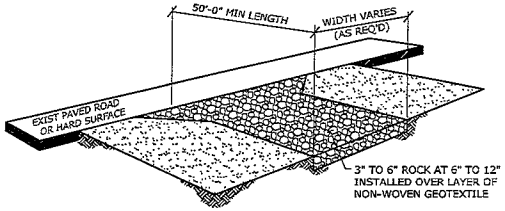
4. NOT FOR USE IN CONCENTRATED FLOW AREAS.

5. THE SEDIMENT CONTROL LOG SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 2".

SEDIMENT CONTROL LOGS 15
SCALE: NTS



STORM DRAIN INLET PROTECTION 16
SCALE: NTS



NOTES:

1. VEHICLE TRACKING CONTROL PADS SHALL BE INSTALLED AT ALL INGRESS/EGRESS POINTS WHERE VEHICULAR ACCESS TRANSITIONS FROM PAVED SURFACES TO DISTURBED SURFACES.

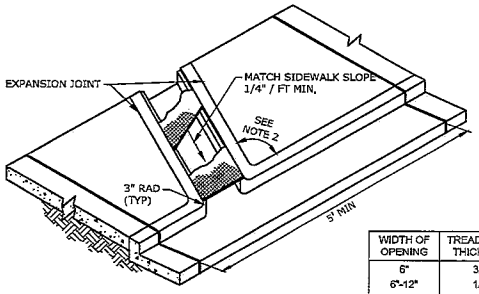
2. THE VTC PAD SHALL CONSIST OF HARD, ANGULAR, DENSE, AND DURABLE STONE. ROUNDED STONE, BOULDERS, RECYCLED ASPHALT, AND RECYCLED CONCRETE ARE NOT ACCEPTABLE.

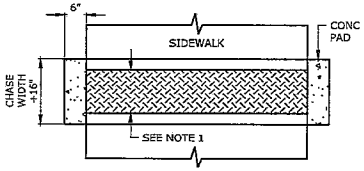
3. ANY CRACKED OR DAMAGED CURB AND/OR GUTTER SHALL BE REPLACED BY THE CONTRACTOR.

4.PAD WILL BE REPAIRED AND REFRESHED AS NEEDED TO MAINTAIN FUNCTION AND INTEGRITY.

5. VTC PADS SHALL BE INSTALLED AT ALL CONCRETE WASHOUT AREAS AND AT STABILIZED STAGING/STORAGE AREAS.

VEHICLE TRACKING CONTROL 17
SCALE: NTS

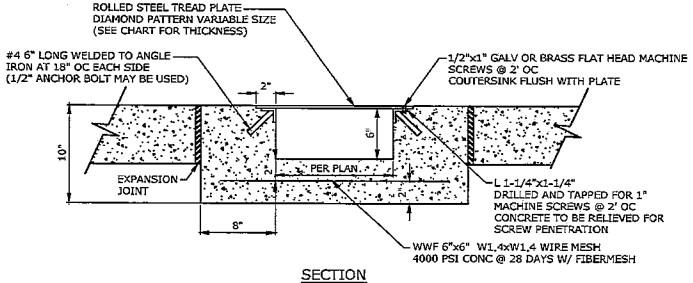




WIDTH OF OPENING	TREAD PLATE THICKNESS
6"	3/8"
6"-12"	1/2"
12"-24"	9/16"
18"-24"	5/8"

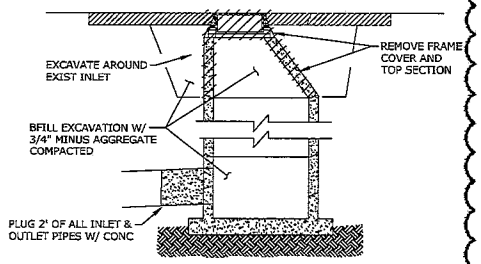
NOTES:

1. WIDTH AS NOTED ON PLANS
2. 90° UNLESS OTHERWISE SPECIFIED
3. DIMENSIONS TO BE INCLUDED IN DETAILED CONSTRUCTION PLANS

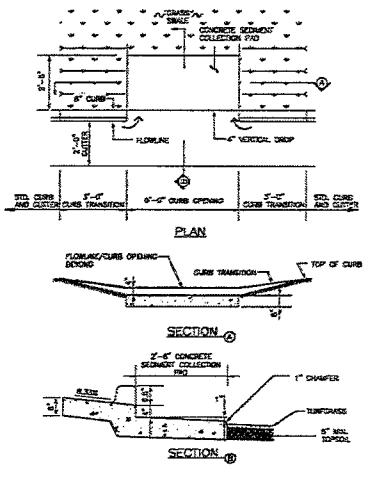


SECTION

SIDEWALK CHASE 18
SCALE: NTS



EXISTING INLET ABANDONMENT 19
SCALE: NTS



1 RAIN GARDEN CURB CUT 20
SCALE: NTS

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PROJECT # 1951

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ISSUE:

DRC review	24 June 2020
review	7 aug 2020
review	11 aug 2020
town planning	14 aug 2020
revised	14 sep 2020
50% const docs	15 dec 2020
pricing	15 jan 2021
revision 1	24 feb 2021

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GENERAL NOTES

1. THESE PLANS SHALL NOT BE UTILIZED FOR CONSTRUCTION OR PERMITTING UNLESS STATED FOR SUCH USE IN THE TITLE BLOCK.
2. DRAWINGS ARE INTENDED TO BE PRINTED ON 24" X 36" PAPER. PRINTING THESE DRAWINGS AT A DIFFERENT SIZE WILL IMPACT THE SCALE. VERIFY THE GRAPHIC SCALE BEFORE REFERENCING ANY MEASUREMENTS ON THESE SHEETS. THE RECIPIENT OF THESE DRAWINGS SHALL BE RESPONSIBLE FOR ANY ERRORS RESULTING FROM INCORRECT PRINTING, COPYING, OR ANY OTHER CHANGES THAT ALTER THE SCALE OF THE DRAWINGS.
3. VERIFY ALL PLAN DIMENSIONS PRIOR TO START OF CONSTRUCTION. NOTIFY THE OWNER'S REPRESENTATIVE TO ADDRESS ANY QUESTIONS OR CLARIFY ANY DISCREPANCIES.
4. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS.
5. SUBMIT A CHANGE ORDER FOR APPROVAL FOR ANY CHANGES TO WORK SCOPE RESULTING FROM FIELD CONDITIONS OR DIRECTION BY OWNER'S REPRESENTATIVE WHICH REQUIRE ADDITIONAL COST TO THE OWNER PRIOR TO PERFORMANCE OF WORK.
6. THE CONTRACTOR SHALL PROVIDE A STAKED LAYOUT OF ALL SITE IMPROVEMENTS FOR INSPECTION BY THE OWNER'S REPRESENTATIVE AND MAKE MODIFICATIONS AS REQUIRED. ALL LAYOUT INFORMATION IS AVAILABLE IN DIGITAL FORMAT FOR USE BY THE CONTRACTOR.
7. IF A GEOTECHNICAL SOILS REPORT IS NOT AVAILABLE AT THE TIME OF CONSTRUCTION, NORRIS DESIGN RECOMMENDS A REPORT BE AUTHORIZED BY THE OWNER AND THAT ALL RECOMMENDATIONS OF THE REPORT ARE FOLLOWED DURING CONSTRUCTION. THE CONTRACTOR SHALL USE THESE CONTRACT DOCUMENTS AS A BASIS FOR THE BID. IF THE OWNER ELECTS TO PROVIDE A GEOTECHNICAL REPORT, THE CONTRACTOR SHALL REVIEW THE REPORT AND SUBMIT AN APPROPRIATE CHANGE ORDER TO THE OWNER'S REPRESENTATIVE IF ADDITIONAL COSTS ARE REQUESTED.
8. CONTRACTOR SHALL CONFIRM THAT SITE CONDITIONS ARE SIMILAR TO THE PLANS, WITHIN TOLERANCES STATED IN THE CONTRACT DOCUMENTS, AND SATISFACTORY TO THE CONTRACTOR PRIOR TO START OF WORK. SHOULD SITE CONDITIONS BE DIFFERENT THAN REPRESENTED ON THE PLANS OR UNSATISFACTORY TO THE CONTRACTOR, THE CONTRACTOR SHALL CONTACT THE OWNER'S REPRESENTATIVE FOR CLARIFICATION AND FURTHER DIRECTION.
9. CONTRACTOR IS RESPONSIBLE TO PAY FOR, AND OBTAIN, ANY REQUIRED APPLICATIONS, PERMITTING, LICENSES, INSPECTIONS AND METERS ASSOCIATED WITH WORK.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO ANY VIOLATIONS OR NON-CONFORMANCE WITH THE PLANS, SPECIFICATIONS, CONTRACT DOCUMENTS, JURISDICTIONAL CODES, AND REGULATORY AGENCIES.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION OF ALL UTILITY LOCATES PRIOR TO ANY EXCAVATION. REFER TO ENGINEERING UTILITY PLANS FOR ALL PROPOSED UTILITY LOCATIONS AND DETAILS. NOTIFY OWNER'S REPRESENTATIVE IF EXISTING OR PROPOSED UTILITIES INTERFERE WITH THE ABILITY TO PERFORM WORK.
12. UNLESS IDENTIFIED ON THE PLANS FOR DEMOLITION OR REMOVAL, THE CONTRACTOR IS RESPONSIBLE FOR THE COST TO REPAIR UTILITIES, ADJACENT OR EXISTING LANDSCAPE, ADJACENT OR EXISTING PAVING, OR ANY PUBLIC AND PRIVATE PROPERTY THAT IS DAMAGED BY THE CONTRACTOR OR THEIR SUBCONTRACTOR'S OPERATIONS DURING INSTALLATION. ESTABLISHMENT OR DURING THE SPECIFIED MAINTENANCE PERIOD. ALL DAMAGES SHALL BE REPAIRED TO PRE-CONSTRUCTION CONDITIONS AS DETERMINED BY THE OWNER'S REPRESENTATIVE. CONTRACTOR SHALL BE RESPONSIBLE FOR LOGGING ANY DAMAGES PRIOR TO START OF CONSTRUCTION AND DURING THE CONTRACT PERIOD.
13. ALL WORK SHALL BE CONFINED TO THE AREA WITHIN THE CONSTRUCTION LIMITS AS SHOWN ON THE PLANS. ANY AREAS OR IMPROVEMENTS DISTURBED OUTSIDE THESE LIMITS SHALL BE RETURNED TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE. IN THE EVENT THE CONTRACTOR REQUIRES A MODIFICATION TO THE CONSTRUCTION LIMITS, WRITTEN PERMISSION MUST BE OBTAINED FROM THE OWNER'S REPRESENTATIVE PRIOR TO ANY DISTURBANCE OUTSIDE OF THE LIMITS OF WORK.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ANY OF THEIR TRENCHES OR EXCAVATIONS THAT SETTLE.
15. THE CONTRACTOR SHALL BE RESPONSIBLE TO PREPARE AND SUBMIT A TRAFFIC CONTROL PLAN TO THE APPROPRIATE JURISDICTIONAL AGENCIES AND THE OWNER'S REPRESENTATIVE IF THEIR WORK AND OPERATIONS AFFECT OR IMPACT THE PUBLIC RIGHTS-OF-WAY. OBTAIN APPROVAL PRIOR TO ANY WORK WHICH AFFECTS OR IMPACTS THE PUBLIC RIGHTS-OF-WAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO THIS REQUIREMENT DURING THE CONTRACT PERIOD.
16. SIGHT TRIANGLES AND SIGHT LINES SHALL REMAIN UNOBSTRUCTED BY EQUIPMENT, CONSTRUCTION MATERIALS, PLANT MATERIAL OR ANY OTHER VISUAL OBSTACLE DURING THE CONTRACT PERIOD AND AT MATURITY OF PLANTS PER LOCAL JURISDICTIONAL REQUIREMENTS. NO PLANT MATERIAL OTHER THAN GROUND COVER IS ALLOWED TO BE PLANTED ADJACENT TO FIRE HYDRANTS AS STIPULATED BY JURISDICTIONAL REQUIREMENTS.
17. COORDINATE SITE ACCESS, STAGING, STORAGE AND CLEANOUT AREAS WITH OWNER'S REPRESENTATIVE.
18. CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY SAFETY FENCING AND BARRIERS AROUND ALL IMPROVEMENTS SUCH AS WALLS, PLAY STRUCTURES, EXCAVATIONS, ETC. ASSOCIATED WITH THEIR WORK UNTIL SUCH FACILITIES ARE COMPLETELY INSTALLED PER THE PLANS, SPECIFICATIONS AND MANUFACTURER'S RECOMMENDATIONS.
19. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF THEIR MATERIAL STOCK PILES AND WORK FROM VANDALISM, EROSION OR UNINTENDED DISTURBANCE DURING THE CONSTRUCTION PERIOD AND UNTIL FINAL ACCEPTANCE IS ISSUED.
20. THE CONTRACTOR SHALL KNOW, UNDERSTAND AND ABIDE BY ANY STORM WATER POLLUTION PREVENTION PLAN (SWPPP) ASSOCIATED WITH THE SITE. IF A STORM WATER POLLUTION PREVENTION PLAN IS NOT PROVIDED BY THE OWNER'S REPRESENTATIVE, REQUEST A COPY BEFORE PERFORMANCE OF ANY SITE WORK.
21. MAINTAIN ANY STORM WATER MANAGEMENT FACILITIES THAT EXIST ON SITE FOR FULL FUNCTIONALITY. THE CONTRACTOR SHALL INSTALL AND MAINTAIN ANY NEW STORM WATER MANAGEMENT FACILITIES THAT ARE IDENTIFIED IN THE SCOPE OF WORK TO FULL FUNCTIONALITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER FOR FAILURE TO MAINTAIN STORM WATER MANAGEMENT FACILITIES DURING THE CONTRACT PERIOD.
22. THE CONTRACTOR SHALL PREVENT SEDIMENT, DEBRIS AND ALL OTHER POLLUTANTS FROM EXITING THE SITE OR ENTERING THE STORM SEWER SYSTEM DURING ALL DEMOLITION OR CONSTRUCTION OPERATIONS THAT ARE PART OF THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO THESE REQUIREMENTS DURING THEIR CONTRACTED COURSE OF WORK.
23. THE CONTRACTOR SHALL BE RESPONSIBLE TO PREVENT ANY IMPACTS TO ADJACENT WATERWAYS, WETLANDS, OR OTHER ENVIRONMENTALLY SENSITIVE AREAS RESULTING FROM WORK DONE AS PART OF THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO THESE STANDARDS DURING THEIR CONTRACTED COURSE OF WORK.
24. THE CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL ENSURE THAT ALL LOADS OF CONSTRUCTION MATERIAL IMPORTED TO OR EXPORTED FROM THE PROJECT SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF MATERIAL DURING TRANSPORT. TRANSPORTATION METHODS ON PUBLIC RIGHT-OF WAYS SHALL CONFORM TO JURISDICTIONAL REQUIREMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO THESE REQUIREMENTS.
25. THE CLEANING OF EQUIPMENT IS PROHIBITED AT THE JOB SITE UNLESS AUTHORIZED BY THE OWNER'S REPRESENTATIVE IN A DESIGNATED AREA. THE DISCHARGE OF WATER, WASTE CONCRETE, POLLUTANTS, OR OTHER MATERIALS SHALL ONLY OCCUR IN AREAS DESIGNED FOR SUCH USE AND APPROVED BY THE OWNER'S REPRESENTATIVE.
26. THE CLEANING OF CONCRETE EQUIPMENT IS PROHIBITED AT THE JOB SITE EXCEPT IN DESIGNATED CONCRETE WASHOUT AREAS. THE DISCHARGE OF WATER CONTAINING WASTE CONCRETE IN THE STORM SEWER IS PROHIBITED.
27. OPEN SPACE SWALES: IF SWALES ARE EXISTING ON SITE AND ARE NOT INTENDED TO BE MODIFIED AS PART OF THIS PLANS, THE CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN THE CONVEYANCE OF WATER WITHIN THE SWALES DURING THE CONTRACT PERIOD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DIVERSION OR PUMPING OF WATER IF REQUIRED TO COMPLETE WORK. ANY SWALES DISTURBED BY THE CONTRACTOR SHALL BE REPAIRED/RESTORED TO THEIR ORIGINAL CONDITION. IF THE SWALE NEEDS TO BE DISTURBED OR MODIFIED FOR ANY REASON, THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO DISTURBANCE.
28. DETENTION AND WATER QUALITY PONDS: IF DETENTION PONDS AND WATER QUALITY PONDS ARE EXISTING ON SITE AND ARE NOT INTENDED TO BE MODIFIED AS PART OF THE PLANS, THE CONTRACTOR SHALL MINIMIZE DISTURBANCE TO THE PONDS, DRAINAGE STRUCTURES AND SPILLWAYS DURING CONSTRUCTION. ALL PONDS, DRAINAGE STRUCTURES AND SPILLWAYS SHALL BE MAINTAINED IN OPERABLE CONDITIONS AT ALL TIMES. ANY POND OR SPILLWAY AREAS DISTURBED BY THE CONTRACTOR SHALL BE REPAIRED/RESTORED TO THEIR ORIGINAL CONDITION. IF THE POND NEEDS TO BE DISTURBED OR MODIFIED FOR ANY REASON, THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO DISTURBANCE.
29. LOCAL, STATE AND FEDERAL JURISDICTIONAL REQUIREMENTS, RESTRICTIONS OR PROCEDURES SHALL SUPERSEDE THESE PLANS, NOTES AND SPECIFICATIONS WHEN MORE STRINGENT. NOTIFY THE OWNER'S REPRESENTATIVE IF CONFLICTS OCCUR.

LANDSCAPE NOTES

1. THE CONTRACTOR SHALL FOLLOW THE LANDSCAPE PLANS AND SPECIFICATIONS AS CLOSELY AS POSSIBLE. ANY SUBSTITUTION OR ALTERATION SHALL NOT BE ALLOWED WITHOUT APPROVAL OF THE OWNER'S REPRESENTATIVE. OVERALL PLANT QUANTITY AND QUALITY SHALL BE CONSISTENT WITH THE PLANS.
2. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL PLANT QUANTITIES. GRAPHIC QUANTITIES TAKES PRECEDENCE OVER WRITTEN QUANTITIES.
3. THE OWNER'S REPRESENTATIVE RESERVES THE RIGHT TO INSPECT AND TAG ALL PLANT MATERIAL PRIOR TO SHIPPING TO THE SITE. IN ALL CASES, THE OWNER'S REPRESENTATIVE MAY REJECT PLANT MATERIAL AT THE SITE IF MATERIAL IS DAMAGED, DISEASED, OR DECLINING IN HEALTH AT THE TIME OF ONSITE INSPECTIONS OR IF THE PLANT MATERIAL DOES NOT MEET THE MINIMUM SPECIFIED STANDARD IDENTIFIED ON THE PLANS AND IN THE SPECIFICATIONS. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR INSPECTION AND APPROVAL OF ALL MATERIALS AND PRODUCTS PRIOR TO INSTALLATION.
4. THE OWNER'S REPRESENTATIVE MAY ELECT TO UPSIZE PLANT MATERIAL AT THEIR DISCRETION BASED ON SELECTION, AVAILABILITY, OR TO ENHANCE SPECIFIC AREAS OF THE PROJECT. THE CONTRACTOR SHALL VERIFY PLANT MATERIAL SIZES WITH OWNER'S REPRESENTATIVE PRIOR TO PURCHASING, SHIPPING OR STOCKING OF PLANT MATERIALS. SUBMIT CHANGE ORDER REQUEST TO OWNER'S REPRESENTATIVE FOR APPROVAL IF ADDITIONAL COST IS REQUESTED BY THE CONTRACTOR PRIOR TO INSTALLATION. RE-STOCKING CHARGES WILL NOT BE APPROVED IF THE CONTRACTOR FAILS TO SUBMIT A REQUEST FOR MATERIAL CHANGES.
5. THE CONTRACTOR SHALL WARRANTY ALL CONTRACTED WORK AND MATERIALS FOR A PERIOD OF TWO YEARS AFTER SUBSTANTIAL COMPLETION HAS BEEN ISSUED BY THE OWNER'S REPRESENTATIVE FOR THE ENTIRE PROJECT UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS OR SPECIFICATIONS.
6. REFER TO IRRIGATION PLANS FOR LIMITS AND TYPES OF IRRIGATION DESIGNED FOR THE LANDSCAPE. IN NO CASE SHALL IRRIGATION BE EMITTED WITHIN THE MINIMUM DISTANCE FROM BUILDING OR WALL FOUNDATIONS AS STIPULATED IN THE GEOTECHNICAL REPORT. ALL IRRIGATION DISTRIBUTION LINES, HEADS AND EMITTERS SHALL BE KEPT OUTSIDE THE MINIMUM DISTANCE AWAY FROM ALL BUILDING AND WALL FOUNDATIONS AS STIPULATED IN THE GEOTECHNICAL REPORT.
7. LANDSCAPE MATERIAL LOCATIONS SHALL HAVE PRECEDENCE OVER IRRIGATION MAINLINE AND LATERAL LOCATIONS. COORDINATE INSTALLATION OF IRRIGATION EQUIPMENT SO THAT IT DOES NOT INTERFERE WITH THE PLANTING OF TREES OR OTHER LANDSCAPE MATERIAL.
8. THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING POSITIVE DRAINAGE EXISTS IN ALL LANDSCAPE AREAS. SURFACE DRAINAGE ON LANDSCAPE AREAS SHALL NOT FLOW TOWARD STRUCTURES AND FOUNDATIONS. MAINTAIN SLOPE AWAY FROM FOUNDATIONS PER THE GEOTECHNICAL REPORT RECOMMENDATIONS. ALL LANDSCAPE AREAS BETWEEN WALKS AND CURBS SHALL DRAIN FREELY TO THE CURB UNLESS OTHERWISE IDENTIFIED ON THE GRADING PLAN. IN NO CASE SHALL THE GRADE, TURF THATCH, OR OTHER LANDSCAPE MATERIALS DAM WATER AGAINST WALKS. MINIMUM SLOPES ON LANDSCAPE AREAS SHALL BE 2%; MAXIMUM SLOPE SHALL BE 25% UNLESS SPECIFICALLY IDENTIFIED ON THE PLANS OR APPROVED BY THE OWNER'S REPRESENTATIVE.
9. PRIOR TO INSTALLATION OF PLANT MATERIALS, AREAS THAT HAVE BEEN COMPACTED OR DISTURBED BY CONSTRUCTION ACTIVITY SHALL BE THOROUGHLY LOOSENED TO A DEPTH OF 8" - 12" AND AMENDED PER SPECIFICATIONS.
10. ALL LANDSCAPED AREAS ARE TO RECEIVE ORGANIC SOIL PREPARATION AS NOTED IN THE TECHNICAL SPECIFICATIONS.
11. TREES SHALL NOT BE LOCATED IN DRAINAGE SWALES, DRAINAGE AREAS, OR UTILITY EASEMENTS. CONTACT OWNER'S REPRESENTATIVE FOR RELOCATION OF PLANTS IN QUESTIONABLE AREAS PRIOR TO INSTALLATION.
12. THE CENTER OF EVERGREEN TREES SHALL NOT BE PLACED CLOSER THAN 8' AND THE CENTER OF ORNAMENTAL TREES CLOSER THAN 6' FROM A SIDEWALK, STREET OR DRIVE LANE. EVERGREEN TREES SHALL NOT BE LOCATED ANY CLOSER THAN 15' FROM IRRIGATION ROTOR HEADS. NOTIFY OWNER'S REPRESENTATIVE IF TREE LOCATIONS CONFLICT WITH THESE STANDARDS FOR FURTHER DIRECTION.
13. ALL EVERGREEN TREES SHALL BE FULLY BRANCHED TO THE GROUND AND SHALL NOT EXHIBIT SIGNS OF ACCELERATED GROWTH AS DETERMINED BY THE OWNER'S REPRESENTATIVE.
14. ALL TREES ARE TO BE STAKED AND GUYED PER DETAILS FOR A PERIOD OF 3 YEARS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING STAKES AT THE END OF 3 YEARS FROM ACCEPTANCE OF LANDSCAPE INSTALLATION BY THE OWNER'S REPRESENTATIVE. OBTAIN APPROVAL BY OWNER'S REPRESENTATIVE PRIOR TO REMOVAL.
15. ALL TREES INSTALLED ABOVE RETAINING WALLS UTILIZING GEO-GRID MUST BE HAND DUG TO PROTECT GEO-GRID. IF GEO-GRID MUST BE CUT TO INSTALL TREES, APPROVAL MUST BE GIVEN BY OWNER'S REPRESENTATIVE PRIOR TO DOING WORK.
16. ALL TREES IN SEED OR TURF AREAS SHALL RECEIVE MULCH RINGS. OBTAIN APPROVAL FROM OWNER'S REPRESENTATIVE FOR ANY TREES THAT WILL NOT BE MULCHED FOR EXCESSIVE MOISTURE REASONS.
17. SHRUB, GROUNDCOVER AND PERENNIAL BEDS ARE TO BE CONTAINED BY SENO-A-BOARD. EDGER IS NOT REQUIRED WHEN ADJACENT TO CURBS, WALLS, WALKS OR SOLID FENCES WITHIN 3" OF PRE-MULCHED FINAL GRADE. EDGER SHALL NOT BE REQUIRED TO SEPARATE MULCH TYPES UNLESS SPECIFIED ON THE PLANS.
18. ALL SHRUB BEDS ARE TO BE MULCHED LANDSCAPE SHREDDED BARK MULCH OVER GEOTEXTILE WEED CONTROL FABRIC AS SPECIFIED IN THE DETAILS AND TECHNICAL SPECIFICATIONS OR MATERIALS SCHEDULE. ALL GROUND COVER AND PERENNIAL FLOWER BEDS SHALL BE MULCHED WITH LANDSCAPE MULCH AS SPECIFIED IN THE DETAILS AND TECHNICAL SPECIFICATIONS OR MATERIALS SCHEDULE. NO WEED CONTROL FABRIC IS REQUIRED IN GROUNDCOVER OR PERENNIAL AREAS.
19. AT SEED AREA BOUNDARIES ADJACENT TO EXISTING NATIVE AREAS, OVERLAP ABUTTING NATIVE AREAS BY THE FULL WIDTH OF THE SEEDER.
20. EXISTING TURF AREAS THAT ARE DISTURBED DURING CONSTRUCTION, ESTABLISHMENT AND THE MAINTENANCE PERIOD SHALL BE RESTORED WITH NEW SOD TO MATCH EXISTING TURF SPECIES. DISTURBED NATIVE AREAS WHICH ARE TO REMAIN SHALL BE OVER SEEDED AND RESTORED WITH SPECIFIED SEED MIX.
21. CONTRACTOR SHALL OVER SEED ALL MAINTENANCE OR SERVICE ACCESS BENCHES AND ROADS WITH SPECIFIED SEED MIX UNLESS OTHERWISE NOTED ON THE PLANS.
22. ALL SEEDED SLOPES EXCEEDING 25% IN GRADE (4:1) SHALL RECEIVE EROSION CONTROL BLANKETS. PRIOR TO INSTALLATION, NOTIFY OWNER'S REPRESENTATIVE FOR APPROVAL OF LOCATION AND ANY ADDITIONAL COST IF A CHANGE ORDER IS NECESSARY.
23. WHEN COMPLETE, ALL GRADES SHALL BE WITHIN +/- 1/8" OF FINISHED GRADES AS SHOWN ON THE PLANS.
24. SOFT SURFACE TRAILS NEXT TO MANICURED TURF OR SHRUB BEDS SHALL BE CONTAINED WITH EDGER SPECIFIED IN PLANS OR APPROVED EQUAL.
25. PRIOR TO THE PLACEMENT OF MULCH AND WEED FABRIC, A GRANULAR, PRE-EMERGENT, WEED CONTROL AGENT SHALL BE ADDED TO ALL PLANTING BEDS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTION, EXCEPT AROUND ORNAMENTAL GRASSES.
26. THE CONTRACTOR IS EXPECTED TO KNOW AND UNDERSTAND THE TOWN AND COUNTY SPECIFICATIONS FOR LANDSCAPE AND IRRIGATION. IN CASES OF DISCREPANCIES THE HIGHER OF THE TWO STANDARDS SHALL HAVE PRECEDENCE.
27. THE DEVELOPER, HIS SUCCESSORS AND ASSIGNS SHALL BE RESPONSIBLE FOR THE INSTALLATION, MAINTENANCE AND REPLACEMENT OF ALL IMPROVEMENTS SHOWN OR INDICATED ON THE APPROVED LANDSCAPE PLAN ON FILE IN THE PLANNING DEPARTMENT.

LAYOUT NOTES

1. WRITTEN DIMENSIONS WILL TAKE PRECEDENCE OVER SCALED DIMENSIONS.
2. SHOULD SITE CONDITIONS BE DIFFERENT THAN WHAT IS INDICATED ON THE DRAWINGS CONTACT THE LANDSCAPE ARCHITECT IMMEDIATELY FOR CLARIFICATION.
3. CURVED WALKS AND CURB EDGES ARE INTENDED TO BE CONSTRUCTED WITH SMOOTH FLOWING CURVES, ANYTHING OTHER THAN SMOOTH FLOWING CURVES WILL BE REJECTED.
4. THE CONTRACTOR SHALL OBTAIN, AT HIS EXPENSE, ALL PERMITS WHICH ARE NECESSARY TO PERFORM THE PROPOSED WORK.
5. THE CONTRACTOR SHALL PROVIDE A STAKED LAYOUT OF ALL SITE IMPROVEMENTS FOR INSPECTION BY THE OWNER'S REPRESENTATIVE AND MAKE MODIFICATIONS AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
6. THE CONTRACTOR SHALL INSTALL SLEEVING FOR IRRIGATION IMPROVEMENTS PRIOR TO INSTALLING CONCRETE FLATWORK. REFER TO IRRIGATION PLANS.
7. LAYOUT WALKS, SCORE JOINTS AND PAVING PATTERNS AS CLOSELY AS POSSIBLE TO PLANS, DETAILS, AND SPECIFICATIONS. DO NOT DEVIATE FROM PLANS UNLESS SPECIFIC APPROVAL IS OBTAINED FROM THE OWNER'S REPRESENTATIVE.
8. ALL WORK SHALL BE CONFINED TO THE AREA WITHIN THE CONSTRUCTION LIMITS AS SHOWN ON THE PLANS. ANY AREAS OR IMPROVEMENTS DISTURBED OUTSIDE THESE LIMITS SHALL BE RETURNED TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE. IN THE EVENT THE CONTRACTOR REQUIRES A MODIFICATION TO THE CONSTRUCTION LIMITS, WRITTEN PERMISSION MUST BE OBTAINED FROM THE LANDSCAPE ARCHITECT PRIOR TO ANY DISTURBANCE OUTSIDE OF THE LIMITS OF WORK. SEE TECHNICAL SPECIFICATIONS.
9. CONTRACTOR IS RESPONSIBLE FOR SUPERVISING ALL SAFETY SURFACING AND PAVEMENT DURING THE CURING PROCESS.

SHEET LIST

L-100	LANDSCAPE NOTES
L-101	LANDSCAPE SCHEDULES
L-200	LANDSCAPE PLAN
L-201	PLANTING PLAN
L-300	LANDSCAPE DETAILS

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SHEET TITLE:
LANDSCAPE NOTES

L-100

PLANTING SCHEDULE

SYM.	QTY.		COMMON NAME	BOTANICAL NAME	SIZE & COND.	EXPOSURE	WATER
			DECIDUOUS TREES				
	3	NAR	NARROWLEAF COTTONWOOD	POPULUS ANGUSTIFOLIA	3" CAL, B&B	SUN	LOW-MED
	3	CHO	NATIVE CHOKECHERRY	PRUNUS VIRGINIANA	2" CAL, B&B	PART SUN	LOW-MED
	10	ANG	QUAKING ASPEN	POPULUS TREMULOIDES	2" CAL, B&B	PART SUN	MED
			DECIDUOUS SHRUBS				
	22	ART	DWARF ARCTIC BLUE WILLOW	SALIX PURPUREA 'NANA'	#5 CONTAINER	SUN/PART	MED
	15	LMC	MISS CANADA LILAC	SYRINGA X PRESTONIAE 'MASS CANADA'	#5 CONTAINER	SUN	XERIC
	21	PEK	PEKING COTONEASTER	COTONEASTER ACUTIFOLIA	#5 CONTAINER	SUN/PART	LOW-MED
	16	PIX	PIXWELL GOOSEBERRY	RIBES HIRTELLUM PIXWELL	#5 CONTAINER	SUN/PART	LOW-MED
	15	RRO	REDLEAF ROSE	ROSA GLAUCA	#5 CONTAINER	SUN/PART	LOW-MED
	22	WRO	WOODS ROSE	ROSA WOODSII	#5 CONTAINER	SUN/PART	LOW
			ORNAMENTAL GRASSES				
	32	IRG	INDIAN RICEGRASS	ACHNATHERUM HYMENOIDES	#1 CONTAINER	SUN	XERIC
	24	AVG	BLUE AVENA	HELICTOTRICHON SEMPERVIRENS	#1 CONTAINER	SUN/PART	XERIC
	31	BFE	BLUE FESCUE	FESTUCA GLAUCA 'ELIJAH BLUE'	#1 CONTAINER	SUN	XERIC
			PERENNIALS				
	21	SMN	MAY NIGHT SALVIA	S. SYLVESTRIS x 'MAINACHT'	#1 CONTAINER		
	10	SLV	SILVERWEED	POTENTILLA ANSERINE	#1 CONTAINER		
	15	LUP	RUSSEL HYBRIDS LUPINE	LUPINUS 'RUSSELL STRAIN'	#4 CONTAINER		
	15	DRA	DRAGON'S BLOOD SEDUM	SEDUM SPURIUM 'DRAGON'S BLOOD'	#4 CONTAINER		
	7	YAM	MOONSHINE YARROW	ACHILLEA 'MOONSHINE'	#1 CONTAINER		

BIOSWALE / RAIN GARDEN PLANTING SCHEDULE

SYM.	QTY.		COMMON NAME	BOTANICAL NAME	SIZE & COND.	EXPOSURE	WATER
			DECIDUOUS SHRUBS				
	3	ART	DWARF ARCTIC BLUE WILLOW	SALIX PURPUREA 'NANA'	#5 CONTAINER	SUN/PART	MED
	4	WCY	COYOTE WILLOW	SALIX EXIGUA	#5 CONTAINER	SUN/PART	MED
			ORNAMENTAL GRASSES				
	30	THG	TUFTED HAIR GRASS	DESCHAMPSIA CESPITOSA	#4 CONTAINER	SUN	MED
			CUSTOM WILDFLOWER MIX (CONTACT AND FINALIZE ARKANSAS VALLEY SEED)				
		RGD	BLACK-EYED SUSAN / RUDBECKIA	RUDBECKIA FULGIDA 'GOLDSTURM'	#1 CONTAINER		
		PCF	PRAIRIE CONEFLOWER / MEXICAN HAT	RATIBIDA COLUMNIFERA 'RED'	#1 CONTAINER		
		RMI	ROCKY MOUNTAIN IRIS	IRIS MISSOURIENSIS	#1 CONTAINER		
		YMF	YELLOW MONKEYFLOWER	MIMULUS GUTTATUS	#1 CONTAINER		

WETLAND SEED MIXTURE

COMMON NAME	BOTANICAL NAME	%	LBS./1000 S.F.
PERENNIAL RYEGRASS	LOLIUM PERENNE	30%	0.6 LBS.
CHEWINGS FESCUE	FESTUCA RUBRA	30%	0.6 LBS.
KENTUCKY BLUEGRASS, LIMOUSINE	POA PRATENSIS	25%	0.5 LBS.
KENTUCKY BLUEGRASS, MARQUIS	POA PRATENSIS	15%	0.2 LBS.
	TOTAL	100%	2.0 LBS.

NOTES
1. ACQUIRE WETLAND SEED MIX FROM NEIL'S LUNCEFORD

TURF GRASS

COMMON NAME

BLACK BEAUTY FESCUE (OR APPROVED EQUAL)
SUPPLIER: GRAFF'S TURF FORT MORGAN, CO
https://graffsturf.com/turfgrass/black-beauty-fescue/

AMENITY SCHEDULE

ITEM	DESCRIPTION	MANUFACTURER	CONTACT	PRODUCT NAME	PRODUCT NUMBER	COLOR/FINISH	NOTES
1	BIKE RACK	SITE PIECES	CONTACT: 800.484.0797 www.sitepieces.com	MONOLINE STANDARD BIKE ROAD	ML-STAND-19	BLUE BIRD	QUANTITY: 6 SURFACE MOUNT
2	TRASH AND RECYCLING RECEPTACLE	SITE PIECES	CONTACT: 800.484.0797 www.sitepieces.com	MONOLINE LITTER BIN	ML-XXLITTER	BLUE BIRD	QUANTITY: 1 SURFACE MOUNT
3	BOLLARD	RELIANCE FOUNDRY	CONTACT: 604.547.9460 www.reliance-foundry.com	STEEL BOLLARD	R-7901	BLACK TEXTURED	QUANTITY: 17 EMBEDDED MOUNT
4	FOLD-DOWN BOLLARD	RELIANCE FOUNDRY	CONTACT: 604.547.9460 www.reliance-foundry.com	STEEL BOLLARD	R-7901	BLACK TEXTURED	QUANTITY: 7 FOLD-DOWN MOUNTING SYSTEM

MATERIALS SCHEDULE

ITEM	DESCRIPTION	MANUFACTURER	CONTACT	PRODUCT NAME	SIZE / DIMENSIONS	COLOR/FINISH	NOTES
1	BENDER BOARD	PIONEER LANDSCAPE CENTERS	CONTACT: 866.500.0652 www.pioneersand.com	EPIC EDGE BENDER BOARD	1" x 4" x 20'	CARAMEL BROWN	229 LF REFER TO DETAIL 5, SHEET L300
2	COBBLE	PIONEER LANDSCAPE CENTERS	CONTACT: 866.500.0652 www.pioneersand.com	GREY ROSE COBBLESTONE OR APPROVED EQUAL	2" - 4" DIAMETER	SMOOTH / EARTH TONES	MAINTAIN POSITIVE DRAINAGE AWAY FROM ALL STRUCTURES
3	CRUSHER FINES	PIONEER LANDSCAPE CENTERS	CONTACT: 866.500.0652 www.pioneersand.com	BREEZE / MINUS	¾" MINUS	GREY	REFER TO DETAIL 6, SHEET L300

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TOWN OF FRISCO PLANNING

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SHEET TITLE:
LANDSCAPE SCHEDULES

L-101

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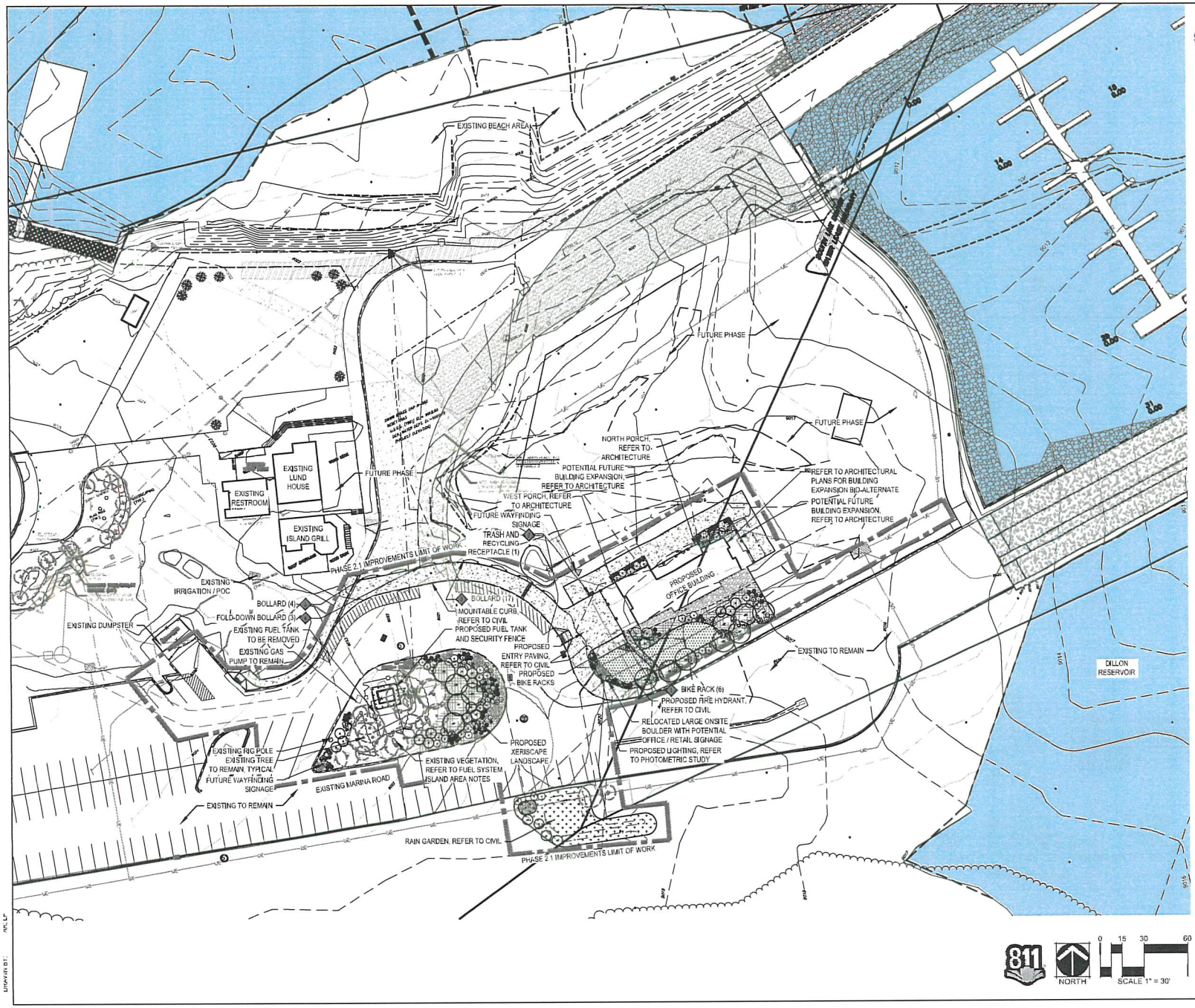

LEGEND

- EXISTING TREES TO REMAIN
- DECIDUOUS TREES; DETAIL 1 / L-300
- SHRUBS; DETAIL 2 / L-300
- ORNAMENTAL GRASS, DETAIL 3 / L-300
- LANDSCAPE BOULDERS FROM ONSITE
- PERENNIAL PLANTING; DETAIL 3 / L-300
- SHORT GRASS SEED MIX
- BIOSWALE / RAIN GARDEN PLANTING
- LANDSCAPE BED, SHREDDED BARK MULCH
- COBBLE DRIP LINE
- CRUSHER FINES PATH; DETAIL 6 / L-300
- BENDER BOARD EDGER; DETAIL 5 / L-300
- SPADE CUT EDGER; DETAIL 4 / L-300
- LIMIT OF WORK

FUEL SYSTEM ISLAND AREA NOTES

1. LIMB UP ALL 3.5" + CALIPER DECIDUOUS TREES WITH BRANCHES BELOW 4' IN HEIGHT.
2. REMOVE ALL SUCKERS FROM THE BASE OF DECIDUOUS TREES LARGER THAN 2.5" CALIPER.
3. THIN AND REMOVE ALL VOLUNTEER TREES LESS THAN 1" CALIPER.
4. PRUNE ALL SHRUBS FOLLOWING BEST PRACTICE INDUSTRY STANDARDS. NO MORE THAN 1/3 OF ANY SHRUB SHALL BE PRUNED OR REMOVED IN ONE SEASON.
5. REMOVE ALL INVASIVE SPECIES AND NOXIOUS WEEDS FROM UNDERSTORY USING A MECHANICAL METHOD.

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277 MARINA ROAD, FRISCO, COLORADO

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SHEET TITLE:

LANDSCAPE PLAN

L-200

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LEGEND

- EXISTING TREES TO REMAIN
- DECIDUOUS TREES; DETAIL 1 / L-300
- SHRUBS; DETAIL 2 / L-300
- ORNAMENTAL GRASS, DETAIL 3 / L-300
- LANDSCAPE BOULDERS FROM ONSITE
- PERENNIAL PLANTING; DETAIL 3 / L-300
- SHORT GRASS SEED MIX
- BIOSWALE / RAIN GARDEN PLANTING
- LANDSCAPE BED, SHREDDED BARK MULCH
- COBBLE DRIP LINE
- CRUSHER FINES PATH; DETAIL 6 / L-300
- BENDER BOARD EDGER; DETAIL 5 / L-300
- SPADE CUT EDGER; DETAIL 4 / L-300
- LIMIT OF WORK

FUEL SYSTEM ISLAND AREA NOTES

1. LIMB UP ALL 3.5 + CALIPER DECIDUOUS TREES WITH BRANCHES BELOW 4' IN HEIGHT.
2. REMOVE ALL SUCKERS FROM THE BASE OF DECIDUOUS TREES LARGER THAN 2.5" CALIPER.
3. THIN AND REMOVE ALL VOLUNTEER TREES LESS THAN 1" CALIPER.
4. PRUNE ALL SHRUBS FOLLOWING BEST PRACTICE INDUSTRY STANDARDS. NO MORE THAN 1/3 OF ANY SHRUB SHALL BE PRUNED OR REMOVED IN ONE SEASON.
5. REMOVE ALL INVASIVE SPECIES AND NOXIOUS WEEDS FROM UNDERSTORY USING A MECHANICAL METHOD.

IRRIGATION NOTES

1. REPAIR AND REPLACE EXISTING DAMAGED IRRIGATION WITHIN PHASE 2.1 IMPROVEMENTS LIMIT OF WORK BOUNDARY.
2. ALL TREES AND SHRUBS TO BE DRIP IRRIGATED.
3. ALL PERENNIALS AND SOD TO BE SPRAY IRRIGATED.
4. EXISTING IRRIGATION SYSTEM TO BE USED FOR NEW PLANTINGS WITH NEW IRRIGATIONS ZONES WITHIN THE PLANTING ISLAND. ALL OTHER NEW PLANTINGS AND SOD TO BE IRRIGATED WITH A NEW IRRIGATION SYSTEM TO BE COORDINATED WITH THE TOWN OF FRISCO.
5. INSTALL PVC SLEEVING FOR IRRIGATION UNDER ALL NEW HARDSCAPE.
6. IRRIGATION SYSTEM DESIGN TO BE DETERMINED PRIOR TO 100% CONSTRUCTION DOCUMENTS.

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PLANTING PLAN

L-201

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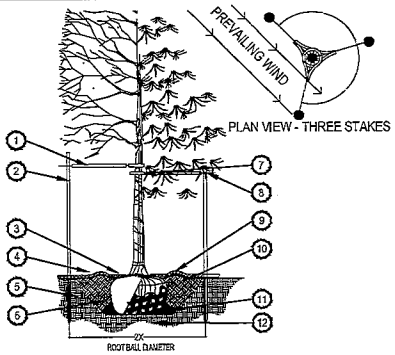


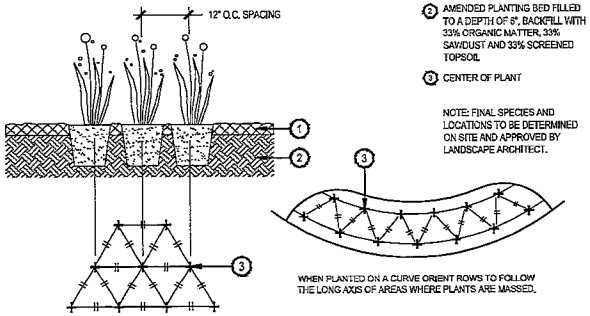
PRUNING NOTES:
1. ALL PRUNING SHALL COMPLY WITH ANSI A300 STANDARDS.
2. DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS AND BROKEN BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED. HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.

STAKING NOTES:
1. STAKE TREES PER DIAGRAM. AFTER A MINIMUM OF (3) THREE YEARS CONFIRM TREE IS ESTABLISHED. CHECK FOR ROOTBALL STABILITY. APPLY HAND PRESSURE TO TRUCK OF TREE, WHEN ROOTBALL DOES NOT MOVE, REMOVE STAKING.
2. WIRE OR CABLE SHALL BE MIN. 12 GAUGE, TIGHTEN WIRE OR CABLE ONLY ENOUGH TO KEEP FROM SLIPPING, ALLOW FOR SOME TRUNK MOVEMENT. NYLON STRAPS SHALL BE LONG ENOUGH TO ACCOMMODATE 1-½" OF GROWTH AND BUFFER ALL BRANCHES FROM WIRE.
3. ADJUST STAKING, STRAPS AND GUY WIRES ANNUALLY.

1. PLACE MIN. ½" PVC PIPE AROUND EACH WIRE. EXPOSED WIRE SHALL BE MAX. 2" EACH SIDE
2. INSTALL STAKING PER SPECIFICATIONS
3. PLANT TREE SO THAT FIRST ORDER MAJOR ROOT IS 1"-2" ABOVE FINAL GRADE.
4. 3" DEEP MULCH RING PLACED A MINIMUM OF 4 FT. IN DIAMETER ON TOP OF WEED FABRIC. DO NOT PLACE MULCH IN CONTACT WITH TREE TRUNK (FINISHED GRADE REFERENCES TOP OF MULCH).
5. 1:1 SLOPE ON SIDES OF PLANTING HOLE.
6. REMOVE ALL TWINE, ROPE, BURLAP AND WIRE FROM ENTIRE ROOT BALL AND TRUNK
7. GROMMETED NYLON STRAPS
8. GALVANIZED WIRE, MIN. 12 GAUGE CABLE - TWIST WIRE ONLY TO KEEP FROM SLIPPING.
9. 4-6" HIGH WATER SAUCER IN NON-TURF AREAS.
10. BACKFILL WITH PLANT MIX. PLANT MIX SHALL CONSIST OF EQUAL PARTS TOPSOIL, COMPOST, AND EXCAVATED SOIL. WATER THOROUGHLY WHEN BACKFILLING
11. PLACE SOIL AROUND ROOT BALL FIRMLY, DO NOT COMPACT OR TAMP. SETTLE SOIL WITH WATER TO FILL ALL AIR POCKETS.
12. PLACE ROOT BALL ON UNDISTURBED SOIL TO PREVENT SETTLEMENT.

1 TREE PLANTING

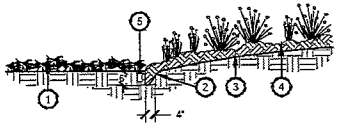
SCALE: 3/16" = 1'-0"



1. SPECIFIED MULCH
2. AMENDED PLANTING BED FILLED TO A DEPTH OF 8", BACKFILL WITH 33% ORGANIC MATTER, 33% SAWDUST AND 33% SCREENED TOPSOIL
3. CENTER OF PLANT

NOTE: FINAL SPECIES AND LOCATIONS TO BE DETERMINED ON SITE AND APPROVED BY LANDSCAPE ARCHITECT.

WHEN PLANTED ON A CURVE ORIENT ROWS TO FOLLOW THE LONG AXIS OF AREAS WHERE PLANTS ARE MASSED.

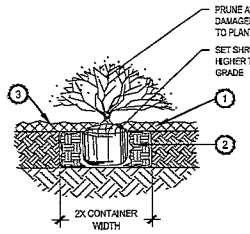


1. ADJOINING LANDSCAPE - TYPICALLY IRRIGATED DRY LAND SEED
2. VERTICAL SPADE CUT EDGE FILLED WITH SPECIFIED MULCH, TAPER EDGE OF BED SO MULCH IS DEEPER AGAINST SPADED EDGE.
3. SPECIFIED DEPTH OF MULCH (TYPICALLY WOOD MULCH 3"-4" DEEP)
4. PLANTING BED
5. IRRIGATION HEADS SHOULD BE LOCATED ADJACENT TO MULCH BEDS, OFFSET HEAD INTO GRASS AREA TO ENSURE STABLE SUPPORT.

NOTE:
1. SPADE CUT EDGE TO UTILIZED FOR TRANSITION BETWEEN PLANTING BEDS AND PLANTING POCKETS AND ADJACENT LANDSCAPE (EXCEPT TURF), RE: LANDSCAPE PLANS.
2. IF IRRIGATION HEAD IS LOCATED ADJACENT TO MULCH BEDS, OFFSET HEAD INTO GRASS AREA TO ENSURE STABLE SUPPORT.

2 SHRUB PLANTING

SCALE: 1-1/2" = 1'-0"

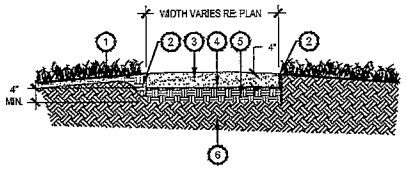


1. SPECIFIED MULCH
2. AMENDED SOIL IN PLANTING BED PER SPECIFICATIONS. TILL SOIL TO A DEPTH OF EIGHT INCHES.
3. FINISH GRADE (TOP OF MULCH)

NOTE:
1. BROKEN OR CRUMBLING ROOT-BALLS WILL BE REJECTED
2. CARE SHOULD BE TAKEN NOT TO DAMAGE THE SHRUB OR ROOT-BALL WHEN REMOVING IT FROM ITS CONTAINER
3. ALL JUNIPERS SHOULD BE PLANTED SO THE TOP OF THE ROOT-BALL OCCURS ABOVE THE FINISH GRADE OF THE MULCH LAYER
4. DIG PLANT PIT TWICE AS WIDE AND HIGH AS THE CONTAINER

3 PERENNIAL / ORNAMENTAL GRASS PLANTING

SCALE: 1" = 1'-0"



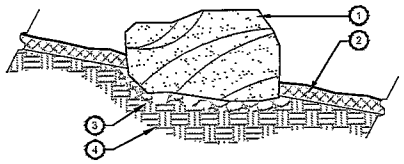
1. SLOPE ADJACENT GRADE AWAY FROM TRAIL, SWALE IF NECESSARY
2. EDGE TYPE, SEE PLAN. SPADE CUT EDGER (RE: DETAIL 4/L-300) OR BENDA BOARD EDGER (RE: DETAIL 5/L-300)
3. 4" DEPTH CRUSHER FINES; COMPACTED IN 2 - 2" LIFTS
4. WEED FABRIC
5. COMPACTED SUBGRADE COMPACTED TO 95% PROCTOR DENSITY
6. UNDISTURBED SOIL

COMPACTION NOTES:
1. REFER TO CIVIL DRAWINGS FOR SITE GRADING.
2. COMPACT WET FOR BEST RESULTS.
3. USE A SMALL (4') RIDING ROLLER TO COMPACT TRAIL.
4. CROWN TRAIL IN FLAT AREAS (AS SHOWN).
5. CROSS-SLOPE TRAIL AT 1-2% WITH GRADE WHERE TOPOGRAPHY DICTATES.

REVEGETATION NOTES:
1. RE-SEED DISTURBED EDGES OF TRAIL UPON COMPLETION OF TRAIL CONSTRUCTION.
2. FOLLOW SEEDING SPECIFICATIONS AS PROVIDED BY LANDSCAPE ARCHITECT.

4 SPADE CUT EDGER

SCALE: 1/2" = 1'-0"

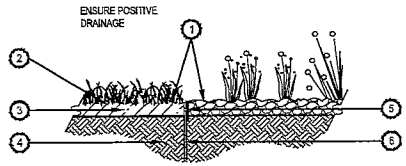


1. BOULDER, NATURALLY SET BOULDER SO THAT A MINIMUM 1/4 OF BOULDER IS BELOW FINISH GRADE, REFER TO MATERIAL SCHEDULE M, SHEET L101
2. ADJACENT LANDSCAPE, SPECIFIED MULCH, CRUSHER FINES OR COBBLE, REFER TO PLAN
3. 3" MINIMUM ROAD BASE COMPACTED TO 95% OF STANDARD PROCTOR DENSITY
4. UNDISTURBED GRADE

NOTES:
1. THESE ARE FREE STANDING BOULDERS ONLY. THE OWNER'S REPRESENTATIVE OR LANDSCAPE ARCHITECT SHALL APPROVE LOCATIONS AND SIZES OF ALL BOULDERS PRIOR TO PLACING.
2. CONTRACTOR SHALL SUBMIT SAMPLE OR PHOTOS FOR APPROVAL.
3. LANDSCAPE ARCHITECT SHALL BE ON SITE FOR PLACING OF ALL FREE STANDING BOULDERS.

5 BEND-A-BOARD EDGER

SCALE: 1" = 1'-0"



SECTION

1. FINISHED GRADE - TOP OF SOD THATCH LAYER AND TOP OF MULCH OR CRUSHER FINES SHALL BE FLUSH WITH TOP OF EDGER
2. TURF THATCH
3. AMENDED SOIL PER SPECIFICATIONS
4. SUBGRADE
5. BEND-A-BOARD EDGER
6. EDGER STAKE

NOTES:
1. THERE SHALL BE NO EXPOSED SHARP / JAGGED EDGES.
2. CONTRACTOR SHALL INSTALL STAKES AS REQUIRED BY THE MANUFACTURER.

6 CRUSHER FINES PATH

SCALE: 3/4" = 1'-0"

LANDSCAPE BOULDER

SCALE: 3/4" = 1'-0"

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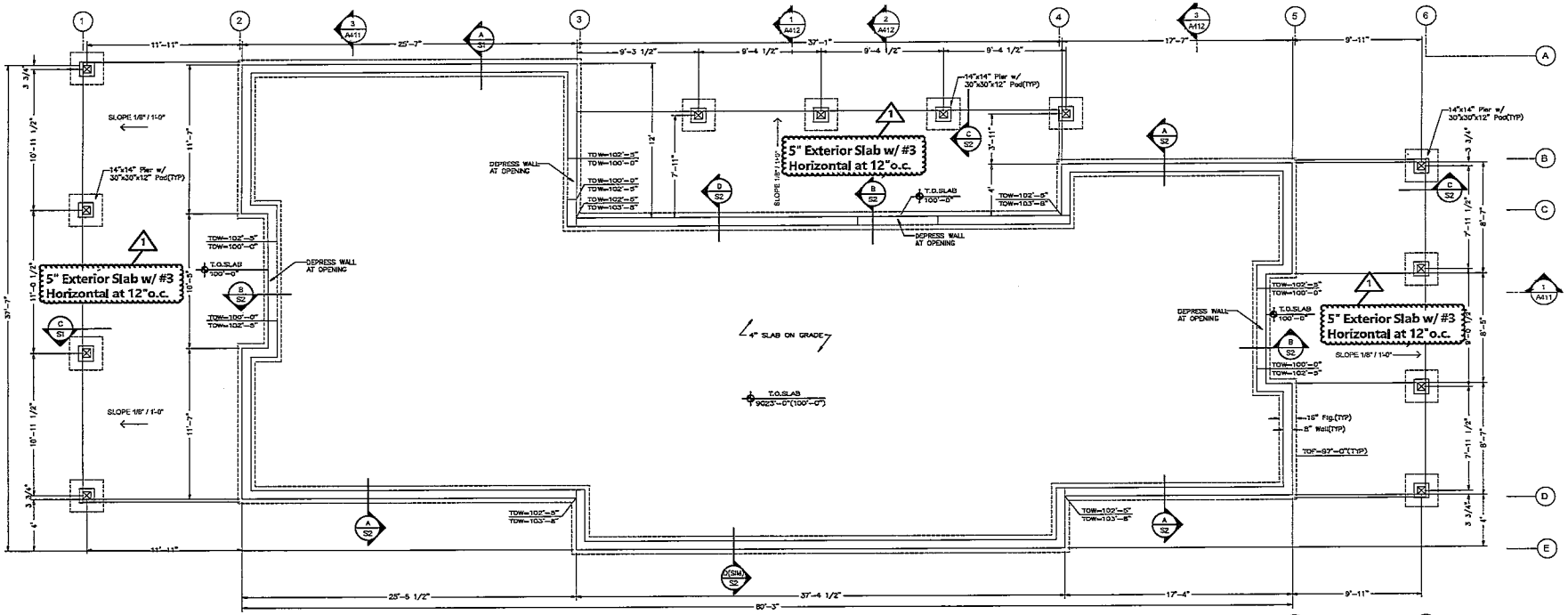
DATE:
06/24/20: DRC REVIEW
08/14/20: TOWN PLANNING
09/14/20: REVISED
12/15/20: 50% CONST DOCS
01/15/21 PRICING

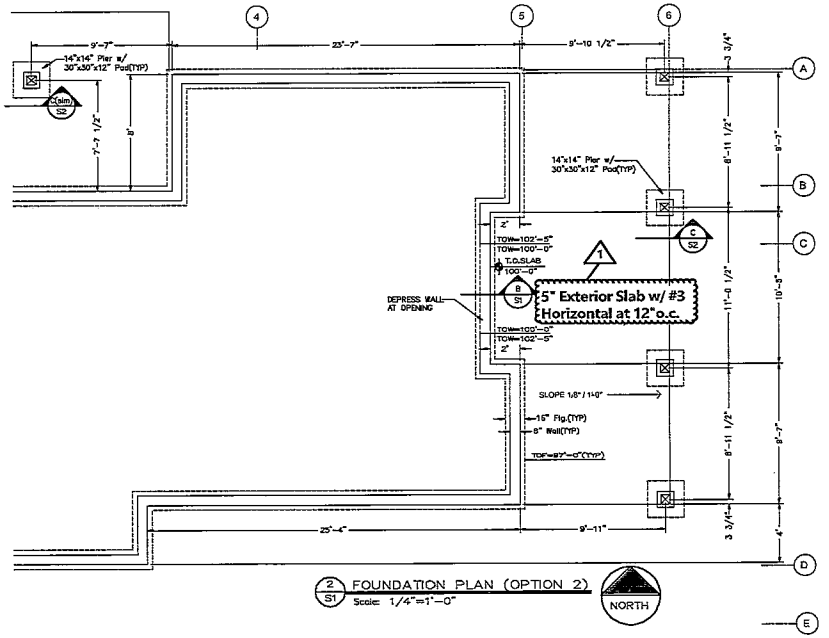
SHEET TITLE:
LANDSCAPE DETAILS

L-300

DRAWN BY: JPC/LP



1 S1 FOUNDATION PLAN
Scale: 1/4"=1'-0"



2 S1 FOUNDATION PLAN (OPTION 2)
Scale: 1/4"=1'-0"

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FOUNDATION PLAN

S1

GENERAL

1. **DESIGN LIVE LOADS: GROUND SNOW LOAD=80psf, FLOOR & DECK=100psf, STAGE=150psf, STAIRS=100psf or 300lbs. concentrated load over 2in.x2in. HANDRAILS & GUARDRAILS=200lbs. concentrated load & 50lbs. concentrated load over 1Ft.x1Ft., Wind 90mph (3 Second Gust) Exposure C, Seismic Zone B**
2. RESPONSIBILITY: The contractor is responsible for cross referencing all plans and inspecting work placement at the site to assure that no omissions or discrepancies exist that might adversely affect construction or the integrity of the finished product. Job site and construction safety are not addressed in these plans and are the responsibility of the contractor. These responsibilities are industry standard.
3. These plans are intended to be in accordance with 2012 IBC and IRC codes. All construction to be in conformance with these codes.

FOUNDATION

1. Foundation designed in accordance with KUMAR & ASSOC. site specific soils report, which is hereby made a part of these drawings. Maximum allowable soil bearing pressure = 3000 psf, 0 min. Proper authorization for use of the report or its recommendations are the responsibility of the owner.
2. We recommend the soils engineer verify during excavation (and before construction of any part of the foundation) that soils types and conditions match those described in the pit log(s) of the above mentioned soils report.
3. Remove topsoils, organic material, and any questionable material below pads and footers. All pads and footings exposed to frost must maintain the required 40" frost depth. Minimum pad thickness = 12". The footing elevations of this design are indicated in economical relation to architectural elements. Proper soil bearing and/or the soil report may require lower footings.
4. Drainage and grading details to divert surface drainage at least 10' away from the structure. Do not backfill against any foundation or retaining wall until all supporting floor and slab systems are in place and securely anchored, or other adequate wall support is provided.
5. Where exterior backfill rises above any adjacent floor, use granular free draining backfill from drain tile up. Exterior backfill may be native inorganic material where final grade is below lowest floor (UNO). Before placing finish topsoil, we recommend capping backfill with a Mirafi fabric under 12"-24" of water impermeable material (e.g. clay).
6. Provide 4" diameter perforated PVC draintile in a 12" by 12" gravel envelope at lowest levels of and perimeter of excavation sloped a minimum of 1/8" per foot to an adequate daylighting drain. Provide cleanouts and screen end. Mirafi or other filter barriers will help prevent drain clogging. Test draintile before and after backfilling.
7. All construction and materials to conform with ACI 318.
8. Reinforcing bar to be deformed 60 ksi steel (per ASTM A-615). Lap all rebar splices and corners 38 bar diameters minimum.
9. Concrete supplier to provide mixes that replace 20% of portland cement with recycled fly ash from local coal burning power plants.
10. Minimum concrete 28 day compressive strength = 3500psi for walls, footers, and pads, and 4000psi for slabs.
11. Concrete cover: Concrete cast against and permanently exposed to earth: footing, pad = 3". Concrete exposed to earth or weather: walls, slabs = 1.5"
12. Consolidate concrete per ACI 309. Cast in place concrete shall be poured continuously so as to prevent cold joints.
13. Provide 1/2" diameter by 10"min anchor bolts at 24" on center with an embedment of 7" to connect framing to foundation (UNO). Anchor bolts to be located not more than 12" from foundation corner (TYP). Use galvanized anchor bolts with pressure treated plates. Finish all concrete wall tops to within 1/8" of specified elevations.
14. Foundation insulation and waterproofing to be specified and installed in accordance with the above mentioned soils report, IRC, local codes, and accepted construction practice.
15. Do not use foam form systems without approval of engineer.
16. Provide slab shrinkage reinforcement of 6x6xW1.4 welded wire mesh with 2" laps. Exterior slabs to be 5" minimum thickness with #5 rebar at 12" on center each way on reinforcement.
17. Provide isolation joints where floors, tracks, walkers, or columns occur. Finish all concrete slabs to a steel trowel, smooth appearance, and with a surface plane tolerance not exceeding 1/8" in 10'0" when tested with a 10' straightedge.
18. Provide 1" deep tooled (or cut) control joints at approximately 10' on center in each direction.
19. Provide 1/2" expansion joint material at all slab to wall, footing, or column interfaces. Provide a 6 mil poly barrier under all interior slabs for moisture protection and as a bond breaker. Provide an approved hardener and sealer to the surface of all slabs.
20. If foundation is to sit through winter without complete framing, we recommend the building achieve enough backfill, framing, and floor sheathing to protect foundation bearing soils from moisture accumulation and frost heave.

STRUCTURAL STEEL

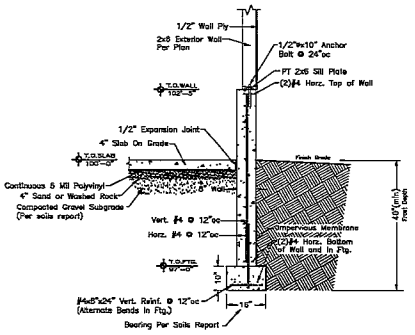
1. All structural steel shall conform to ASTM specifications A36 except pipe columns which shall conform to ASTM A53 Grade B, and steel tube columns which shall conform to ASTM A500 Grade B. Steel to steel member connection bolts shall be A325 steel and miscellaneous wood embedded items shall be A36 steel.
2. Steel column base plates shall bear evenly to concrete below via 4000 psi non shrink grout.
3. Minimum welds to be per AISC and/or AWS, but not less than 3\16" continuous fillet unless otherwise noted. Welding quality control shall be per AWS. All welders shall have evidence of passing the American Welding Society Standard Qualifications Test as detailed in AWS D1.1.

TYPICAL ABBREVIATIONS

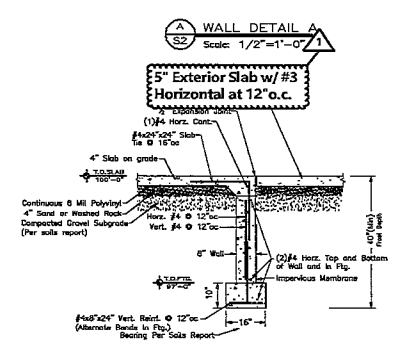
BOGB = bottom of grade beam
BRG = bearing
CL = center line
E.E. = each end
E.M. = each member
E.S. = each side
E.W. = each way
GL = Glulam
HDR = header
LVL = Laminated veneer lumber
oc = on center
OF = overframe
OH = overhang
OPP SIM = opposite similar
PL = plate
PT = pressure treated
PSL = parallam
R.O. = Rough opening
SOG = slab on grade
STR = Structural
TOBL = top of brick ledge
TOF = top of footing
TOGB = top of grade beam
TOS = top of slab
TOSB = top of steel beam
TOW = top of wall
TYP = Typical
UNO = Unless noted otherwise
WS = steel web stiffeners

WOOD FRAMING

1. Framing plans show structural requirements only. Additional members may be required for blocking, nailers and code requirements.
2. Use Douglas Fir or Hem Fir "stud grade" (S4S) 2x6 for all wall studs(UNO). Use DF#2 (S4S) or better for all multi-stud posts, joists, rafters, headers, posts, beams and plates.
3. Sill plates and any other lumber in direct contact with concrete- California Foundation Grade Redwood or Species Group B Pressure Treated Lumber. Use galvanized anchor bolts with pressure treated plates.
4. Glulams (GL)- 24F-V8 manufactured in accordance with AITC 117-84, fb=2400psi. OK to use 24F-V4 for simple span applications only. All Glulams used in exterior applications must be sealed and protected from moisture with an appropriate preservative.
5. Laminated Veneer Lumber (LVL)- manufactured in accordance with APA criteria. fb=2600psi.
6. Timbers- Douglas Fir (DF) Grade specified on plan- #1 Fb>1300psi, #2 Fb>850psi.
7. Exterior Wall Ply- 7/16" OSB APA rated 24/16 min with 8d's @6"oc edge, 12" oc field. Manufactured in conformance with APA PS 1-83. Floor Ply- 3/4" T&G OSB APA rated 24/0 minimum, 8d's @6"oc edge, 10"oc field. Glue to joists. Roof Ply - 5/8" OSB APA rated 40/20 minimum, 8d's @6"oc edge, 12"oc field.
8. Roof Trusses- 90 psf snow load, 24"oc. Truss design and fabrication by others. No drop top cable truss adjacent to scissor truss without approval of Engineer.
9. Maintain 6" clearance between untreated wood or siding and soils at finish grade.
10. 1/2" Plywood/OSB sheath 100% all exterior frame. Ply to lap floor rim, top plates and sill plate.
11. All floor and roof plywood place with 8' dimension perpendicular to framing with end joints staggered.
12. All load bearing headers in 2x6 wall (3)2x10; in 2x4 wall (2)2x10, (UNO).
13. Provide 2 studs under each end of all load bearing beams or headers >36"(UNO). (1)King stud min.(UNO)
14. Multiple stud posts anticipate 2"min wall sections preventing buckling. Verify new adjacent openings with engineer.
15. Studs removed for doors and windows shall be placed equally at the end of headers, up to (2)king (full height) studs each end.
16. Posts to stack over equal below (UNO). Trusses spanning >15' to stack over studs below (UNO). Provide end joist where studs above do not stack over studs below.
17. Solid block all bearing walls and posts for continuity to foundation.
18. Block all trusses, cutlookers, rafters and joists at all bearing points.
19. Where full height foundation wall parallel to joists, block 1st joist space @24"oc.
20. Wall studs to be continuous from floor to floor, or floor to roof. Balloon frame all gable walls. Provide firestop blocking at 10' max intervals in any wall with studs over 10' height.
21. Connect joists to blocking with a minimum of (2)10d nails and connect joists to plate or beam below with a minimum of (3)10d toenails. Connect rim to plate below with 10d toenails @6"oc.
22. Nail exterior wall sole plate to joists below with (3)10d and to blocking, rim or end joist with 10d's @4"oc.
23. Connect all BCI rafters to blocking with (3)10d nails, and to plate or beam below with (4) 10d nails. Provide beveled bearing plate at interior bearing, birdsmouth cut at exterior bearing. Provide beveled web stiffeners at birdsmouth and regular web stiffeners at interior bearing. Strap BCI rafters across ridge with LSTA 18. Connect blocking to plate below with (3)10d toenails minimum. Refer to BCI Specifiers Guide roof details.
24. Connect all 2x rafters to blocking with (3)10d nails, and to plate or beam below with (4) 10d nails. Provide birdsmouth or seat cut bearing at beams and wall plates UNO.
25. Connect common trusses to all bearing points with Simpson H2.5 connectors (UNO). Scissor trusses connect one end with Simpson TC26. Connect to blocking with (3)15d nails.
26. Ventilate roof framing per local codes.
27. Nailing, blocking, and all other construction details per 2006 IBC and IRC, such as Table R602.3(1). (UNO)
28. All connector callouts to be Simpson Strong-Tie or equal by Simpson Strong-Tie Company, Inc. Install per manufacturer's instructions.
29. TJI and MicroLam (ML) are products by Trus Joist MacMillan. Install per manufacturer's instructions. Multiple ML's glue and nail together with (2) rows 16d @12"oc (UNO).
30. Steel beams peek out per detail where noted. Where not otherwise noted, provide 2x full width nailer on top with 1/2" Thru bolt at 24"oc staggered side to side of beam web. Where frame wall pocket prevents beam rolling, connect steel beam base to post or beam below with (2)5/8" Lags. Otherwise connect beam to bearing via welded "ears" i.e., flanges similar to Simpson CC. Provide 1/4" fitted web stiffeners at steel beam point loads and bearing points (UNO).
31. Ply shear wall sheath both sides fully with 1/2" CD ply with 8d's at 4"oc edge, 12"oc field (i.e. block edges). Frame from floor ply to roof ply or floor ply to floor ply (or provide sleeper or blocking in rafter/joist level). Double studs at each end of shear wall connect to adjacent walls with (4)5/8" Lag bolt. At ply above connect to shear wall top plate with 10d's @4"oc. Connect bottom plate to floor ply with 8d's at 3"oc and glue. See plans for any holdown requirements.
32. 5/8 Gyp shear wall sheath each side fully with drywall nails at 4"oc edges and field, block edges.
33. If slab on grade is placed on expansive soils (i.e. minimum soil bearing required, see foundation note 1 above) all partition walls framed on slab to be slip jointed per soils report.



A S2 WALL DETAIL A
Scale: 1/2"=1'-0"



B S2 WALL DETAIL B
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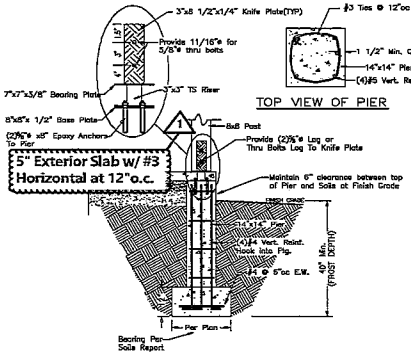
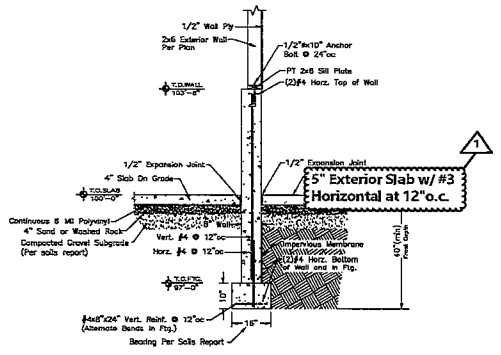


C S2 EXTERIOR PAD/PIER DETAIL C
Scale: 1/2"=1'-0"



D S2 WALL DETAIL D
Scale: 1/2"=1'-0"

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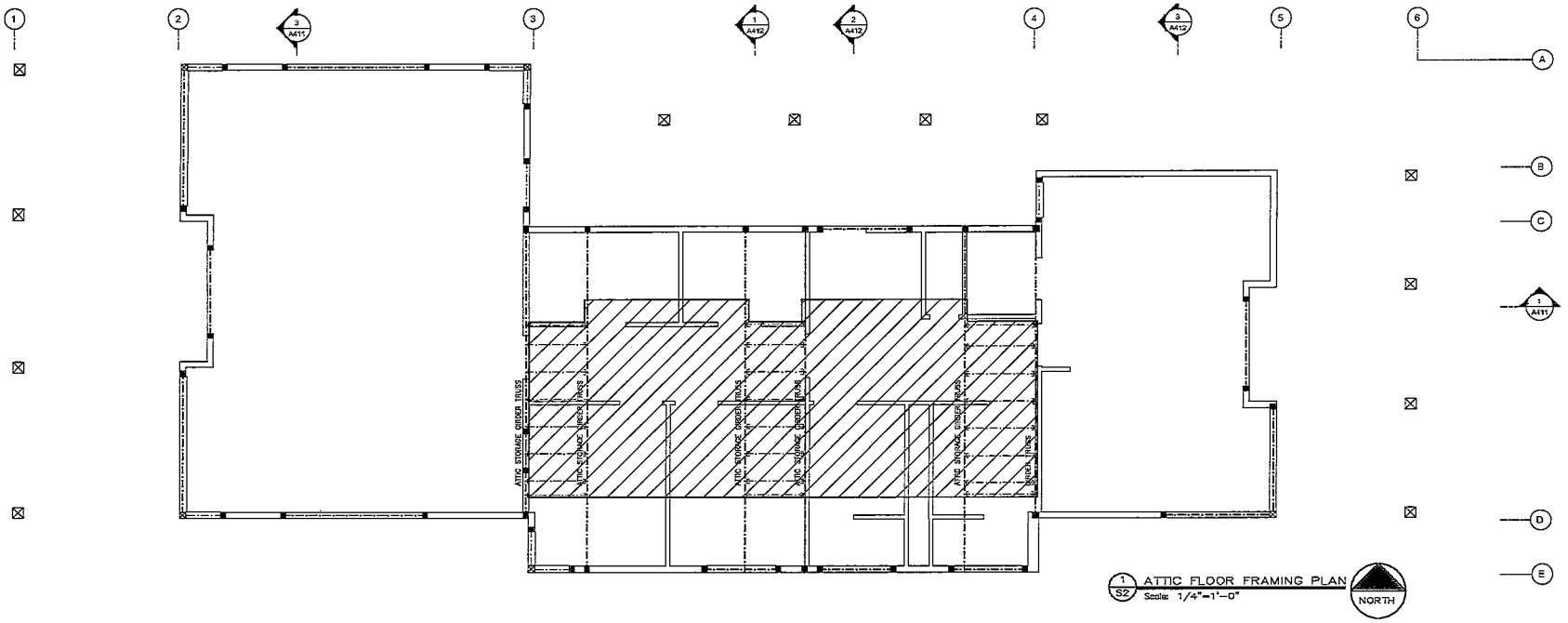
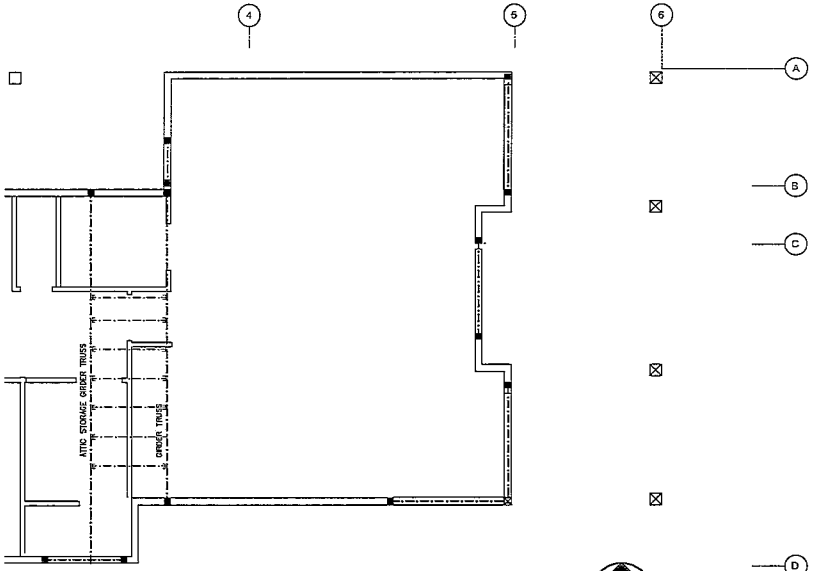
FOUNDATION DETAILS

S2



1 S2 ATTIC FLOOR FRAMING PLAN
Scale: 1/4"=1'-0"



2 S2 ATTIC FLOOR FRAMING PLAN (OPTION 2)
Scale: 1/4"=1'-0"

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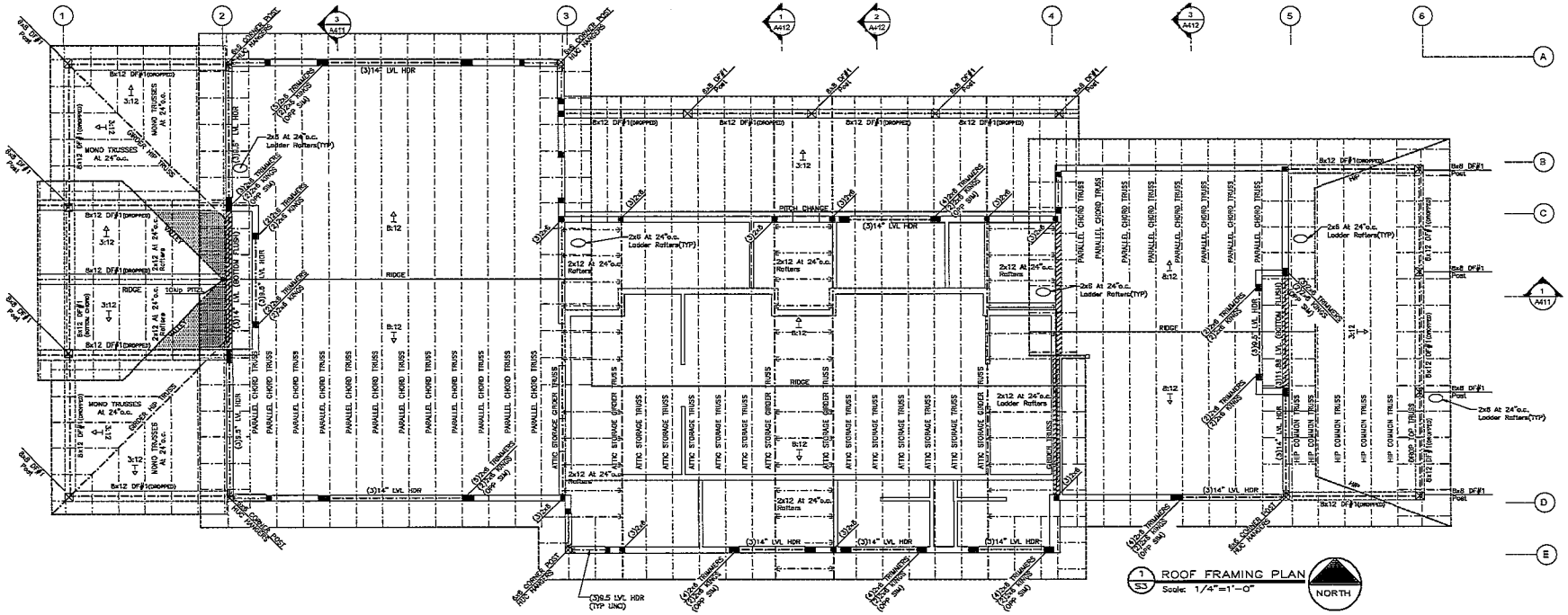
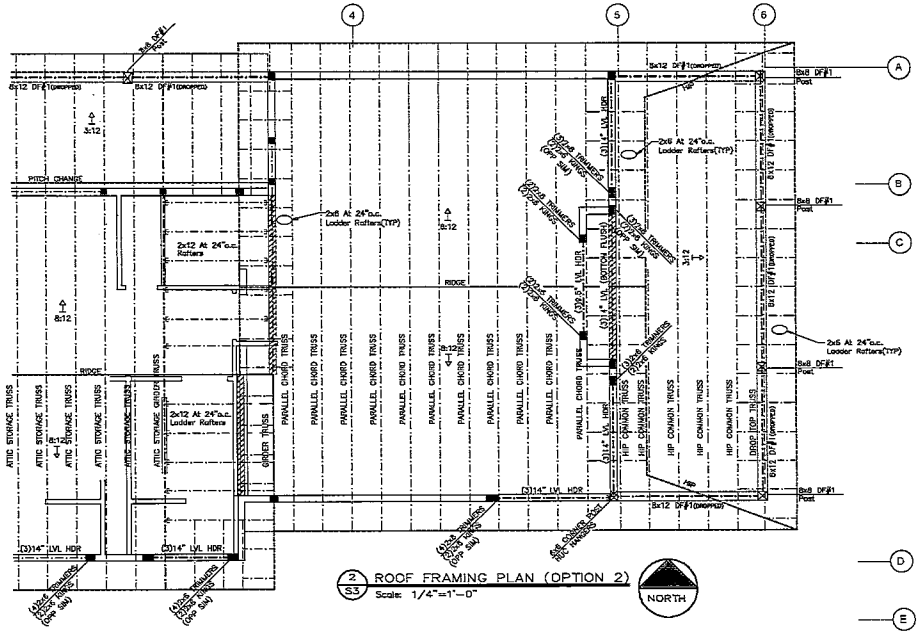
ATTIC FLOOR FRAMING PLAN

S3



1 S3 ROOF FRAMING PLAN
Scale: 1/4"=1'-0"



2 S3 ROOF FRAMING PLAN (OPTION 2)
Scale: 1/4"=1'-0"

GENERAL ROOF FRAMING NOTES

- Engineer to review and approve truss manufacturers shop drawings prior to ordering trusses. Truss Mfg. to provide matching tails.
- Block all trusses, outlookers, and rafters at all bearing points.
- Wall studs to be continuous from floor to roof. Balloon frame all gable walls. Provide firestop blocking at 10' max intervals. Wall studs over 12' vertical height to be 1 3/4"x5 1/2" LVL/LSL (UNO)
- Roof Ventilation per Local Codes and Architect.
- Roof Attic System Designed to be cross ventilated with a minimum Area of 1/150 of the Area of the Space Ventilated. The net free Cross Ventilation Area may be reduced to 1/300 when an approved Vapor Barrier is installed on the Warm Side of the Ceiling.

TYPICAL ROOF OVER FRAME NOTES

- Overframe
- 2x8 At 24"oc Rafters to stack Over Rafters/Trusses Below
- Provide Intermediate 2x4 bearing walls at 6'-0" maximum
- Provide 2x10 Valley Plates

GENERAL TIMBER FRAMING NOTES

- All Timber Beams/Columns Doug Fir #1 Graded Per Plan
- All Timber Beams Dimensions are Nominal. (i.e. 10x12 measures 9.25"x11.25")
- Provide 30 Square Inches of Bearing Minimum at Timber Bearing Points
- (2)5/8"ø Lag Screws w/ 6" Min Penetration at Timber to Timber Connections UNO
- (2)5/8"ø Lag Screws with 6" Embedment At Bearing on 2x6 Framing

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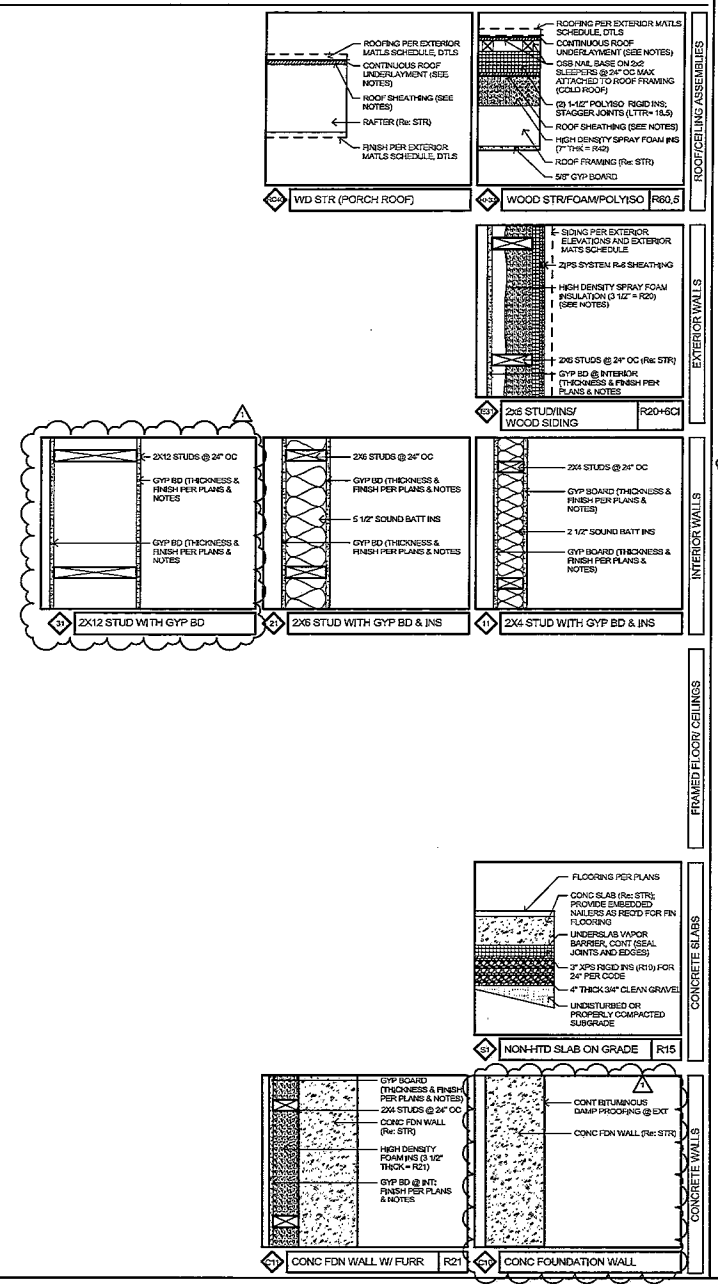
ROOF FRAMING PLAN

S4

CONSTRUCTION ASSEMBLY TYPES



CONSTRUCTION ASSEMBLY NOTES

1) THESE ARE STANDARD CONSTRUCTION ASSEMBLY NOTES; NOT EVERY NOTE APPLIES TO EVERY PROJECT. REFER TO DRAWINGS & DETAILS FOR SPECIFIC CONDITIONS.

2) TYPICAL CONSTRUCTION ASSEMBLIES (UNLESS OTHERWISE NOTED ON DWGS):
   - ROOFS = RF30
   - PORCH ROOFS = RC40
   - EXTERIOR WALLS = E31
   - INTERIOR WALLS = I1
   - INTERIOR PLUMBING WALLS = I2
   - CONCRETE SLABS = S1
   - CONCRETE: WALLS ABOVE GRADE = C11
   - CONCRETE WALLS BELOW GRADE = C10

3) WALL TYPES SHOWN ON PLANS ARE TAKEN AT 5'-0" ABOVE FINISH FLOOR. NOT ALL EXTERIOR MATERIALS AND FINISHES ARE SHOWN ON FLOOR PLANS - REFER TO EXTERIOR ELEVATIONS FOR EXACT LOCATIONS OF EXTERIOR MATERIAL AND FINISH TRANSITIONS. REFER TO STRUCTURAL DRAWINGS FOR EXACT LOCATIONS OF STRUCTURAL MATERIAL TRANSITIONS.

4) ALL GYPSUM BOARD TO BE 5/8" UNLESS OTHERWISE NOTED.

5) REFER TO PLANS, INTERIOR ELEVATIONS, DETAILS AND LOCAL CODE ENFORCEMENT AUTHORITIES FOR EXTENT OF MOISTURE RESISTANT GYPSUM WALLBOARD AND CEMENT BOARD. GENERAL CONTRACTOR SHALL MAINTAIN REQUIRED FIRE RATING OF WALL ASSEMBLIES AND COORDINATE THIS WORK WITH APPROPRIATE SUBCONTRACTORS.

6) TYPICAL DIMENSIONS ARE SHOWN FOR CONSTRUCTION ASSEMBLIES. REFER TO PLANS AND DETAILS FOR NONSTANDARD DIMENSION CONDITIONS.

7) REFER TO STRUCTURAL DRAWINGS AND SPECIFICATIONS FOR ALL LOAD BEARING CONSTRUCTION ASSEMBLIES. FIRE RATINGS PER ASSEMBLY TYPES SHALL BE MAINTAINED AT LOAD BEARING ASSEMBLIES.

8) REFER TO PLANS, FINISH SCHEDULE, AND INTERIOR ELEVATIONS FOR INTERIOR FINISHES.

9) REFER TO PLANS FOR COMPLETE DESCRIPTIONS OF ALL ASSEMBLY COMPONENTS AND CONSTRUCTION. CONFORM TO ALL APPLICABLE ASSEMBLY RATINGS AS NOTED HEREIN.

10) REFER TO PLANS, REFLECTED CEILING PLANS, DETAILS, AND ENGINEERING DRAWINGS FOR DROPPED CEILING AND SOFFIT AREAS. DETAILS AND REQUIREMENTS.

11) IN STUD WALLS, OFFSET WALL PENETRATIONS ON OPPOSITE SIDES OF WALLS BY AT LEAST 1 STUD BAY. GC TO COORDINATE THIS WORK WITH ALL SUBCONTRACTOR TRADES.

12) ALL ACOUSTICAL WALLS (NOTED IN TYPES AS 'ACU') SHALL HAVE CONTINUOUS BEADS OF ACOUSTICAL SEALANT AT TOP & BOTTOM OF WALLS AND AT ALL WALL PENETRATIONS.

13) REFER TO FLOOR PLAN FOR DRAFT STOPS AT ATTICS (IF APPLICABLE).

14) PROVIDE FIRE STOPPING IN ALL STUD WALLS ADJACENT TO STRINGERS IN ALL STAIRS.

15) REFER TO PROJECT MANUAL FOR FURTHER DETAILS ON PRODUCTS & INSTALLATION.

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CONSTRUCTION ASSEMBLIES & NOTES

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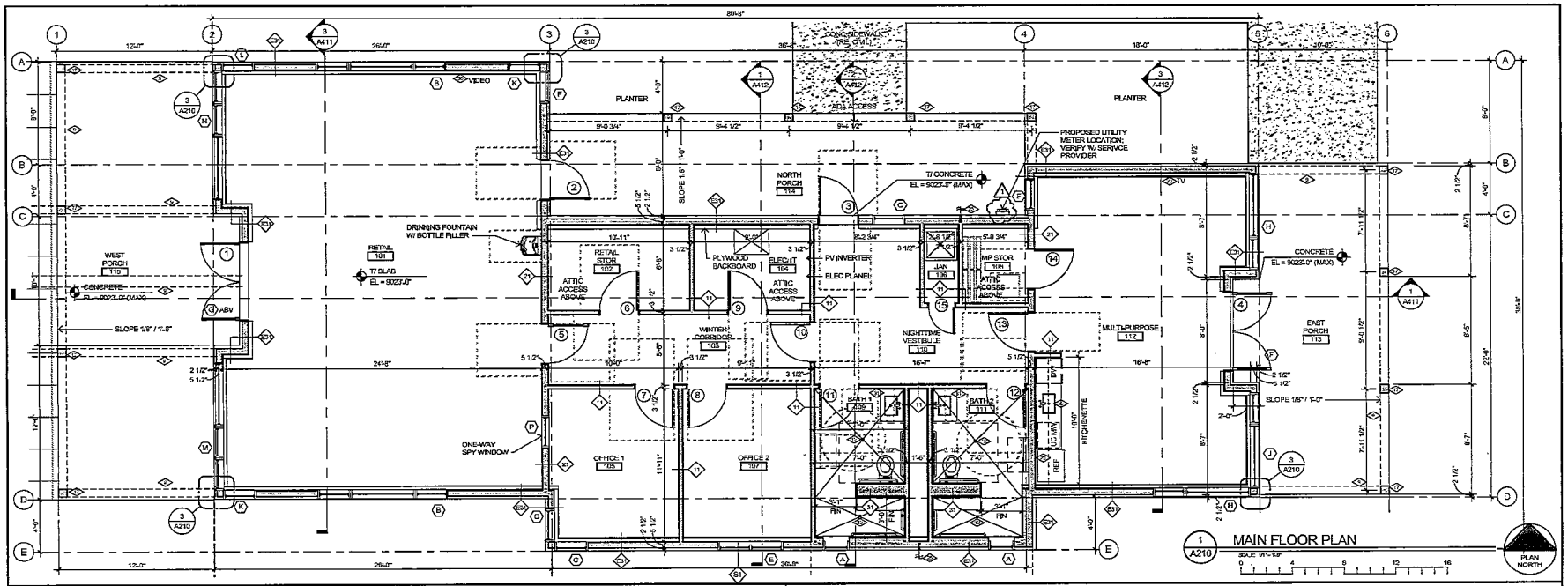
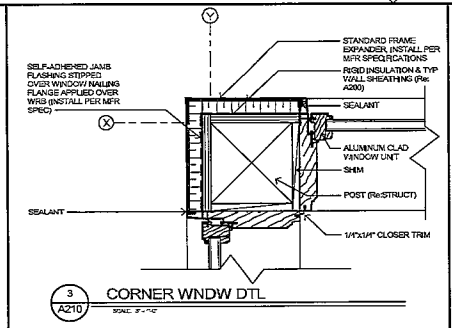
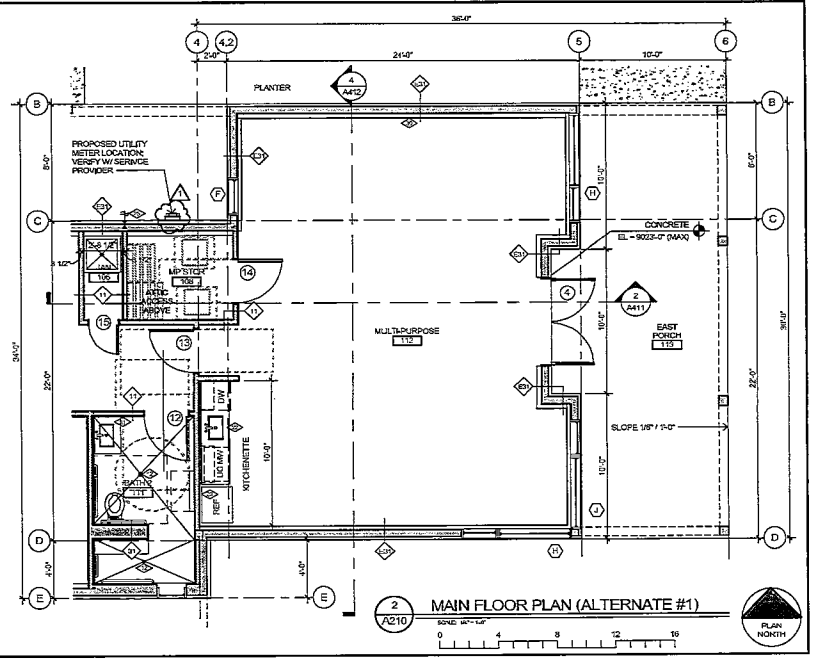




FLOOR PLAN KEY NOTES

- LOCATE ROUGH OPENING FROM THIS POINT
- LAYOUT POINT FOR WALL
- CANTILEVER WALL ON COLUMN
- CENTER DOOR IN WALL
- CENTER WINDOW IN INSIDE FACE OF WALL
- CANTILEVER ABOVE
- PROVIDE 2x4 FURRED WALL @ FACE OF RTN
- HALF WALL @ HGH (REL: D1L)
- DROPPED BEAM ABOVE (RE: STRUCTURAL)
- TIMBER BRACKET ABOVE (RE: ELEVATIONS)
- H-LOCKING MATERIAL TRANSITION
- FLOOR DRAIN
- ONE HOUR RATED FLUE
- PULL DOWN STAIR FOR ATTIC ACCESS (MIN RO 22"x30")
- TYP ROD & SHELF - SEE INTERIOR FINISH NOTES
- (W/SEAL CLOSET: 2'-0 1/2" INSIDE, SHELF/ROD W/ ROD & SHELF PER INTERIOR FINISH NOTES
- (FHS" TIMBER POST; ALIGN W/ BM ABV (IF PRESENT (MF)
- CLOSETS - SEE INTERIOR FINISH NOTES
- PANTRY SHELVING - SEE INTERIOR FINISH NOTES
- HNDMUN BLOCKING 5'-3" AFF FOR CLOSET SHELVING, COAT HOOKS OR IRONING BD (MF)
- HNDMUN BLOCKING 3'-3" AFF FOR TOWEL BAR
- PROVIDE SINK & PLUMBING FOR KITCHENETTE
- PROVIDE WATER CONN FOR ICE MAKER; VERIFY SIZING & CONN REQMTS W/ FINAL APPLIANCE SELECTION
- RECESSED WASHER BOX
- FREEZE PROOF HOSE BIBB
- ENTERTAINMENT CENTER CABINET (PER OWNER); PROVIDE ELEC, CATV & PHONE CONNECTIONS @ WALL
- BENCH (16" x 42") - FBO
- STORAGE CABINET / CLOSET BUILT-INS PER OWNER
- RECYCLING AREA - 4 SF MIN
- TELEVISION (TBD) - PROVIDE ELEC & CATV CONN AT WALL
- ELECTRIC HAND DRYER



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MAIN FLOOR PLAN

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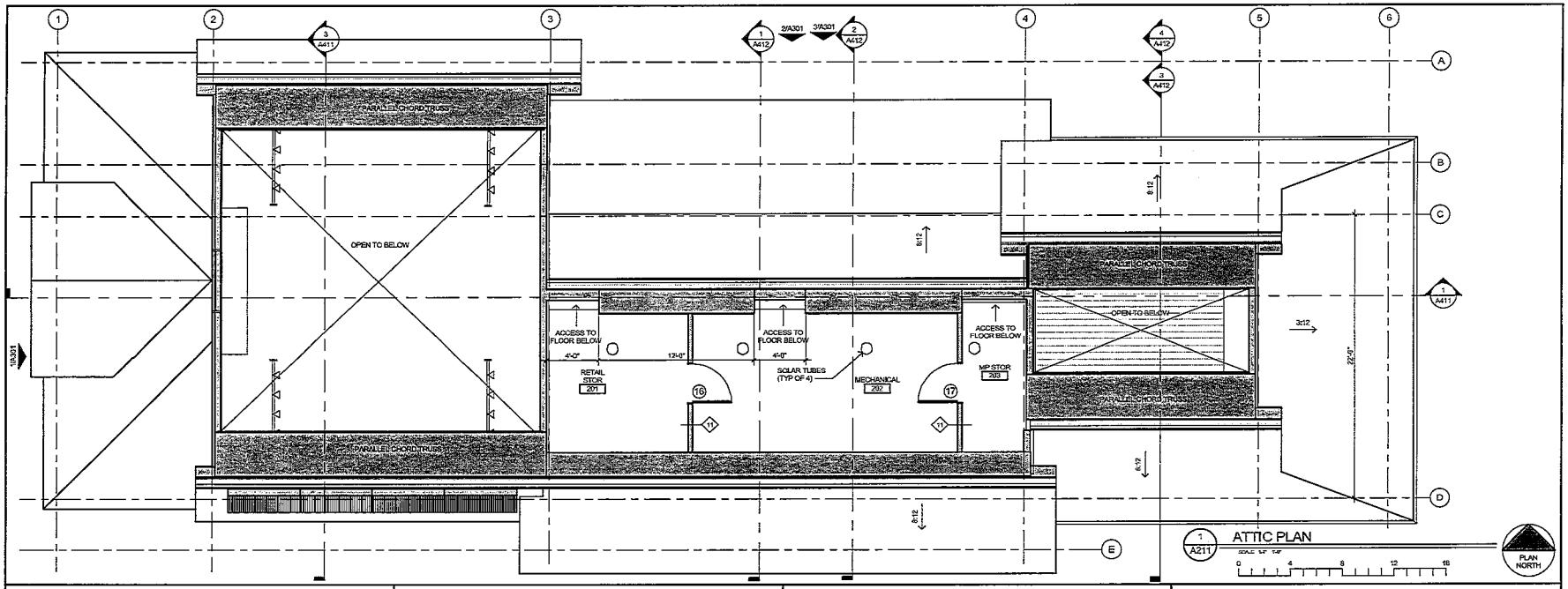

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ATTIC PLAN

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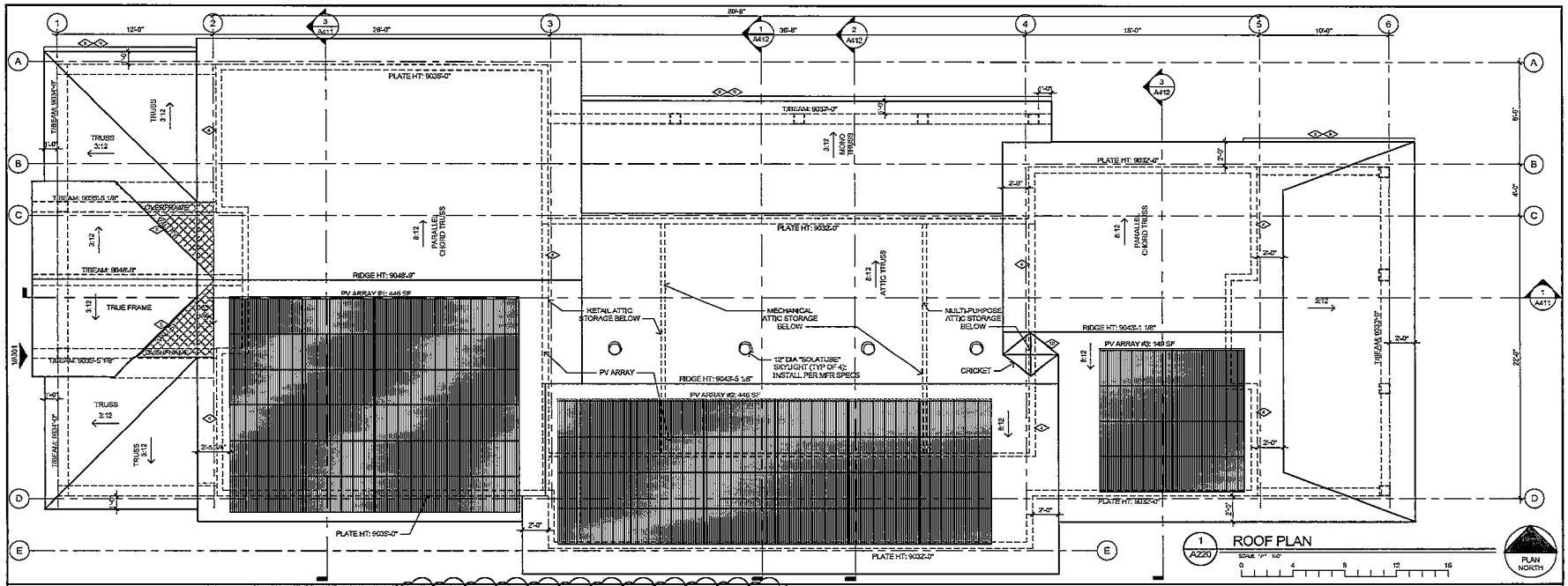
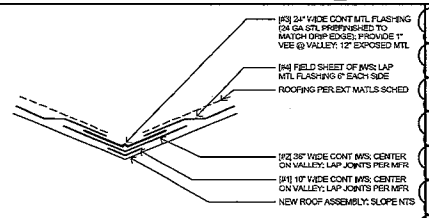


1 A220 ROOF PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH



NOTE: "IWS" = GRACE ICE & WATER SHIELD. INSTALL PER MFR INSTRUCTIONS AND PROJECT MANUAL.

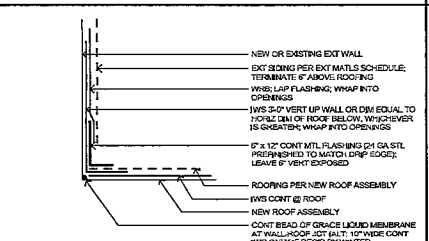
3 A220 '4-STEP' VALLEY FLASHING DETAIL

SCALE: 3/4" = 1'-0"

PHOTOVOLTAIC SYSTEM SUMMARY

ARRAY	BASE BID (SF)	BID ALT #1 (SF)
#1	446	446
#2	446	446
#3	149	371
TOTAL	1,041	1,263

1. PROVIDE COMPLETE GRID-TIED PHOTOVOLTAIC SYSTEM WITH ALL COMPONENTS SIZED TO CORRESPOND WITH PV ARRAYS SHOWN ON ROOF PLANS.
2. WORK SHALL INCLUDE PURCHASE AND INSTALLATION OF RAIL SYSTEMS TO SUPPORT PV PANELS ALONG WITH ASSOCIATED STRUCTURAL AND WATERPROOFING SYSTEMS TO INTEGRATE CONSTRUCTION OF PV ARRAYS WITH BUILDING CONSTRUCTION.
3. HIGH EFFICIENCY PV PANELS SHALL BE SPECIFIED FOR ALL ARRAYS.
4. BIDDERS SHALL HAVE 3 YEARS MINIMUM LOCAL EXPERIENCE WITH PV SYSTEM INSTALLATION IN SUMMIT COUNTY, COLORADO.
5. BIDDERS SHALL REVIEW AND ADJUST SIZE OF ARRAYS BASED ON LOCAL EXPERIENCE AND REGULATIONS.
6. BIDDERS SHALL SUPPLY DETAILED SYSTEM INFORMATION WITH BID FOR OWNER REVIEW.
7. OWNER RESERVES THE RIGHT TO ADJUST SCOPE OF SYSTEM TO SUIT PROJECT NEEDS.

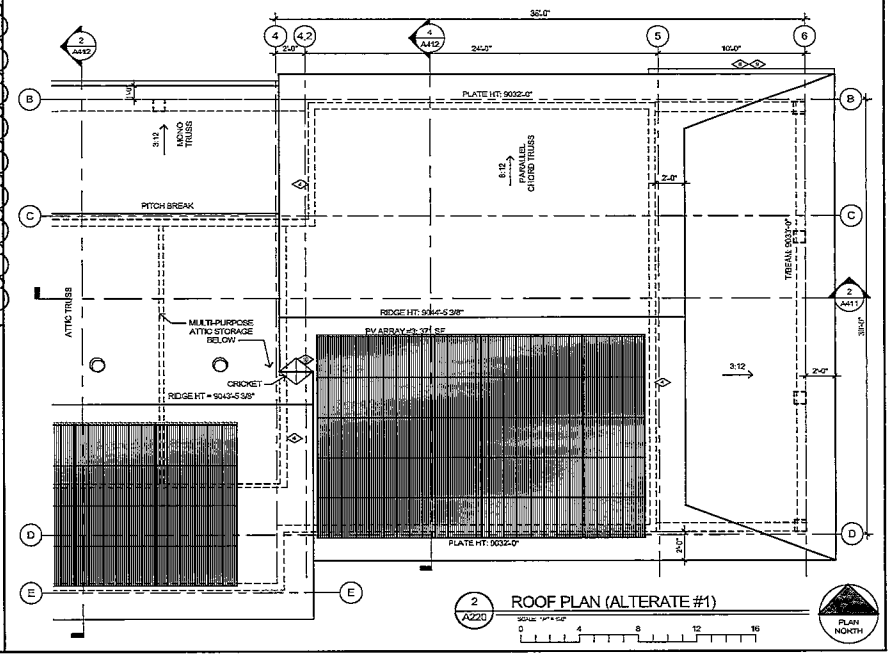


4 A220 TYPICAL SIDEWALL FLASHING DTL

SCALE: 3/4" = 1'-0"

ROOF PLAN KEY NOTES

1. ROOF PITCH 3:12 UNLESS NOTED ON DRAWINGS.
2. ROOF OVERHANG 2'-0" TO EDGE OF RAKE & EAVE UNLESS OTHERWISE NOTED ON DRAWINGS.
3. ALL FLASHING, VENTS, FLUES, ROOFTOP MECHANICAL EQUIPMENT, UTILITY BOXES, AND SIMILAR ITEMS SHALL BE PAINTED TO MATCH ADJACENT PORTION OF BUILDING UNLESS OTHERWISE NOTED.
4. TYPICAL SIDEWALL FLASHING (RE: 4/A220) ICE & WATER SHIELD 3'-0" VERT UP WALL OR DIM EQUAL TO HORIZ DIM OF ROOF BELOW, WHICHEVER IS GREATER; WRAP INTO OPENINGS; MTL FLASHING EXPOSED 6" UP WALL; TYPICAL AT ALL SIDEWALL CONDITIONS UNLESS OTHERWISE NOTED ON EXTERIOR ELEVATIONS.
5. TYPICAL VALLEY FLASHING: RE: 3/A220.
6. REFER TO STRUCTURAL FOR OVERFRAME AREAS.
7. PROVIDE CONVENIENCE WP DUPLEX RECEPTACLE AT SOFFIT.
8. PROVIDE ELECTRICAL PROVISION FOR HEAT TAPE.
9. PROVIDE ELECTRICAL PROVISION, HEATED GUTTER & DOWNSPOUT TO GRADE FROM THIS EAVE LOCATION - RE: 1/A330.
10. PROVIDE CRICKET @ CHIMNEY.
11. TYPICAL EXTERIOR WALL AT GABLE END WALL, OVERFRAME AREA, OR CLOSURE WALL BETWEEN ROOF PITCHES.
12. CHIMNEY CAP - SLOPE 1/4" PER FT SOUTHWARDS, UNLESS OTHERWISE NOTED ON PLANS OR DETAILS.
13. REFER TO FLOOR PLAN SHEETS FOR LOWER ROOFS.



2 A220 ROOF PLAN (ALTERATE #1)

SCALE: 1/8" = 1'-0"

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ROOF PLAN

A220

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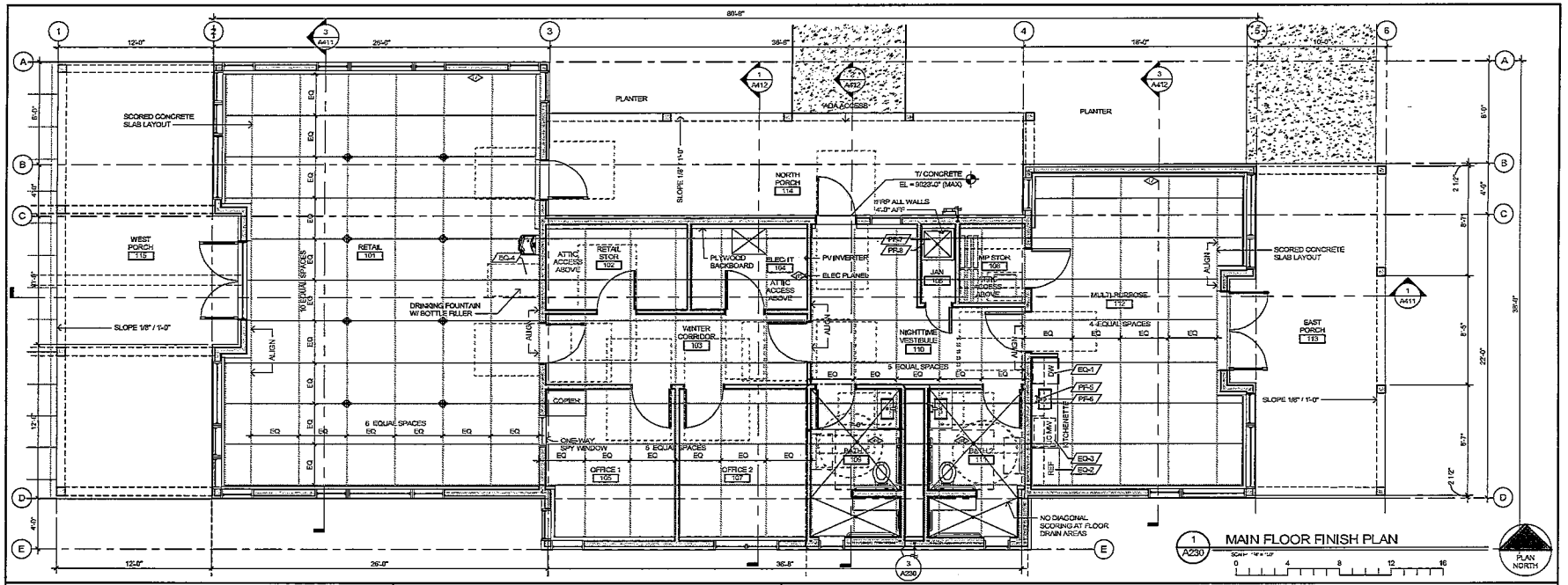


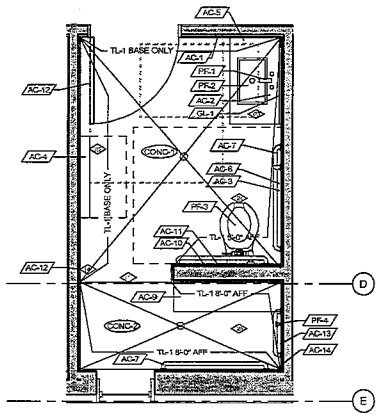
1 A230 MAIN FLOOR FINISH PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH

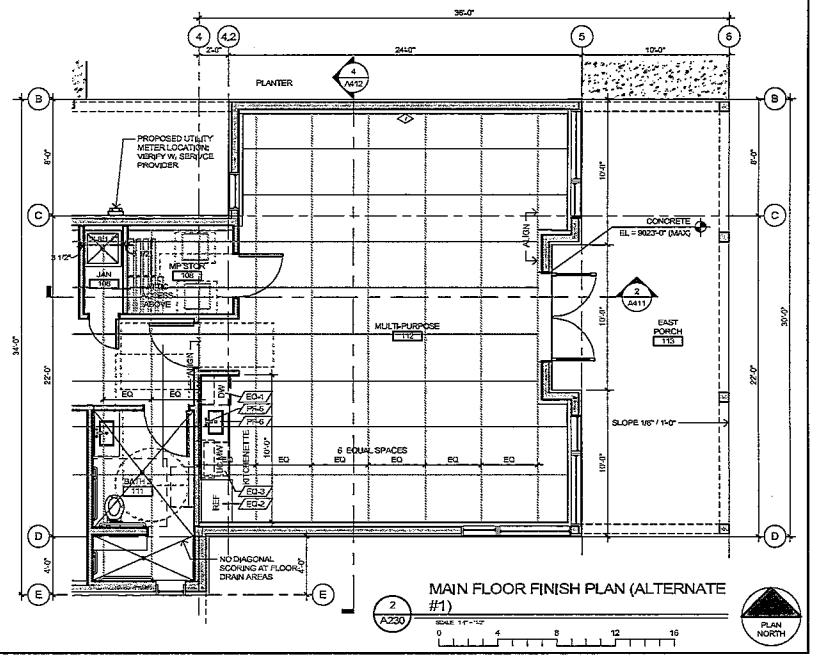
FINISH PLAN KEY NOTES

- FLOORING MATERIAL TRANSITION
- HALF WALL WITH CAP, 3'-6" AFF U/O/N
- SHOWER CURTAIN
- TOWEL HOOKS, PROVIDE BLOCKING, 3'-6" AFF U/O/N
- TOWEL BAR, PROVIDE BLOCKING, 3'-0" AFF U/O/N
- TYPICAL ROD & SHELF PER PRINT FINISH NOTES
- PROVIDE TV CONNECTION
- PROVIDE COMPUTER NETWORK CONNECTION
- PROVIDE PHONE JACK
- BICYCLE STORAGE RACK
- SKI/SNOWBOARD STORAGE RACK
- DIAPER CHANGING COUNTER
- TYPICAL ADA ROD & SHELF
- MECH CLOSET
- ELECTRICAL PANEL
- FINISHED HEARTH
- FINISHED END PANEL AT CABINETRY
- PROVIDE 5'-0" MIN CLEAR ADA TURNING DIAMETER @ THIS AREA
- TYPICAL PARKING SPACE (8'-0" x 18'-0") PROVIDE STRIPING
- ADA PARKING SPACE (8'-0" x 18'-0") PROVIDE STRIPING AND ADA SYMBOL
- ADA TRAVEL AISLE (5'-0" x 18'-0") PROVIDE DIAGONAL STRIPING
- SERVICE AREA - PROVIDE DIAGONAL STRIPING
- TYPICAL ACCESSIBLE LAVATORY (RE2,3,4/A701)
- TYPICAL ACCESSIBLE WATER CLOSET (RE5,6,7/A701)
- TYPICAL ACCESSIBLE ROLL-IN-TYPE SHOWER (RE5,8,9,10/A701)



3 A230 ENLARGED PLAN AT TYP BATH

SCALE: 1/2" = 1'-0"



2 A230 MAIN FLOOR FINISH PLAN (ALTERNATE #1)

SCALE: 1/8" = 1'-0"

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MAIN FLOOR FINISH PLAN

A230

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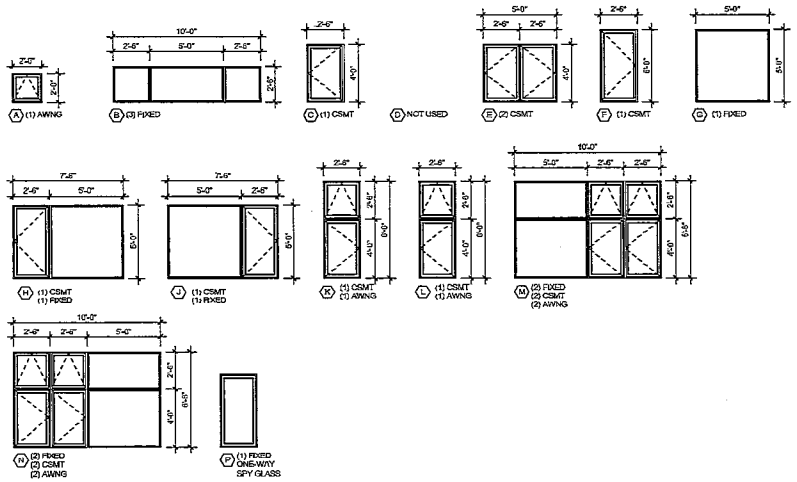
DOOR & WINDOW NOTES

1) UNIT SIZES (NOT ROUGH OPENINGS) HAVE BEEN SHOWN ON DOOR & WINDOW TYPES AND MAY HAVE BEEN ROUNDED FOR COMPARISON WITH OTHER MANUFACTURERS. VERIFY ALL DOOR, FRAME, WINDOW, AND ROUGH OPENING SIZES WITH MANUFACTURER PRIOR TO START OF CONSTRUCTION. SUBSTITUTION OF MANUFACTURERS WILL BE ALLOWED ONLY WITH OWNER / ARCHITECT APPROVAL.
2) REFER TO FLOOR PLANS FOR DOOR AND FRAME HANDING. NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO ORDERING.
3) SEE EXTERIOR ELEVATIONS FOR HANDING AND OPERATION.
4) ALL WINDOWS & EXTERIOR DOORS TO HAVE 'LOW E' INSULATED GLAZING UNLESS NOTED ON SCHEDULE AND SHALL BE RATED FOR USE AT HIGH ALTITUDES, PER MANUFACTURERS' REQUIREMENTS.
5) FIELD MEASURE FOR ALL CUSTOM UNIT SIZES PRIOR TO ORDERING.
6) PROVIDE WEATHERSTRIPPING AND ALUMINUM THRESHOLDS AT ALL EXTERIOR DOORS PER SCHEDULES.
7) WRAP TYVEK INTO ALL WINDOW AND DOOR OPENINGS (PER TYVEK MFR SPEC) PRIOR TO SETTING UNITS.
8) PROVIDE 1/2" CJR FOR INSULATION AT ALL EXTERIOR SHIM SPACES OF DOORS AND WINDOWS.
9) VERIFY WINDOW AND DOOR HARDWARE FINISHES WITH OWNER PRIOR TO ORDERING.
10) PROVIDE ALL COMBINATION UNITS WITH EXTERIOR MULLION COVERS.
11) WINDOWS AND DOORS TO HAVE FIELD APPLIED EXTENTION TRIM (NE A501); JAMB EXTENSION AND CASED OPENING AT INTERIOR.
12) ALL GLAZED AREAS IN HAZARDOUS LOCATIONS MUST BE GLAZED WITH SAFETY MATERIAL PER IRC.
13) ALL RATED ASSEMBLIES AS NOTED ON DOOR SCHEDULE SHALL INCLUDE RATED DOOR, FRAME AND HARDWARE.
14) U-VALUE OF WINDOW AND DOOR ASSEMBLIES TO COMPLY WITH CURRENT IECC REQMTS.
15) PROVIDE FRAME PROFILE AT ALL FIXED WINDOWS TO MATCH CASEMENT PROFILE (NO DIRECT SET).
16) TYPICAL DOOR FRAMING TO BE 4" FROM ADJACENT WALL ON HINGED SIDE UNLESS OTHERWISE DIMENSIONED ON PLANS.

WINDOW TYPES

NOTES: 1. VERIFY ALL SWINGS WITH EXTERIOR ELEVATIONS.
2. PROVIDE SHOP DRAWINGS FOR ARCHITECT REVIEW AND APPROVAL PRIOR TO ORDERING UNITS
3. REFER ALSO TO DOOR AND WINDOW NOTES BELOW



EXTERIOR MATERIALS SCHEDULE

TAG	ITEM	MATERIAL	COLOR
E1	PRIMARY ROOF:	CLASS 4 ASPHALT SHINGLES	TAMKO "WEATHERED WOOD"
E2	DRIP EDGE:	ALUMINUM (PREFINISHED)	MATCH ADJACENT ROOF
E3	FASCIA:	2x RS CEDAR (RE: DTL)	SW # 3525 "CHESTNUT" SEMI-TRANSPARENT STAIN
E4	SOFFIT:	1x6 T&G CEDAR; SELECT KNOTTY (RUN PARALLEL TO EAVE)	MATCH FASCIA
E5	PRIMARY SIDING:	1x8 SHIPLAP VERT RS PINE BEETLE KILL	SW # 3521 "CROSSROADS" SEMI-TRANSPARENT STAIN
E6	SECONDARY SIDING:	BRIDGERSTEEL ULTRA BATTEN 13 3/4" COVERAGE	"REGAL BLUE"
E7	DOORS/WINDOWS:	ALPEN "ZENITH SERIES" FIBERGLASS	"GUNBARREL"
E8	PATIOS/DECKS:	CONCRETE	NATURAL
E9	EXPOSED BEAMS & POSTS	DOUGLAS FIR OR GLULAM	MATCH FASCIA
E10	CONCRETE BASE:	CONCRETE W/ BARNWOOD FORMLINERS (https://www.specformliners.com/patterns/pdfs/1203barnwood.pdf)	CLEAR SEALER PER SPEC SECTION 07 1900
E11	PORCH CEILINGS:	1x6 T&G ROUGH SAWN CEDAR (RUN PARALLEL TO EAVE)	MATCH SOFFIT

NOTES:

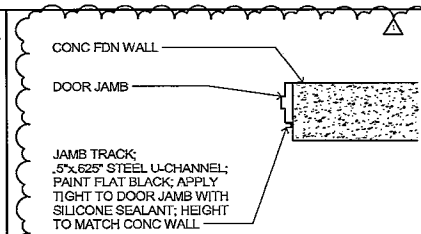
1) IN THE CASE OF ANY DISCREPANCIES BETWEEN THIS SCHEDULE AND OTHER CONTRACT DOCUMENTS, THE INFORMATION ON THIS SCHEDULE SHALL TAKE PRECEDENCE.
2) NOT USED.
3) ALL FLASHING, VENTS, FLUES, ROOFTOP MECHANICAL EQUIPMENT, UTILITY BOXES, AND SIMILAR ITEMS SHALL BE PAINTED TO MATCH ADJACENT PORTION OF BUILDING UNLESS OTHERWISE NOTED.
4) TYPICAL SIDEWALL FLASHING: ICE & WATER SHIELD 24" VERT UP WALL; WRAP INTO OPENINGS; MTL FLASHING EXPOSED 6" UP WALL; TYPICAL AT ALL SIDEWALL CONDITIONS.
5) EXTERIOR PAINT & STAIN AREAS TO RECEIVE (2) COATS MINIMUM, PLUS PRIMER COAT.
6) SIDING MATERIAL CHANGES TO OCCUR AT INTERIOR CORNERS.

DOOR & FRAME SCHEDULE

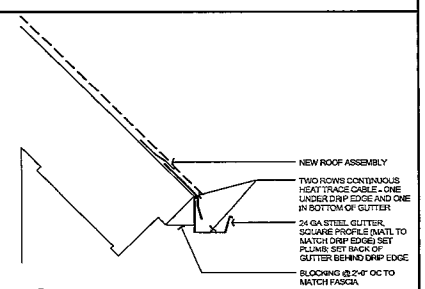
#	MATL	TYPE	OP	FRAME	WIDTH	HEIGHT	THKNSS	CLOSER	NOTES
1	AL	FLUSH	SWING	AL	(2) 3-0"	7'-0"	1 3/4"	Y	STOREFRONT WITH 2'-0" TRANSOM
2	MTL/INS	FLUSH	SWING	HM	3'-0"	8'-0"	1 3/4"	Y	FLUSH DOOR BELOW GL
3	MTL/INS	FLUSH	SWING	HM	3'-0"	8'-0"	1 3/4"	Y	FLUSH DOOR BELOW GL
4	AL	PLUSH	SWING	AL	(2) 3-0"	8'-0"	1 3/4"	Y	STOREFRONT
5	MTL/INS	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	Y	
6	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	N	
7	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	N	
8	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	N	
9	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	N	
10	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	Y	
11	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	Y	
12	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	Y	
13	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	Y	
14	MTL	FLUSH	SWING	HM	3'-0"	7'-0"	1 3/4"	N	
15	MTL	FLUSH	SWING	HM	2'-0"	7'-0"	1 3/4"	N	
16	WD-SC	FLUSH	SWING	WD	3'-0"	6'-8"	1 3/4"	N	
17	WD-SC	FLUSH	SWING	WD	2'-0"	6'-8"	1 3/4"	N	

INTERIOR FINISH NOTES

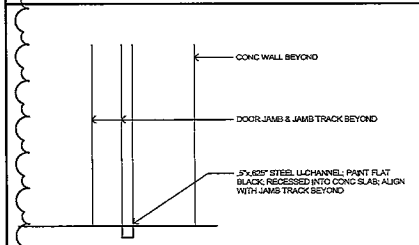
1) FOLLOW ALL MANUFACTURER'S RECOMMENDATIONS AND INSTALLATION INSTRUCTIONS PER GENERAL NOTES.
2) COMMENCEMENT OF FINISH WORK INDICATES ACCEPTANCE OF PRIOR WORKMANSHIP BY INSTALLER.
3) ALL "TYPICAL" ASSEMBLIES AS INDICATED BELOW SHALL BE PRICED AND INSTALLED UNLESS OTHERWISE NOTED IN CONTRACT DOCUMENTS. VERIFY ALL DEPARTURES FROM "TYPICAL" ASSEMBLIES WITH GC AND ARCHITECT.
4) TYPICAL WALL BASE TRIM: SPECIES & PROFILE PER FINISH SPECIFICATIONS. PROVIDE BASE TRANSITION @ OUTSIDE CORNERS, SANITARY COVE BASE AT RESTROOMS.
5) TYPICAL DOOR CASING PER FINISH SPECIFICATIONS.
6) TYPICAL WINDOW CASING PER FINISH SPECIFICATIONS.
7) ALL WALLS AND CEILINGS SHALL RECEIVE 5/8" GYPSUM BOARD, TAPE, (2) COATS MUD, TEXTURE AS NOTED BELOW, AND (2) COATS LATEX PAINT UNLESS NOTED HEREIN OR IN OTHER CONTRACT DOCUMENTS.
8) TEXTURE AT GYPSUM BOARD WALLS PER SPECIFICATIONS.
TEXTURE AT GYPSUM BOARD CEILINGS PER SPECIFICATIONS.
9) OUTSIDE WALL CORNERS AT GYPSUM BOARD SHALL HAVE SQUARE CORNERS, UNLESS NOTED.
10) FINISH ALL CLOSETS AND STORAGE AREAS TO MATCH ADJACENT SPACES UNLESS NOTED.
11) PROVIDE 1/2" CEMENT BOARD UNDERLAYMENT AT ALL CERAMIC TILE.
12) PROVIDE MOISTURE RESISTANT GYPSUM BOARD AT WET AREAS PER CODE AND CUSTOMARY PRACTICES.
13) TYPICAL KITCHEN COUNTERTOP: PER FINISH SPECIFICATIONS.
14) ALL PLUMBING FIXTURES: PER FINISH SPECIFICATIONS.
15) TYPICAL VANITY SINK: PER FINISH SPECIFICATIONS AND ADA (RE:A701).
16) TYPICAL SHOWER ASSEMBLY: PER ADA (RE:A701).
17) PROVIDE SOUND BATT INSULATION @ ALL INTERIOR WALLS.
18) ALL BATHROOMS TO HAVE A MINIMUM OF (1) GFI RECEPTACLE.
19) ANY INTERIOR FINISH ITEMS NOT NOTED HEREIN OR ELSEWHERE IN CONTRACT DOCUMENTS SHALL BE COORDINATED WITH GC / ARCHITECT BY MEANS OF ALLOWANCES FOR PURCHASES AND/OR INSTALLATION.



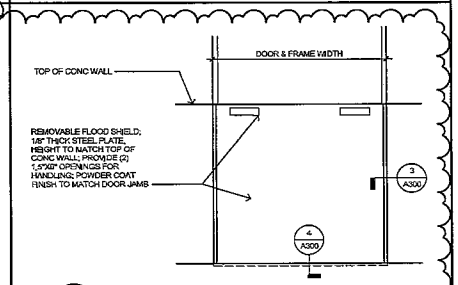
3 / A300 FLOOD SHIELD JAMB TRACK DETAIL
SCALE: 1 1/2" = 1'-0"



1 / A300 HEATED GUTTER DETAIL
SCALE: 1 1/2" = 1'-0"



4 / A300 FLOOD SHIELD SILL TRACK DETAIL
SCALE: 3" = 1'-0"



2 / A300 FLOOD SHIELD DETAIL
SCALE: 1" = 1'-0"

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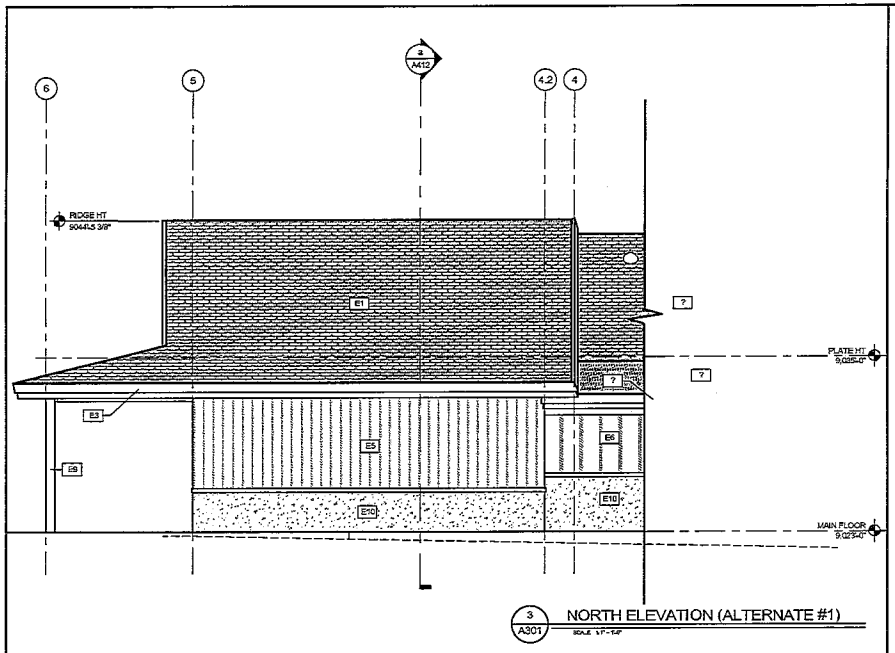
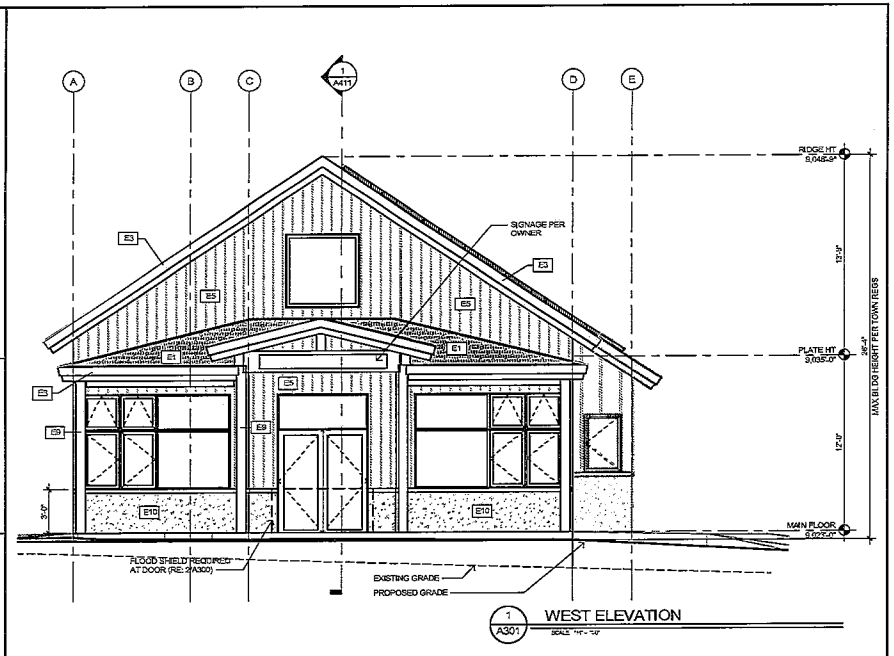
EXT MATLS SCHEDULE, DOOR & FRAME SCHED, WINDOW TYPES, NOTES

A300

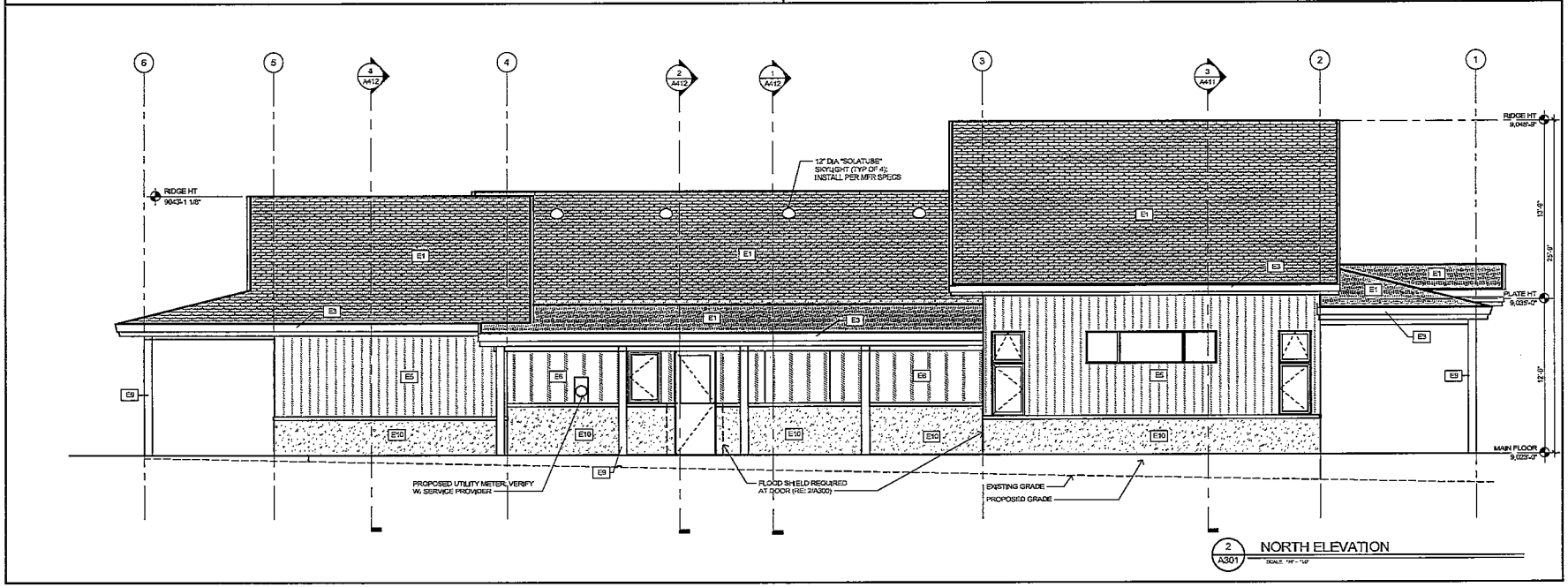
2/26/2021 9:11:42 AM T:\stais\architects.com\autocad\revit\revit files\Documents\FRAM - 3D model R19_jtest@staisarchitects.com.rvt



3 A301 NORTH ELEVATION (ALTERNATE #1)



1 A301 WEST ELEVATION



2 A301 NORTH ELEVATION

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EXTERIOR ELEVATIONS

A301

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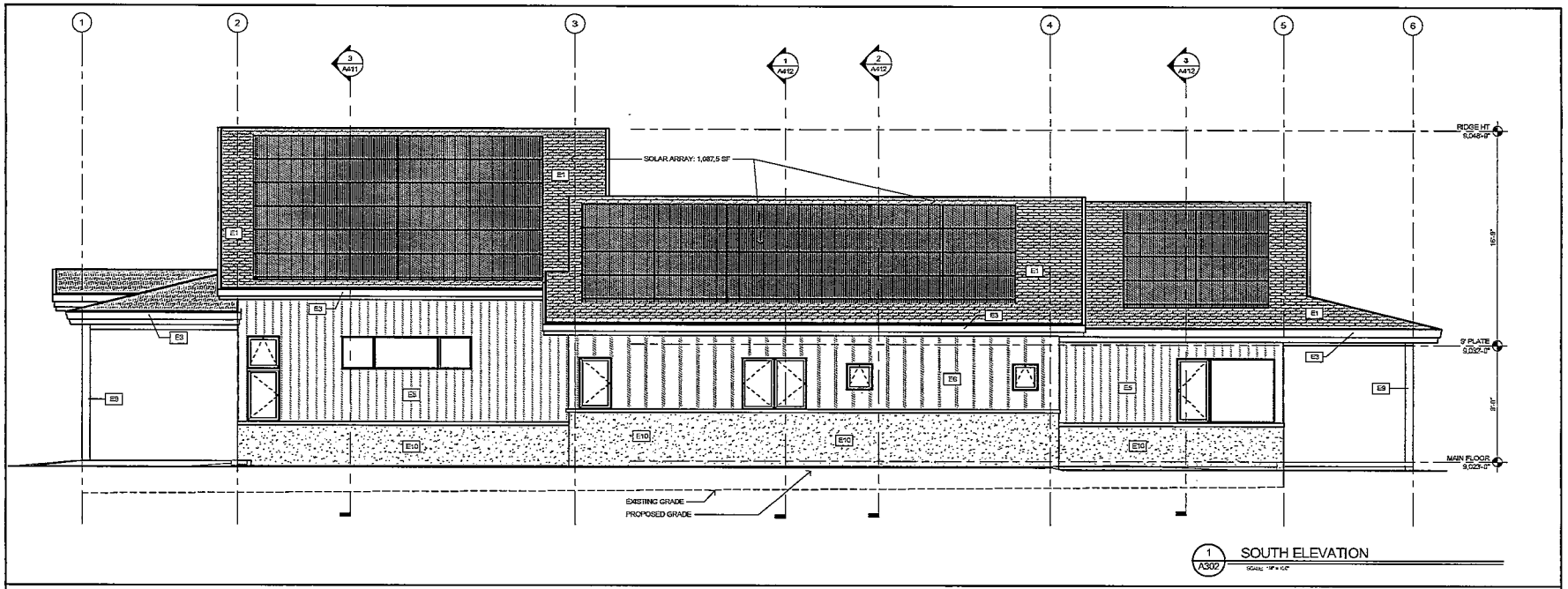
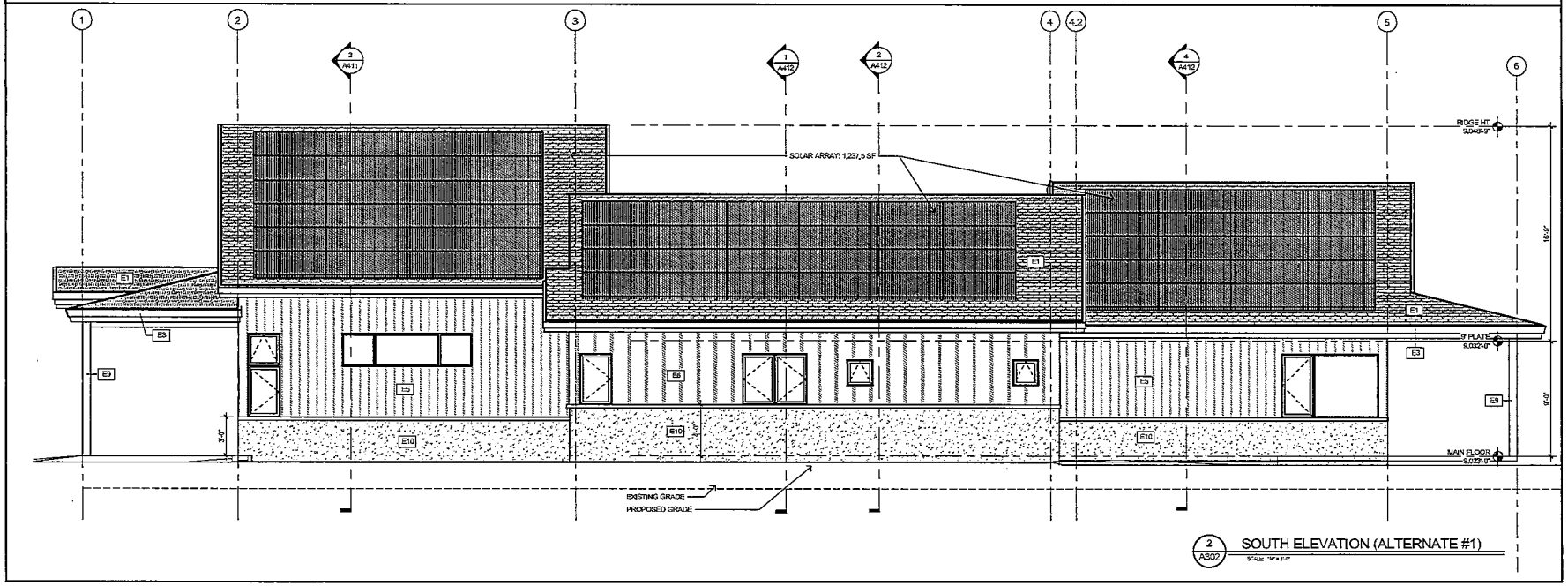


1 A302 SOUTH ELEVATION



2 A302 SOUTH ELEVATION (ALTERNATE #1)

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EXTERIOR ELEVATIONS

A302

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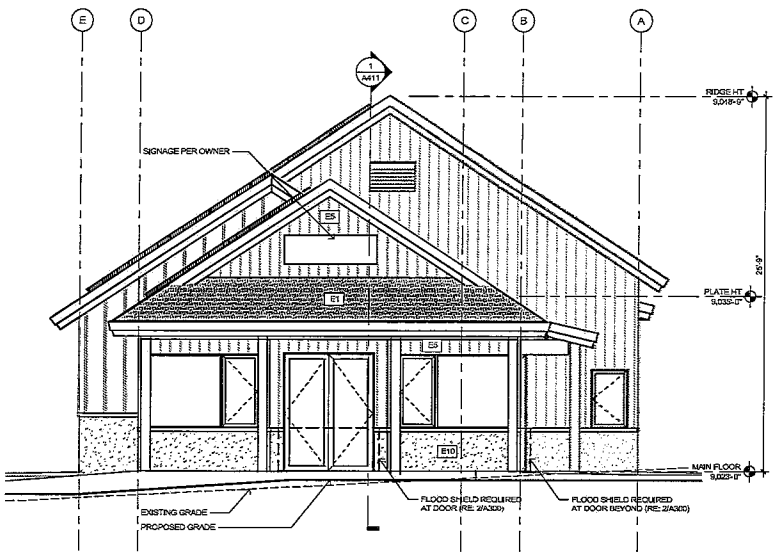
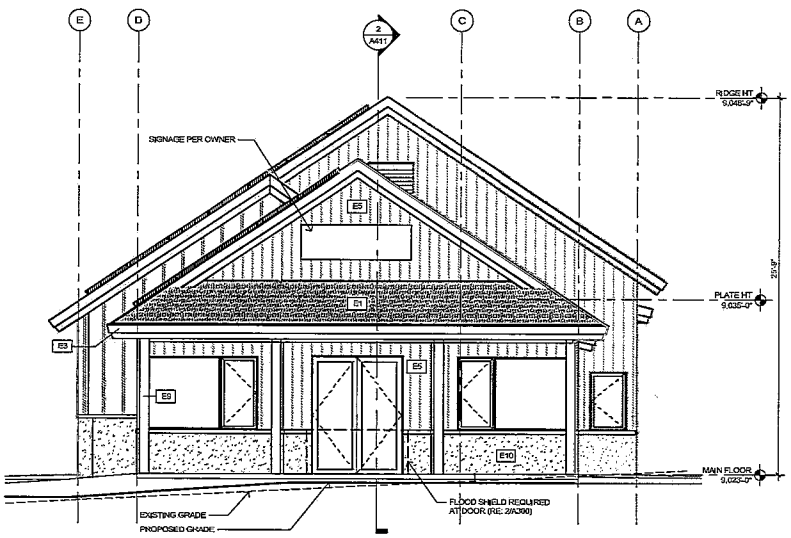


1 A303 EAST ELEVATION

SCALE: 1/4"=1'-0"



2 A303 EAST ELEVATION (ALTERNATE #1)

SCALE: 1/4"=1'-0"

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EXTERIOR ELEVATIONS

A303

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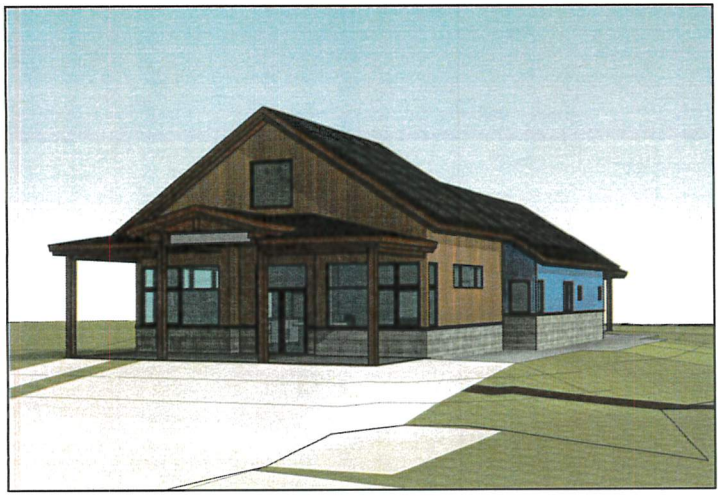
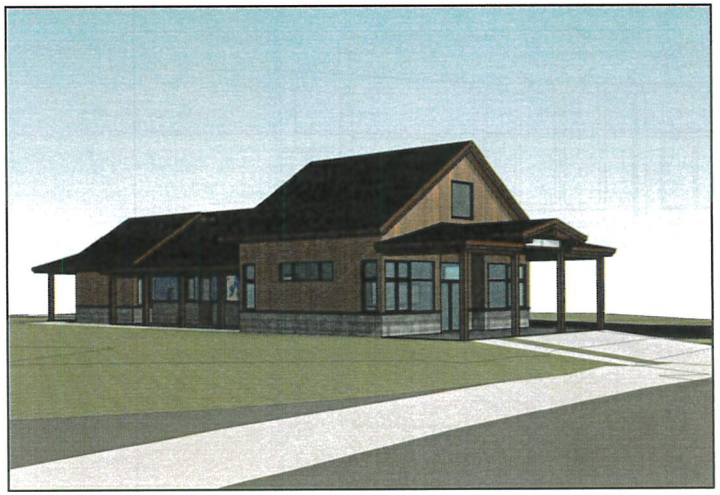
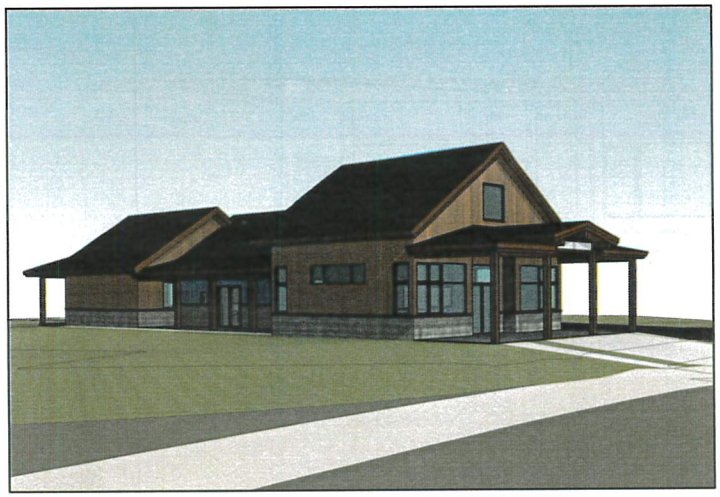


3 A311 VIEW FROM SOUTHWEST
SCALE



1 A311 VIEW FROM NORTHWEST
SCALE



2 A311 VIEW FROM NORTHWEST (ALTERNATE #1)
SCALE

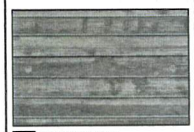
EXTERIOR MATERIALS KEY

E1 PRIMARY ROOF
ASPHALT SHINGLES
COLOR: TAMKO "WEATHERED WOOD"

E5 PRIMARY SIDING:
1x8 SHIPLAP VERT RS PINE BEETLE KILL
COLOR: BARWOOD "CROSSROADS"
SEMI-TRANSPARENT STAIN

E6 SECONDARY SIDING:
BRIDGERSTEEL ULTRA BATTEN
13 3/4" COVERAGE
COLOR: "REGAL BLUE"

E3 FASCIA, TRIM, BEAMS, MISC WOOD
COLOR: SW#3525 "CHESTNUT"
SEMI-TRANSPARENT STAIN



E10 CONCRETE BASE W/
BARNWOOD FORMLINERS

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EXTERIOR PERSPECTIVES

A311

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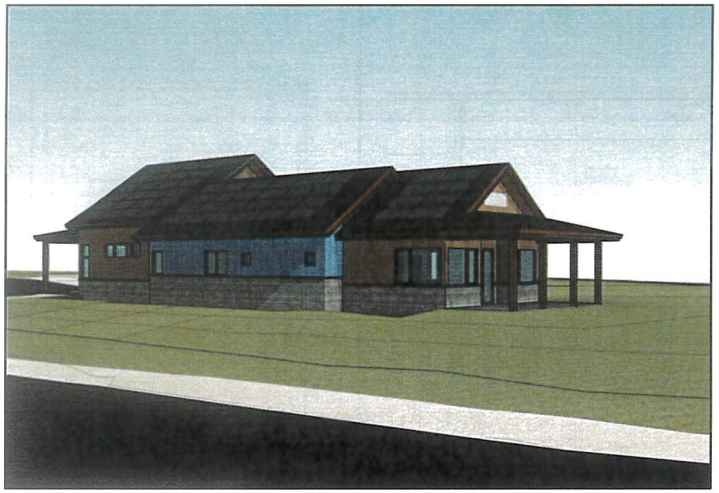
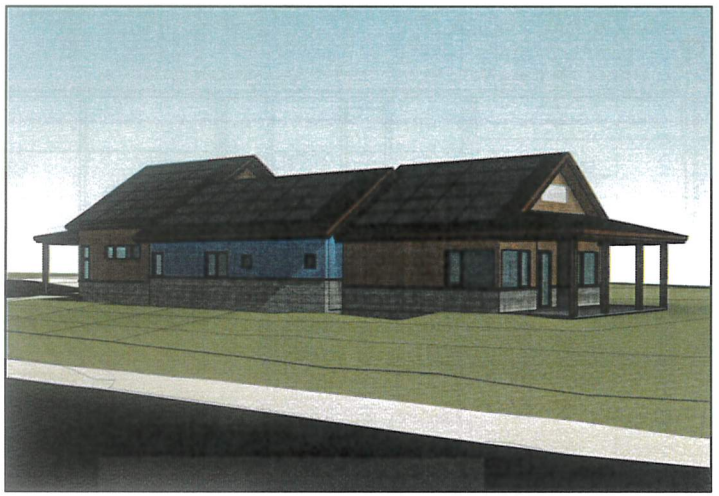
3 / A312 VIEW FROM NORTHEAST



1 / A312 VIEW FROM SOUTHEAST

4 / A312 VIEW FROM NORTHEAST (ALTERNATE #1)



2 / A312 VIEW FROM SOUTHEAST (ALTERNATE #1)

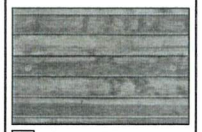
EXTERIOR MATERIALS KEY

E1 PRIMARY ROOF:
ASPHALT SHINGLES.
COLOR: TAMKO "WEATHERED WOOD"

E5 PRIMARY SIDING.
1x8 SHIPLAP VERT RS PINE BEETLE KILL
COLOR: SW9321 "CROSSROADS"
SEMI-TRANSPARENT STAIN

E6 SECONDARY SIDING.
BRIDGERSTEEL ULTRA BATTEN
13 3/4" COVERAGE
COLOR: "REGAL BLUE"

E3 FASQA, TRIM, BEAMS, MISC WOOD
COLOR: SW9326 "CHESTNUT"
SEMI-TRANSPARENT STAIN



E10 CONCRETE BASE W/
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EXTERIOR PERSPECTIVES

A312

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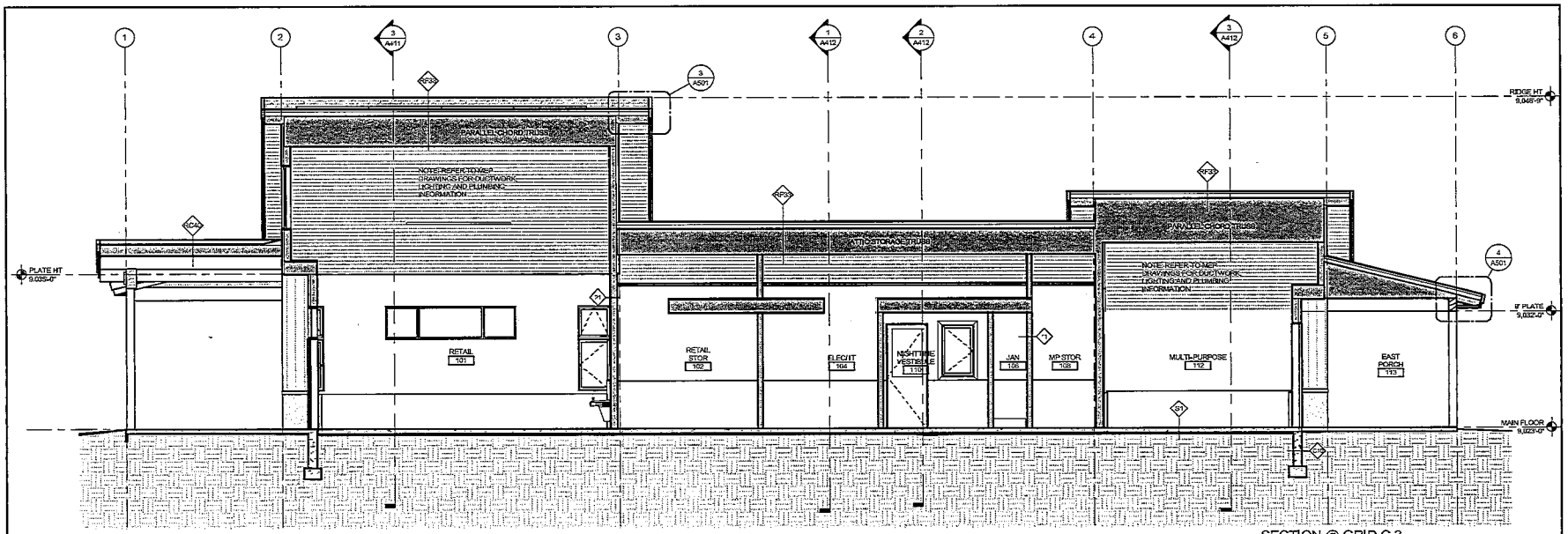
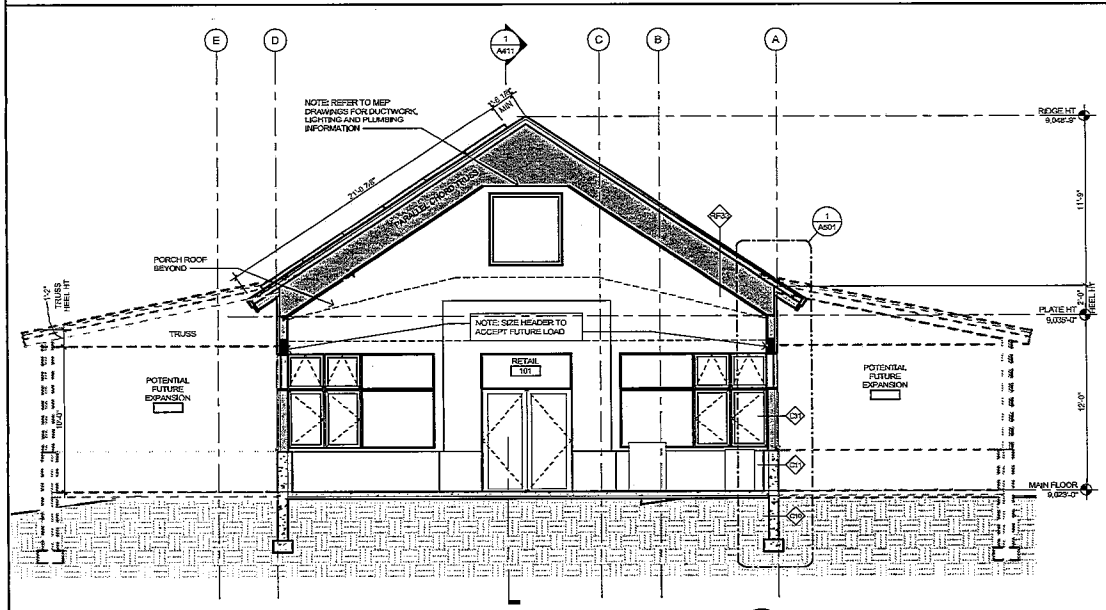
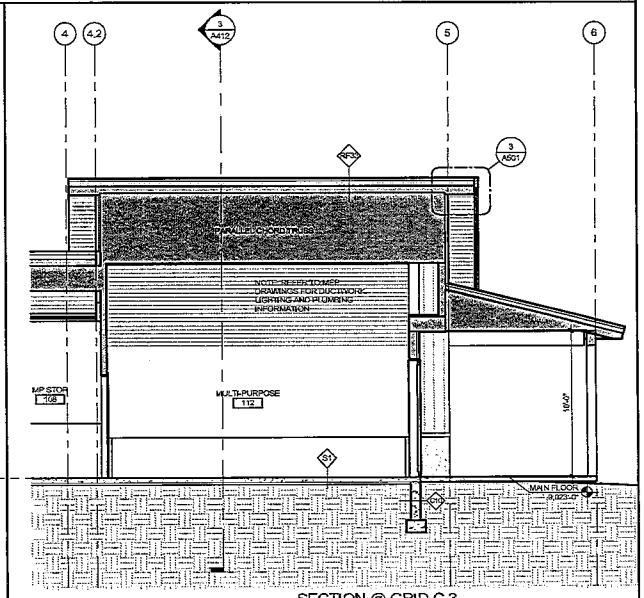


1 A411 SECTION @ GRID C.3 (LOOKING NORTH)



3 A411 SECTION @ RETAIL (LOOKING WEST)



2 A411 SECTION @ GRID C.3 (LOOKING NORTH) (ALTERNATE #1)

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BUILDING SECTIONS

A411

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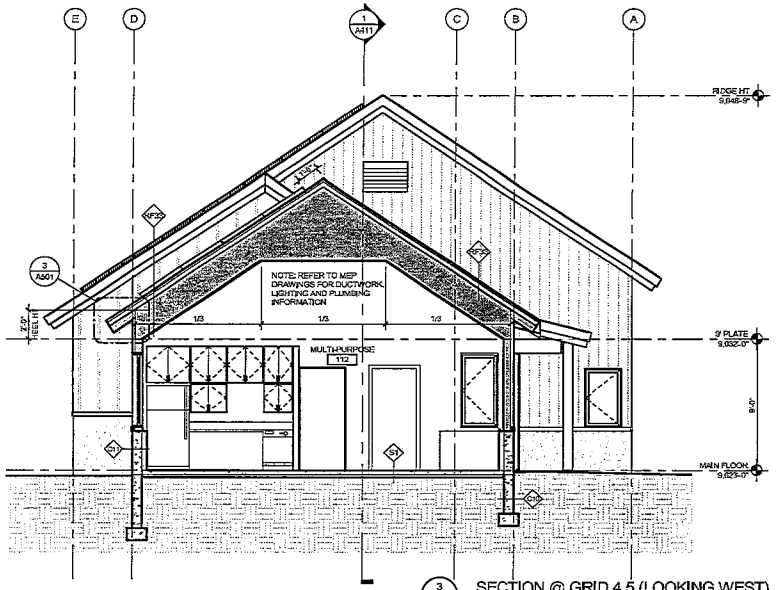
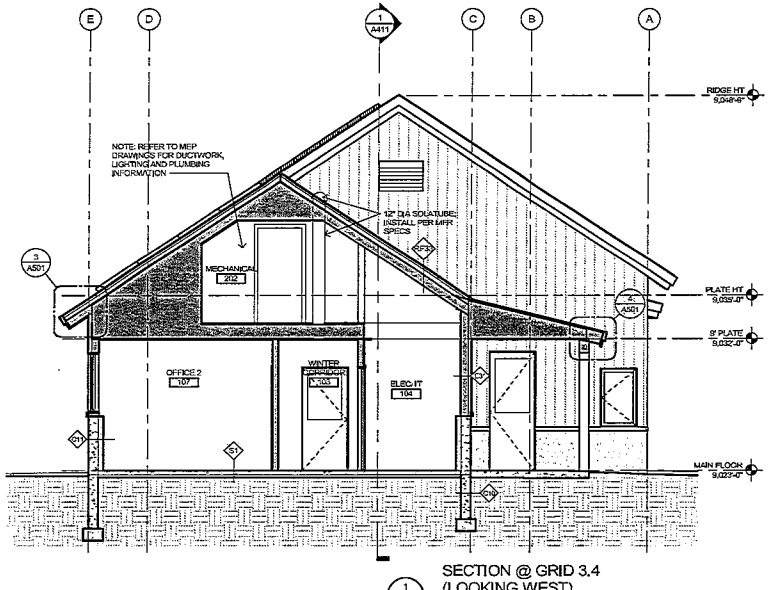
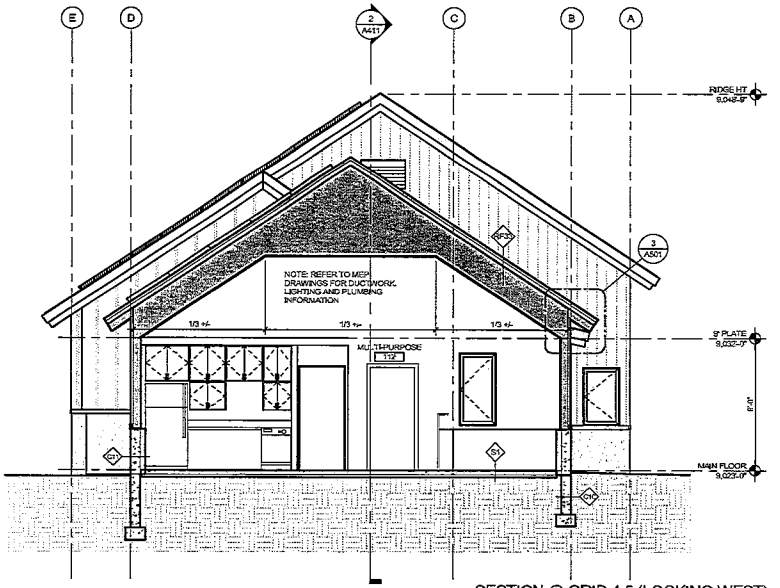


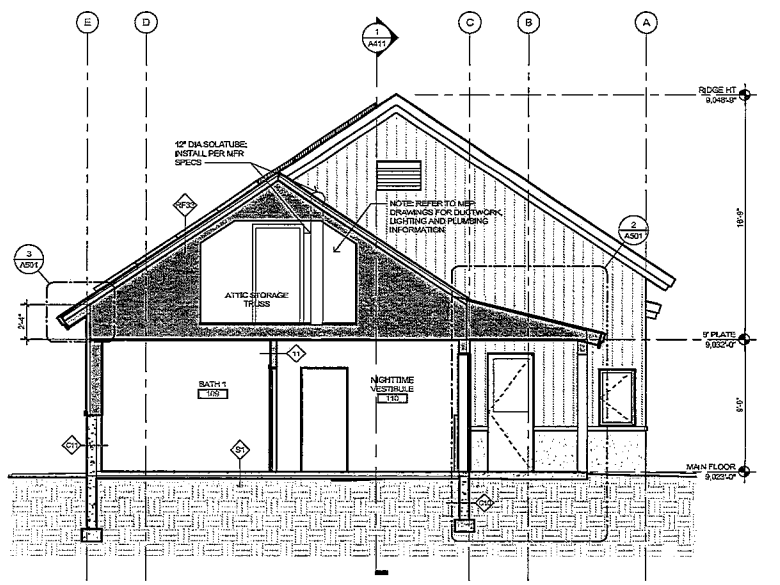
3 A412 SECTION @ GRID 4.5 (LOOKING WEST)



1 A412 SECTION @ GRID 3.4 (LOOKING WEST)



4 A412 SECTION @ GRID 4.5 (LOOKING WEST) (ALTERNATE #1)



2 A412 SECTION @ GRID 3.6 (LOOKING WEST)

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BUILDING SECTIONS

A412

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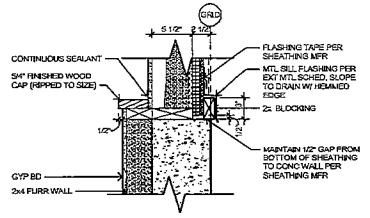
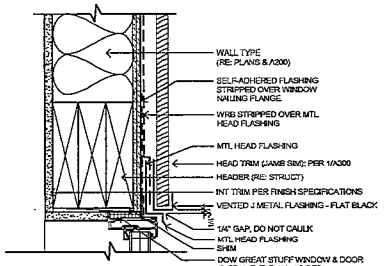


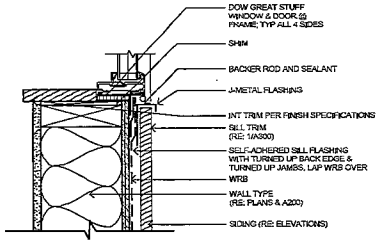
5 A501 WALL STEP @ FOUNDATION

SCALE: 1" = 1'-0"



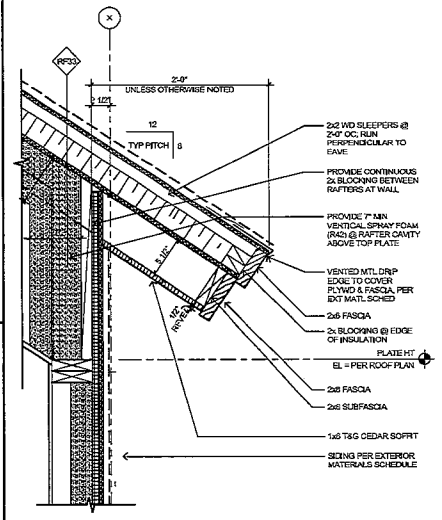
6 A501 EXT WINDOW HEAD @ WD SIDING

SCALE: 3" = 1'-0"



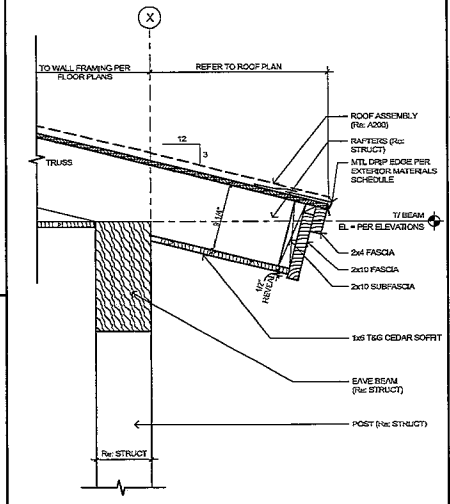
7 A501 EXT WINDOW SILL @ WD SIDING

SCALE: 3" = 1'-0"



3 A501 EAVE DETAIL (TYPE "A")

SCALE: 1" = 1'-0"



4 A501 EAVE DETAIL (TYPE "B")

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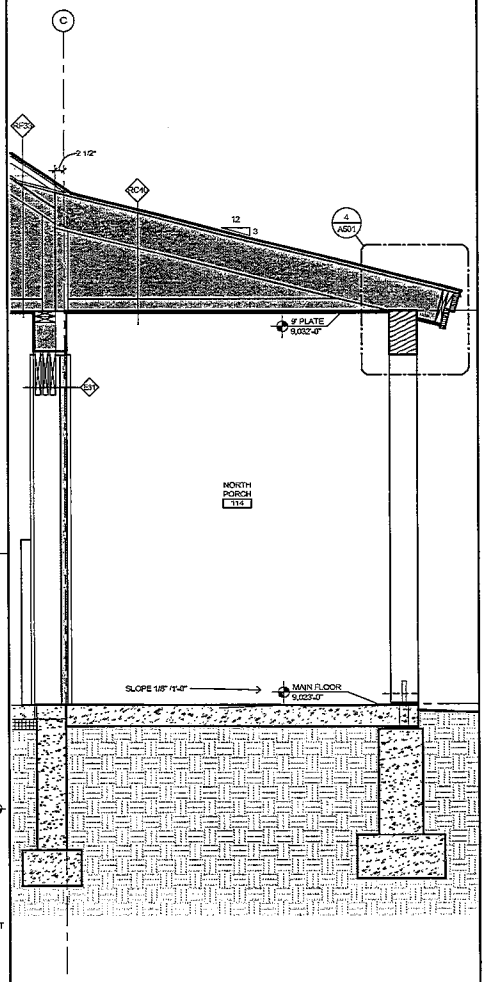
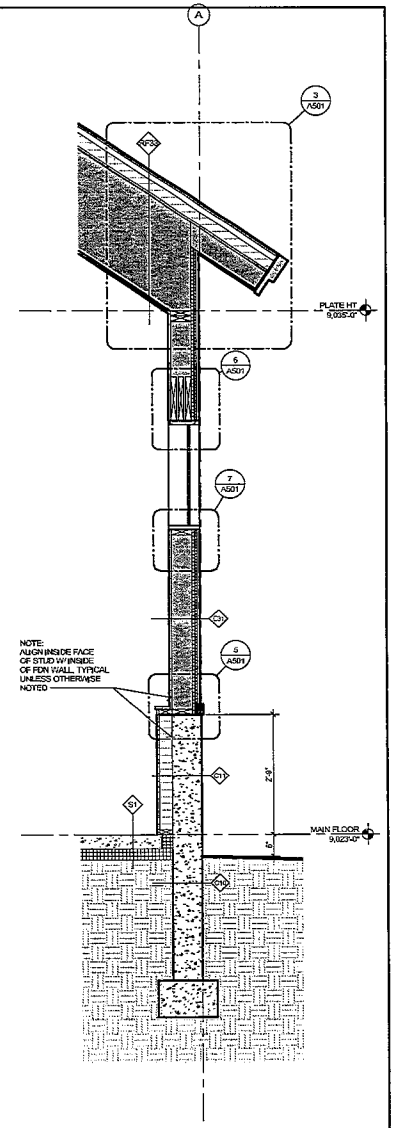


2 A501 WALL SECTION @ PORCH

SCALE: 3/4" = 1'-0"



1 A501 WALL SECTION @ RETAIL

SCALE: 3/4" = 1'-0"

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WALL SECTION & DETAILS

A501

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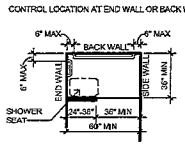
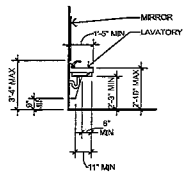
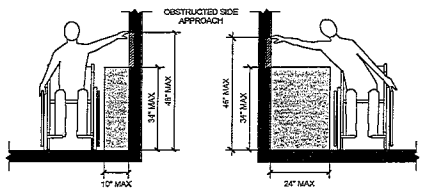


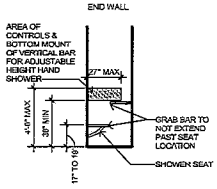
8 A701 TYP ACCESSIBLE ROLL-IN-TYPE SHOWER - PLAN



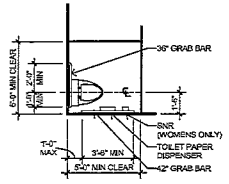
4 A701 TYP ACCESSIBLE LAVATORY - SIDE ELEVATION



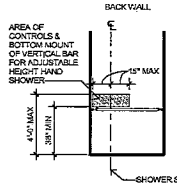
1 A701 REACH RANGES



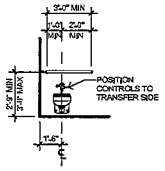
9 A701 TYP ACCESSIBLE ROLL-IN-TYPE SHOWER - END CONTROL WALL



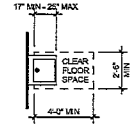
5 A701 TYP ACCESSIBLE WATER CLOSET - PLAN



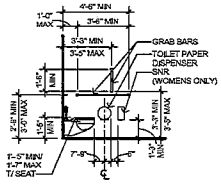
10 A701 TYP ACCESSIBLE ROLL-IN-TYPE SHOWER - BACK CONTROL WALL



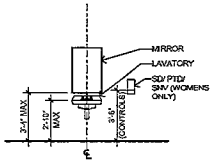
6 A701 TYP ACCESSIBLE WATER CLOSET - FRONT ELEVATION



2 A701 TYP ACCESSIBLE LAVATORY - PLAN



7 A701 TYP ACCESSIBLE WATER CLOSET - SIDE ELEVATION



3 A701 TYP ACCESSIBLE LAVATORY - FRONT ELEVATION

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frisco bay marina
phase 2,1
site improvements
277 marina road
frisco , colorado
PROJECT # 1951

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ISSUE:

pmang	15 jan 2021

TYPICAL MOUNTING HEIGHTS & ACCESSIBILITY DETAILS

A701

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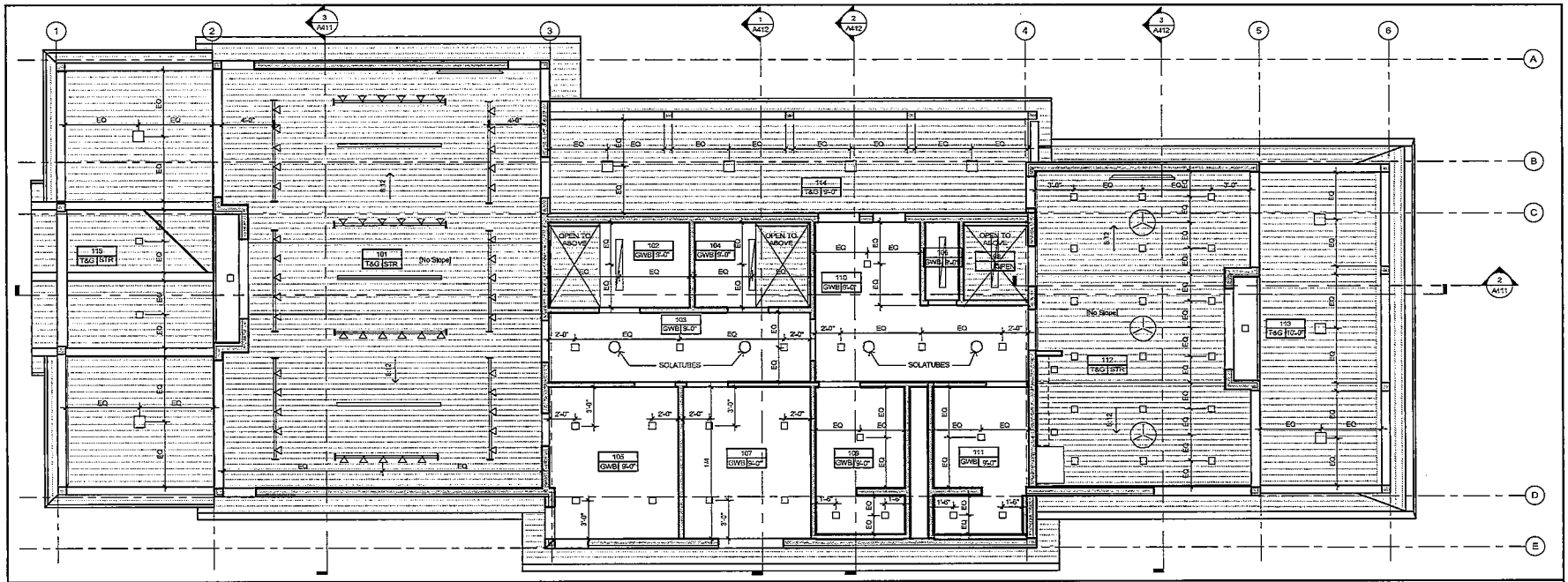


CEILING PLAN GENERAL NOTES

A) FINISH CODE TAGS CONTAIN THE FOLLOWING INFORMATION.

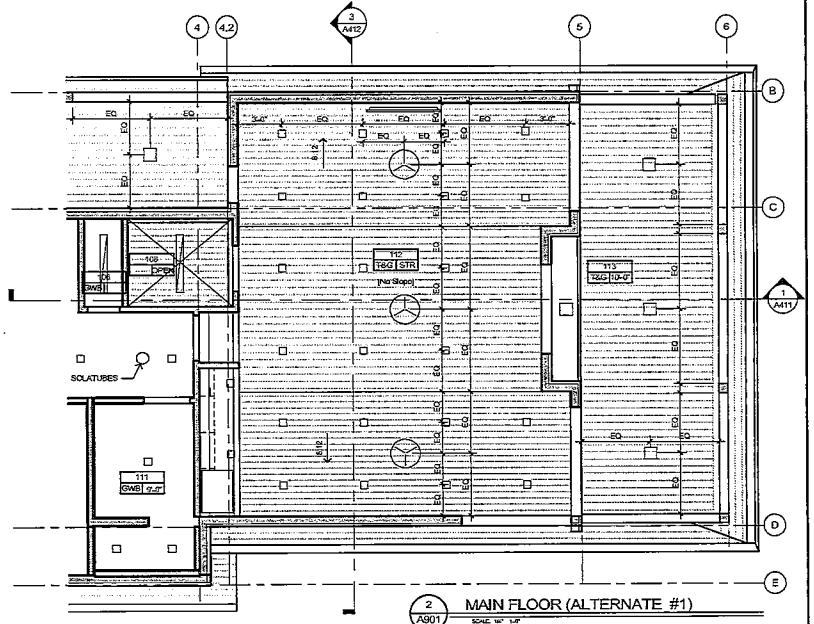
ROOM NUMBER
CEILING TYPE (SEE BELOW)
CEILING HEIGHT (SEE BELOW)

B) CEILING TYPES:
1) GWB = GYPSUM WALL BOARD (TYP @ UNITS AND HALLS)
2) T&G = 1X6 TONGUE AND GROOVE (TYP @ EXTERIOR SOFFITS & DECK CEILINGS)
3) SAT = SUSPENDED ACOUSTICAL TILE
4) CLOSET CEILINGS SHALL MATCH CEILING TYPE OF ADJACENT ROOM UNLESS OTHERWISE NOTED.

C) CEILING HEIGHTS:
1) DIMENSIONS ARE TO BOTTOM OF CEILING FRAMING UNLESS OTHERWISE NOTED.
2) STR = TIGHT TO UNDERSIDE OF STRUCTURE ABOVE
3) OPEN = OPEN TO ABOVE
4) CLOSET CEILINGS SHALL MATCH CEILING TYPE OF ADJACENT ROOM UNLESS OTHERWISE NOTED.

D) LOCATION OF FIXTURES:
1) CEILING PLAN SHALL GOVERN OVER ELECTRICAL AND MECHANICAL PLANS REGARDING LOCATION OF FIXTURES, GRILLES , DIFFUSERS AND OTHER EQUIPMENT SHOWN. RE: PLANS FOR DIMENSIONS. GENERAL CONTRACTOR SHALL COORDINATE THIS WORK WITH ALL APPROPRIATE SUBCONTRACTOR TRADES.
2) WALL WASH FIXTURES TO BE LOCATED 30" MINIMUM FROM ADJACENT WALL UNLESS OTHERWISE NOTED.
3) CEILING PLANS SHOW MAJOR DUCTWORK AND OVERHEAD EQUIPMENT, NOT ALL PLUMBING, PIPING, MECHANICAL OR SPRINKLER WORK IS SHOWN ON THESE PLANS. REFER TO MECHANICAL, PLUMBING AND SPRINKLER DRAWINGS.

E) COORDINATION:
1) CEILING PLAN MAY NOT SHOW EVERY LIGHT. RE: ELECTRICAL PLANS, CONSULT ARCHITECT WITH ANY DISCREPANCIES.



2 A901 MAIN FLOOR (ALTERNATE #1)
SCALE: 1/4" = 1'-0"

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frisco bay marina
phase 2,1
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ISSUE:

20% const	30 nov 2020
50% const docs	15 dec 2020
pricing	15 jan 2021

MAIN FLOOR REFLECTED CEILING PLAN

A901

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DRAWING ABBREVIATIONS

AAV	AUTOMATIC AIR VENT	CONN	CONNECTION	EXPAN	EXPANSION	HT	HEIGHT	OAT	OUTSIDE AIR TEMPERATURE	SA	SUPPLY AIR
ARV	AIRDVF	CONTN	CONTINUATION	EXT	EXTERNAL	HTR	HEATER	OR	OFF RIDTOM	SAD	SUPPLY AIR DIFFUSER
AC	AIR CONDITIONING UNIT	CONTR	CONTRACTOR	F	DEGREES FAHRENHEIT	HV	HEATING AND VENTILATING UNIT	OSD	OPPOSED BLADE DAMPER	SAR	SUPPLY AIR REGISTER
AD	ACCESS DOOR	CP	CONDENSATE PUMP	FD	FIRE DAMPER	HWC	HOT WATER CONVERTER	OC	ON CENTER	SCD	SCHEDULE CONTROL CIRCUIT
ADS	AREA DRAIN (SITE SYMBOL S)	CT	COOLING TOWER	FSD	WITH FIRE SMOKE DAMPER	HWP	HOT WATER PUMP	OCC	OCCUPIED	SCH	SCHEDULE
AFF	ABOVE FINISHED FLOOR	CU	CONDENSING UNIT		ACCESS DOOR	HWR	HEATING HOT WATER RETURN	OD	OUTSIDE DIMENSION	SCHEM	SCHEMATIC
AH	AIR HANDLER (SPLIT RETRGI	CUH	CABINET UNIT HEATER	FA	FROM ABOVE	HWS	HEATING HOT WATER SUPPLY	OD	OUTSIDE DIAMETER	SD	SMOKE DAMPER
AHU	AIR HANDLING UNIT	CVS	CONSTANT VOLUME BOX	FA	FREE AREA	HX	HEAT EXCHANGER	OGH	OUTSIDE GROUND HYDRANT	SEF	SMOKE EXHAUST FAN
AL	ADJUSTABLE LIVING	CWP	CONDENSER WATER PUMP	FB	FROM BELOW	HZ	HERTZ	OPNG	OPENING	SF	SUPPLY FAN
ALUM	ALUMINUM	CWR	CONDENSER WATER RETURN	FC	FAN CLOSED	ID	INTERNAL DIAMETER	OI	OIL IDP	SF	SHEETROCK HIGH
AP	ACCESS PANEL	CWS	CONDENSER WATER SUPPLY	FCU	FAN COIL UNIT	ID	INSIDE DIAMETER	OZ	OUNCE	SP	STATIC PRESSURE
ATC	AUTOMATIC TEMP. CONTROL	DA	DIRECT ACTING	FCV	FLOW CONTROL VALVE	IN	INCHES	PART	PARTIAL	SPEC	SPECIFICATION
AVSH	AVSHAGE	DAMP	DAMPER	FD	FLOOR DRAIN	INCL	INCLUDING	PBD	PARALLEL BLADE DAMPER	SQ	SQUARE
AVT	AVERAGE WATER TEMP.	DB	DRY BULB	FD	FIRE DAMPER	INT	INTERNAL	PD	PRESSURE DROP (SEE SCHEDULE)	SS	STAINLESS STEEL
B	BOILER	DEPT	DEPARTMENT	FIN	FINISHED	INV	INVERT	PDR	PLENUM DRAIN	STD	STANDARD
BB	ELECTRIC BASEBOARD RADIATION	DIA	DIAMETER	FL	FLANGE	KW	KILOWATT	PERF	PERFORATED	STL	STEEL
BDD	BACK DRAFT DAMPER	DIAG	DIAGRAM	FLA	FULL LOAD AMPS	L	LENGTH	PH	PHASE	STM	STEAM
BFD	BFLOW FINISHED FLOOR	DIFF	DIFFERENTIAL	FLEX	FLEXIBLE	LAT	LEAVING AIR TEMPERATURE	PNEU	PNEUMATIC	STR	STRUCTURAL
BFP	BACK FLOW PREVENTOR	DISCH	DISCHARGE	FLR	FLOOR	LB	POUND	POS	POSITIVE PRESS	SUCT	SUCTION
BLDG	BUILDING	DIV	DIVISION	FD	FALL DOWN	LD	LINEAR DIFFUSER	PRESS	PRESSURE	SYS	SYSTEM
BLW	BELOW	DW	DOWN IN WALL	FOB	FLAT ON BOTTOM	LF	LINEAR FEET	PRV	PRESSURE REDUCING VALVE	TAD	TRANSFER AIR DUCT
BOB	BOTTOM OF BEAM	DL	DOOR LOUVER	FOP	FLEXIBLE OIL PUMP	LIN	LINEAR	PS	PRESSURE SWITCH	TDH	TOTAL DYNAMIC HEAD
BOD	BOTTOM OF DUCT	DN	DOWN	FOT	FLAT ON TOP	LNG	LOUVER	PSI	POUNDS PER SQUARE INCH	TEMP	TEMPERATURE
BOP	BOTTOM OF PIPE	DS	DUCT SILENCER	FP	FIRE PROTECTION	LRA	LOCK ROTOR AMPS	PT	PRESSURE TRANSMITTER	TG	TRANSFER GRILLE
BSMT	BASEMENT	DWG	DRAWING	FP	FIRE PUMP	LWT	LEAVING	PTAC	PACKAGED TERMINAL	THT	TOTAL HEAT
BTU	BRITISH THERMAL UNIT	DWP	DOMESTIC WATER PUMP	FPM	FEET PER MINUTE	LWT	LEAVING WATER TEMPERATURE		AIR CONDITIONER	TP	TOTAL PRESSURE
C	CHILLER	DX	DIRECT EXPANSION	FPS	FEET PER SECOND			PV	PLUG VALVE	TT	TEMPERATURE TRANSMITTER
CAP	CAPACITY	EA	EACH	FRICT	FRICTION			PVC	POLYVINYL CHLORIDE	TYP	TYPICAL
CBV	CIRCUIT BALANCING VALVE	EAT	ENTERING AIR TEMPERATURE	FS	FLOW SWITCH			QUAN	QUANTITY	UC	UNDERCUT
CD	CEILING DIFFUSER	EC	ELECTRICAL CONTRACTOR	FT	FEET			R	REGISTER	UH	UNIT HEATER
CFH	CUBIC FEET PER HOUR	ECC	ECCENTRIC	FTR	FINNED TUBE RADIATION			RA	RETURN AIR	UNDIM	UNDIMMED
CFM	CUBIC FEET PER MINUTE	EF	EXHAUST FAN	FV	FACE VELOCITY			RAG	RETURN AIR GRILLE	UNLESS	UNLESS OTHERWISE NOTED
CFM	CUBIC FEET PER MINUTE	EFF	EFFICIENCY	FX	FLEXIBLE CONNECTION			RAR	RETURN AIR REGISTER	V	VOLTS
CHP	CONCRETE HOUSEKEEPING PAD	EJ	EXPANSION JOINT	FXC	FLEXIBLE CONNECTION			RCP	REFLECTED CEILING PLAN	VA	VOLT AMPERE
CHWP	CHILLED WATER PUMP	EL	ELEVATION	GA	GAUGE			RD	ROOF DRAIN	VAV	VARIABLE AIR VOLUME UNIT
CHWR	CHILLED WATER RETURN	ELEC	ELECTRIC	GAL	GALLON			RE	ROUNDED ENTRANCE/EXIT	VB	VACUUM BREAKER
CHWS	CHILLED WATER SUPPLY	EMER	EMERGENCY	GALV	GALVANIZED			REF	REFRIGERANT	VD	VOLUME DAMPER
CI	CAST IRON	ENT	ENTERING	GC	GENERAL CONTRACTOR			REQD	REQUIRED	VEL	VELOCITY
CL	CENTER LINE	EQ	EQUAL	GPH	GALLONS PER HOUR			RET	RETURN	VI	VIBRATION ISOLATOR
CLG	CEILING	EQUIP	EQUIPMENT	GPM	GALLONS PER MINUTE			RF	RETURN FAN	VOLT	VOLTAGE
CMU	CONCRETE MASONRY UNIT	EQUIV	EQUIVALENT	GR	GRILLE			RH	RELATIVE HUMIDITY	VTR	VENT THRU ROOF
CO	CLEAN OUT	ER	ENGINEER REGISTER	GWB	GYPSUM WALLBOARD			RHC	REHEAT COIL	W	WIDTH
COL	COLUMN	ES	END SWITCH	H20	WATER			RGW	RUN IN CASEWORK	W/	WITH
COMP	COMPRESSOR	ESP	EXTERNAL STATIC PRESSURE	HB	HOSE BIBB			RIE	RUN IN ENCLOSURE	W/O	WITHOUT
CON	CONCRETE	EW	EXPANSION TANK	HD	HAND DAMPER			RIW	RUN IN WALL	WB	WET BULB
CONC	CONCRETE	EWC	ELECTRIC WATER COOLER	HD	HEAD (SEE SCHEDULES)			RLA	RATED LOAD AMPS	WB	WET BULB
COND	CONDENSATE	EWT	ENTERING WATER TEMPERATURE	HP	HORSEPOWER			RM	ROOM	WC	WATER COLUMN
		EX	EXHAUST	HP	HEAT PUMP			ROD	ROOF OVERFLOW DRAIN	WG	WATER GAUGE
				HR	HOUR			RPM	REVOLUTIONS PER MINUTE	WMS	WIRE MESH SCREEN

RESPONSIBLE DIVISION

UNLESS OTHERWISE INDICATED ALL HEATING, VENTILATING, AIR CONDITIONING, PLUMBING, AND OTHER MECHANICAL EQUIPMENT, MOTORS, AND CONTROLS SHALL BE FURNISHED, SET IN PLACE AND WIRED AS FOLLOWS:

ITEM	FURNISHED	SET	POWER	CONTROL
EQUIPMENT COMBINATION MAGNETIC MOTOR STARTERS, MAGNETIC MOTOR STARTERS AND CONTACTORS	23	23	26	–
FUSED AND UNFUSED DISCONNECT SWITCHES, THERMAL OVERLOAD SWITCHES AND HEATER, MANUAL MOTOR STARTERS	23	26	26	25
MANUAL OPERATING AND MULTI-SPEED SWITCHES	23[1]	25(1)	26	–
CONTROLS, RELAYS, TRANSFORMERS	23	23	26	26
THERMOSTATS (LOW VOLTAGE) AND TIME SWITCHES	23	23	26	26
THERMOSTATS (LINE VOLTAGE)	23	23	26	26
TEMPERATURE CONTROL PANELS	23	23	26	26
MOTOR AND SOLENOID VALVES, DAMPER MOTORS, PE & EP SWITCHES	23	23(2)	–	23(2)
PUSH-BUTTON STATIONS AND PILOT LIGHTS	23	23(2)	–	23(2)
HEATING, COOLING, VENTILATION AND AIR CONDITIONING CONTROLS	23	23	26	23
EXHAUST FAN SWITCHES	23	26	26	23(2)

SUBSCRIPT FOOTNOTES:
1) UNDER DIVISION 23 IF FURNISHED FACTORY-WIRED AS PART OF EQUIPMENT OTHERWISE FURNISHED WITH COMBINATION STARTERS.
2) IF ITEM IS FOR LINE VOLTAGE, SET IN PLACE AND CONNECT UNDER DIVISION 26, WHERE FACTORY MOUNTED ON EQUIPMENT OR ATTACHED TO PIPING OR DUCTS AND USING LOW VOLTAGE FURNISH AND SET UNDER DIVISION 23, CONNECT UNDER DIVISION 26.

SUBSTITUTIONS:

A. SUBSTITUTIONS: SUBSTITUTION OF SYSTEMS, EQUIPMENT WILL BE ALLOWED THROUGH A PRIOR APPROVAL PROCESS INITIATED BY THE CONTRACTOR. CONTRACTOR SHALL SUBMIT INTENDED SUBSTITUTION AT LEAST FIVE DAYS PRIOR TO BID FOR APPROVAL FROM ENGINEER. SUBMITTAL SHALL INCLUDE DRAWINGS, DIMENSIONS AND OPERATING INSTRUCTIONS FOR EACH PIECE OF EQUIPMENT. SUBSTITUTION SHALL INCLUDE ALL NECESSARY CHANGES IN THE DRAWINGS OR IN SPECIFICATIONS FOR COORDINATION OF APPROVED SUBSTITUTION AND SHALL INCLUDE ALL COSTS ASSOCIATED WITH THE SUBSTITUTION INCLUDING STRUCTURAL MODIFICATIONS, SPACE LAYOUT AND REDESIGN COSTS. SEE ALSO DIVISION 1 GENERAL REQUIREMENTS.

EXAMINATION OF SITE, DRAWINGS, SPECIFICATIONS:

A. EXAMINE CAREFULLY THE SITE AND CONDITIONS OF THE SITE, PROPOSE ALL NECESSARY EQUIPMENT AND LABOR TO INSTALL A COMPLETE WORKING SYSTEM WITHIN THE SITE CONDITIONS.

B. EXAMINE THE DRAWINGS AND SPECIFICATIONS AND 5 DAYS PRIOR TO BIDDING REPORT ANY ERRORS, OMISSIONS, INCONSISTENCIES, AND CONFLICTS TO THE ENGINEER TO BE REMEDIED IN AN ADDENDUM TO THE PROJECT PRIOR TO BID TIME.

C. DRAWINGS ARE DIAGRAMMATIC AND CATALOG NUMBERS GIVEN ARE FOR REFERENCE ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE CAPACITY OF THE EQUIPMENT MEETS THE DRAWING REQUIREMENTS AND SHALL NOT DIMENSION FROM THE MECHANICAL, PLUMBING, OR PIPING DRAWINGS.

D. THE LATEST ADOPTED VERSIONS OF THE INTERNATIONAL BUILDING CODES SHALL BE USED AS REQUIRED. THIS WILL ALSO INCLUDE THE LATEST ADOPTED VERSIONS OF THE MECHANICAL, PLUMBING AND ENERGY CONSERVATION CODES. ALL METHODS AND MATERIALS REQUIRED BY THESE CODES SHALL BE REQUIRED BY THESE SPECIFICATIONS UNLESS INDICATED OTHERWISE. OTHER APPLICABLE LOCAL CODES AND ORDINANCES SHALL BE ALSO REQUIRED AND IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO BE KNOWLEDGEABLE OF THESE REQUIREMENTS.

E. WHERE INSTALLATION PROCEDURES OR ANY PART THEREOF ARE REQUIRED TO BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER OF THE MATERIAL BEING INSTALLED, PRINTED COPIES OF THESE RECOMMENDATIONS SHALL BE FURNISHED TO THE ENGINEER PRIOR TO INSTALLATION. INSTALLATION OF THE ITEM WILL NOT BE ALLOWED TO PROCEED UNTIL THE RECOMMENDATIONS ARE AVAILABLE. FAILURE TO COMPLY WITH THESE RECOMMENDATIONS CAN BE CAUSE FOR REJECTION OF THE MATERIAL.

REFER TO ARCHITECTURAL SPECIFICATIONS SECTION 10 0100 TITLED "FIRE SPECIFICATIONS" FOR ADDITIONAL INFORMATION CONCERNING THIS ITEM.

LINE DESIGNATION SYMBOLS

CS	CONDENSER WATER SUPPLY
CR	CONDENSER WATER RETURN
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
RD	REFRIGERANT DISCHARGE
GS	GLYCOL SUPPLY
GR	GLYCOL RETURN
HWS	HOT WATER SUPPLY
HWR	HOT WATER RETURN
HPS	HEAT PUMP SUPPLY
HPR	HEAT PUMP RETURN
PC	PUMPED CONDENSATE
CF	CHEMICAL FEED
V	VENT PIPING
R	RELIEF PIPING
MU	MAKE-UP WATER
OF	OVERFLOW
D	DRAIN
FL	FILL LINE
G	NATURAL GAS
GV	GAS VENT
SW	SOFT WATER
SNS	SNOWMELT SUPPLY
SNR	SNOWMELT RETURN
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN

PIPING ELEMENTS / VALVING

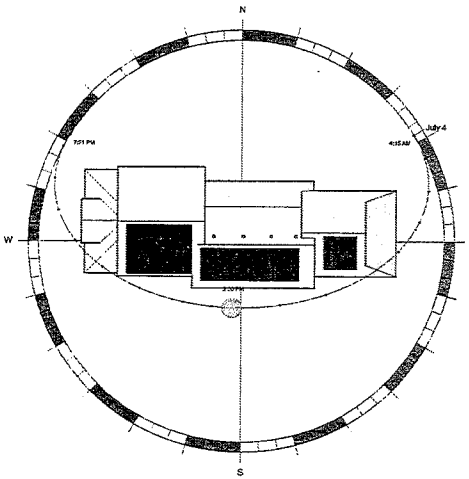
- EXISTING EQUIPMENT OR PIPE TO BE REMOVED
- GATE VALVE
- GLOBE VALVE
- PLUG VALVE
- BUTTERFLY VALVE
- BALL VALVE
- SWING CHECK VALVE
- LIFT CHECK VALVE
- GATE VALVE, ANGLE
- GLOBE VALVE, ANGLE
- DIAPHRAGM VALVE
- BALANCING VALVE
- CBV CIRCUIT SETTING BALANCING VALVE
- THREE WAY CONTROL VALVE
- TWO WAY CONTROL VALVE
- S SOLENOID VALVE
- P PRESSURE REDUCING VALVE (PRV)
- TPV TEMPERATURE/PRESSURE RELIEF VALVE
- RELIEF/SAFETY VALVE
- GAS COCK
- FUSIBLE LINK VALVE-QUICK CLOSING
- FUSIBLE LINK VALVE-QUICK CLOSING
- AUTOMATIC FILL VALVE
- MV MANUAL AIR VENT
- AV AUTOMATIC AIR VENT (CLOSED DISCHARGE TO DRAIN)
- FLOW METER-VENTURI
- FLOW METER-ORIFICE
- DIRECTION OF FLOW
- DIRECTION OF PITCH-RISE OR DROP
- STRAINER
- STRAINER WITH BLOW OFF VALVE
- PIPE RISING UP
- PIPE DROPPING DOWN
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- UNION - SCREWED OR FLANGED
- STEAM LEAK DETECTOR
- A ANCHOR
- G GUIDE
- EJ EXPANSION JOINT
- FS FLOW SWITCH
- TT TEMPERATURE TRANSMITTER
- PTPS PRESSURE TRANSMITTER OR PRESSURE SWITCH
- TH THERMOMETER
- GAUGE WITH GAUGE COCK & SYPHON (STEAM)
- AQUASTAT
- GAS PRESSURE REGULATOR
- FLOAT OPERATED CONTROL VALVE
- BASKET STRAINER
- STEAM TRAP
- ELECTRICALLY TRACED PIPING
- EJ EXPANSION LOOP (WMS)
- VB VACUUM BREAKER

HVAC & DUCTWORK SYMBOLS

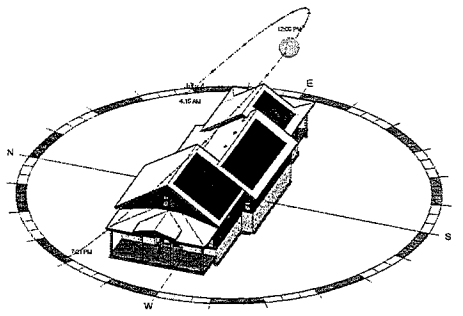
- SECTION THROUGH RETURN OR EXHAUST AIR
- SECTION THROUGH SUPPLY OR OUTSIDE AIR DUCT
- SUPPLY OR OUTSIDE AIR DUCT
- ACCESS DOOR (BOTTOM OR SIDE)
- ACOUSTICALLY LINED DUCT
- FD DAMPER, FIRE
- VD DAMPER, MANUAL VOLUME
- INCLINED DROP IN DIRECTION OF ARROW
- INCLINED RISE IN DIRECTION OF ARROW
- TRANSITION, RECTANGULAR TO ROUND
- FLEXIBLE DUCT
- IN-LINE FAN
- TRANSITION, RECTANGULAR
- SPIN-IN COLLAR INTO ADAPTER ON TOP OF DUCT
- CEILING SUPPLY AIR DIFFUSER (CD)
- SIDEWALL SUPPLY AIR REGISTER (SR)
- ELBOW TURNED DOWN
- ELBOW TURNED UP
- ELBOW, RADIUS TYPE
- ELBOW, SQUARE OR RECTANGULAR TYPE WITH SOUND LINING VANES
- RETURN OR EXHAUST AIR DUCT
- CEILING RETURN AIR REGISTER (RR)
- SIDEWALL RETURN AIR REGISTER (RR)
- OPEN END DUCT
- FC FLEXIBLE CONNECTION
- CO CARBON MONOXIDE
- CO2 CARBON DIOXIDE
- T THERMOSTAT
- FSD FIRE SMOKE DAMPER

MECHANICAL - SHEET LIST

Sheet Number	Sheet Name
M0-1	MECHANICAL - COVER SHEET
M0-2	MECHANICAL - SCHEDULES
M0-3	MECHANICAL - ZONES AND AREAS
M1-1	MECHANICAL - MAIN FLOOR PLAN
M1-2	MECHANICAL - ATTIC FLOOR PLAN
M1-3	MECHANICAL - ROOF PLAN
M2-1	MECHANICAL - DETAILS



1 SUN PATH - PLAN VIEW



2 SUN PATH - PERSPECTIVE VIEW

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frisco , colorado
PROJECT # 20-005

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pricing	15 jan 2021
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MECHANICAL - COVER SHEET

M0-1

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ENERGY RECOVERY VENTILATOR SCHEDULE

Mark	SERVICE	LOCATION	AIR TEMPURATURE		SUPPLY FAN						EXHAUST FAN						PRE-HEAT (kW)	ELECTRICAL		MANUFACTURER	MODEL #	OPTIONS/ ACCESSORIES
			EAT	LAT	AIRFLOW (CFM)	E.S.P.	MOTOR HP	VOLTS	PHASE	FREQUENCY	AIRFLOW (CFM)	E.S.P. (IN. W.G.)	MOTOR HP	VOLTS	PHASE	FREQUENCY		MCA (A)	MOCP (A)			
ERV-1	VENTILATION	ATTIC			585	0.7	1	208 V	1	60 HP	585	0.7	1	208 V	1	60 HP		2.7 A	15 A	RENEWAIRE	KE*_EN	

ELECTRIC FURNACE SCHEDULE

MARK	SERVICE	SUPPLY FAN			FILTERS	HEATING ELEMENT						BLOWER						MANUFACTURER	MODEL #	OPTIONS/ ACCESSORIES
		SUPPLY AIRFLOW (CFM)	OUTSIDE AIRFLOW (CFM)	SUPPLY E.S.P. (IN. W.G.)		NOMINAL ELECTRIC HEAT (kW)	VOLTS	PHASE(S)	FREQUENCY	MCA (A)	MOCP (A)	SUPPLY FAN MOTOR POWER	VOLTS	PHASE	FREQUENCY	MCA (A)	MOCP (A)			
F-1	ZONE 1	2000		0.7		15	208 V	3	60 Hz	56 A	60 A	3HP	208 V	3	60 HP	6.6 A	15 A	GOODMAN	MBVC	SEE NOTE 1
F-2	ZONE 2	2000		0.7		15	208 V	3	60 Hz	56 A	60 A	3HP	208 V	3	60 HZ	6.6 A	15 A	GOODMAN	MBVC	SEE NOTE 1

NOTES:
1. —

ELECTRIC BASEBOARD SCHEDULE

MARK	SERVICE	LOCATION	LENGTH	HEATING OUTPUT (BTU)	WATTS	AMPS	VOLTS	PHASE	FREQUENCY	MANUFACTURER	MODEL #	FINISH	OPTIONS/ ACCESSORIES
BB-1	RESTROOM	FLOOR	2'-4"	1706	500 W	2.4 A	208 V	1	60 Hz	RAYWALL	3700 SERIES	PER ARCH	SEE NOTE 1
BB-2	RESTROOM	FLOOR	2'-4"	1706	500 W	2.4 A	208 V	1	60 Hz	RAYWALL	3700 SERIES	PER ARCH	SEE NOTE 1
BB-3	STORAGE	FLOOR	2'-0"	1275	375 W	1.8 A	208 V	1	60 Hz	RAYWALL	3700 SERIES	PER ARCH	SEE NOTE 1
BB-4	KITCHENETTE	FLOOR	3'-0"	2048	600 W	2.9 A	208 V	1	60 Hz	RAYWALL	3700 SERIES	PER ARCH	SEE NOTE 1

NOTES:
1. PROVIDE WITH THERMAL LIMIT, WIRE GUARDS, AND THERMOSTAT.

EXHAUST FAN SCHEDULE

MARK	SERVICE	LOCATION	FAN				ELECTRICAL				MANUFACTURER	MODEL #	NOTES
			EXHAUST AIRFLOW (CFM)	EXHAUST E.S.P.	EXHAUST FAN MOTOR POWER	EXHAUST FAN SPEED (RPM)	VOLTS	PHASE	ELECTRICAL FREQUENCY	FLA (A)			
ER-1	RESTROOM	CEILING	75	0.3	23W	1515	120 V	1	60 Hz	0.2 A	PANASONIC	FV-05-11VK2	SEE NOTE 1
EA-2	RESTROOM	CEILING	75	0.3	23W	1515	120 V	1	60 Hz	0.2 A	PANASONIC	FV-05-11VK2	SEE NOTE 1
EF-3	JANITOR	CEILING	75	0.3	23W	1315	120 V	1	60 Hz	0.2 A	PANASONIC	FV-05-11VK2	SEE NOTE 2
EF-4	IT	CEILING	75	0.3	23W	1315	120 V	1	60 Hz	0.2 A	PANASONIC	FV-05-11VK2	SEE NOTE 3

NOTES:
1. —

ELECTRIC UNIT HEATER SCHEDULE

TYPE MARK	SERVICE	FAN		HEATING ELEMENT (W)	ELECTRICAL				MANUFACTURER	MODEL #	OPTIONS/ ACCESSORIES
		CFM	RPM		FLA (A)	VOLTS	PHASE	FREQUENCY			
EUH-1	JANITOR	75	2200	750	3.6 A	208 V	1	60 HZ	RAYWALL	1300 SERIES	SEE NOTE 1

NOTES:
1. —

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MECHANICAL - SCHEDULES

M0-2

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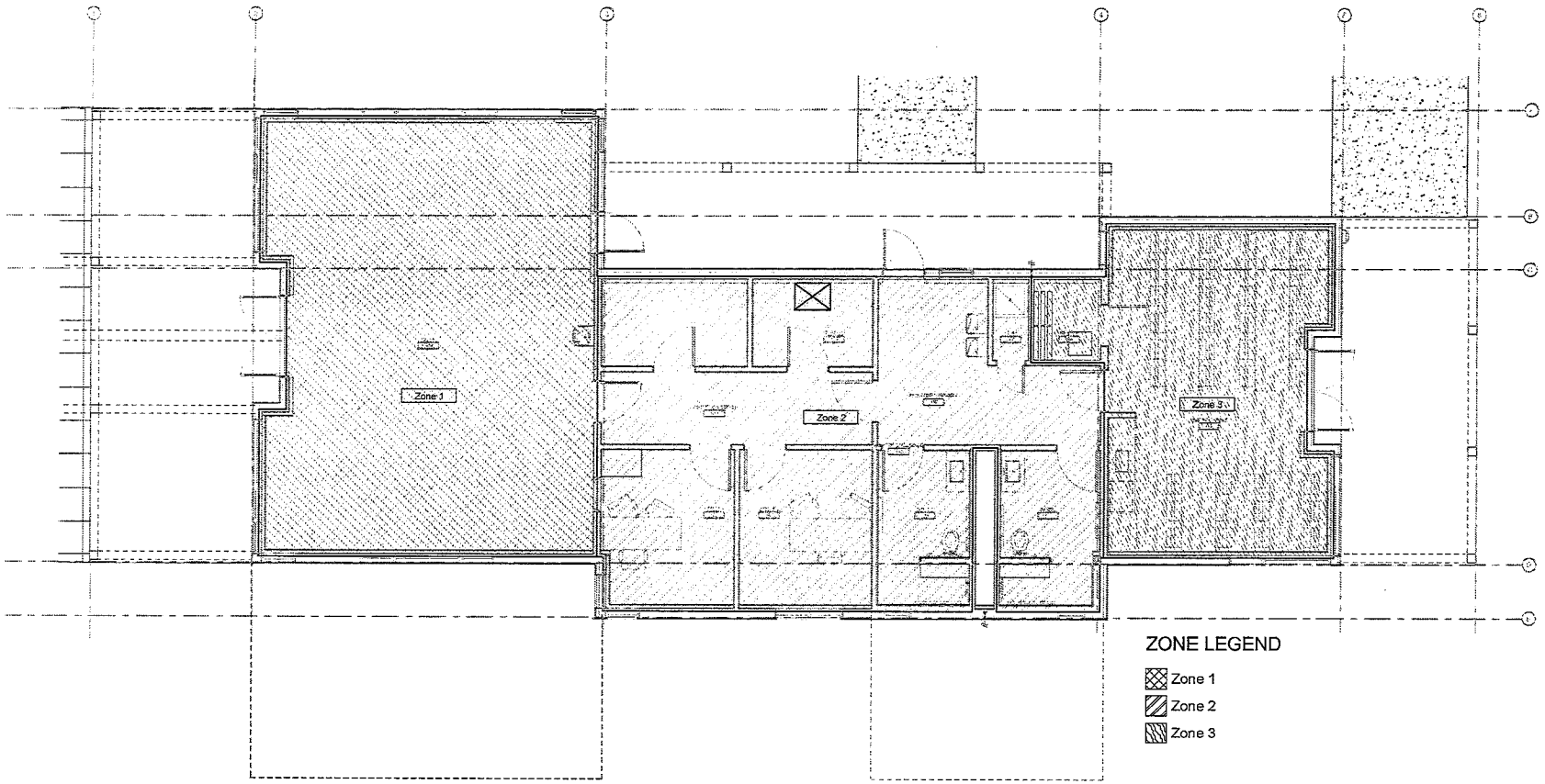

ZONE LEGEND

- Zone 1
- Zone 2
- Zone 3

1 MECHANICAL - ZONING & AREA PLAN
1/4" = 1'-0"

ZONE & AREAS

Name	Number	Zone	Area (FT²)
RETAIL	101	Zone 1	749
Zone 1			749
RETAIL STOR	102	Zone 2	68
MENTER CORRIDOR	103	Zone 2	108
ELECT/T	104	Zone 2	56
OFFICE 1	105	Zone 2	113
JAN	106	Zone 2	15
OFFICE 2	107	Zone 2	113
BATH 1	109	Zone 2	76
NIGHTTIME VESTIBULE	110	Zone 2	147
BATH 2	111	Zone 2	81
Zone 2			778
MP STOR	108	Zone 3	29
MULTI-PURPOSE	112	Zone 3	908
Zone 3			937
Grand total			1935

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MECHANICAL - ZONES AND AREAS

M0-3

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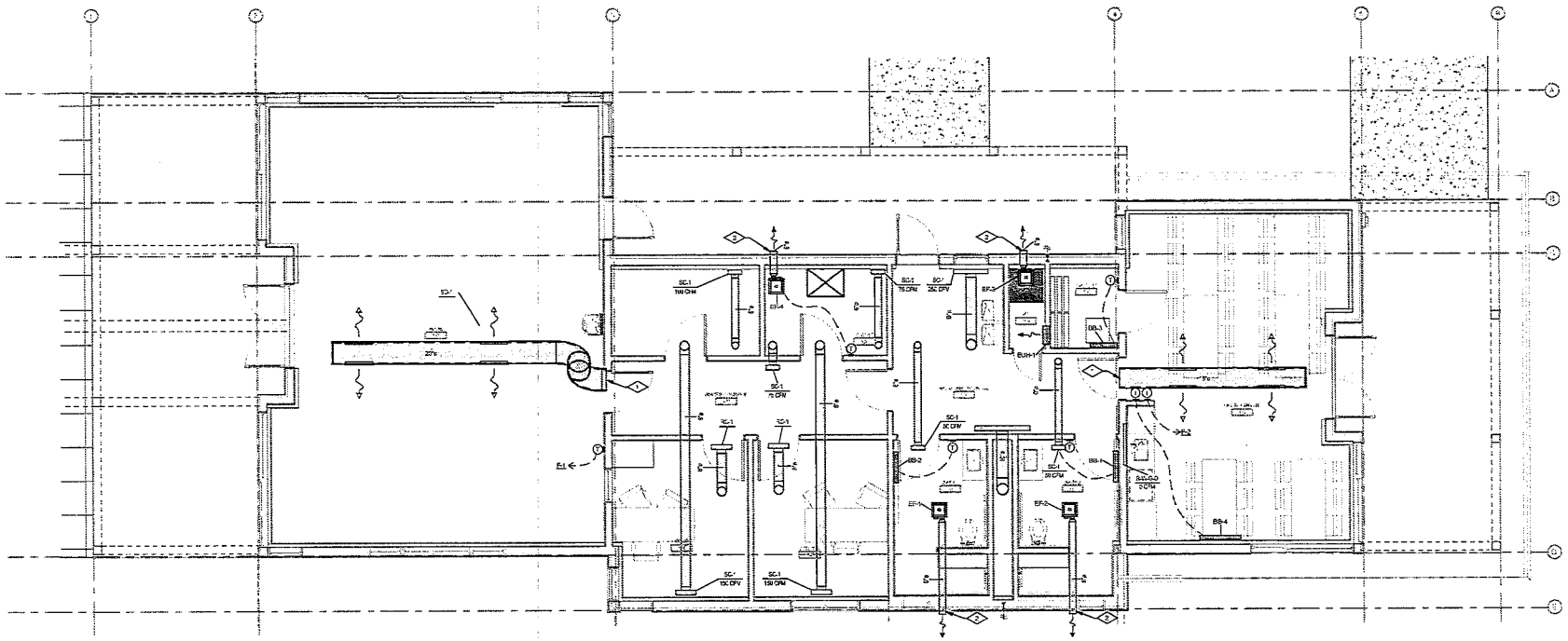

M1-1 FLAG NOTES	
Flag Number	Flag Text
1	SEE ATTIC PLAN FOR CONTINUATION OF DUCTWORK.
2	ROUTE EXHAUST FAN DUCTWORK TO THE EXTERIOR THRU JOIST AND STUD SPACE, TERMINATE WITH WALL CAP. ALL CODE REQUIRED CLEARANCES FROM BUILDING OPENINGS SHALL BE MET. COORDINATE FINAL LOCATION OF TERMINATION WITH ARCHITECT AND CONTRACTOR.

1 MECHANICAL - MAIN FLOOR PLAN
1/4" = 1'-0"
0 4 8 12 16

PLAN NORTH

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MECHANICAL - MAIN FLOOR PLAN

M1-1

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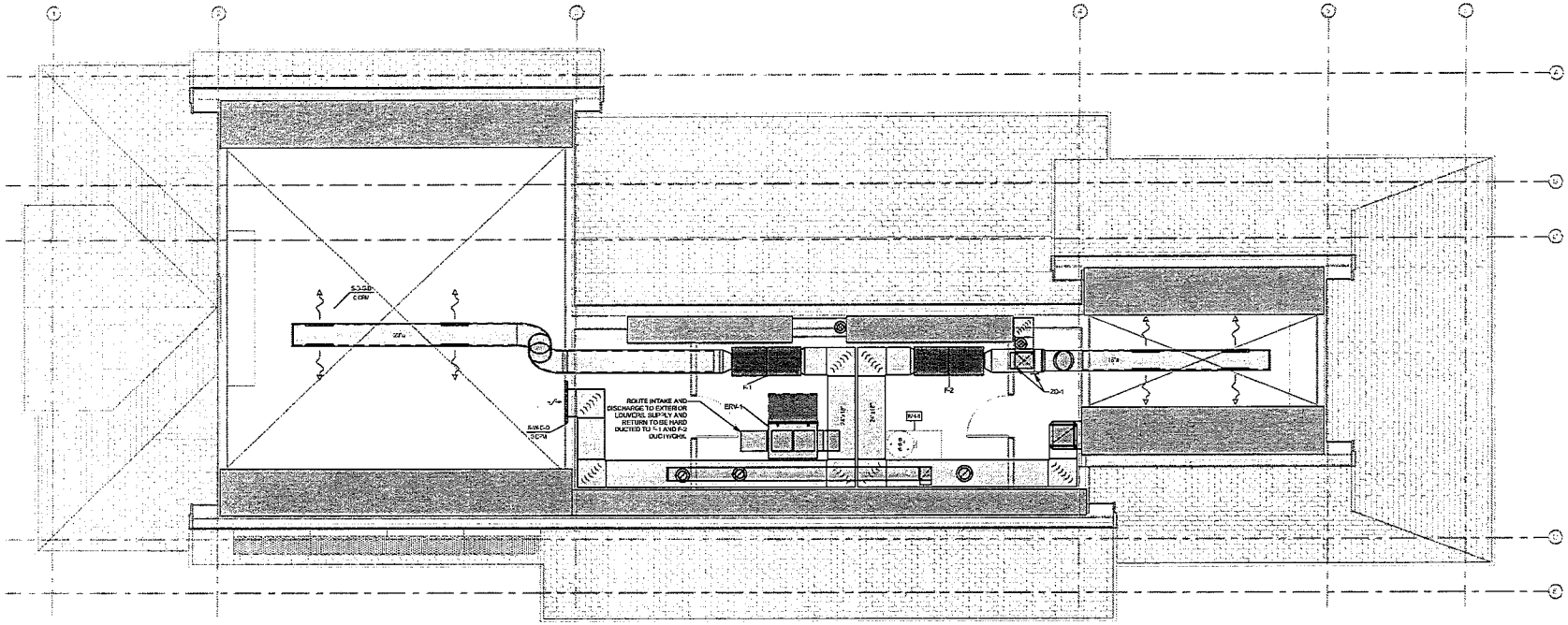

1 MECHANICAL - ATTIC FLOOR PLAN
1/4" = 1'-0"

0 4 8 12 16

PLAN NORTH

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MECHANICAL - ATTIC FLOOR PLAN

M1-2

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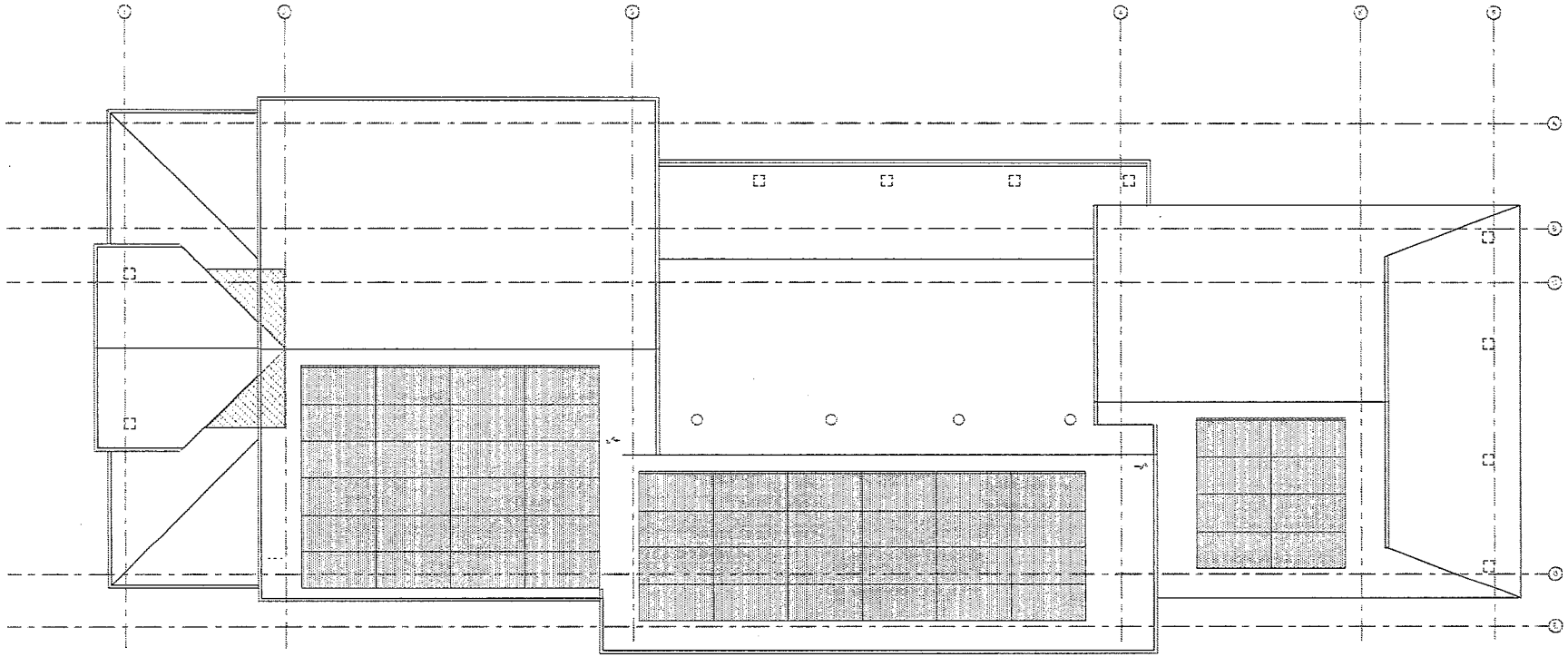

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MECHANICAL - ROOF PLAN

M1-3

1 MECHANICAL - ROOF PLAN
1/4" = 1'-0"
0 4 8 12 16

PLAN NORTH

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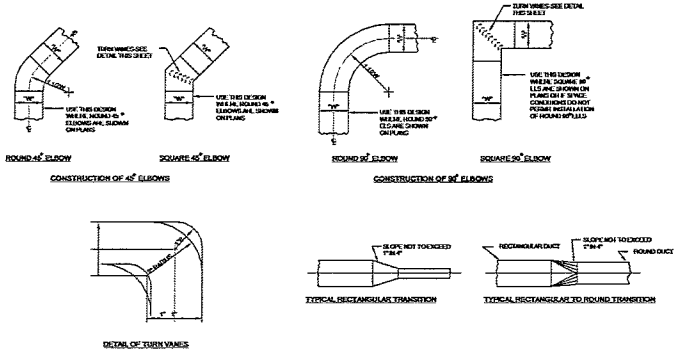
DUCTWORK SYMBOLS

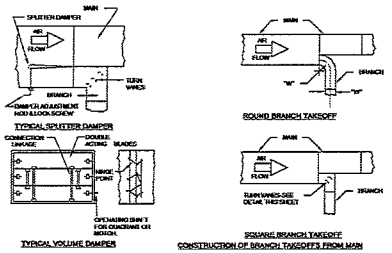
SECTION THROUGH RETURN OR EXHAUST AIR
SECTION THROUGH SUPPLY OR OUTSIDE AIR DUCT
SUPPLY OR OUTSIDE AIR DUCT
ACCESS DOOR (BOTTOM OR SIDE)
ACOUSTICALLY LINED DUCT
DAMPER, FIRE
DAMPER, MANUAL VOLUME
INCLINED DROP IN DIRECTION OF ARROW
INCLINED RISE IN DIRECTION OF ARROW
TRANSITION, RECTANGULAR TO ROUND
FLEXIBLE DUCT
IN-LINE FAN
TRANSITION, RECTANGULAR
SPIN-IN COLLAR INTO ADAPTER ON TOP OF DUCT
CEILING SUPPLY AIR DIFFUSER (CD)
SIDEWALL SUPPLY AIR REGISTER (SR)
ELBOW TURNED DOWN
ELBOW TURNED UP
ELBOW, RADIUS TYPE
ELBOW, SQUARE OR RECTANGULAR TYPE WITH AIR-DIL TURNING VANES
RETURN OR EXHAUST AIR DUCT
CEILING RETURN AIR REGISTER (RR)
SIDEWALL RETURN AIR REGISTER (RR)
OPEN END DUCT
FLEXIBLE CONNECTION

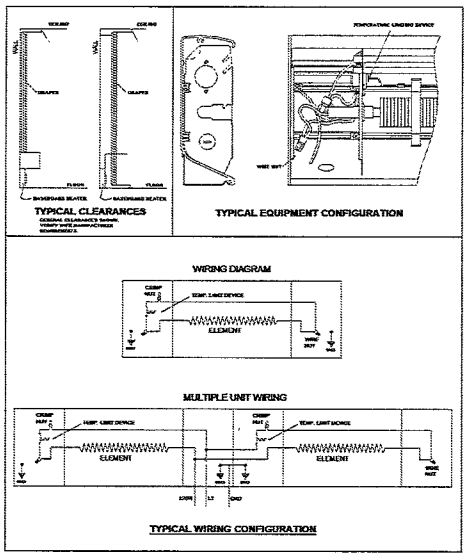
DOUBLE LINE		SINGLE LINE
	EXISTING EQUIPMENT OR DUCTWORK TO BE REMOVED	
	EXISTING DUCTWORK TO REMAIN	
	NEW DUCTWORK	
VD	MANUAL VOLUME DAMPER (MVD) MOTOR OPERATED DAMPER (MOD)	VD
AD	ACCESS DOOR	AD
	RADIUS ELBOW (R=1.5)	
	MITERED ELBOW	
	BRANCH DUCT TAKE-OFF	
D R	RISE OR DROP DIRECTION OF AIR FLOW	D R
	FLEXIBLE CONNECTION (FXC)	
SIZE CFM/FLOW	DIFFUSER	SIZE CFM/FLOW
SIZE CFM	CEILING RETURN/EXHAUST REGISTER (R) OR GRILLE (G)	SIZE CFM
NUMBER CFM SIZE	SUPPLY AIR GRILLE (G) OR SUPPLY AIR REGISTER (R)	BRANCH CFM SIZE
NUMBER CFM SIZE	RETURN/EXHAUST AIR GRILLE (G) OR REGISTER (R)	NUMBER CFM SIZE
	CONTROL DAMPER, OPPOSED BLADE	AIR DEVICE TO BE REMOVED
	CONTROL DAMPER, PARALLEL BLADE	SUPPLY AIR
	BACKDRAFT DAMPER	RETURN OR EXHAUST AIR
UC	UNDERCUT DOOR	
GL	DOOR LOUVER (FREE AREA RECORDED INDICATED IN SQUARE FEET)	FD FIRE DAMPER; SD SMOKE DETECTOR



DETAILS OF THE LOW VELOCITY DUCT LAYOUT

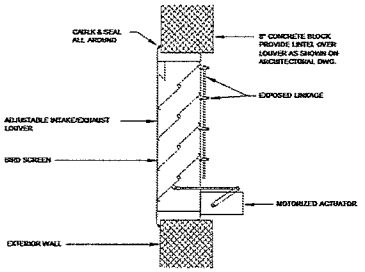
NO SCALE





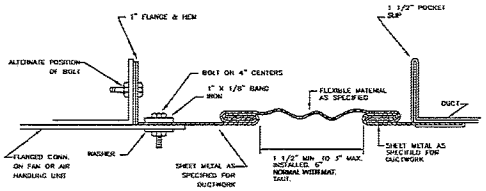
ELECTRIC BASEBOARD INSTALLATION DETAIL

N.T.S.



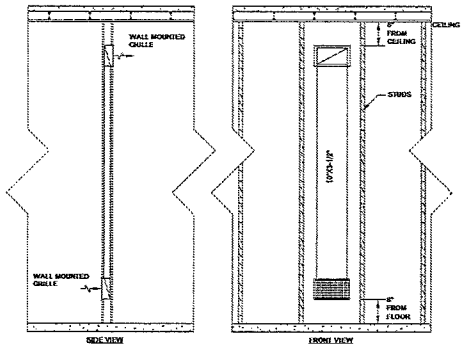
MOTORIZED LOUVER DETAIL

NOT TO SCALE



RECTANGULAR FLEXIBLE CONNECTION DETAIL

N.T.S.



SECTION OF HIGH-LOW TRANSFER THRU WALL

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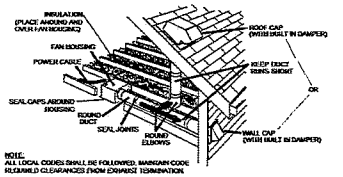

TYPICAL EXHAUST FAN INSTALLATION DETAIL

N.T.S.

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MECHANICAL - DETAILS

M2-1

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DRAWING ABBREVIATIONS

AAV	AUTOMATIC AIR VENT	CONN.	CONNECTION	EXPAN	EXPANSION	HT	HEIGHT
ABV	ABOVE	CONTN	CONTINUATION	EXT	EXTERNAL	HTR	HEATER
AC	AIR CONDITIONING UNIT	CONTR	CONTRACTOR	F	HEATING AND VENTILATING UNIT	HV	HEATING AND VENTILATING UNIT
AD	ACCESS DOOR	CP	CONDENSATE PUMP	FD	FIRE DAMPER	HWC	HOT WATER CONVERTER
ADR	AREA DRAIN (SEE SYMBOLS)	CT	COOLING TOWER	FSD	WITH FIRESTAT DAMPER	HWP	HOT WATER PUMP
AFF	ABOVE FINISHED FLOOR	CU	CONDENSING UNIT		ACCESS DOOR	HWR	HEATING HOT WATER RETURN
AH	AIR HANDLER (SPLIT REFRIG)	CUH	CABINET UNIT HEATER	FA	FROM ABOVE	HWS	HEATING HOT WATER SUPPLY
AHU	AIR HANDLING UNIT	CVR	CONSTANT VOLUME BOX	FA	FIRE AREA	HX	HEAT EXCHANGER
AL	ACOUSTICAL LINING	CVP	CONDENSER WATER PUMP	FB	FROM BELOW	HZ	HERTZ
ALUM	ALUMINUM	CWR	CONDENSER WATER RETURN	FC	FAIL CLOSED	ID	INTERNAL DIAMETER
AP	ACCESS PANEL	CWS	CONDENSER WATER SUPPLY	FCU	FAN COIL UNIT	IF	INSIDE DIAMETER
ATC	AUTOMATIC TEMP. CONTROL	DA	DIRECT ACTING	FCV	FLOW CONTROL VALVE	IN	INCHES
AVER	AVERAGE	DAMP	DAMPER	FD	FLOOR DRAIN	INCL	INCLUDING
AWT	AVERAGE WATER TEMP.	DB	DRY BULB	FD	FIRE DAMPER	INT	INTERNAL
B	BOILER	DEPT	DEPARTMENT	FIN	FINISHED	INV	INVERT
BH	BUILT-IN BASEBOARD HEATING UNIT	DIA	DIAMETER	FL	FLANGE	KW	KILOWATT
BDD	BACK DRAFT DAMPER	DIAG	DIAGRAM	FLA	FULL LOAD AMPS	L	LENGTH
BFC	BELOW FINISHED CEILING	DIFF	DIFFERENTIAL	FLEX	FLEXIBLE	LAT	LEAVING AIR TEMPERATURE
BFP	BACK FLOW PREVENTION	DISCH	DISCHARGE	FLR	FLOOR	LB	POUND
BLDG	BUILDING	DIV	DIVISION	FO	FAIL OPEN	LD	LINEAR DIFFUSER
BLW	BELOW	DIW	DOWN IN WALL	FOB	FLAT ON BOTTOM	LF	LINEAR FEET
BOB	BOTTOM OF BEAM	DL	DOOR LOUVER	FOF	FUEL OIL PUMP	LA	LINEAR
BOD	BOTTOM OF DUCT	DN	DOWN	FOT	FLAT ON TOP	LIQ	LIQUID
BOP	BOTTOM OF PIPE	DS	DUCT SMOKE DETECTOR	FP	FIRE PROTECTION	LRA	LOCK ROTOR AMPS
BSMT	BASEMENT	DWG	DRAWING	FP	FIRE PUMP	LVG	LEAVING
BTU	BRITISH THERMAL UNIT	DWP	DOMESTIC WATER PUMP	FPM	FEET PER MINUTE	LVR	LOUVER
C	CHILLER	DX	DIRECT EXPANSION	FPS	FEET PER SECOND	LWT	LEAVING WATER TEMPERATURE
CAP	CAPACITY	EA	EACH	FRICT	FRICTION	LWT	LEAVING WATER TEMPERATURE
CBV	CIRCUIT BALANCING VALVE	EAT	ENTERING AIR TEMPERATURE	FS	FLOW SWITCH	MBH	THOUSANDS OF BTU PER HOUR
CD	CEILING DIFFUSER	EC	ELECTRICAL CONTRACTOR	FT	FEET	MC	MECHANICAL CONTRACTOR
CFH	CUBIC FEET PER HOUR	ECC	ECCENTRIC	FTR	FINNED TUBE RADIATION	MED	MEDIUM
CFM	CUBIC FEET PER MINUTE	EF	EXHAUST FAN	HV	HIGH VELOCITY	MH	MANHOLE
CFM	CUBIC FEET PER MINUTE	EFF	EFFICIENCY	FX	FLEXIBLE CONNECTION	MH	MANHOLE
CHP	CONCRETE HOUSEKEEPING PAD	EJ	EXPANSION JOINT	FXC	FLEXIBLE CONNECTION	MH	MANHOLE
CHWP	CHILLED WATER PUMP	EL	ELEVATION	GA	GAUGE	MISC	MISCELLANEOUS
CHWR	CHILLED WATER RETURN	ELEC	ELECTRIC	GAL	GALLON	MOD	MOTOR OPERATED DAMPER
CHWS	CHILLED WATER SUPPLY	ELEV	ELEVATOR	GALV	GALVANIZED	MTD	MOUNTED
CI	CAST IRON	ENT	ENTERING	GC	GENERAL CONTRACTOR	MUA	MAKE-UP AIR UNIT
CL	CENTER LINE	EQ	EQUAL	GPH	GALLONS PER HOUR	NC	NORMALLY CLOSED
CLG	CEILING	EQUIP	EQUIPMENT	GPM	GALLONS PER MINUTE	NFG	NATURAL GAS
CMU	CONCRETE MASONRY UNIT	EQUIV	EQUIVALENT	GR	GRILLE	NIC	NOT IN CONTRACT
CO	CLEAN OUT	ER	EXHAUST REGISTER	GR/LB	GRAINS PER POUND	NK	NECK
CO	CONDUIT	FS	FAN SWITCH	H2O	WATER	NO	NORMALLY OPEN
COMP	COMPRESSOR	ESP	EXTERNAL STATIC PRESSURE	HB	HOSE BIBB	NO	NUMBER
CON	CONCRETE	ET	EXPANSION TANK	HD	HAND DAMPER	NO	NORMALLY OPEN
CONC	CONCRETE	EWC	ELECTRIC WATER COOLER	HD	HEAD (SEE SCHEDULES)	NOM	NOMINAL
COND	CONDENSATE	EWT	ENTERING WATER TEMPERATURE	HP	HORSEPOWER	NTS	NOT TO SCALE
		EX	EXHAUST	HP	HEAT PUMP	OA	OUTSIDE AIR
				HR	HOUR	OAI	OUTSIDE AIR INTAKE

OAT	OUTSIDE AIR TEMPERATURE	SA	SUPPLY AIR
OB	OFF BOTTOM	SAD	SUPPLY AIR DIFFUSER
OBD	OPPOSED BLADE DAMPER	SAS	SUPPLY AIR REGISTER
OC	ON CENTER	SCD	SCOS VOKE CONTROL GRILLE
OCC	OCCUPIED	SCH	SCHEDULE
OD	OUTSIDE DIMENSION	SCHEM	SCHEMATIC
OD	OUTSIDE DIAMETER	SD	SMOKE DAMPER
OGH	OUTSIDE GROUND HYDRANT	SEF	SMOKE EXHAUST FAN
OPG	OPENING	SF	SUPPLY FAN
OT	OFF TOP	SH	SENSIBLE HEAT
OT	ON/OFF THERMOSTAT	SP	STATIC PRESSURE
OZ	OUNCE	SPEC	SPECIFICATION
PART	PARTIAL	SQ	SQUARE
PBD	PARALLEL BLADE DAMPER	SS	STAINLESS STEEL
PD	PRESSURE DROP (SEE SCHEDULE)	STD	STANDARD
PDR	PLENUM DRAIN	STL	STEEL
PLHW	PLUMBING HOT WATER	STM	STEAM
PH	PHASE	STR	STRUCTURAL
PHEU	PNEUMATIC	SUCT	SUCTION
PSE	POUNDS PER SQUARE INCH	SYS	SYSTEM
PRESS	PRESSURE	TAD	TRANSFER AIR DUCT
PRV	PRESSURE REDUCING VALVE	TDH	TOTAL DYNAMIC HEAD
PS	PRESSURE SWITCH	TEMP	TEMPERATURE
PSI	POUNDS PER SQUARE INCH	TS	TRANSFER GRILLE
PT	PRESSURE TRANSMITTER	THT	TOTAL HEAT
PVAC	PACKAGED TERMINAL AIR CONDITIONER	TP	TOTAL PRESSURE
PV	PLUG VALVE	TT	TEMPERATURE TRANSMITTER
PVC	POLYVINYL CHLORIDE	TYP	TYPICAL
QUAN	QUANTITY	UC	UNDERCUT
R	REGISTER	UH	UNIT HEATER
RA	RETURN AIR	UNOCC	UNOCCUPIED
RAG	RETURN AIR GRILLE	UON	UNLESS OTHERWISE NOTED
RAR	RETURN AIR REGISTER	V	VOLTS
RCP	REFLECTED CEILING PLAN	VA	VALVE
RD	ROOF DRAIN	VAV	VARIABLE AIR VOLUME UNIT
RE	ROUNDED ENTRANCE/EAT	VB	VACUUM BREAKER
REL	RELIEF	VD	VOLUME DAMPER
REQD	REQUIRED	VEL	VELOCITY
RET	RETURN	VI	VIBRATION ISOLATOR
RF	RETURN FAN	VOLT	VOLTAGE
RH	RELATIVE HUMIDITY	VTR	VENT THRU ROOF
RHC	REHEAT COIL	W	WIDTH
RLCW	RUN IN CASEWORK	W/	WITH
RIE	RUN IN ENCLOSURE	W/O	WITHOUT
RIW	RISE IN WALL	WB	WET BULB
RLA	RATED LOAD AMPS	WB	WET BULB
RM	ROOM	WC	WATER COLUMN
ROD	ROOM DRAIN-LOW DRAIN	WG	WATER GAUGE
RPM	REVOLUTIONS PER MINUTE	WMS	WIRE MESH SCREEN

RESPONSIBLE DIVISION

UNLESS OTHERWISE INDICATED ALL HEATING, VENTILATING, AIR CONDITIONING, PLUMBING, AND OTHER MECHANICAL EQUIPMENT, MOTORS, AND CONTROLS SHALL BE FURNISHED, SET IN PLACE AND WIRED AS FOLLOWS:

ITEM	FURNISHED	SET	POWER	CONTROL
EQUIPMENT	23	23	26	–
COMBINATION MAGNETIC MOTOR STARTERS, MAGNETIC MOTOR STARTERS AND CONTACTORS	23	26	26	23
FUSES AND UNFUSED DISCONNECT SWITCHES, THERMAL OVERLOAD SWITCHES AND HEATERS, MANUAL MOTOR STARTERS	26(1)	26(1)	26	–
MANUAL OPERATING AND MULTI-SPEED SWITCHES	23	26	26	26
CONTROL RELAYS, TRANSFORMERS	23	23	26	23
THERMOSTATS (LOW VOLTAGE) AND TIME SWITCHES	23	23	26	23
THERMOSTATS (LINE VOLTAGE)	23	23	26	26
HUMIDISTATS, CONTROL PANELS	23	23	26	23
MOTOR AND SOLENOID VALVES, DAMPER MOTORS, PE & EP SWITCHES	23	23(2)	–	23(2)
PUSH-BUTTON STATIONS AND PILOT LIGHTS	23	23(2)	–	23(2)
HEATING, COOLING, VENTILATION AND AIR CONDITIONING CONTROLS	23	23	26	23
LINE VOLTAGE SWITCHES	23	26	26	23(2)

SUBSCRIPTS ADDED TO:
1) UNDER DIVISION 23 IF FURNISHED FACTORY WIRED AS PART OF EQUIPMENT OR IF FURNISHED WITH COMBINATION STARTERS.
2) IF ITEM IS FOR LINE VOLTAGE, SET IN PLACE AND CONNECT UNDER DIVISION 26, WHERE FACTORY MOUNTED ON EQUIPMENT OR ATTACHED TO PIPING OR DUCTS AND USING LINE VOLTAGE FURNISH AND SET UNDER DIVISION 23, CONNECT UNDER DIVISION 26.

SUBSTITUTIONS:

A. SUBSTITUTIONS: SUBSTITUTION OF SPECIFIED EQUIPMENT WILL BE ALLOWED THROUGH A PROPER APPROVAL PROCESS AS INITIATED BY THE CONTRACTOR. CONTRACTOR SHALL SUBMIT A TENDERED SUBSTITUTION AT LEAST FIVE DAYS PRIOR TO BID FOR APPROVAL FROM ENGINEER. SUBMITTAL SHALL INCLUDE CAPACITIES, DIMENSIONS AND OPERATING INSTRUCTIONS FOR EACH PIECE OF EQUIPMENT. SUBSTITUTION SHALL OCCUR AT NO COST TO THE OWNER. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF APPROVED SUBSTITUTION AND SHALL INCUR ALL COSTS ASSOCIATED WITH THE SUBSTITUTION INCLUDING STRUCTURAL, MODIFICATIONS, SPACE LAYOUT AND REDESIGN COSTS. SCC ALSO DIVISION 01 GENERAL REQUIREMENTS.

EXAMINATION OF SITE, DRAWINGS, SPECIFICATIONS:

A. EXAMINE CAREFULLY THE SITE AND CONDITIONS OF THE SITE. PREPARE ALL NECESSARY EQUIPMENT AND LABOR TO INSTALL A COMPLETE WORKING SYSTEM WITHIN THE SITE CONDITIONS.

B. EXAMINE THE DRAWINGS AND SPECIFICATIONS AND 5 DAYS PRIOR TO BIDDING REPORT ANY ERRORS, OMISSIONS, INCONSISTENCIES, AND CONFLICTS TO THE ENGINEER TO BE REMEDIED IN AN ADDENDUM TO THE PROJECT PRIOR TO BID TIME.

C. DRAWINGS ARE DIAGRAMATIC AND CATALOG NUMBERS GIVEN ARE FOR REFERENCE ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE CAPACITY OF THE EQUIPMENT MEETS THE DRAWING REQUIREMENTS AND SHALL NOT DIMENSION FROM THE MECHANICAL, PLUMBING, OR PIPING DRAWINGS.

D. THE LATEST ADOPTED VERSIONS OF THE INTERNATIONAL BUILDING CODES SHALL BE USED AS REQUIRED. THIS WILL ALSO INCLUDE THE LATEST ADOPTED VERSIONS OF THE MECHANICAL, PLUMBING AND ENERGY CONSERVATION CODES. ALL MATERIALS AND MATERIALS REQUIRED BY THESE CODES SHALL BE REQUIRED BY THESE SPECIFICATIONS UNLESS INDICATED OTHERWISE. OTHER APPLICABLE LOCAL CODES AND ORDINANCES SHALL BE AS REQUIRED AND IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO BE KNOWLEDGEABLE OF THESE REQUIREMENTS.

E. WHERE INSTALLATION PROCEDURES OR ANY PART THEREOF ARE REQUIRED TO BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER OF THE MATERIAL BEING INSTALLED, PRINTED COPIES OF THESE RECOMMENDATIONS SHALL BE FURNISHED TO THE ENGINEER PRIOR TO INSTALLATION. INSTALLATION OF THE ITEM WILL NOT BE ALLOWED TO PROCEED UNTIL THE RECOMMENDATIONS ARE HAVE BEEN INCORPORATED INTO THE INSTALLATION. FAILURE TO COMPLY WITH THIS MAY BE CAUSE FOR REJECTION OF THE MATERIAL.

REFER TO ARCHITECTURAL SPECIFICATIONS SECTION 09 9100 TITLED "PAINT SPECIFICATIONS" FOR ADDITIONAL INFORMATION CONCERNING THESE ITEMS.

PLUMBING SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
FD	FLOOR DRAIN		PRESSURE GAGE
CO	CLEAN-OUT (FLOOR)		TEMPERATURE GAGE
CO	CLEAN-OUT (WALL)		WATER METER
WH	HOT WATER HEATER		PRESSURE REDUCING VALVE
	GATE VALVE		GAS COCK
	CHECK VALVE	VTR	VENT THROUGH ROOF
	TEMP./PRESS. RELIEF VALVE	LAV	LAVATORY
	FIXTURE ISOLATION VALVE	WC	WATER CLOSET
	VACUUM BREAKER	URN	URINAL
RD	ROOF DRAIN	DF	DRINKING FOUNTAIN
		SH	SHOWER
		A.D.	ACCESS DOOR
		SS	SAFETY SHOWER

PLUMBING LINE DESIGNATIONS

LINE TYPE	DESCRIPTION	LINE TYPE	DESCRIPTION
	SOIL OR WASTE PIPE	G	NATURAL GAS
	VENT PIPE (V)	PG	PROPANE GAS
	COLD WATER PIPE (CW)	DWS	DISTILLED WATER SUPPLY
	HOT WATER PIPE (DW)	DWR	DISTILLED WATER RETURN
	HOT WATER RECIRCULATION (DWR)	DIES	DEIONIZED WATER SUPPLY
T	TEMPERED HOT WATER LINE (THW)	DIER	DEIONIZED WATER RETURN
G	NATURAL GAS PIPE	WFIS	WATER FOR INJECTION SUPPLY
		WFIR	WATER FOR INJECTION RETURN
SD	STORM DRAIN PIPE	USPS	USP PURIFIED WATER SUPPLY
D	EQUIPMENT DRAIN	PRWR	PROCESS HOT WATER RECIRC.
LW	LAB WASTE	PW	PUMPED WASTE
LV	LAB VENT	PV	PROCESS VENT
F	FIRE MAIN	RE	HELIUM
PS	PURE STEAM	N2	NITROGEN
PSC	PURE STEAM CONDENSATE	O2	OXYGEN
CA	COMPRESSED AIR	H2	HYDROGEN
SP	SPRINKLER PIPE	N2O	NITROUS OXIDE
ST	STORM WATER	MA	MEDICAL AIR
OD	OVERFLOW STORM WATER	VAC	VACUUM
HPS	HIGH PRESSURE STEAM	DC	DECONTAMINATION PIPING
HPC	HIGH PRESSURE CONDENSATE	LPC	LOW PRESSURE CONDENSATE
LPS	LOW PRESSURE STEAM	TWS	TOWER WATER SUPPLY
		TWR	TOWER WATER RETURN

PIPING ELEMENTS/VALVING

LINE TYPE	DESCRIPTION	LINE TYPE	DESCRIPTION
	PRESSURE REDUCING VALVE (PRV)		PIPE RISING UP
	GATE VALVE		PIPE DROPPING DOWN
	GLOBE VALVE		UNION - SCREWED OR FLANGED
	BUTTERFLY VALVE	FS	FLOW SWITCH
	VALVE IN RISE OR DROP	TT	TEMPERATURE TRANSMITTER
	BALL VALVE	PT/PS	PRESSURE TRANSMITTER OR PRESSURE SWITCH
	SWING CHECK VALVE	PI/TI	THERMOMETER/ITEMPERATURE INDICATOR
	LIFT CHECK VALVE	PI/GA	GAUGE WITH GAUGE COCK/ PRESSURE INDICATOR
	GATE VALVE, ANGLE		BACKFLOW PREVENTOR (RELIEVED ZONE)
	GLOBE VALVE, ANGLE		BACKFLOW PREVENTOR (DOUBLE CHECK VALVE ASSEMBLY)
	THREE WAY CONTROL VALVE	SA	WATER HAMMER ARRESTER
	TWO WAY CONTROL VALVE	CBV	CIRCUIT SETTING BALANCING VALVE
	SOLENOID VALVE	HB	HOSE BIBB
	TEMPERATURE AND PRESSURE RELIEF VALVE	RD	ROOF DRAIN
	RELIEF/SAFETY VALVE	OS	OPEN SITE DRAIN
	GAS COCK	FD	FLOOR DRAIN
	GAS PRESSURE REGULATOR	ADR	AREA DRAIN
	STRAINER	CO	CLEANOUT
	STRAINER WITH BLOW OFF VALVE	CO	WALL CLEAN OUT
			FLEXIBLE CONNECTION
			SPRINKLER HEAD

PLUMBING - SHEET LIST

Sheet Number	Sheet Name
P0-1	PLUMBING COVER SHEET
P0-2	PLUMBING SCHEDULES
P1-1	PLUMBING - MAIN FLOOR PLAN
P1-2	PLUMBING - ATTIC FLOOR PLAN
P1-3	PLUMBING - ROOF PLAN

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PLUMBING COVER SHEET

P0-1

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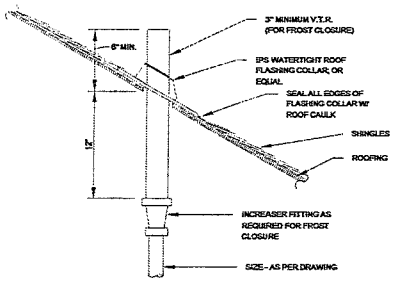
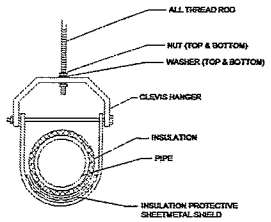


PLUMBING VENT THROUGH PITCHED ROOF DETAIL

NOT TO SCALE



TYPICAL CLEVIS HANGER DETAIL

NOT TO SCALE

ELECTRIC TANK WATER HEATER SCHEDULE

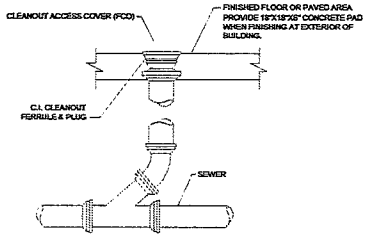
TYPE MARK	TANK SIZE	RECOVERY @ ? DEG. F RISE	DOMESTIC CW PIPE CONNECTION SIZE	ELECTRICAL				MANUFACTURER	MODEL #	OPTIONS/ ACCESSORIES
				HEATING ELEMENT KW	VOLTS	PHASE	FREQUENCY			
WH-1	83 GAL.			9 kW	208 V	1	60 HP	RHEEM	ELOMS	SEE NOTE 1

NOTES:
1. ---

PLUMBING FIXTURE SCHEDULE

TYPE MARK	DESCRIPTION	MANUFACTURER	MODEL #	TRIM	PIPE CONNECTIONS				OPTIONS/ ACCESSORIES
					S/W	VENT	C/W	H/W	
FD-*	FLOOR DRAIN								
LV-1	LAVATORY								
USB-1	MOP SINK								
SK-*	SINK								
WC-1	FLUSH VALVE WATER CLOSET								

* COMMERCIAL GRADE FIXTURES.



CLEANOUT DETAIL

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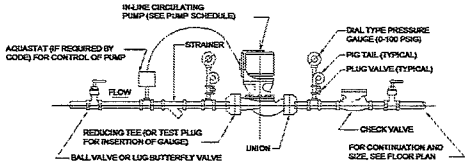

IN-LINE CIRCULATING PUMP DETAIL

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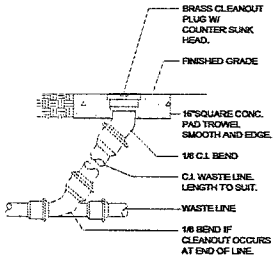

CLEANOUT TO GRADE

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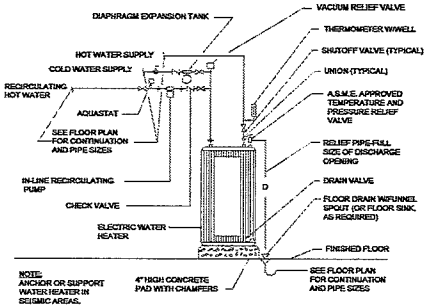

ELECTRIC WATER HEATER DETAIL

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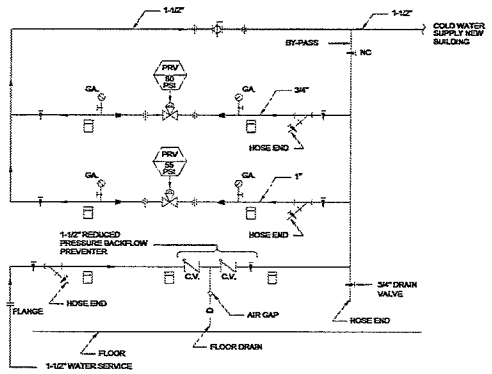

DOMESTIC WATER PRESSURE REDUCING STATION DETAIL

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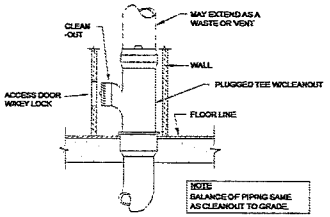

WALL CLEANOUT DETAIL

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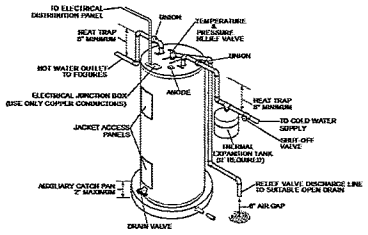

RHEEM LIGHT COMMERCIAL ELECTRIC WATER HEATER DETAIL

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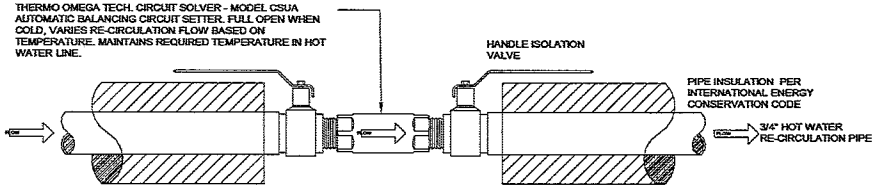

CIRCUIT SOLVER - AUTOMATIC CIRCUIT SETTER DETAIL

NOT TO SCALE

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PLUMBING SCHEDULES

P0-2

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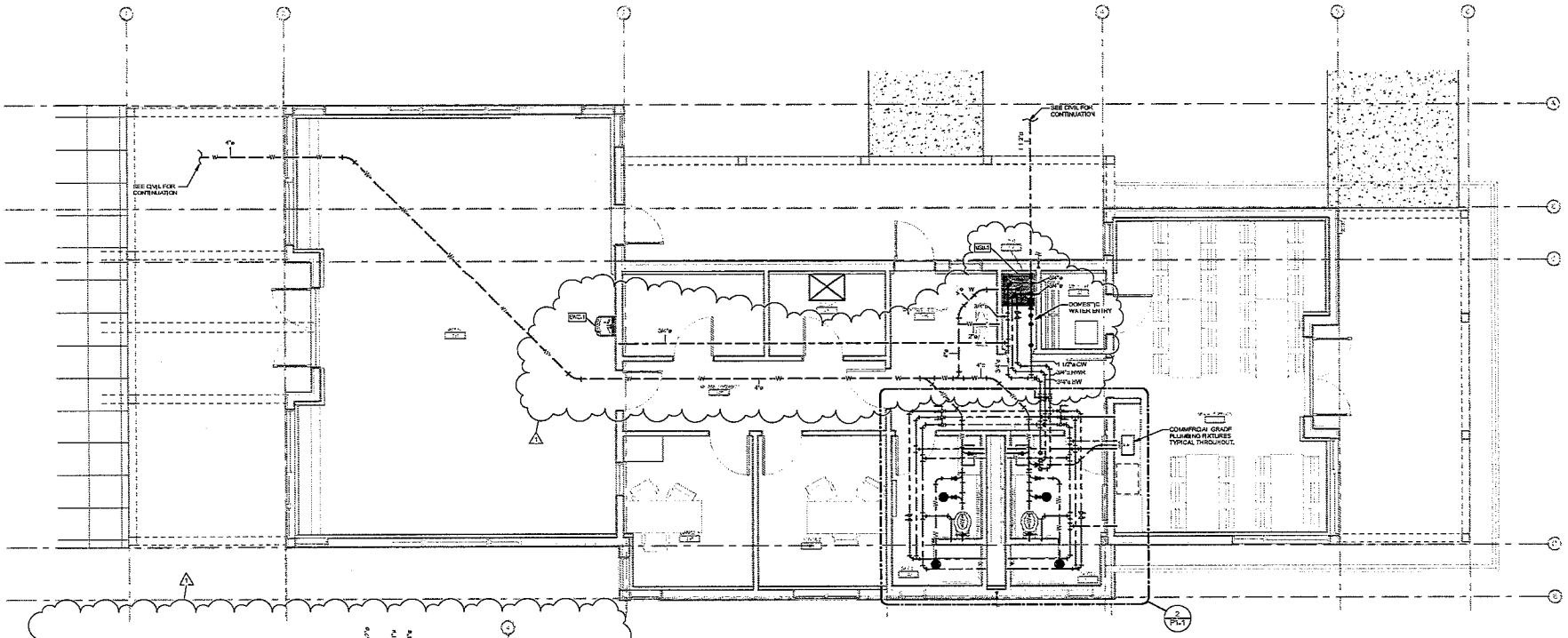

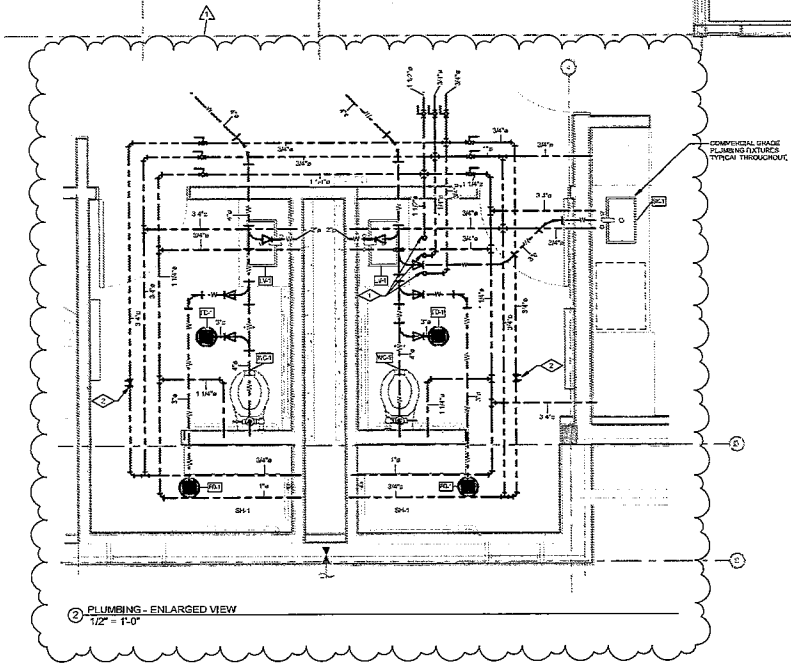

② PLUMBING - ENLARGED VIEW
1/2" = 1'-0"

'P1-' FLAG NOTES

Flag Number	Flag Text
1	PLUMBING ROUTED UP TO WATER HEATER ON LEVEL ABOVE.
2	PROVIDE CIRCUIT SETTER, COORDINATE LOCATION & ACCESS WITH ARCHITECT.

① PLUMBING - MAIN FLOOR PLAN
1/4" = 1'-0"

0 4 8 12 16

PLAN NORTH

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PLUMBING - MAIN FLOOR PLAN

P1-1

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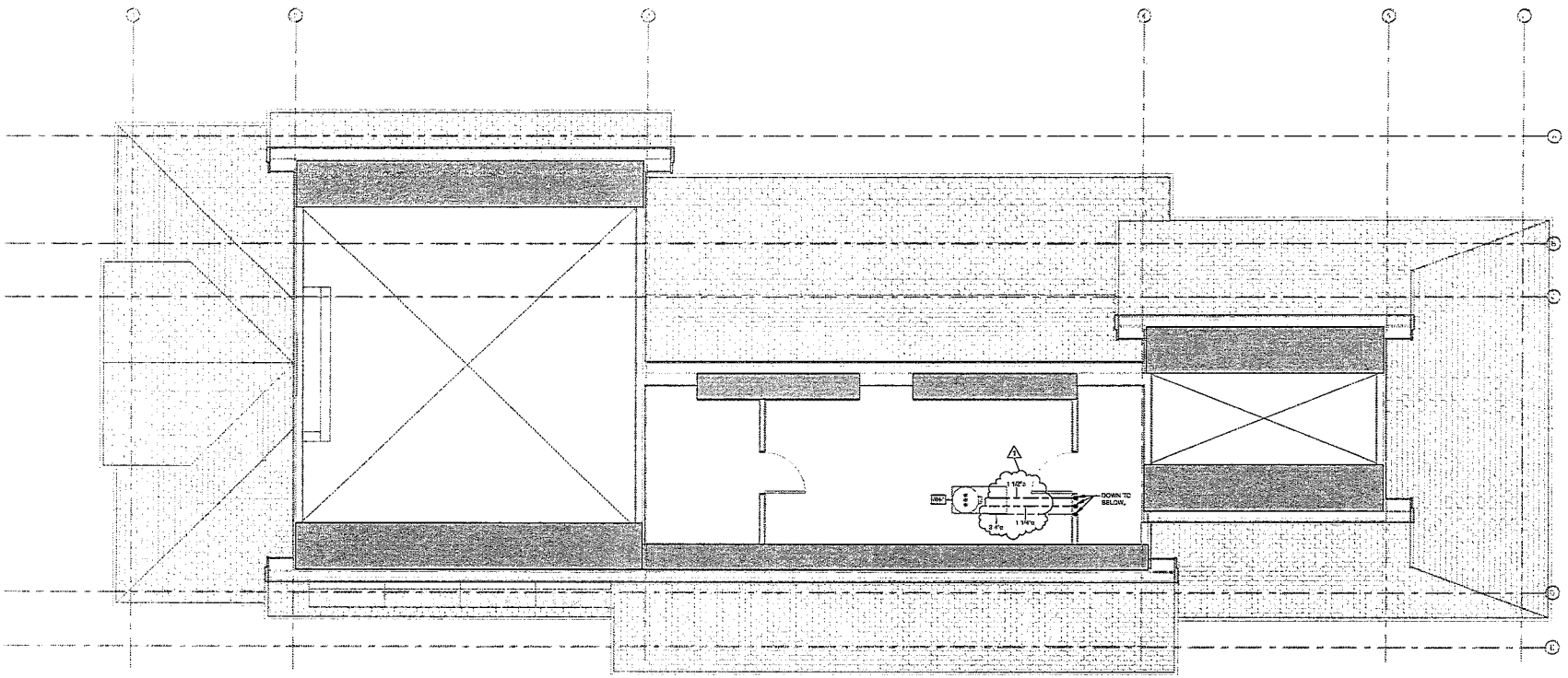

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1 PLUMBING - ATTIC FLOOR PLAN
1/4" = 1'-0"
0 4 8 12 16

PLAN NORTH

PLUMBING - ATTIC FLOOR PLAN

P1-2

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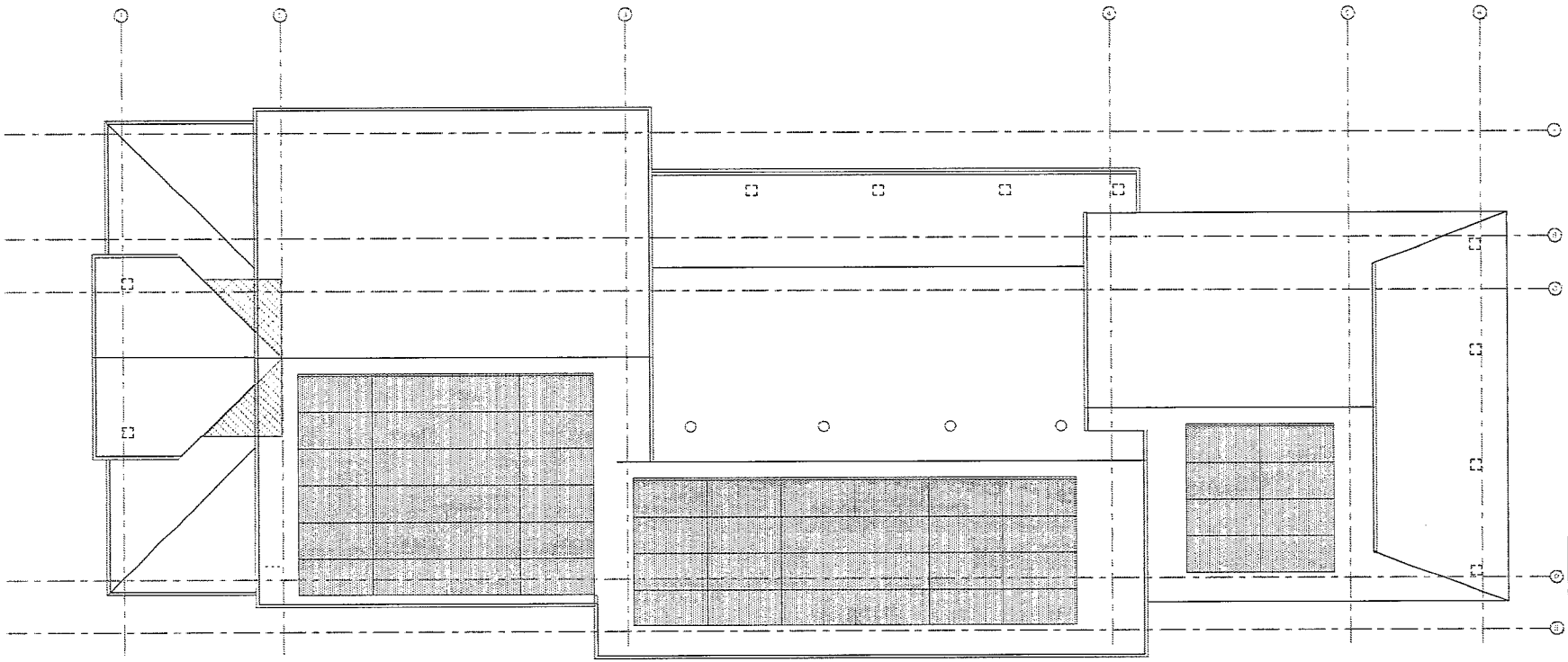

1 PLUMBING - ROOF PLAN
1/4" = 1'-0"
0 4 8 12 16

PLAN NORTH

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PLUMBING - ROOF PLAN

P1-3

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DRAWING ABBREVIATIONS

AAV	AUTOMATIC AIR VENT	CONN	CONNECTION	EXPAN	EXPANSION	HT	HEIGHT	OAT	OUTSIDE AIR TEMPERATURE	SA	SUPPLY AIR
ABV	ABOVE	CONTN	CONTINUATION	EXT	EXTERNAL	HTR	HEATER	OB	OFF BOTTOM	SAD	SUPPLY AIR DIFFUSER
AC	AIR CONDITIONING UNIT	CONTR	CONTRACTOR	F	DEGREES FAHRENHEIT	HV	HEATING AND VENTILATING UNIT	OBD	OPPOSED BLADE DAMPER	SAR	SUPPLY AIR REGISTER
AD	ACCESS DOOR	CP	CONDENSATE PUMP	FD	FIRE DAMPER	HWC	HOT WATER CONVECTER	OC	ON CENTER	SCG	SOFFMOC CONTROL GRILLE
ADR	AREA DRAIN (SIFF SYMBOL 5)	CT	COOLING TOWER	FSD	HOT WATER PUMP	HWP	HOT WATER PUMP	OCC	OCCUPIED	SCH	SCHEDULE
AFF	ABOVE FINISHED FLOOR	CU	CONDENSING UNIT		ACCESS DOOR	HWR	HEATING HOT WATER RETURN	OD	OUTSIDE DIMENSION	SCHEM	SCHEMATIC
AH	AIR HANDLER (SPLIT FLTTRG)	CUH	CABINET UNIT HEATER	FA	FROM ABOVE	HWS	HEATING HOT WATER SUPPLY	OD	OUTSIDE DIAMETER	SD	SMOKE DAMPER
AHU	AIR HANDLING UNIT	CVS	CONSTANT VOLUME BOX	FA	FREE AREA	HX	HEAT EXCHANGER	OGH	OUTSIDE GROUND HYDRANT	SEF	SMOKE EXHAUST FAN
AL	ACOUSTICAL LINING	CWP	CONDENSER WATER PUMP	FB	FROM BELOW	HZ	HERTZ	OPG	OPENING	SF	SUPPLY FAN
ALUV	ALUMINUM	DWH	CONDENSER WATER RETURN	FC	FAN COIL UNIT	ID	INFERNAL DIAMETER	Q1	OFF-LOP	SH	SHEET(S) (SAI
AP	ACCESS PANEL	CWS	CONDENSER WATER SUPPLY	FCU	FAN COIL UNIT	ID	INSIDE DIAMETER	OZ	OUNCE	SP	STATIC PRESSURE
ATC	AUTOMATIC TEMP. CONTRO...	DA	DIRECT ACTING	FDV	FLOW CONTROL VALVE	INCH	INCHES	PART	PARTIAL	SPEC	SPECIFICATION
AWH	AWNING	DAMP	DAMPER	FD	FLOOR DRAIN	INCL	INCLUDING	PJR	PANELLE BLADE DAMPER	SQ	SQUARE
AWT	AVERAGE WATER TEMP.	DB	DRY BULB	FD	FIRE DAMPER	INT	INTERNAL	PD	PRESSURE DROP (SEE SCHEDULE)	SS	STAINLESS STEEL
B	BOILER	DEPT	DEPARTMENT	FIN	FINISHED	INV	INVERT	POR	PLENUM DRAIN	STD	STANDARD
BB	ELECTRIC BASEBOARD RADIATION	DIA	DIAMETER	FL	FLANGE	KW	KILOWATT	PERF	PERFORATED	STL	STEEL
BDD	BACKDRAFT DAMPER	DWG	DRAWING	FLA	FULL LOAD AMPS	L	LENGTH	PH	PHASE	STM	STEAM
BFC	BFI OW FINISHED CFILING	DIFF	DIFFERENTIAL	FI FX	FI FXFRF	LAT	LEAVING AIR TEMPERATURE	PNEU	PNEUMATIC	STR	STRUCTURAL
BFP	BACK FLOW PREVENTOR	DISCH	DISCHARGE	FLR	FLOOR	LB	POUND	POS	POSITIVE PRESS	SUCT	SUCTION
BLDG	BUILDING	DIV	DIVISION	FD	FAL OPEN	LD	LINEAR DIFFUSER	PRESS	PRESSURE	SYS	SYSTEM
B W	BFI OW	DOW	DOWN IN WALL	FOB	FLAT ON BOTTOM	LF	LINEAR FEET	PRV	PRESSURE REDUCING VALVE	TAD	TRANSFER AIR DUCT
BOB	BOTTOM OF BEAM	DL	DOOR LOUVER	FOP	FULL OF PLUMB	LIN	LINEAR	PS	PRESSURE SWITCH	TH	TOTAL DYNAMIC HEAD
BOD	BOTTOM O" DUCT	DN	DOWN	TOT	FLAT ON TOP	LIQ	LIQUID	PSI	POUNDS PER SQUARE INCH	TEMP	TEMPERATURE
BOP	BOTTOM O" PIPE	DS	DUCT SILENCER	FP	FIRE PROTECTION	LRA	LOCK ROTOR AMPS	PT	PRESSURE TRANSMITTER	TG	TRANSFER GRILLE
BSMT	BASEMENT	DWG	DRAWING	FP	FIRE PUMP	LVG	LEAVING	PTAC	PACKAGED TERMINAL	TH	TOTAL HEAT
BTU	BRITISH THERMAL UNI T	DWP	DOMESTIC WATER PUM	HPM	HIGH PRESSURE MIST	LVR	LOUVER		AIR CONDITIONER	P	TOTAL PRESSURE
C	CHILLER	DX	DIRECT EXPANSION	FRS	FEET PER SECOND	LWT	LEAVING WATER TEMPERATURE	PL	PLUG VALVE	TT	TEMPERATURE TRANSMITTER
CAP	CAPACITY	EA	EACH	FRCT	FEET OF	LWT	LEAVING WATER TEMPERATURE	PVC	POLYVINYL CHLORIDE	TYP	TYPICAL
CBV	CHILD BALANCING VALVE	EAT	ENTERING AIR TEMPERATURE	FS	FLOW SWITCH	MBH	THOUSANDS OF BTU PER HOUR	QUAN	QUANTITY	UC	UNDERCUT
CD	CEILING DIFFUSER	EC	ELECTRICAL CONTRACTOR	FT	FEET	MC	MECHANICAL CONTRACTOR	R	REGISTER	UH	UNIT HEATER
CFH	CUBIC FEET PER HOUR	ECC	ECCENTRIC	FTR	FINNED TUBE RADIATION	MED	MEDIUM	RA	RETURN AIR	UNDCT	UNDUCTURED
CFM	CUBIC FEET PER MINUTE	EF	EXHAUST FAN	FV	FACE VELOCITY	MFR	MANUFACTURER	RAG	RETURN AIR GRILLE	UON	UNLESS OTHERWISE NOTED
CFM	CUBIC FEET PER MINUTE	EFF	EFFICIENCY	FX	FLEXIBLE CONNECTION	MH	MANHOLE	RAR	RETURN AIR REGISTER	V	VOLTS
CHP	CONCRETE HOUSEKEEPING PAD	EJ	EXPANSION JOINT	FXC	FLEXIBLE CONNECTION	MIN	MINIMUM	RC	REINFORCED CEILING PLAN	VA	VOLT
CHWP	CHILLED WATER PUMP	EL	ELEVATION	GA	GAUGE	MISC	MISCELLANEOUS	RD	ROOF DRAIN	VAV	VARIABLE AIR VOLUME UNIT
CHWR	CHILLED WATER RETURN	ELEC	ELECTRIC	GAL	GALLON	MOD	MOTOR OPERATED DAMPER	RE	RECESSED ENTRANCE MAT	VD	VOLUME DAMPER
CHWS	CHILLED WATER SUPPLY	EV	EVAPORATOR	GALV	GALVANIZED	MTD	MOUNTED	RFI	REFLECTED	VD	VOLUME DAMPER
CI	CAST IRON	EWT	ENTERING	GC	GENERAL CONTRACTOR	MUA	MAKE-UP AIR UNIT	REQD	REQUIRED	VEL	VELOCITY
CL	CENTER LINE	FC	COOLING	GPH	GALLONS PER HOUR	NC	NORMALLY CLOSED	RET	RETURN	VI	VIBRATION ISOLATOR
CLG	CEILING	EQUIP	EQUIPMENT	GPM	GALLONS PER MINUTE	NEG	NEGATIVE	RF	RETURN FAN	VOLT	VOLTAGE
CMU	CONCRETE MASONRY UNIT	EQUIV	EQUIVALENT	GR	GRILLE	NIC	NOT IN CONTRACT	RH	RELATIVE HUMIDITY	VTR	VENT THRU ROOF
CO	CLEAN OUT	ER	EXHAUST REGISTER	GRS/LB	GRAINS PER POUND	NK	NECK	RHC	REHEAT COIL	W	WIDTH
COL	COLUMN	ES	EXHAUST GRILLE	H 2O	WATER	NO	NORMALLY OPEN	RGW	RUN IN RACEWORK	W	WITH
COMP	COMPRESSOR	ESP	EXTERNAL STATIC PRESSURE	HB	HOSE BIBB	NS	NUMBER	RE	RUN IN ENCLOSURE	WO	WITHOUT
CON	CONCENTRIC	EX	EXPANSION TANK	HD	HEAD DIAMETER	NO	NORMALLY OPEN	VEW	VIEW	WB	WET BULB
CONC	CONCRETE	EWC	ELECTRIC WATER COOLER	HD	HEAD (SEE SCHEDULES)	NOM	NOMINAL	RLA	RATED LOAD AMPS	WB	WET BULB
CONT	CONTINUATE	FWT	ENTERING WATER TEMPERATURE	HP	HORSEPOWER	NTS	NOT TO SCALE	RM	ROOM	WC	WATER CLOSET
		EX	EXHAUST	HP	HEAT PUMP	OA	OUTSIDE AIR	ROD	ROOF OVERFLOW DRAIN	WG	WATER GAUGE
				HH	HOUR	OAI	OUTSIDE AIR INTAKE	RPM	REVOLUTIONS PER MINUTE	WMS	WHEELCHAIR SCHELLY

RESPONSIBLE DIVISION

UNLESS OTHERWISE INDICATED ALL HEATING, VENTILATING, AIR CONDITIONING, PLUMBING, AND OTHER MECHANICAL EQUIPMENT, MOTORS, AND CONTROLS SHALL BE FURNISHED, SETTING PLACE AND WIRED AS FOLLOWS:

ITEM	FURNISHED	SET	POWER	CONTROL
EQUIPMENT COMBINATION MAGNETIC MOTOR STARTERS, MAGNETIC MOTOR STARTERS AND CONTACTORS	23	23	26	--
FUSED AND UNFUSED DISCONNECT SWITCHES THERMAL OVERLOAD SWITCHES AND HEATERS, MANUAL MOTOR STARTERS	23(1)	26(1)	26	--
MANUAL-OPERATING AND MULTI-SPEED SWITCHES	23	26	26	26
CONTROLS, RELAYS, TRANSFORMERS	23	23	26	23
THERMOSTATS (LINE VOLTAGE) AND TIME SWITCHES	23	23	26	23
THERMOSTATS (LOW VOLTAGE)	23	23	26	26
HUMIDIFIER UNIT CONTROL PANELS	23	23	26	23
MOTOR AND SOLENOID VALVES, DAMPER MOTORS, RELAYS SWITCHES	23	23(2)	--	23(2)
PUSH-BUTTON STATIONS AND PILOT LIGHTS	23	23(2)	--	23(2)
HEATING, COOLING VENTILATION AND AIR CONDITIONING CONTROLS	23	23	26	23
EXHAUST FAN SWITCHES	23	26	26	23(2)

SUBSCRIPTIONS:
1) UNDER DIVISION 23 IF FURNISHED FACTORY-WIRED AS PART OF EQUIPMENT OR IF FURNISHED WITH COMBINATION STARTERS.
2) IF ITEMS FOR LINE VOLTAGE, SET IN PLACE AND CONNECT UNDER DIVISION 26, WHERE FACTORY MOUNTED ON EQUIPMENT OR ATTACHED TO PIPING OR DUCTS AND USING LOW VOLTAGE FURNISH AND SET UNDER DIVISION 23, CONNECT UNDER DIVISION 26.

SUBSTITUTIONS:

A. SUBSTITUTIONS: SUBSTITUTION OF SPECIFIED EQUIPMENT WILL BE ALLOWED THROUGH A PRIOR APPROVAL PROCESS INITIATED BY THE CONTRACTORS. CONTRACTOR SHALL SUBMIT INTENDED SUBSTITUTION AT LEAST FIVE DAYS PRIOR TO BID FOR APPROVAL FROM ENGINEER. SUBMITTAL SHALL INCLUDE CAPACITIES, DIMENSIONS AND OPERATING INSTRUCTIONS FOR EACH PIECE OF EQUIPMENT. SUBSTITUTION SHALL OCCUR AT NO COST TO THE OWNER. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF APPROVED SUBSTITUTION AND SHALL INCUR ALL COSTS ASSOCIATED WITH THE SUBSTITUTION, INCLUDING STRUCTURAL MODIFICATIONS, SPACE LAYOUT AND REDESIGN COSTS, SEE ALSO DIVISION 1 GENERAL REQUIREMENTS.

EXAMINATION OF SITE, DRAWINGS, SPECIFICATIONS:

A. EXAMINE CAREFULLY THE SITE AND CONDITIONS OF THE SITE, PROVIDE ALL NECESSARY EQUIPMENT AND LABOR TO INSTALL A COMPLETE WORKING SYSTEM WITHIN THE SITE CONDITIONS.

B. EXAMINE THE DRAWINGS AND SPECIFICATIONS AND 5 DAYS PRIOR TO BIDDING REPORT ANY ERRORS, OMISSIONS, INCONSISTENCIES, AND CONFLICTS TO THE ENGINEER TO BE REMEDIED IN AN ADDENDUM TO THE PROJECT PRIOR TO BID TIME.

C. DRAWINGS ARE DIAGRAMMATIC AND CATALOG NUMBERS GIVEN ARE FOR REFERENCE ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE CAPACITY OF THE EQUIPMENT MEETS THE DRAWING REQUIREMENTS AND SHALL NOT DEVIATE FROM THE MECHANICAL, PLUMBING, OR PIPING DRAWINGS.

D. THE LATEST ADOPTED VERSIONS OF INTERNATIONAL BUILDING CODES SHALL BE USED AS REQUIRED. THIS WILL ALSO INCLUDE THE LATEST ADOPTED VERSIONS OF THE MECHANICAL, PLUMBING AND ENERGY CONSERVATION CODES. ALL MATERIALS AND DETAILS REQUIRED BY THESE CODES SHALL BE REQUIRED BY THESE SPECIFICATIONS UNLESS INDICATED OTHERWISE. OTHER APPLICABLE LOCAL CODES AND ORDINANCES SHALL BE ADHERED AND IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO BE KNOWLEDGEABLE OF THESE REQUIREMENTS.

E. WHERE INSTALLATION PROCEDURES OR ANY PART THEREOF ARE REQUIRED TO BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER OF THE MATERIAL BEING INSTALLED, PRINTED COPIES OF THESE RECOMMENDATIONS SHALL BE FURNISHED TO THE ENGINEER PRIOR TO INSTALLATION. INSTALLATION OF THE ITEM WILL NOT BE ALLOWED TO PROCEED UNTIL THE RECOMMENDATIONS ARE READILY AVAILABLE TO ENGINEER. NONCONFORMANCES CAN BE CAUSE FOR REJECTION OF THE MATERIAL.

REFER TO ARCHITECTURAL SPECIFICATIONS SECTION 10 0100 "TITLE "TITLE SPECIFICATIONS" FOR ADDITIONAL INFORMATION CONCERNING THESE ITEMS.

LIGHTING LEGEND

NOTES:
SYMBOLS SHOWN ARE STANDARD. VARIATION AND/OR COMBINATIONS MAY BE USED ON THE PLANS. THIS LIST SHOWS STANDARD SYMBOLS AND ALL MAY NOT APPEAR ON THE PROJECT DRAWINGS, HOWEVER, WHENEVER THE SYMBOL ON THE PROJECT DRAWINGS OCCUR, THE ITEM SHALL BE PROVIDED AND INSTALLED.

A LOWER CASE LETTER NEXT TO LIGHT FIXTURE OR SWITCH INDICATES A SWITCH DESIGNATION.

AN UPPER CASE LETTER NEXT TO A SWITCH INDICATES THE TYPE OF SWITCH. SEE THE LIST BELOW

AN UPPER CASE LETTER NEXT TO A LIGHT FIXTURE INDICATES THE TYPE OF FIXTURE. REFER TO THE LUMINAIRE SCHEDULE ON FIXTURE SPECIFICATIONS.

SWITCHES

- S SINGLE POLE SWITCH
- S_2 TWO POLE SWITCH
- S_3 THREE WAY SWITCH
- S_4 FOUR-WAY SWITCH
- S_D DIMMER SWITCH
- S_{3D} 3 WAY DIMMER SWITCH - (AD INDICATES A 4-WAY DIMMER)
- S_{DR} DOOR ACTIVATED SWITCH
- S_{WA} WALL MOUNTED DUAL TECHNOLOGY MANUAL ON/ AUTO OFF VACUUM SENSOR SWITCH
- S_{LV} LOW VOLTAGE LIGHT SWITCH
- S_{MD} MANUAL MOTOR STARTER
- S_P PILOT LIGHT SWITCH
- S_{OS} MANUAL ON / AUTO OFF LIGHT SWITCH
- S_{MD} MANUAL ON / AUTO OFF DIMMING LIGHT SWITCH
- S_K KEY OPERATED LIGHT SWITCH
- S_T TIMER SWITCH
- S_{VU} S_{VM} CEILING MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR SWITCH — PP1: 120/208V 3PH, 4W; PP1: 225A MLO 120/208V 3PH, 4W
- S_{SC} SCENE CONTROL STATION
- S_{MS} LINE LIGHTING MANAGEMENT CONSOLE STATION,

LIGHT FIXTURES

ALL FIXTURES: THE UPPER CASE LETTER INDICATES FIXTURE TYPE PER THE LUMINAIRE SCHEDULE FOR SPECIFICATIONS, THE LOWER CASE LETTER INDICATES WHICH SWITCH CONTROLS THE LIGHT.

ACTUAL FIXTURE ON PLANS MAY VARY FROM THE SYMBOL SHOWN HERE

- A — 1'X4' LED TROFFER OR DIRECT/INDIRECT TYPE FIXTURE; GRID, FLANGE, OR SURFACE MOUNTED
- A — 2'X4' LED TROFFER OR DIRECT/INDIRECT TYPE FIXTURE; GRID, FLANGE OR SURFACE MOUNTED
- A — 2'X2' LED TROFFER OR DIRECT/INDIRECT TYPE FIXTURE; GRID, FLANGE, OR SURFACE MOUNTED
- A — WALL BRACKET LIGHT FIXTURE
- A — RECESSED DOWNLIGHT CAN FIXTURE
- A — SURFACE CEILING OR PENDANT MOUNTED FIXTURE
- EX2 — DOUBLE FACE EXIT SIGN, WALL AND CEILING MOUNTED
- EX1 — SINGLE FACE EXIT SIGN, WALL AND CEILING MOUNTED
- EM — WALL MOUNTED EMERGENCY LIGHT
- EMR — EMERGENCY EXTERIOR EGRESS FIXTURE

ELECTRICAL EQUIPMENT LEGEND

- BRANCH CIRCUIT PANELBOARD
- TELEPHONE TERMINAL BOARD
- ELECTRIC MOTOR
- FUSED SAFETY SWITCH/DISCONNECT COMBINATION
- MOTION STARTER
- CONTACTOR
- 1A-2 — CIRCUITRY HOMERUN: PANEL 1A - CIR. #2
- CONDUIT OR WIRE CONCEALED IN WALL/CLG.
- CONDUIT OR WIRE UNDERFLOOR/GRADE

MAIN DISTRIBUTION GEAR

- CIRCUIT BREAKER IN A PANEL BOARD
- PAD MOUNTED UTILITY TRANSFORMER
- FUSED DISCONNECT 100A - AMP RATING 2P - NUMBER OF POLES
- 100 A 2 POLE FUSED DISCONNECT
- ELECTRICAL METER SHOWN IN PLAN VIEW
- ELECTRICAL POWER PANEL WITH MAIN LUG OR MAIN BREAKER
  - PP1= PANEL NAME
  - 225A MLO = MAIN LUG OR BREAKER SIZE
  - 120/208V = PANEL VOLTAGE
  - 3PH, 4 WIRE = PANEL PHASE AND WIRE SIZE

ELECTRICAL DEVICE LEGEND

- CEILING JUNCTION BOX - SURFACE/FLUSH
- J-1 — WALL JUNCTION BOX - SURFACE/FLUSH
- DUPLEX RECEPTACLE
- FLOOR MOUNTED RECEPTACLE
- SPLIT WIRED DUPLEX RECEPTACLE
- CEILING MOUNTED DUPLEX RECEPTACLE
- FOUR PLEX RECEPTACLE
- FLOOR MOUNTED FOURPLEX RECEPTACLE
- APPLIANCE RECEPTACLE - 3 WIRE
- GFCI — GROUND FAULT CIRCUIT INTERRUPTER
- WP — GROUND FAULT CIRCUIT INTERRUPTER WITH WEATHERPROOF COVER
- AC — RECEPTACLE MOUNTED ABOVE COUNTER
- CW — RECEPTACLE MOUNTED IN CASEWORK
- ELECTRIC HAND DRYER
- THERMOSTAT
- OPEN/CLOSE/STOP PUSH BUTTON

FIRE ALARM EQUIPMENT LEGEND

- FA — FIRE ALARM PULL STATION
- FA — FIRE ALARM HORN
- FA — FIRE ALARM STROBE
- FA — FIRE ALARM HORN/STROBE
- FA — CEILING MOUNTED SPEAKER
- FA — DUCT DETECTOR
- FA — REMOTE LAMP
- FA — SMOKE DETECTOR - STANDARD
- FA 135° — 135° STANDARD HEAT DETECTOR
- FA — PIR DETECTOR
- FA — FLOW SWITCH
- FA — TAMPER SWITCH

COMMUNICATION LEGEND

- CLOCK ONLY
- CLOCK/PA SPEAKER WALL MOUNTED
- ROUND CEILING MOUNTED SPEAKER
- SQUARE SPEAKER
- INTERCOM PUSH TO CALL SWITCH
- WAP — WIRELESS ACCESS POINT ABOVE THE CEILING
- PROJECTOR — ABOVE THE CEILING PROJECTOR CONNECTION
- SHDMI — WALL MOUNTED HDMI
- PLAIN DATA OUTLET
- 60" — PLAIN DATA OUTLET WITH MOUNTING HEIGHT

SECURITY SYSTEM LEGEND

- SECURITY CAMERA
- ADA DOOR OPERATOR PUSH BUTTON

GENERAL NOTES:

SYMBOLS SHOWN ARE STANDARD. VARIATION AND/OR COMBINATION MAY BE USED ON THE PLANS. THIS LIST SHOWS STANDARD SYMBOLS AND ALL MAY NOT APPEAR ON THE PROJECT DRAWINGS, HOWEVER, WHENEVER THE SYMBOL ON THE PROJECT DRAWINGS OCCUR, THE ITEM SHALL BE PROVIDED AND INSTALLED.

VARIATION AND/OR COMBINATIONS MAY BE USED ON THE PLANS SUCH AS: A LOWER CASE LETTER NEXT TO A SWITCH INDICATES THE SWITCH DESIGNATION. A NUMBER NEXT TO A DEVICE INDICATES A CIRCUIT NUMBER.

1. FIELD COORDINATION DURING CONSTRUCTION IS IMPERATIVE. CONTRACTOR BIDDING THIS WORK MUST MAKE REASONABLE ALLOWANCES FOR FIELD CHANGES IN CONDUIT RUNS.
2. ELECTRICAL UTILITY TO ADVISE OWNER AND/OR THE ELECTRICAL ENGINEER, PRIOR TO SERVICE MODIFICATION INCURRING COST TO THE OWNER.
3. COORDINATE THE LOCATION OF EXISTING UTILITIES INCLUDING BUT NOT LIMITED TO THE LUMINAIRES AND SWITCHES WITH THE ARCHITECTURAL, STRUCTURAL AND MECHANICAL DRAWINGS AND ALL OTHER TRADES AS REQUIRED.
4. ALL WIRE TO BE #12 UNLESS NOTED OTHERWISE.
5. COORDINATE THE MOUNTING HEIGHTS OF ALL RECEPTACLES MOUNTED ABOVE COUNTERS, CASEWORK AND APPLIANCE RECEPTACLES WITH ARCHITECTURAL ELEVATIONS.
6. ALL BRANCH CIRCUITS WITH HOME RUNS OVER 50 FEET, WILL BE SIZED ONE SIZE LARGER.
7. ALL ELECTRICAL WORK TO COMPLY WITH LATEST EDITION OF NEC AND ALL APPLICABLE LOCAL CODES.
8. ALL WIRING IS SHOWN DIAGRAMMATICALLY ON DRAWING, FIELD VERIFY ALL CONDITIONS PRIOR TO ROUGH-IN.
9. COORDINATE LUMINAIRE MOUNTING REQUIREMENTS PRIOR TO PLACING ORDER.
10. ALL LIGHTING AND PAIRS OF LOADS TO THE EXTERIOR DOORS, AND THE EXTERIOR PADLOT LOADS AWAY FROM THE BUILDING SHALL REQUIRE EMERGENCY LIGHTING PER CODE.
11. THE LIGHTS IN ALL RESTROOMS, STORAGE CLOSETS, JANITORS CLOSETS AND STAIRWELLS ARE TO BE SWITCHED WITH A MOTION SENSOR ON/OFF SWITCH WITH A TIME DELAY, THE TIME DELAY LENGTH AS DIRECTED BY THE OWNER, EXCEPT IN AREAS WHERE THE SWITCH IS LOCATED OUTSIDE THE AREA WHERE THE LIGHT IS LOCATED.
12. VERIFY THE OVERALL HEIGHT OF ALL PERMANENT MOUNTED FIXTURES PRIOR TO ORDERING.
13. THE LIGHTING PACKAGE SHALL BE APPROVED BY BOTH ARCHITECTS AND ENGINEERS AS APPROVED EQUAL BID ONLY.

ABBREVIATIONS LEGEND

- (M) — DRAWING KEYED NOTES
- ROOM 100 — ROOM DESIGNATION
- NL — NIGHT/SECURITY LIGHT - DO NOT SWITCH
- WP — WEATHERPROOF
- A.F.F — ABOVE FINISHED FLOOR
- AC — ABOVE COUNTER
- GFCI — GROUND FAULT CIRCUIT INTERRUPTER
- CW — COORDINATE MOUNTING HEIGHT W/ CASEWORK
- EM — EMERGENCY FUNCTION
- 44" — MOUNTING HEIGHT - A.F.F. OR A.F.G. TO C.L. HIGH.
- GFCI WP — GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE WITH A WEATHER PROOF COVER
- GFCI 44" — GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE MOUNTED AT 44" ABOVE FINISHED FLOOR

ELECTRICAL - SHEET LIST

Sheet Number	Sheet Name
E0-1	ELECTRICAL COVER SHEET
E0-2	ELECTRICAL SCHEDULES
E1-0	LIGHTING DETAILS AND SCHEDULES
E1-1	LIGHTING - MAIN FLOOR PLAN
E1-2	LIGHTING - ATTIC FLOOR PLAN
E2-1	ELECTRICAL - MAIN FLOOR PLAN
E2-2	ELECTRICAL - ATTIC FLOOR PLAN

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ELECTRICAL COVER SHEET

E0-1

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POWER FOR ENERGY RECOVERY VENTILATOR SCHEDULE

Mark	SERVICE	LOCATION	SUPPLY FAN				EXHAUST FAN				PRE-HEAT (kW)	ELECTRICAL		MANUFACTURER	MODEL #	Panel	Circuit Number	Panel	Circuit Number
			MOTOR HP	VOLTS	PHASE	FREQUENCY	MOTOR HP	VOLTS	PHASE	FREQUENCY		MCA (A)	MOCP (A)						
ERV-1	VENTILATION	ATTIC	1	208 V	1	60 Hz	1	208 V	1	60 Hz		7.7 A	15 A	RENEWAIRE	HE150N	RSP	1,3,5	RSP	2,4,6

POWER FOR ELECTRIC TANK WATER HEATER SCHEDULE

TYPE MARK	TANK SIZE	ELECTRICAL				MANUFACTURER	MODEL #	Panel	Circuit Number
		HEATING ELEMENT KW	VOLTS	PHASE	FREQUENCY				
WH-1	80 GAL	8 kW	208 V	1	60 Hz	RHEEM	EL080	RSP	19,20

POWER FOR ELECTRIC FURNACE SCHEDULE

MARK	SERVICE	NOMINAL ELECTRIC HEAT (kW)	HEATING ELEMENT					BLOWER						MANUFACTURER	MODEL #				
			VOLTS	PHASE(S)	FREQUENCY	MCA (A)	MOCP (A)	SUPPLY FAN MOTOR POWER	VOLTS	PHASE	FREQUENCY	MCA (A)	MOCP (A)			Panel	Circuit Number	Panel	Circuit Number
F-1	ZONE 1	15	208 V	3	60 Hz	56 A	60 A	3H	208 V	3	60 Hz	6.5 A	15 A	GOODMAN	MBVC	RSP	49,51,53	RSP	43,45,47
F-2	ZONE 2	15	208 V	3	60 Hz	56 A	60 A	3H	208 V	3	60 Hz	6.5 A	15 A	GOODMAN	MBVC	RSP	55,57,59	RSP	44,46,48

POWER FOR ELECTRIC BASEBOARD SCHEDULE

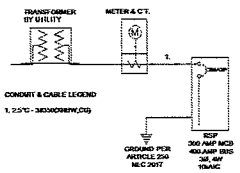
MARK	SERVICE	LOCATION	LENGTH	WATTS	AMPS	VOLTS	PHASE	FREQUENCY	MANUFACTURER	MODEL #	Panel	Circuit Number
BB-1	RESTROOM	FLOOR	3'-0"	500 W	2.4 A	208 V	1	60 Hz	RAYWALL	3700 SERIES	RSP	38,40
BB-2	RESTROOM	FLOOR	3'-0"	500 W	2.4 A	208 V	1	60 Hz	RAYWALL	3700 SERIES	RSP	39,41
BB-3	STORAGE	FLOOR	3'-0"	375 W	1.8 A	208 V	1	60 Hz	RAYWALL	3700 SERIES	RSP	35,37
BB-4	KITCHENETTE	FLOOR	7'-0"	980 W	2.8 A	208 V	1	60 Hz	RAYWALL	3700 SERIES	RSP	36,38

POWER FOR ELECTRIC UNIT HEATER SCHEDULE

TYPE MARK	SERVICE	FAN		HEATING ELEMENT (W)	ELECTRICAL				MANUFACTURER	MODEL #	Panel	Circuit Number
		CFM	RPM		FLA (A)	VOLTS	PHASE	FREQUENCY				
UH-1	JANITOR	70	2200	750	3.8 A	208 V	1	60 Hz	RAYWALL	4300 SLHLS	RSP	26,27

POWER FOR EXHAUST FAN SCHEDULE

MARK	SERVICE	LOCATION	ELECTRICAL				MANUFACTURER	MODEL #	Panel	Circuit Number
			VOLTS	PHASE	ELECTRICAL FREQUENCY	FLA (A)				
EF-1	RESTROOM	CEILING	120 V	1	60 Hz	0.2 A	PANASONIC	FV-05-11VK2	RSP	21
EF-2	RESTROOM	CEILING	120 V	1	60 Hz	0.2 A	PANASONIC	FV-05-11VK2	RSP	23
EF-3	JANITOR	CEILING	120 V	1	60 Hz	0.2 A	PANASONIC	FV-05-11VK2	RSP	25
EF-4	IT	CEILING	120 V	1	60 Hz	0.2 A	PANASONIC	FV-05-11VK2	RSP	12



ONE LINE DIAGRAM

Branch Panel: RSP

Location: ELEC/ IT 104
Supply From:
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Meter Type:
Mains Rating: 400 A
MCB Rating: 300 A

Notes:

CKT	Circuit Description	Trip	Poles	A	B	C	Poles	Trip	Circuit Description	CKT
1	Receptacle RETAIL-1 15-1	20 A	1	1080 VA	900 VA		1	20 A	Receptacle RETAIL-1 15-1	2
3	Power RETAIL-2 16-2	20 A	1		600 VA	600 VA	1	20 A	Power RETAIL-2 16-2	4
5	Power RETAIL-2 16-2	20 A	1			600 VA	600 VA	1	20 A	Power RETAIL-2 16-2	6
7	Receptacle RETAIL OFFICE 9	20 A	1	900 VA	1260 VA		1	20 A	Receptacle RETAIL STORAGE 10	8
9	Receptacle RETAIL-1 15-1	20 A	1		900 VA	180 VA	1	20 A	Receptacle BATH 11	10
11	Receptacle CORRIDOR 15	20 A	1			180 VA	900 VA	1	20 A	Receptacle SVC, ELEC, IT 12	12
13	Receptacle STAFF BATH 1 21	20 A	1	1080 VA	900 VA		1	20 A	Receptacle MULTI-PURPOSE 112	14
15	Receptacle MULTI-PURPOSE 112	20 A	1		180 VA	180 VA	1	20 A	Receptacle MULTI-PURPOSE 112	16
17	Receptacle MULTI-PURPOSE 112	20 A	1			180 VA	180 VA	1	20 A	Receptacle MULTI-PURPOSE 112	18
19	Receptacle MP STOR 108	20 A	1	1260 VA	600 VA		1	20 A	Power	20
21	Receptacle BATH 1 109	20 A	1		180 VA	180 VA	1	20 A	Receptacle BATH 2 111	22
23	Spare	20 A	1			0 VA	180 VA	1	20 A	Receptacle JAN 106	24
25	Spare	20 A	1	0 VA	192 VA		1	20 A	RETAIL 101	26
27	Spare	60 A	2	0 VA	1000 VA		1	20 A	Power Room 109, 111	28
29	--	--	--			0 VA	0 VA	1	20 A	Spare	30
31	ENERGY RECOVERY VENT, EXHAUST FAN	20 A	2	801 VA	0 VA			1	20 A	Spare	32
33	--	--	--		801 VA	801 VA		2	20 A	ENERGY RECOVERY VENT, SUPPLY FAN	34
35	BASEBOARD HEATERS BATH 109 & 111	20 A	2			750 VA	801 VA	--	--	--	36
37	--	--	--	750 VA	4500 VA		2	60 A	WATER HEATER MECHANICAL 202	38
39	BASEBOARD HEATERS BATH 109 & 111	20 A	2		500 VA	4500 VA		--	--	--	40
41	--	--	--			800 VA	0 VA	1	15 A	EXHAUST FANS	42
43	FURNACE #1 BLOWER & HEATER #1	60 A	3	5532 VA	5532 VA			3	60 A	FURNACE #2 BLOWER & HEATER #1	44
45	--	--	--			5532 VA	5532 VA	--	--	--	46
47	--	--	--				5532 VA	5532 VA	--	--	--	48
49	FURNACE #1 HEATER #2	50 A	3	4756 VA	4756 VA			3	50 A	FURNACE #2 HEATER #2	50
51	--	--	--			4756 VA	4756 VA	--	--	--	52
53	--	--	--				4756 VA	4756 VA	--	--	--	54
55	Receptacle RETAIL 101	20 A	1	900 VA	180 VA			1	20 A	Receptacle OFFICE 1 105	56
57	Lighting MULTI-PURPOSE 112	20 A	1		486 VA	60 VA		1	20 A	Room 114	58
59	Lighting Room 103, 110, 105, 107, 109, 111	20 A	1			392 VA	768 VA	1	20 A	Other RETAIL 101	60
			Total Load:	35809 VA	31428 VA	25975 VA				
			Total Amps:	305 A	268 A	221 A				

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
HVAC	64774 VA	100.00%	64774 VA	
Lighting	903 VA	100.00%	903 VA	Total Conn. Load: 93600 VA
Other	12460 VA	100.00%	12460 VA	Total Est. Demand: 92860 VA
Power	4000 VA	100.00%	4000 VA	Total Conn.: 280 A
Receptacle	11680 VA	92.09%	10640 VA	Total Est. Demand: 258 A

Notes:

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ELECTRICAL SCHEDULES

E0-2

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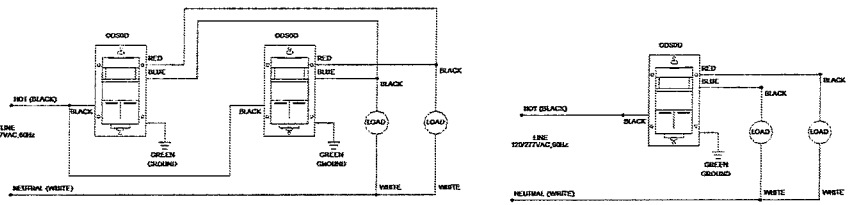


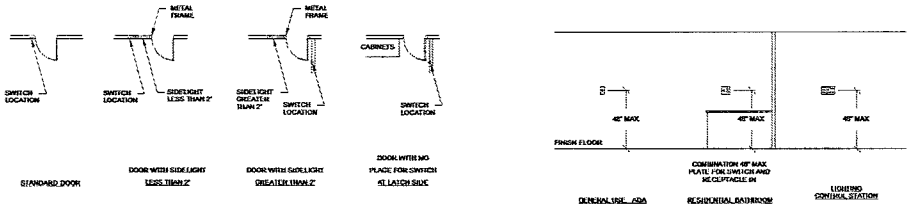
BI-LEVEL SWITCHING DETAIL

NOT TO SCALE

DETAIL NOTES:
1. PROVIDE SWITCHERS THAT ARE COMPATIBLE WITH THE LIGHT FIXTURES THAT ARE BEING INSTALLED.
2. PROVIDE DIGITAL CONTROL IN THE CORRIDORS AND ALL ROOMS WITH MORE THAN ONE DOOR.
3. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE EXACT LOCATION OF THE SWITCHES WITH THE ARCHITECTURAL DETAILS OF THE SPACE.

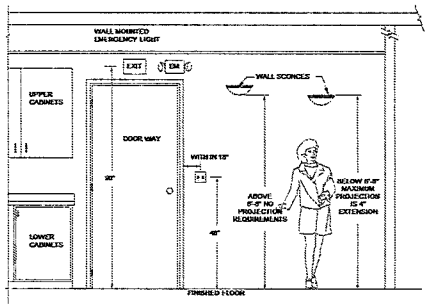
LIGHTING FIXTURE SCHEDULE

TYPE MARK	Manufacturer	Model	Lamp	DESCRIPTION
D1	DALS LIGHTING	RGR4SQ-3K	9WLM, 3,000K, 79W, 80CRI	SQUARE RECESSED DOWNLIGHT, SMOOTH BAFFLE, WHITE FINISH
D2	DALS LIGHTING	RGR6SQ-3K	1,600LM, 3,000K, 13W, 80CRI	SQUARE RECESSED DOWNLIGHT, SMOOTH BAFFLE, WHITE FINISH
D3	FORTI CLIO LIGHTING	LDSQALA-A-6-3-D010TE-EMBOD/ST-LAR14-GH-4ESOAG-MW	4x600LM, 3,000K, 80CRI, 120V	RECESSED ADJUSTABLE RECESSED DOWNLIGHT, VERIFY IF TO BE WIRING IS NEEDED. WHITE FINISH, EM AS INDICATED BY OOR.
EXIT	CS LONGE	XR-EXIT-SWH-MW-RB-SD	LED WITH UNIT	COMPACT EMERGENCY EXIT COMBINATION UNIT, UNIVERSAL MOUNTING, WHITE HOUSING
P1	STUDIO M LIGHTING	SMDY-3Y13K	4320 DEL, LM, 3000K, 80CRI, 96W, 120V	MINIMALIST RATIONS OF FIXTURE WITH A UNIQUE SHAPED ACRYLIC DIFFUSER.
P2	NEXURA LIGHTING	QSLS1220FLC-1050LS-840-ETD-*SRS-LEM-UNV-DCA	3840LM, 4000K, 68W, 80CRI, 120V	2'WIDE, LINEAR PENDANT IN THE RETAIL SPACE, PROVIDE EVEN FIXTURES AS REQUIRED BY CODE
S1	METALUX LIGHTING	4ST2_40WW	1453LM, 4100K, 40W, 80CRI, 120V	LINEAR SINGLE LONG SURFACE MOUNTED STRIP LIGHT
S2	STUDIO M LIGHTING	SMW2724WTBC	1,650LM, 2400K, 20W, 97CRI, 120V	27"D X 24"H WAFER DESIGN, WET LOCATION LISTED, BLACK FINISH
T1	DIMTOGEL	ONICM-24W-3MCT-LBKTX-UNV, TC54-8-2	2295LM, 4000K, 24W, 80CRI, 120V	ONICO MEDIUM TRAC-HEAD, BLACK FINISH, DIE-CAST ALUMINUM HEAD. PROVIDE COMPATIBLE 8' TRACK AND ALL ACCESSORIES FOR A FULL INSTALLATION
V1	DALS LIGHTING	LEDVANITY30-UNV	1,900LM, 3500K, 22W, 90CRI, 120V	4'L VANITY LED LIGHT BLACK FINISH, MOUNT HORIZONTAL OVER MIRRO



SWITCH MOUNTING DETAILS

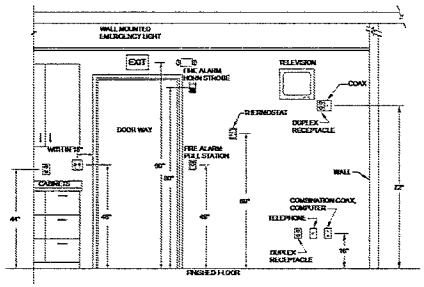
SCALE: NOT TO SCALE



LIGHTING DEVICE MOUNTING HEIGHT DETAIL

NOT TO SCALE

DETAIL NOTES:
1. ALL DEVICES SHOWN ON THIS DETAIL ARE FOR REFERENCES OF MOUNTING HEIGHTS ONLY. THE ELECTRICAL CONTRACTOR SHALL FIELD ADJUST THE HEIGHTS AND LOCATIONS OF THE DEVICES AS REQUIRED FOR PROPER MOUNTING.
2. ALL DEVICES REQUIRED FOR THIS PROJECT MAY NOT APPEAR ON THIS DETAIL. ALL ITEMS SHOWN ON THIS DETAIL MAY NOT BE REQUIRED FOR THIS PROJECT.
3. THE AMERICANS WITH DISABILITIES ACT, KNOWN AS ADA, AFFECTS LIGHT FIXTURES USED IN CIRCULATION OR EGRESS SPACES. IN PRACTICE, THIS MEANS THAT WALL MOUNTED FIXTURES LOCATED BELOW 6'-8" AFF IN HALLS, CORRIDORS, PASSAGEWAYS OR AISLES, MUST BE NO GREATER THAN 4" DEEP. THE ADA AFFECTS CONSTRUCTION FOR BOTH NEW AND EXISTING BUILDINGS.



DEVICE MOUNTING HEIGHT

NOTES:
1. THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF ALL TELEVISION OUTLETS WITH THE ARCHITECT PRIOR TO INSTALLATION.
2. ALL DEVICES SHOWN ON THIS DETAIL ARE FOR REFERENCES OF MOUNTING HEIGHTS ONLY. THE ELECTRICAL CONTRACTOR SHALL FIELD ADJUST THE HEIGHTS OF THE DEVICES AS REQUIRED FOR PROPER MOUNTING OF THE DEVICES.
3. ALL DEVICES REQUIRED FOR THIS PROJECT MAY NOT APPEAR ON THIS DETAIL. ALL ITEMS SHOWN ON THIS DETAIL MAY NOT BE REQUIRED FOR THIS PROJECT.

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ISSUE:

LIGHTING DETAILS AND SCHEDULES

E1-0

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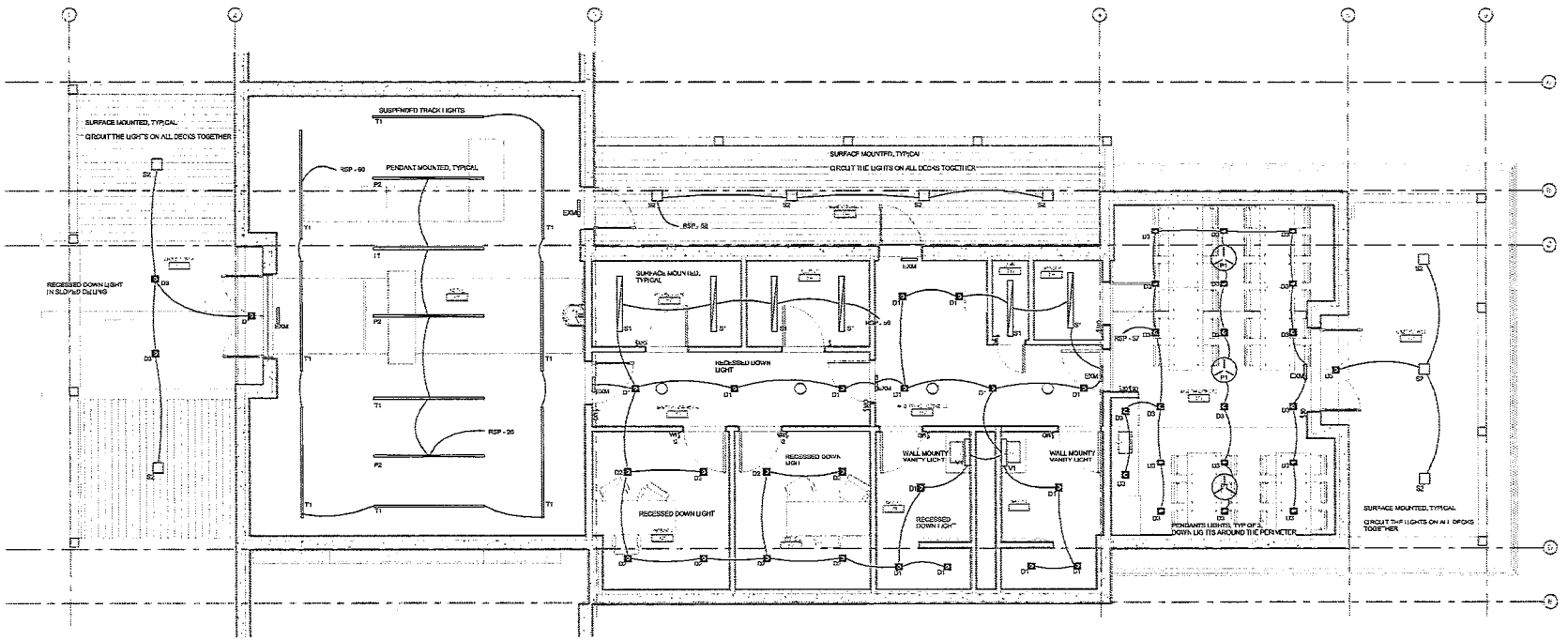

1 LIGHTING - MAIN FLOOR PLAN
1/4" = 1'-0"

0 4 8 12 16

PLAN NORTH

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LIGHTING - MAIN FLOOR PLAN

E1-1

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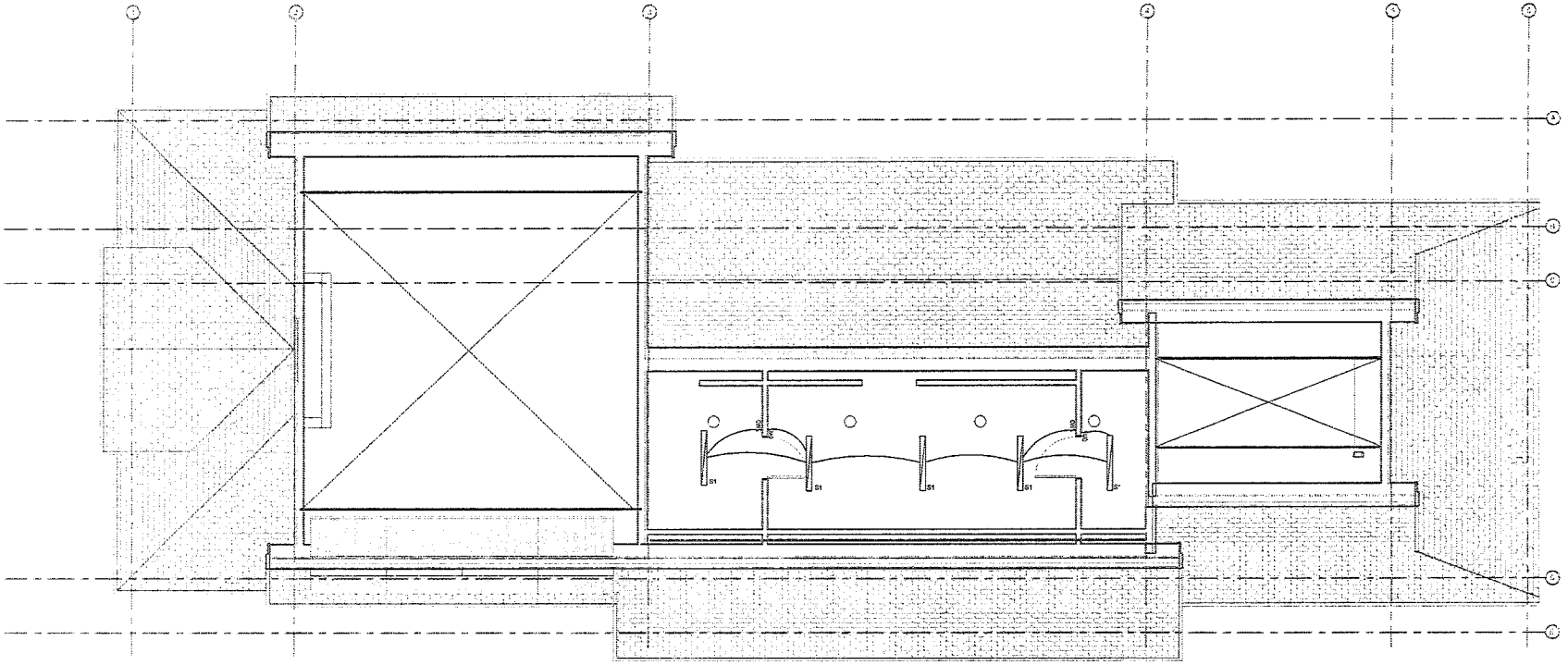

① LIGHTING - ATTIC FLOOR PLAN
1/4" = 1'-0"

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LIGHTING - ATTIC
FLOOR PLAN

E1-2

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& INTERIORS

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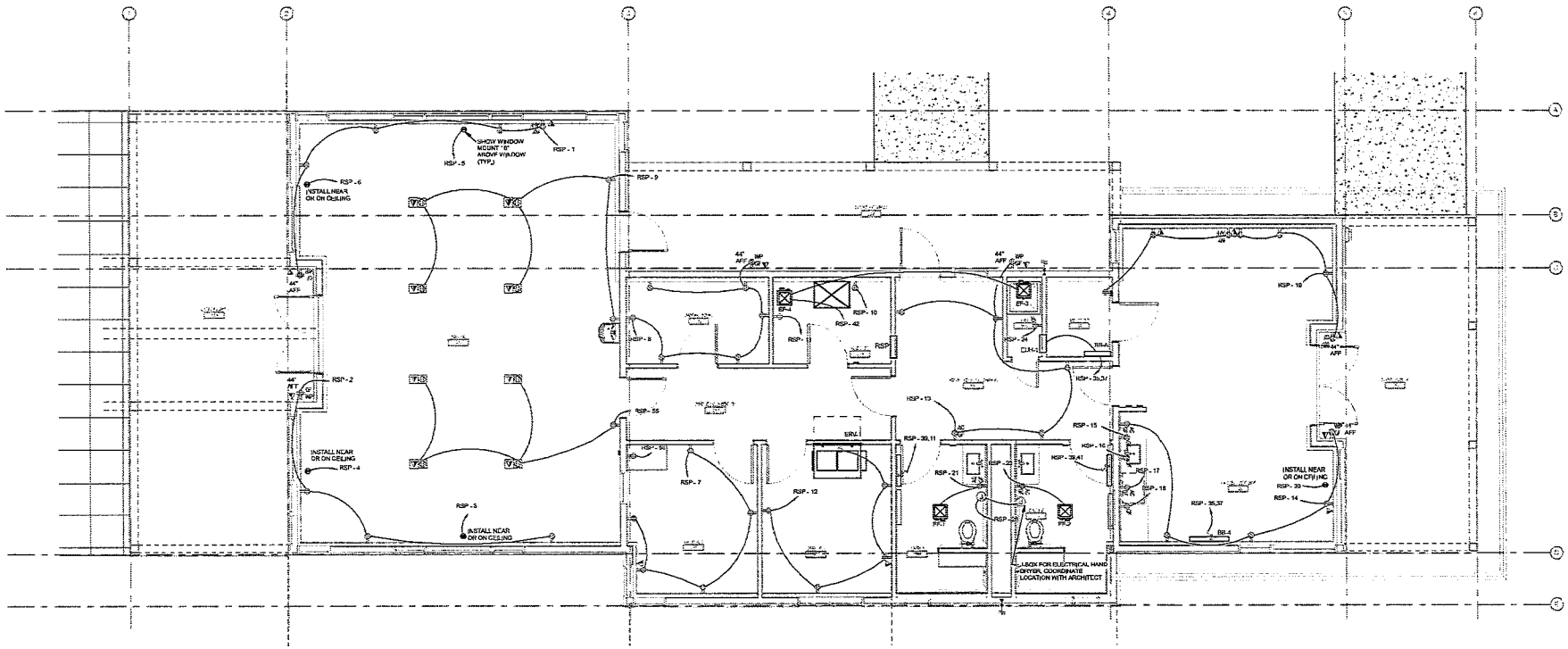

1 ELECTRICAL - MAIN FLOOR PLAN
1/4" = 1'-0"

0 4 8 12 16

PLAN NORTH

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ELECTRICAL - MAIN FLOOR PLAN

E2-1

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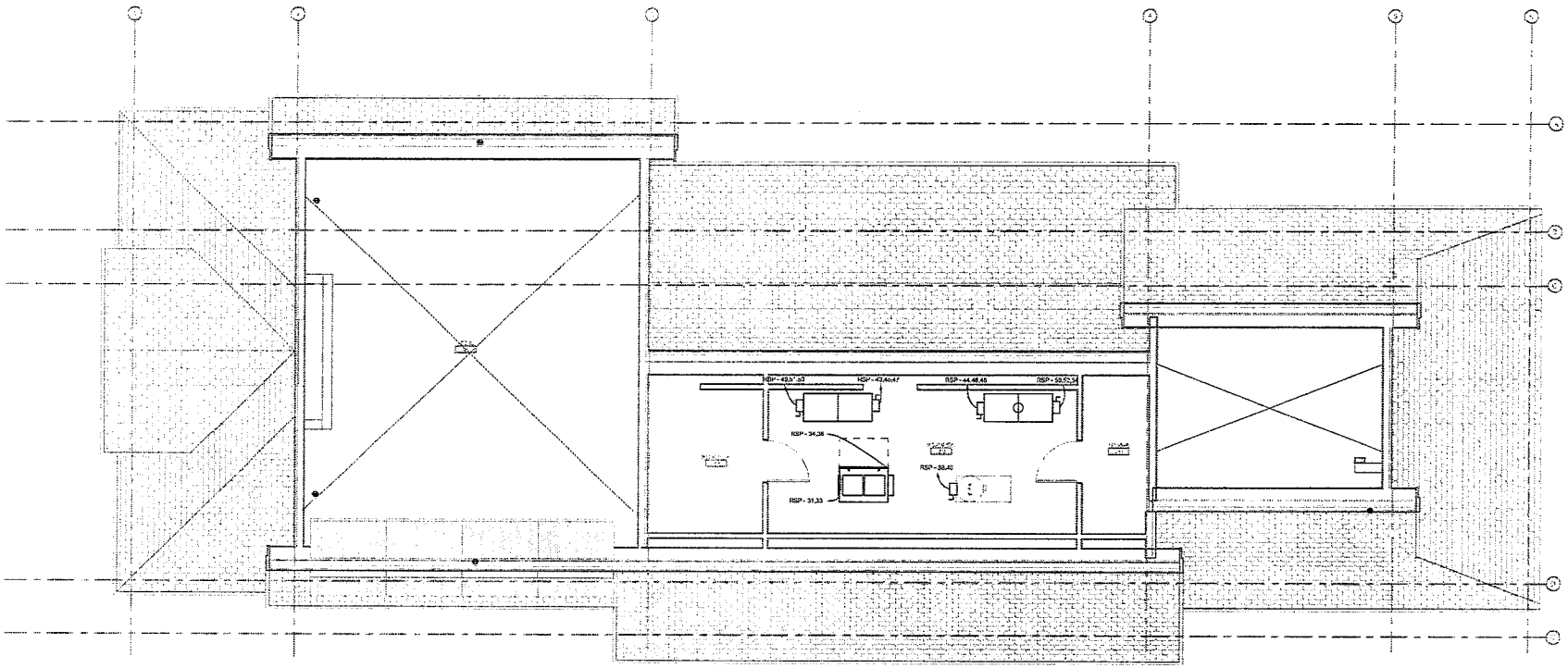

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ELECTRICAL - ATTIC FLOOR PLAN

E2-2

1 ELECTRICAL - ATTIC FLOOR PLAN
1/4" = 1'-0"
0 4 8 12 16

PLAN NORTH

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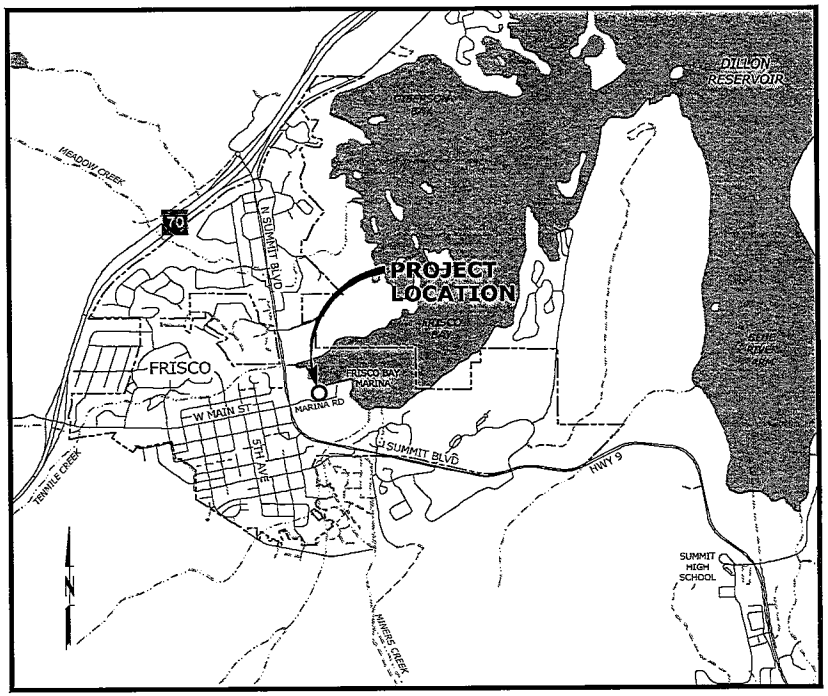
TOWN OF FRISCO, COLORADO
FRISCO MARINA LIFT STATION

JANUARY 2021

PRICING SET

LIFT STATION - INDEX OF DRAWINGS

SHEET	SHEET TITLE
GENERAL	
G-1	COVER SHEET
G-2	LEGEND
G-3	GENERAL AND EROSION CONTROL NOTES
CIVIL	
C-1	EROSION CONTROL PLAN
C-2	PLAN & PROFILE
C-3	SEWER LIFT STATION SECTIONS
DETAILS	
D-1	DETAIL SHEET 1
ELECTRICAL	
E-1	ELECTRICAL LEGEND
E-2	ONE-LINE ELECTRICAL DIAGRAMS



VICINITY MAP

SCALE: 1"=1,500'

murraysmith

850 W. SOUTH BOULDER ROAD #200
LOUISVILLE, CO 80027
P 970.567.8020

811 Know what's **below.** **Call** before you dig.

20-2802

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PIPE & FITTING SYMBOLS

PLANT	SCHEMATIC	
		WELDED JOINT
		FLANGED JOINT
		GROOVED END JOINT
		MECHANICAL JOINT
		PUSH-ON JOINT (RUBBER GASKET)
		FLANGED COUPLING ADAPTER
		DOUBLE BALL FLEXIBLE EXTENSION COUPLING
		FLEXIBLE COUPLING W/ THRUST RING
		90° BEND UP
		90° BEND DOWN
		TEE UP
		TEE DOWN
		LATERAL UP
		LATERAL DOWN
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER
		UNION
		BLIND FLANGE
		CAP
		LONG SLEEVE
		FLEXIBLE COUPLING
		FITTING (45°)

VALVE SYMBOLS

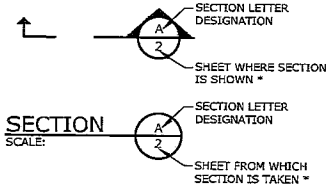
PLANT	SCHEMATIC	
		BUTTERFLY VALVE
		GATE VALVE
		GLOBE VALVE
		BALL VALVE
		BALANCING VALVE
		PLUG VALVE (TOP)
		PLUG VALVE (SIDE)
		3-WAY PLUG VALVE
		CHECK VALVE
		SWING CHECK VALVE
		DOUBLE CHECK ASSEMBLY
		BALL SWING CHECK
		SILENT CHECK VALVE
		PRESSURE REDUCING VALVE
		ALTITUDE CONTROL VALVE
		SOLENOID VALVE
		RELIEF VALVE
		NEEDLE VALVE
		HOSE VALVE
		REDUCED PRESSURE BACKFLOW PREVENTER W/ GATE VALVES
		HOSE BIBB

TOPOGRAPHIC LEGEND

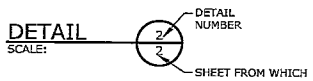
	EXISTING	PROPOSED
WATERLINE	10"W	12"DI W
ELECTRICITY	E	E
GAS	4"G	4"G
TELEPHONE/TELEMETRY	T	T
CABLE TELEVISION	CATV	CATV
SANITARY SEWER LINE	8"SS	8"SS
SANITARY SEWER FORCE MAIN	6"FM	6"FM
STORM DRAIN	8"SD	8"SD
CULVERT		18"D
ABANDON PIPE		
DRAINAGE DITCH		
BARBWIRE FENCE		
CHAIN LINK FENCE		
TEMPORARY SILT FENCE		
GUARDRAIL		
ROCK WALL		
TREE/BUSH LINE		
CENTERLINE		
EASEMENT/PROPERTY LINE		
RIGHT-OF-WAY		
EDGE OF PAVEMENT/AC		
EDGE OF GRAVEL		
CURB		
SIDEWALK	S/W	
STRUCTURE OR FACILITY		
CONTOUR MINOR		
CONTOUR MAJOR	200	200
MANHOLE		
CLEAN-OUT		
CATCH BASIN/FIELD INLET		
THRUST BLOCK		
VALVE		
AIR INJECTION ASSEMBLY		
BLOW-OFF ASSEMBLY		
AIR RELEASE ASSEMBLY		
FIRE HYDRANT ASSEMBLY		
WATER METER		
PULL BOX/JUNCTION BOX		
UTILITY POLE		
GUY WIRE		
LIGHT POST		
MAILBOX		
SIGN		
BENCHMARK/GEOTECH TEST HOLE		
TREE DECIDUOUS		
TREE CONIFEROUS		
TREE TO BE REMOVED		
SURFACE ELEVATION	+ 176.63	+ 176.63

SECTION AND DETAIL DESIGNATIONS

SECTION DESIGNATIONS



DETAIL DESIGNATIONS



* NOTE: IF PLAN AND SECTION FOR DETAIL CALL-OUT AND DETAIL ARE SHOWN ON THE SAME DRAWING, DRAWING NUMBER IS REPLACED WITH A DASH.

MISCELLANEOUS PIPING SYMBOLS

	STRAINER
	SIGHT GLASS
	PRESSURE GAUGE W/ COCK
	PRESSURE SWITCH W/ COCK
M	METER
SP	SLIP-ON JOINT PIPE
R	RESTRAINED JOINT PIPE

PRICING SET

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

AMA DESIGNED
AMA DRAWN
JSP CHECKED

JANUARY 2021

Murraysmith
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TOWN OF FRISCO

FRISCO MARINA LIFT STATION

LEGEND

PROJECT NO.: 20-2802 | SCALE: AS SHOWN | DATE: 15 JAN 2021

SHEET G-2

2 of 9

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GENERAL NOTES:

1. THE CONTRACTOR SHALL POTHOLE AND VERIFY LOCATIONS, ELEVATIONS, TYPES AND SIZES OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTING NEW PIPING FAR ENOUGH IN ADVANCE TO ALLOW NECESSARY ADJUSTMENTS IN GRADE AND SHALL NOTIFY ENGINEER OF NEED TO ADJUST PIPING INSTALLATION ACCORDINGLY. POTHOLING SHALL SUFFICIENTLY PRECEDE LAYING OF PIPE TO ALLOW REQUIRED ELEVATION ADJUSTMENTS TO BE ACCOMPLISHED WITHOUT REWORK. ELEVATION ADJUSTMENTS SHALL BE EXPECTED AND ARE INCIDENTAL TO THE WORK. DEFLECT PIPE AS REQUIRED AND WITHIN SPECIFIED TOLERANCES TO AVOID EXISTING UTILITIES AND COMPLETE TIE-INS.

2. LOCATIONS OF EXISTING UTILITIES ARE BASED ON INFORMATION SUPPLIED BY THE UTILITIES AND CONSIDERED APPROXIMATE ONLY. AS REQUIRED BY STATE LAW, THE CONTRACTOR SHALL OBTAIN UTILITY LOCATES PRIOR TO COMMENCING CONSTRUCTION.

3. CONTRACTOR SHALL PROVIDE ENGINEER WITH MINIMUM 24 HOURS NOTICE WHEN POTHOLING WILL BE COMPLETE. COORDINATE WITH ENGINEER TO REVIEW UTILITY INVESTIGATIONS AND TO MAKE APPROPRIATE ADJUSTMENTS FOR ANY ALIGNMENT CONFLICTS WHERE CONNECTING TO EXISTING UTILITIES.

4. COLORADO LAW REQUIRES THE CONTRACTOR TO FOLLOW THE RULES ADOPTED BY THE COLORADO UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN C.R.S. 9-1.5-101 THROUGH C.R.S. 9-1.5-108. THE CONTRACTOR MAY OBTAIN COPIES OF THE RULES BY CALLING THE UTILITY NOTIFICATION CENTER AT 303-232-1991.

5. PROVIDE "AS CONSTRUCTED" DRAWINGS INDICATING ALL CHANGES IN GRADE, ALIGNMENT, FITTINGS AND MATERIALS INSTALLED AND ANY OTHER UTILITIES OR OBSTACLES NOT SO INDICATED ON THESE PLANS.

6. CONTRACTOR SHALL PROTECT ALL PROPERTY CORNERS, SURVEY MONUMENTS AND CONTROL SURVEY MONUMENTS, ANY DISTURBED DURING CONSTRUCTION SHALL BE REPLACED AT CONTRACTOR'S EXPENSE, WITH APPROPRIATE SURVEY FILED WITH COUNTY SURVEYOR.

7. CONTRACTOR SHALL SUPPORT AND PROTECT AS NECESSARY ANY PIPE OR CONDUIT EXPOSED AS PART OF THE CONSTRUCTION. CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITIES IN SERVICE AT ALL TIMES AND SHALL COORDINATE WITH RESPECTIVE UTILITY COMPANIES TO MAINTAIN AND PROTECT SERVICES.

8. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ANY GROUNDWATER ENCOUNTERED DURING THE CONSTRUCTION OF ANY PORTION OF THIS PROJECT. GROUNDWATER SHALL BE PUMPED, PIPED, REMOVED, AND DISPOSED OF IN A MANNER WHICH DOES NOT CAUSE FLOODING NOR EROSION OF ADJACENT PROPERTY IN ORDER TO CONSTRUCT THE IMPROVEMENTS SHOWN ON THESE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND COMPLYING WITH ALL APPLICABLE PERMITS FOR GROUNDWATER DISCHARGE.

9. CONTRACTOR SHALL DISPOSE OF ALL REMOVED OR REPLACED MATERIAL AND EQUIPMENT IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS.

10. CONTRACTOR TO LEAVE ALL AREAS OF PROJECT FREE OF DEBRIS AND UNUSED CONSTRUCTION MATERIAL.

TOPOGRAPHIC SURVEY NOTES:

1. SURVEY WAS COMPLETED BY SCHMIDT LAND SURVEYING, INC. ELEVATIONS ARE BASED ON DENVER WATER DEPARTMENT DATUM WHICH IS HIGHER BY 1.85' THAN U.S.G.S. SEA LEVEL DATUM (1929). CONTROL ELEVATIONS WERE HELD FROM RANGE WEST SURVEYOR'S ORIGINAL TOPOGRAPHY DONE OCTOBER 2012. HORIZONTAL COORDINATES ARE NAD 1983 DATUM.

2. UTILITY INFORMATION SHOWN HEREON IS COMPILED FROM FIELD OBSERVED SURFACE FEATURES, AND FIELD LOCATED PAINT MARK "LOCATES" PERFORMED BY OTHERS. SURVEYOR MAKES NO GUARANTEE THAT UTILITIES SHOWN HEREON COMPRISE ALL POSSIBLE UTILITIES IN THE AREA NOR WARRANTS THAT UTILITIES ARE IN THE EXACT LOCATIONS INDICATED.

3. TOPOGRAPHIC SURVEY INFORMATION IS PROVIDED ONLY. NO BOUNDARY, RIGHT OF WAY OR PARCEL LINE INFORMATION ARE INDICATED.

4. THIS TOPOGRAPHIC SURVEY WAS PERFORMED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT, AND THEREFORE DOES NOT PURPORT TO SHOW ALL EASEMENTS, ENCUMBRANCES, OR RESTRICTIONS OF RECORD, IF ANY.

5. CONTACT SURVEYOR FOR BASIS OF BEARING.

PROJECT CONTACTS:

OWNER:
TOWN OF FRISCO, DEPT OF PUBLIC WORKS
P.O. BOX 4100 | FRISCO, CO 80443
CONTACT: JEFF GOBLE, CWP
E: JEFFG@TOWNOFFRISCO.COM
P: 970-668-9151

CIVIL ENGINEER:
MURRAYSMITH
850 W SOUTH BOULDER RD, SUITE #200
LOUISVILLE, CO 80027
CONTACT: JOEL PRICE, PE
E: JOEL.PRICE@MURRAYSMITH.US
P: 970-567-8020

SURVEYOR:
SCHMIDT LAND SURVEYING, INC.
P.O. BOX 5761
FRISCO, CO 80443
CONTACT: ELIZABETH SCHMIDT, PLS
E: LIZ@SCHMIDTLANDSURVEYING.COM
P: 970-409-9963

ELECTRICAL ENGINEER:
BROWNS HILL ENGINEERING & CONTROLS
8119 SHAFFER PARKWAY, UNIT C
LITTLETON, CO 80127
CONTACT: TED WILLE
E: TWILLE@MBROWNSHILLENG.COM
P: 720-344-7771

GEOTECHNICAL ENGINEER:
KUMAR & ASSOCIATES, INC.
240 ANNIE ROAD
SILVERTHORNE, CO 80498
CONTACT: JAMES PARKER, PE PG
E: JPARKER@KUMARUSA.COM
P: 970-230-1016

SITE UTILITIES:
XCEL ENERGY
P.O. BOX 1819
SILVERTHORNE, CO 80498
CONTACT: AMY LAGACE
E: AMY.LAGACE@SCELENERGY.COM
P: 970-262-4033

EROSION CONTROL NOTES:

1. CONTRACTOR SHALL PREPARE, SUBMIT, AND ACQUIRE AN COLORADO DEPARTMENT OF PUBLIC HEALTH AND THE ENVIRONMENT (CPDHE) EROSION CONTROL PLAN AND PERMIT PRIOR TO BEGINNING ANY SITE DISTURBING ACTIVITY. IF DISTURBING GREATER THAN ONE ACRE OF LAND AS PART OF THIS PROJECT, CONTRACTOR SHALL PROVIDE PAYMENT FOR ALL PERMIT FEES.

2. CONTRACTOR SHALL INSTALL AND MAINTAIN EROSION/SEDIMENTATION CONTROL DURING CONSTRUCTION (ANY TIME OF YEAR) IN ACCORDANCE WITH THE CDPHE EROSION PREVENTION AND SEDIMENT CONTROL REQUIREMENTS, THE STANDARD CONSTRUCTION SPECIFICATIONS FOR THIS PROJECT AND THE EROSION CONTROL NOTES INCLUDED BELOW AND WITHIN THESE PLANS. IF DISCREPANCIES BETWEEN STANDARDS OCCUR, THE MORE STRINGENT REGULATION SHALL APPLY.

3. APPROVAL OF THIS EROSION SEDIMENTATION CONTROL (ESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G.: SIZE AND LOCATION OF ROADS, PIPES, RESTRICTIONS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).

4. THE IMPLEMENTATION OF EROSION/SEDIMENTATION CONTROL (ESC) PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED AND VEGETATION/LANDSCAPING IS ESTABLISHED.

5. THE BOUNDARIES OF THE LIMITS OF WORK SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED LIMITS OF WORK SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.

6. ESC FACILITIES MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.

7. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONALITY.

8. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 24 HOURS FOLLOWING A STORM EVENT.

9. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

10. CONTRACTOR SHALL PROVIDE DUST CONTROL AS REQUIRED.

11. SEEDING SHALL BE PERFORMED NO LATER THAN SEPTEMBER 1 FOR EACH PHASE OF CONSTRUCTION. ROUGHEN AND SEED ALL DISTURBED SURFACES OUTSIDE OF CRUSHED ROCK SURFACING TOP DRESSING.

12. ESC MEASURES SHALL BE REMOVED BY THE CONTRACTOR WHEN VEGETATION IS FULLY ESTABLISHED.

13. CONTRACTOR SHALL PROVIDE AND MAINTAIN A CONCRETE WASHOUT FACILITY.

GEOTECHNICAL NOTES:

1. THE EXPLORATORY BORING WAS DRILLED ON JUNE 2, 2020 WITH A 4-INCH DIAMETER CONTINUOUS FLIGHT POWER AUGER.

2. THE LOCATION OF THE EXPLORATORY BORING WAS MEASURED APPROXIMATELY BY PACING FROM FEATURES SHOWN ON THE SITE PLAN PROVIDED.

3. THE ELEVATION OF THE EXPLORATORY BORING WAS INTERPOLATED FROM CONTOURS ON THE SITE PLAN.

4. THE ELEVATION OF THE EXPLORATORY BORING LOCATION AND ELEVATION SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

5. THE LINES BETWEEN MATERIALS SHOWN ON THE EXPLORATORY BORING LOG REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.

6. GROUNDWATER LEVEL SHOWN ON THE LOG WAS MEASURED AT THE TIME AND UNDER CONDITIONS INDICATED. FLUCTUATIONS IN THE WATER LEVEL MAY OCCUR WITH TIME.

7. LABORATORY TEST RESULTS:
   WC = WATER CONTENT (%) (ASTM D 2216);
   +4 = PERCENTAGE RETAINED ON NO. 4 SIEVE (ASTM D 6913);
   -200 = PERCENTAGE PASSING NO. 200 SIEVE (ASTM D 1140)

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TOWN OF FRISCO

FRISCO MARINA LIFT STATION

GENERAL AND EROSION CONTROL NOTES

PROJECT NO.: 20-2802 | SCALE: AS SHOWN | DATE: 15 JAN 2021

SHEET
G-3
3 of 9

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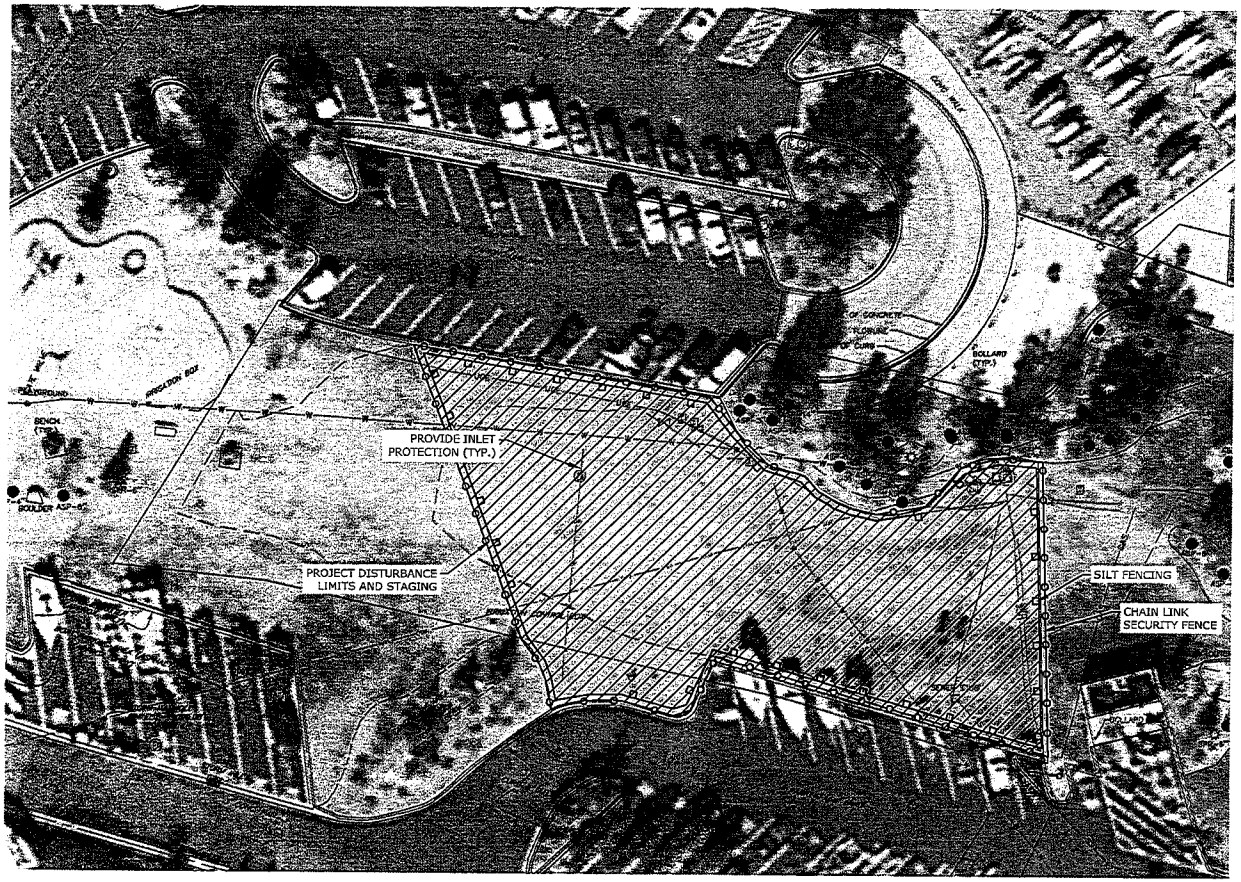

CONSTRUCTION NOTES:

1. PROTECT EXISTING SITE FEATURES, INCLUDING BUT NOT LIMITED TO CURB AND GUTTER, TRANSFORMER, FIRE HYDRANT, TREES AND LANDSCAPE FEATURES.
2. EACH STORM SEWER INLET IN OR IMMEDIATELY ADJACENT TO THE PROJECT DISTURBANCE LIMITS WILL HAVE A TEMPORARY INLET SEDIMENT TRAP CONSTRUCTED AROUND IT. IN PAVED AREAS, THIS TRAP CONSISTS OF WIRE MESH SOCKS TO FILTER RUNOFF AND ALLOW SILT TO SETTLE OUT.
3. SILT FENCING AND SEDIMENT CONTROL LOGS SHALL BE CONSTRUCTED ALONG THE DOWNHILL EDGE OF THE PROJECT DISTURBANCE LIMITS AND AT ALL POINT DISCHARGE AREAS WHETHER SHOWN OR NOT. SILT FENCE AND SEDIMENT CONTROL LOGS SHALL BE MAINTAINED AS NEEDED THROUGHOUT THE CONSTRUCTION PROCESS. THE TEMPORARY SILT FENCE AND SEDIMENT CONTROL LOGS WILL REMAIN UNTIL THE DISTURBED AREA HAS BEEN RESTORED AND GROUND COVER IS EFFECTIVE.
4. CONTRACTOR SHALL STORE CONSTRUCTION MATERIALS AND EQUIPMENT IN CONFINED AREAS ON SITE FROM WHICH RUNOFF WILL BE CONTAINED AND FILTERED. MATERIALS WILL BE STORED OFF THE GROUND AND PROTECTED FROM THE WEATHER BY A COVER OR STORED IN A CONTAINER SUCH AS A VAN OR TRAILER. AN EARTHEN DIKE WILL BE CONSTRUCTED AROUND THE PERIMETER OF THE FUEL STORAGE AREA TO PREVENT MATERIALS FROM CONTACT WITH SURFACE RUNOFF. EQUIPMENT MAINTENANCE WILL BE PERFORMED IN A DESIGNATED AREA AND STANDARD MAINTENANCE PROCEDURES, SUCH AS THE USE OF DRIP PANS, WILL BE USED TO CONTAIN PETROLEUM PRODUCTS.
5. EROSION CONTROL MEASURES WILL BE INSPECTED DAILY DURING CONSTRUCTION BY THE CONTRACTOR AND AFTER EACH RAIN EVENT. ALL INSPECTIONS SHALL BE DOCUMENTED AND SHALL INCLUDE THE DATE OF INSPECTION, ANY INCIDENCES OF NON-COMPLIANCE, SIGNED CERTIFICATION THAT THE SITE IS IN COMPLIANCE, AND ANY NOTES, DRAWINGS, MAPS, ETC. PERTAINING TO REPAIRS. COPIES OF ALL DOCUMENTATION SHALL BE DISTRIBUTED TO THE OWNER ON A REGULAR SCHEDULE AS SPECIFIED BY THE OWNER.

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FRISCO MARINA LIFT STATION

EROSION CONTROL PLAN

PROJECT NO.: 20-2802 | SCALE: AS SHOWN | DATE: 15 JAN 2021

SHEET C-1

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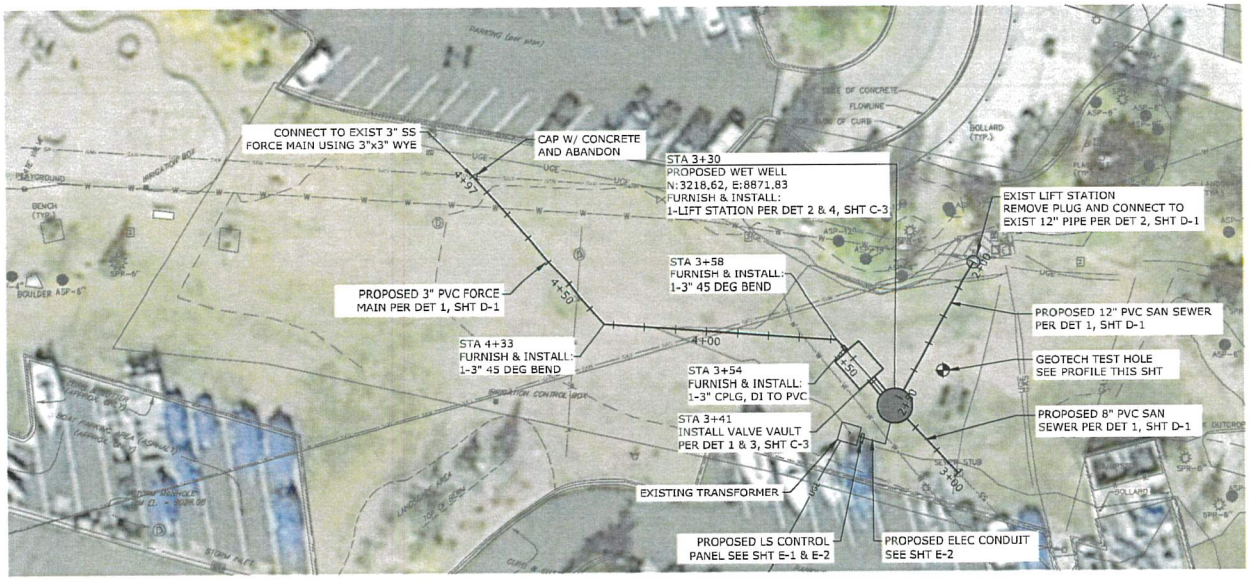

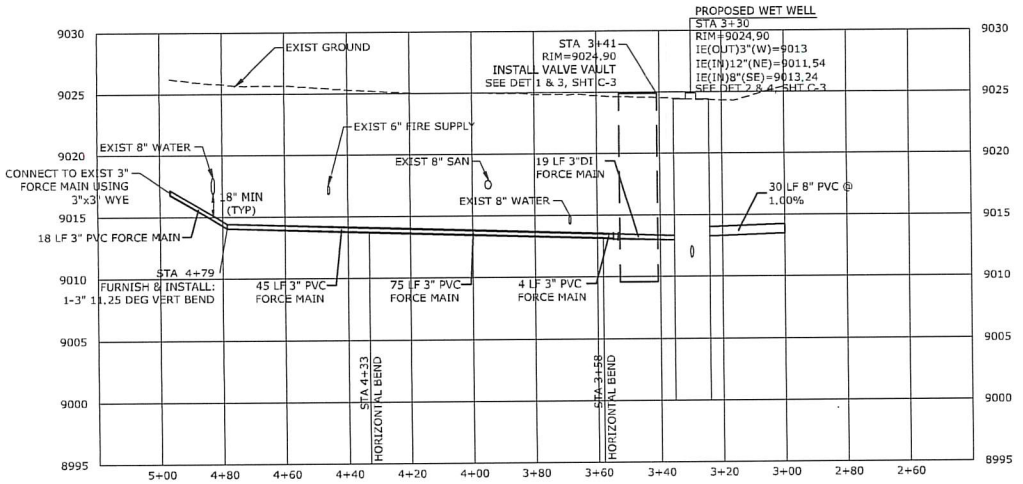

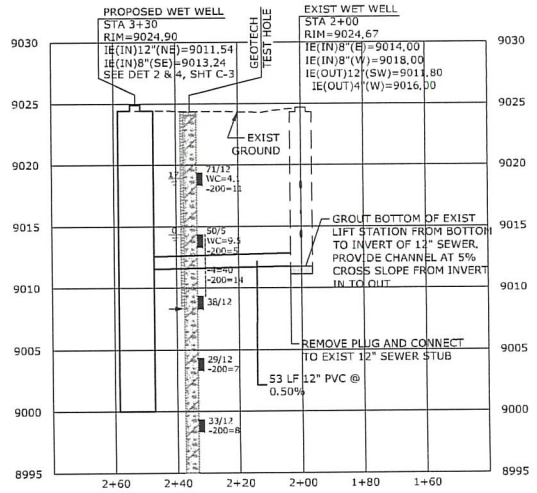

GEOTECHNICAL LEGEND

- TOPSOIL; SILT, SAND AND GRAVEL, WITH ORGANICS, (GRASS SOD), MOIST, BROWN
- POORLY GRADED SILTY GRAVEL (GP-GM); WITH SAND, COBBLES AND SCATTERED BOULDERS, MEDIUM DENSE TO DENSE, MOIST TO WET, BROWN
- DRIVE SAMPLE, 1 3/8-INCH ID SPLIT SPOON STANDARD PENETRATION TEST
- DISTURBED BULK SAMPLE
- SLOTTED PVC PIPE, PLACED IN UPPER 16' OUT TO CAVED BORING
- 71/12 — DRIVE SAMPLE BLOW COUNT, INDICATES THAT 71 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE THE SAMPLER 12 INCHES
- 17 ▽ — DEPTH TO WATER LEVEL AND NUMBER OF DAYS AFTER DRILLING MEASUREMENT WAS MADE
- DEPTH AT WHICH BORING CAVED AFTER DRILLING

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TOWN OF FRISCO

FRISCO MARINA LIFT STATION

LIFT STATION PLAN & PROFILE

SHEET C-2

PROJECT NO.: 20-2802 | SCALE: AS SHOWN | DATE: 15 JAN 2021

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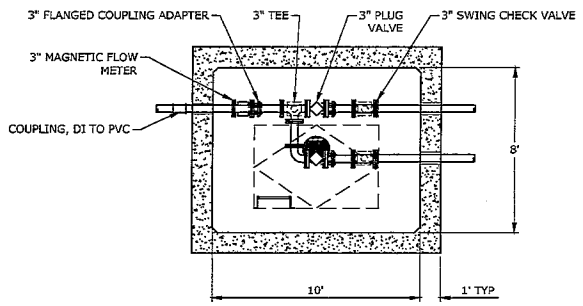
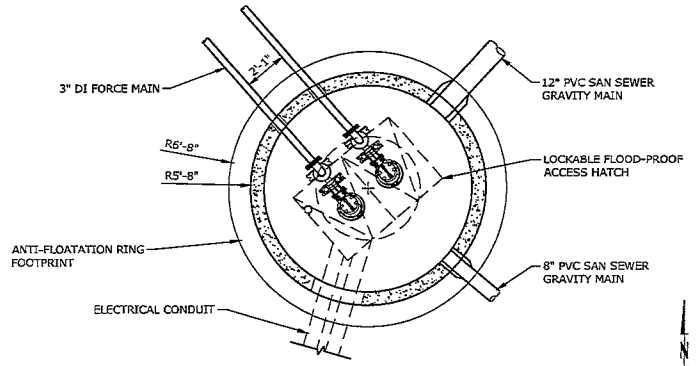
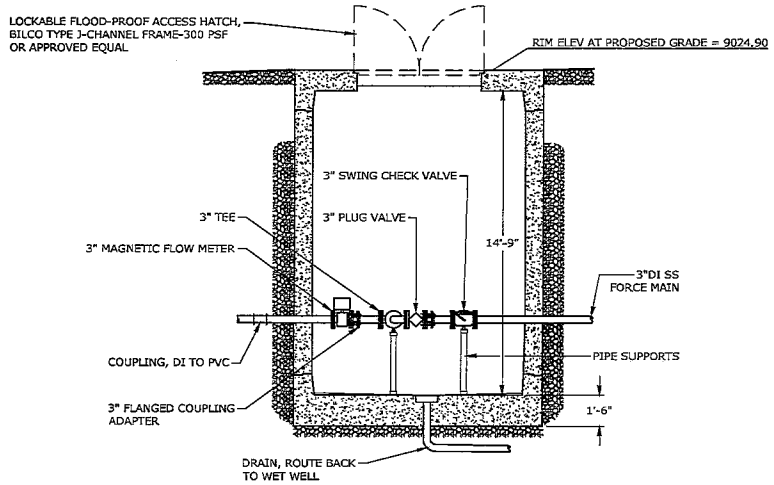


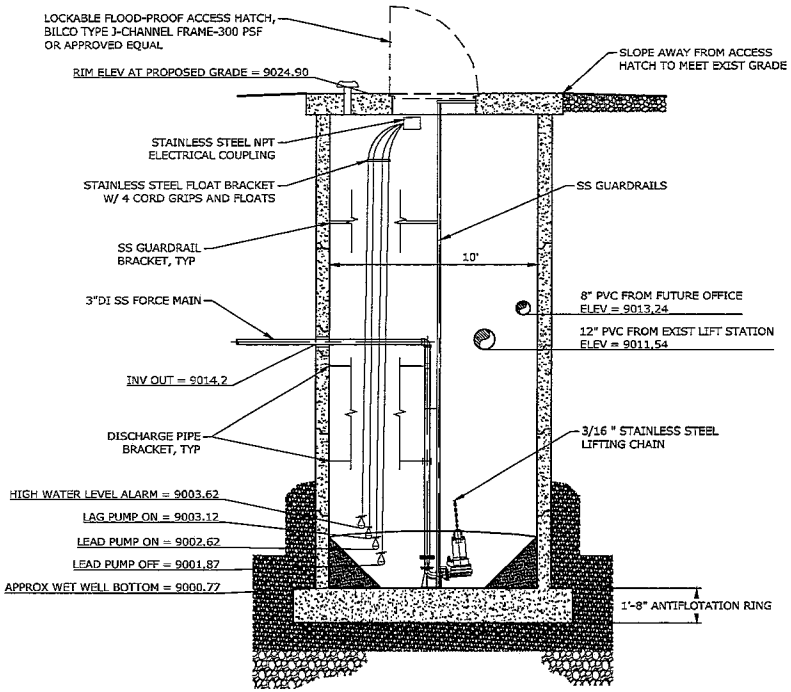
VALVE VAULT PLAN VIEW
SCALE: 1"=3'
1 C-2



LIFT STATION PLAN VIEW
SCALE: 1"=3'
2 C-2



VALVE VAULT SECTION VIEW
SCALE: 1"=3'
3 C-2



LIFT STATION SECTION VIEW
SCALE: 1"=3'
4 C-2

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TOWN OF FRISCO

FRISCO MARINA LIFT STATION

SEWER LIFT STATION SECTIONS

PROJECT NO.: 20-2802 | SCALE: AS SHOWN | DATE: 15 JAN 2021

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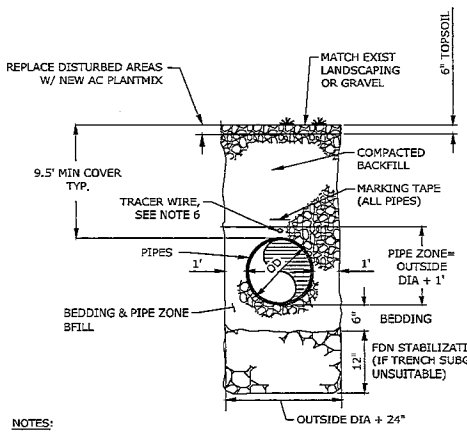


NOTES:

1. USE BEDDING AND PIPE ZONE BACKFILL WHERE SHOWN ON DETAIL. COMPACT TO ACHIEVE 95% OF MAXIMUM DENSITY IN ACCORDANCE WITH AASHTO T-310.

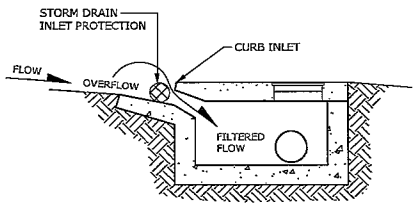
2. INSTALL COMMON BACKFILL TO PAVEMENT BASE OR EXISTING GRADE. COMPACT ALL BACKFILL IN LIFTS TO ACHIEVE 95% OF MAXIMUM DENSITY IN ACCORDANCE WITH AASHTO T-310.

3. REFER TO SPECIFICATIONS FOR OTHER BACKFILL/BEDDING REQUIREMENTS.

4. FURNISH & INSTALL MARKING TAPE ABOVE ALL PIPELINES INCLUDING SERVICES.

5. PIPE DIAMETERS AS SHOWN PER PLAN.

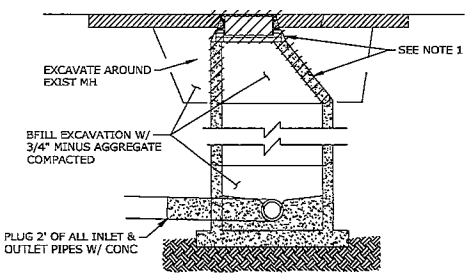
SINGLE PIPE TRENCH DETAIL 1
SCALE: NTS



NOTES:

1. INLET PROTECTION DEVICE SHALL EXTEND 12 INCHES PAST EACH END OF THE INLET.

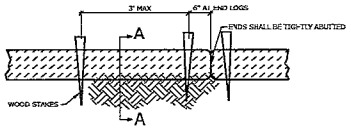
STORM DRAIN INLET PROTECTION TYPE I 4
SCALE: NTS

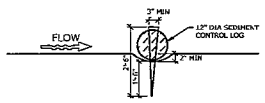


NOTES:

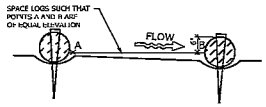
1. REMOVE FRAME, COVER, AND CONE SECTIONS. CONTRACTOR SHALL ALLOW THE CITY SEWER DIVISION TO INSPECT ALL REMOVED MATERIALS AND THE CITY SHALL DETERMINE WHICH MATERIALS THE CITY WISHES TO RETAIN. CONTRACTOR SHALL DELIVER ALL MATERIALS THE CITY WISHES TO RETAIN TO THE CITY SEWER DEPARTMENT STORAGE YARD. CONTRACTOR SHALL REMOVE ALL OTHER MATERIALS FROM THE JOB SITE AND DISPOSE OF THEM AT AN APPROPRIATE SITE.

EXISTING WET WELL ABANDONMENT 2
SCALE: NTS





SECTION A-A



SEDIMENT CONTROL LOG MAINTENANCE NOTES:

1. THE SEDIMENT CONTROL LOGS SHALL BE INSPECTED DAILY, DURING AND AFTER ANY STORM EVENT, AND REPAIRED OR HAVE ANY UPSTREAM SEDIMENT REMOVED.

2. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOGS SHALL BE REMOVED WHEN THE UPSTREAM SEDIMENT DEPTH IS WITHIN 1/2 THE HEIGHT OF THE CREST OF LOG.

3. ALL SEDIMENT CONTROL LOGS SHALL BE REMOVED AT THE END OF CONSTRUCTION. IF ANY DISTURBED AREA EXISTS AFTER REMOVAL, IT SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE ACCEPTABLY STABILIZED.

SEDIMENT CONTROL LOG INSTALLATION NOTES:

1. SEE PLAN VIEW FOR LOCATION AND EXTENT OF SEDIMENT CONTROL LOGS.

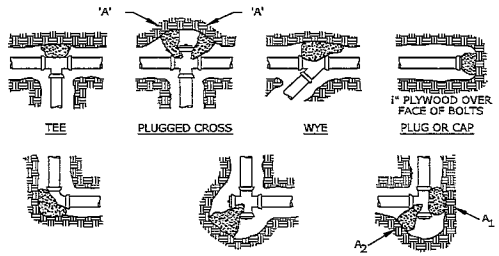
2. SEDIMENT CONTROL LOGS SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES AND AS REQUIRED DURING CONSTRUCTION.

3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR, OR COCONUT FIBER.

4. NOT FOR USE IN CONCENTRATED FLOW AREAS.

5. THE SEDIMENT CONTROL LOG SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 2".

SEDIMENT CONTROL LOGS 5
SCALE: NTS



BEARING AREA, 'A', OF THRUST BLOCKS IN SQUARE FEET*							
FITTING SIZE	TEE, WYE, PLUG OR CAP	90°BEND, PLUGGED CROSS	TEE PLUGGED ON RUN		45° BEND	22 1/2° BEND	11 1/4° BEND
	A	A	A_1	A_2	A	A	A
3 OR 4	1.9	2.5	3.6	2.5	1.3	-	-
6	3.7	5.3	7.5	5.3	2.8	1.5	-
8	6.4	9.1	12.8	9.1	4.9	2.5	1.2
10	9.7	13.7	19.3	13.7	7.5	3.7	1.9
12	13.7	19.3	27.2	19.3	10.5	5.3	2.7
14	18.4	26.0	36.7	26.0	14.1	7.2	3.6
16	23.7	33.6	47.3	33.6	18.1	9.3	4.7
18	29.9	42.3	59.6	42.3	22.8	11.6	5.9
20	36.7	51.9	73.1	51.9	28.0	14.3	7.2
24	52.3	74.0	104.4	74.0	40.0	20.4	10.3

*ABOVE BEARING AREAS BASED UPON TEST PRESSURE OF 200 P.S.I. AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE THE FOLLOWING EQUATION: BEARING AREA=(TEST PRESSURE/200) X (2000/SOIL BEARING STRESS) X (TABLE VALUE).

STANDARD THRUST BLOCK DETAIL 3
SCALE: NTS

NOTES:

1. CONCRETE THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH.

2. KEEP CONCRETE CLEAR OF JOINT AND ACCESSORIES. INSTALL ISOLATION MATERIAL BETWEEN PIPE AND/OR FITTINGS BEFORE POURING BLOCKING.

3. THE MINIMUM REQUIRED THRUST BEARING AREAS FOR SPECIAL CONNECTIONS ARE SHOWN ON THE PLANS; e.g. 15 SF INDICATES 15 SQUARE FEET BEARING AREA REQUIRED.

4. IF NOT SHOWN ON PLANS, REQUIRED BEARING AREAS AT FITTING SHALL BE AS INDICATED IN TABLE BELOW, ADJUSTED IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIFICATIONS.

5. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS DETAIL.

6. CONCRETE SHALL BE 3000 PSI MIN. 28 DAY COMPRESSIVE STRENGTH.

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FRISCO MARINA LIFT STATION

DETAIL SHEET 1

PROJECT NO.: 20-2802 | SCALE: AS SHOWN | DATE: 15 JAN 2021

SHEET D-1

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ONE LINE DIAGRAM LEGEND

- TRANSFORMER WITH PRIMARY AND SECONDARY VOLTAGE, AND KVA RATING AS NOTED.
- CIRCUIT NO. 22 WITH #8 INSULATED CONDUCTORS, 1#10 BARE GROUND WIRE ALL IN 2" CONDUIT TO 20 HP MOTOR.
- ONE-LINE SHOWING POWER AND CONTROL TO A PACKAGE UNIT, AS FOR EXAMPLE A STEAM GENERATOR OR AN AIR HANDLING UNIT, SHALL IMPLY THAT ANY AND ALL ASSOCIATED EQUIPMENT SHALL ALSO BE INSTALLED AND WIRED AS REQUIRED BY THE EQUIPMENT FURNISHED.
- INDICATES THAT ALL OR PART OF CIRCUIT MAY BE ROUTED IN DUCT BANK OR UNDERGROUND. CONDUIT SIZE SHOWN ON ONE-LINE IS ABOVE GROUND AND/OR INSIDE OF STRUCTURE. SEE DUCT BANK SCHEDULE AND SECTIONS FOR CONDUIT SIZE OF UNDERGROUND PORTION OF CIRCUIT.
- HIGH VOLTAGE DRAWOUT AIR OR VACUUM CIRCUIT BREAKER.
- LOW VOLTAGE AIR CIRCUIT BREAKER, 3 POLE, 20 AMPERE.
- SIZE 4 COMBINATION MAGNETIC MOTOR STARTER.
- SIZE 4 REDUCED VOLTAGE SOFT STARTER
- LOW VOLTAGE DRAWOUT AIR CIRCUIT BREAKER.
- HIGH VOLTAGE DRAWOUT CONTACTOR.
- FUSE AND DISCONNECT SWITCH.
- SIZE 2 COMBINATION MAGNETIC MOTOR STARTER, REVERSING OR 2 SPEED.
- POTENTIAL TRANSFORMER.
- CURRENT TRANSFORMER.

CONDUIT & WIRING INSTALLATION LEGEND

- CONDUIT EXPOSED.
- CONDUIT CONCEALED.
- CONDUIT TURNING UP. CONDUIT TURNING DOWN.
- CONDUIT PLUGGED FLUSH. CONDUIT CAPPED.
- TYPICAL FOR HOME RUN TO BE ROUTED TO LIGHTING PANEL L2 AND CONNECTED TO CIRCUIT #5 (MINIMUM NO. 12 AWG CONDUCTORS & ¾" CONDUIT.)
- LIGHTING FIXTURE. REFER TO NUMBER OR LETTER IN FIXTURE SCHEDULE.
- FLUORESCENT FIXTURE. REFER TO NUMBER OR LETTER IN FIXTURE SCHEDULE.
- RECEPTACLE POWERED FROM LIGHTING PANEL LP1, CIRCUIT 3.
- LIGHTING FIXTURE POWERED FROM LIGHTING PANEL LP2, CIRCUIT 2 (NON-SWITCHED.)
- LIGHTING FIXTURE POWERED FROM LIGHTING PANEL LPA, CIRCUIT 4
- LIGHTING FIXTURE POWERED VIA SWITCH A.
- UNDERGROUND CONCRETE ENCASED ELECTRICAL DUCT BANK.
- UNDERGROUND CONCRETE ENCASED ELECTRICAL BANK ROUTED BENEATH SLAB-ON-GRADE.
- DIRECT BURIED CONDUIT.
- GROUND CONDUCTOR.

SCHEMATIC SYMBOLS

- WIRE CONNECTION POINT
- NORMALLY OPEN CONTACT
- NORMALLY CLOSED CONTACT
- STARTER, CONTACTOR OR RELAY COIL
- NORMALLY OPEN PUSH BUTTON
- NORMALLY CLOSED PUSH BUTTON
- MAINTAINED PUSH BUTTON
- NORMALLY CLOSED GEARED LIMIT SWITCH
- NORMALLY OPEN GEARED LIMIT SWITCH
- INDICATING LIGHT
- FUSE
- CONTROL POWER TRANSFORMER
- SWITCH
- MANUAL STARTER
- OVERLOAD
- FLOAT SWITCH (CLOSING ON RISING LEVEL)
- FLOAT SWITCH (OPENING ON RISING LEVEL)
- PRESSURE SWITCH (CLOSING ON RISING PRESSURE)
- PRESSURE SWITCH (OPENING ON RISING PRESSURE)
- VACUUM SWITCH (CLOSING ON INCREASING VACUUM)
- VACUUM SWITCH (OPENING ON INCREASING VACUUM)
- TEMPERATURE SWITCH (CLOSING ON RISING TEMPERATURE)
- TEMPERATURE SWITCH (OPENING ON RISING TEMPERATURE)
- FLOW ACTUATED SWITCH (CLOSING ON INCREASE IN FLOW)
- FLOW ACTUATED SWITCH (OPENING ON INCREASE IN FLOW)
- ON TIME DELAY SWITCH (NORMALLY OPEN WITH TIME DELAY CLOSING AFTER COIL IS ENERGIZED)
- ON TIME DELAY SWITCH (NORMALLY CLOSED WITH TIME DELAY OPENING AFTER COIL IS ENERGIZED)
- OFF TIME DELAY SWITCH (NORMALLY OPEN WITH TIME DELAY OPENING AFTER COIL IS DE-ENERGIZED)
- OFF TIME DELAY SWITCH (NORMALLY CLOSED WITH TIME DELAY CLOSING AFTER COIL IS DE-ENERGIZED)
- TORQUE SWITCH (NORMALLY OPEN)
- TORQUE SWITCH (NORMALLY CLOSED)
- LIMIT SWITCH (NORMALLY OPEN)
- LIMIT SWITCH (NORMALLY OPEN, HELD CLOSED)
- LIMIT SWITCH (NORMALLY CLOSED)
- LIMIT SWITCH (NORMALLY CLOSED, HELD OPEN)
- DIFFERENTIAL PRESSURE SWITCH (NORMALLY OPEN, CLOSING ON INCREASING DIFF.)
- DIFFERENTIAL PRESSURE SWITCH (NORMALLY CLOSED, OPENING ON INCREASING DIFF.)
- SPD 24 VDC SURGE PROTECTION

SWITCH & OUTLET SYMBOLS

- S SINGLE POLE SWITCH. A=SWITCH DESIGNATION
- S2 TWO POLE SWITCH, A=SWITCH DESIGNATION
- S3 THREE-WAY SWITCH, A=SWITCH DESIGNATION
- S4 FOUR-WAY SWITCH, A=SWITCH DESIGNATION
- S WEATHERPROOF SWITCH, A=SWITCH DESIGNATION
- S KEY OPERATED SWITCH, A=SWITCH DESIGNATION
- S EXPLOSION PROOF SWITCH, A=SWITCH DESIGNATION
- DUPLEX RECEPTACLE 120 VOLT
- 240V, 1 PHASE RECEPTACLE, TYPICAL AMPERE RATING NOTED
- 480V, 3 PHASE WELDING RECEPTACLE. TYPICAL AMPERE RATING NOTED

MISCELLANEOUS SYMBOLS

- E ETHERNET PORT
- T THERMOSTAT
- J JUNCTION BOX
- DISCONNECT SWITCH
- COMBINATION STARTER
- POWER PANEL
- LIGHTING PANEL
- MISCELLANEOUS PANEL

ABBREVIATIONS

A	AMBER, AMPERE, ALARM
AC	ALTERNATING CURRENT
A/D	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AM	AMMETER
ATO	AUTOMATIC THROWOVER
AWG	AMERICAN WIRE GAUGE
C	CLOSE, COUNTER, CONTACTOR
CAP	CAPACITOR
CB	CIRCUIT BREAKER
CD	CONTROL DAMPER
CKT	CIRCUIT
CL2	CHLORINE
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CS	CONTROL STATION
CT	CYCLE TIMER, CURRENT TRANSFORMER
CTM	CYCLE TIMER MOTOR
2/C	2 CONDUCTOR
4"C	4" CONDUIT
DC	DIRECT CURRENT
DM	DAMPER MOTOR, DEMAND METER
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DPS	DIFFERENTIAL PRESSURE SWITCH
DS	DISCONNECT SWITCH
E	ELECTRIC OPERATOR FOR CONTROL DAMPER OR VALVE
EMH	ELECTRICAL MANHOLE
ETM	ELAPSED TIME METER
EX	EXISTING
F	FORWARD
FS	FLOW SWITCH
G	GREEN, GROUND
GFI	GROUND FAULT INTERRUPTER
GLS	GEARED LIMIT SWITCH
#8G	#8 GROUND WIRE
H	HIGH, HUMIDISTAT
HH	HANDHOLE
HMT	HIGH MOTOR TEMPERATURE
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
HP	HORSEPOWER
HWCO	HIGH WATER CUTOFF
HZ	HERTZ (CYCLE)
I/O	INPUT/OUTPUT
J	JUNCTION BOX
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAR	KILOVAR
KW	KILOWATT
KWH	KILOWATT HOUR
L	LOW, LEVEL
LA	LIGHTNING ARRESTOR
LAN	LOCAL AREA NETWORK
LP	LIGHTING PANEL
LS	LIMIT SWITCH, LEVEL SWITCH
LWCO	LOW WATER CUTOFF
M	MAGNETIC MOTOR STARTER
MA	MILLIAMPERE
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCM	THOUSAND CIRCULAR MIL
MD	MOISTURE DETECTOR
MH	MANHOLE, MOUNTING HEIGHT
MOV	MOTOR OPERATED VALVE
MS	MANUAL MOTOR STARTER
MSH	MOTOR SPACE HEATER
N	NEUTRAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN, NUMBER
O	OPEN
OL	OVERLOAD
PB	PUSH BUTTON, PULL BOX
PF	POWER FACTOR METER
PH	PHASE (CHEMICAL TERM)
PLC	PROGRAMMABLE LOGIC CONTROLLER
PP	POWER PANEL
PS	PRESSURE SWITCH
PT	POTENTIAL TRANSFORMER, PROGRAM TIMER
2P	2 POLE
R	RED, RAISE, RELAY, REVERSE
RECP	RECEPTACLE
RGS	RIGID GALVANIZED STEEL
RTD	RESISTANCE TYPE TEMP DETECTOR
RTU	REMOTE TERMINAL UNIT
RVSS	REDUCED VOLTAGE SOLID STATE STARTER
S2	SIZE 2 STARTER
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SP	SINGLE POLE
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SS	SELECTOR SWITCH
SV	SOLENOID VALVE
SWB	SWITCHBOARD
SWGR	SWITCHGEAR
T	THERMOSTAT, TIMER, TOTALIZER
TACH	TACHOMETER
TB	TERMINAL BLOCK
TD	TIME DELAY RELAY
TEMP	TEMPERATURE
TQ	TORQUE
TS	TEMPERATURE SWITCH
UG	UNDERGROUND
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLTS
VA	VOLT AMPERE
VLS	VALVE LIMIT SWITCH
VM	VOLTMETER
W	WHITE, WATTS
WH	WATTHOUR METER
WM	WATT METER
WP	WEATHERPROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
Y	YELLOW
Z	AUXILIARY RELAY
ZS	POSITION SWITCH

AREA DESIGNATIONS

THE SPECIAL AREA DESIGNATION BOXES, AS DEFINED BELOW, ARE LOCATED ON THE PLAN DRAWINGS TO DEFINE ELECTRICAL INSTALLATION REQUIREMENTS. DESIGNATION BOXES ARE LOCATED WITHIN ROOM OR BELOW ROOM NUMBER. ALL INDOOR AREAS NOT INDICATED OTHERWISE ARE AREA TYPE 1 AND MINIMUM NEMA TYPE 1 ENCLOSURES.

- AREA TYPE 1: INDOOR AND DRY AREA, REQUIRES MINIMUM NEMA TYP 1 ENCLOSURES FOR ALL EQUIPMENT AND GASKETED FITINGS IN CONDUIT SYSTEMS.
- AREA TYPE "A": CORROSIVE CHEMICAL FEED AND STORAGE ROOMS. CONDUIT SYSTEM SHALL BE EXPOSED PVC COATED CONDUIT WITH FITTINGS, AND ACCESSORIES.
- AREA TYPE 4: INDOOR WET LOCATIONS SUCH AS VAULTS, HOSEDOWN AREAS, BASEMENTS, ETC. MINIMUM NEMA TYPE 4 ENCLOSURE FOR EQUIPMENT AND GASKETED FITTINGS IN A CONDUIT SYSTEM.
- AREA TYPE 7A: CLASS 1, DIVISION 1 AREA AS DERIVED BY NEC. ALL EQUIPMENT AND CONDUIT SYSTEMS SHALL BE RATED FOR USE IN THIS AREA.
- AREA TYPE 7B: CLASS 1, DIVISION 2, GROUP C AND D (METHANE, GASOLINE) AS DEFINED BY NEC. EQUIPMENT AND CONDUIT SYSTEMS SHALL BE RATED FOR USE IN THIS AREA.
- AREA TYPE 12: INDOOR, DRY, DIRTY AREA, REQUIRES MINIMUM NEMA TYPE 12 GASKETED ENCLOSURES FOR ALL EQUIPMENT AND GASKETED FITTINGS IN CONDUIT SYSTEMS.
- AREA TYPE 4X: OUTDOOR AND INDOOR WET LOCATIONS SUBJECT TO CORROSION. CONDUIT SYSTEM SHOULD BE PVC COATED RIGID GALVANIZED STEEL WITH PVC COATED FITTINGS, BOXES, AND STAINLESS STEEL HARDWARE.

GENERAL REQUIREMENTS

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTING ALL CONDUITS NOT SHOWN ON THE PLANS. THIS SHALL INCLUDE ALL CONDUITS SHOWN ON THE ONE-LINES AND HOME-RUNS SHOWN ON THE PLAN DRAWINGS. CONDUITS SHALL BE ROUTED AS DEFINED IN THE SPECIFICATIONS.
2. SPARE WIRES SHALL BE TAPED AND COILED.
3. IF EQUIPMENT SUPPLIED BY MANUFACTURER HAS A LARGER LOAD THAN VALUE SHOWN, THE CABLE CONDUIT AND ELECTRICAL EQUIPMENT SHALL BE ENLARGED, AS REQUIRED, TO ACCOMODATE THE HIGHER VALUE.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING PROPERLY SIZED STARTER OVERLOADS FOR EQUIPMENT FURNISHED.
5. LIGHTING AND RECEPTACLE CIRCUITS DESIGNATED ON THE FLOOR PLANS ARE NOT SHOWN ON THE ONE-LINES. CONDUCTORS FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM NO. 12 AWG. CONDUIT FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM ¾".
6. IN AREAS WHERE THERE ARE OVERHEAD BRIDGE CRANES, HOISTS, ETC., NO CONDUITS SHALL BE RUN OVERHEAD THAT WILL INTERFERE WITH THE OPERATION OF THE EQUIPMENT.

GENERAL NOTES

1. SOLID LINES —— INDICATE NEW WORK OR EQUIPMENT.
2. DOTTED LINES . . . INDICATE EXISTING WORK OR EQUIPMENT.
3. DASHED LINES — — INDICATE FUTURE WORK OR EQUIPMENT.
4. THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT.
5. INFORMATION RELATED TO CIRCUIT IDENTIFICATION, WIRE & CONDUIT SIZES, AND ROUTING, IS ON THE FOLLOWING DRAWING TYPES.
   - A. ONE-LINE DIAGRAMS SHOW CIRCUIT IDENTIFICATION, WIRE QUANTITY AND SIZES, AND CONDUIT SIZE WITHIN STRUCTURES. ONE-LINE DIAGRAMS ALSO INDICATE ORIGIN AND DESTINATION OF CIRCUITS, AND IDENTIFY CIRCUITS ROUTED UNDERGROUND.
   - B. FOR CIRCUITS WITHOUT UNDERGROUND PORTIONS, BUILDING FLOOR PLANS SHOW LOCATION OF EQUIPMENT FOR DETERMINING CIRCUIT LENGTH WITHIN THE STRUCTURE. FOR CIRCUITS WITH UNDERGROUND PORTIONS, ANTICIPATED PENETRATION OF UNDERGROUND CONDUITS ARE SHOWN ON STRUCTURE PLANS FOR DETERMINING THE LENGTH OF IN-STRUCTURE PORTIONS OF CIRCUITS. BUILDING FLOOR PLANS MAY ALSO SHOW HOME RUNS FOR LIGHTING, RECEPTACLE, AND OTHER MISCELLANEOUS EQUIPMENT CIRCUITS.
   - C. SITE PLANS INDICATE THE GENERAL ROUTING OF UNDERGROUND CONDUITS AND DUCT BANKS. CIRCUITS ROUTED IN UNDERGROUND CONDUITS OR DUCT BANKS ARE INDICATED IN DUCT BANK SECTIONS REFERENCED ON THE SITE PLAN.
   - D. DUCT BANK SECTIONS AND SCHEDULES IDENTIFY CONDUIT SIZE, CONDUIT MATERIAL, ARRANGEMENT OF THE UNDERGROUND CONDUITS, AND CIRCUITS ROUTED IN EACH UNDERGROUND CONDUIT.
6. CLOUDED MARKINGS INDICATE WORK IN EXISTING AREAS THAT IS NEW OR NEW WORK ON AN EXISTING PIECE OF EQUIPMENT.

PRICING SET

NO.	DATE	BY	REVISION

NOTICE: 0 ½ 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

XXX DESIGNED
XXX DRAWN
XXX CHECKED

JANUARY 2021

Murraysmith
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BROWNS HILL ENGINEERING & CONTROLS

TOWN OF FRISCO

FRISCO MARINA LIFT STATION

ELECTRICAL LEGEND

PROJECT NO.: 20-2802 | SCALE: AS SHOWN | DATE: 15 JAN 2021

SHEET E1

8 of 9

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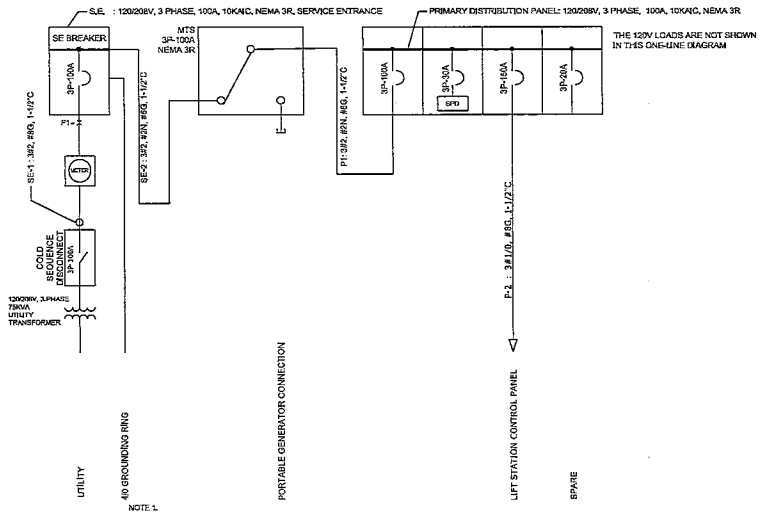
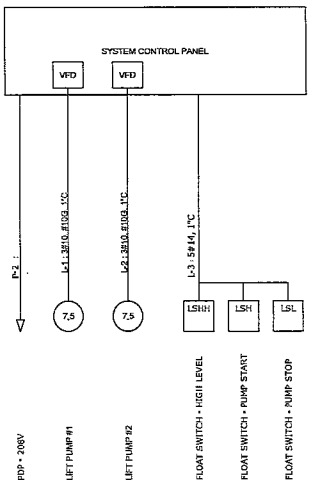


SERVICE ENTRANCE & ATS
ONE-LINE DIAGRAM

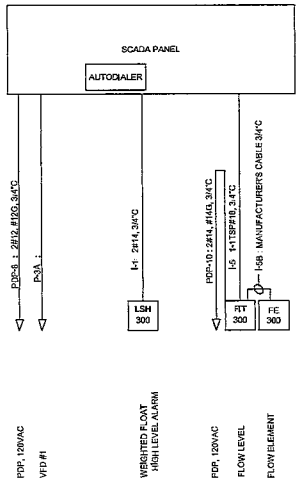
PRIMARY DISTRIBUTION PANEL
ONE-LINE DIAGRAM



LIFT STATION CONTROL PANEL
ONE-LINE DIAGRAM

FAULT CURRENT	
UTILITY	13,000A
F1	9,852A

NOTES:
1. BONDING AND GROUNDING SHALL INCLUDE CONNECTIONS TO THE PROCESS PIPE AND 2 GROUND RODS AS PER N.E.C.
2. ALL 120VAC CONDUCTORS WITH 20 AMP BREAKER SHALL BE 3#12, 3/4"C, ALL OTHER CONDUCTORS SHALL BE SIZED TO OVER CURRENT PROTECTION.



SCADA PANEL PANEL
ONE-LINE DIAGRAM

NAME:	PDP			BUS:		COPPER			MAINS:	3P-100A		
SERVICE:	120/208 VAC			RATING:		100A			LOCATION:	OUTSIDE		
MOUNTING:	SURFACE, NEMA 3R			AIC RATING:		10,000A						
V.A.						CIRCUIT NUMBER				V.A.		
A	B	C	LOAD	PHASE	BREAKER		BREAKER	PHASE	LOAD	A	B	C
12000			LIFT STATION CONTROL PANEL	3	150	1 2	30	3	SPD	0		
	12000		-	-	-	3 4	-	-	-		0	
		12000	-	-	-	5 6	-	-	-			0
0			SPARE	3	20	7 8	15	1	SCADA PANEL	150		
	0		-	-	-	9 10	15	1	FLOW METER		25	
		0	-	-	-	11 12	20	1				0
180			CONVENIENCE RECPT	1	20	13 14	20	1		0		
	0			1	20	15 16	20	1			0	
		0		1	20	17 18	20	1				0
0				1	20	19 20	20	1		0		
	0			1	20	21 22	20	1			0	
		0		1	20	23 24	20	1				0
0				1	20	25 26	20	1		0		
	0			1	20	27 28	20	1	GENERATOR - BLOCK HEATER		1500	
		0		1	20	29 30	20	1	GENERATOR - BATTERY CHARGER			40
12180	12000	12000	TOTALS PER PHASE PER SIDE							150	1525	40
12330	13525	12040	TOTALS PER PHASE									
	37895		PANEL TOTAL									

PRICING SET

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

XXX DESIGNED
XXX DRAWN
XXX CHECKED

JANUARY 2021

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ONE-LINE
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PROJECT NO.: 20-2802 | SCALE: AS SHOWN | DATE: 15 JAN 2021

SHEET
E2
9 of 9

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FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT M

DOCUMENTS SUBMITTED BY CONTRACTOR

PRIOR TO NOTICE OF AWARD

SAUNDERS Heath

A LOCAL BUILDER, UNIQUELY QUALIFIED FOR YOUR PROJECT

From its start in 1977, to its role today as a powerhouse among mid-sized northern Colorado firms, Saunders Heath has remained dedicated to its core values: to work tirelessly for clients; treat employees, subcontractors and other project partners with the respect they deserve; and support its neighbors through community service.

In 2014, Saunders Construction, Inc., acquired Fort Collins based Heath Construction, LLC, creating a new construction solutions provider in the northern Colorado market, Saunders Heath — one that leverages Saunders' experience and resources with Heath's local relationships and resume. While Saunders Heath remains a separate company, dedicated exclusively to customers in northern Colorado, the resources Saunders has made available have increased our capabilities to meet the special needs of each customer.

UNPARALLELED PRECONSTRUCTION SERVICES

Our Preconstruction Services Department is one of the largest and most accomplished in Colorado. From early conceptual planning through design development and move in, we approach every aspect of a project from the owner's perspective — balancing the often competing objectives of design integrity, construction efficiency and operational continuity — all with an in-depth understanding of the exacting challenges that owners face. With an average tenure of 20 years within this group, they excel at understanding the client's vision and consistently analyzing, informing and assessing value-add solutions.

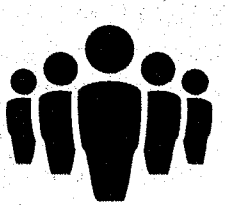
SUCCESSFUL WITH THE POWER OF OUR PEOPLE

Saunders Heath has more than 250 skilled field personnel including foreman, carpenters and laborers, giving us the ability to self-perform some aspects of a project. By training our own forces to complete selective demolition, concrete work, general labor and carpentry, we can ensure quality workmanship and dramatically accelerate project schedules.

Headquartered in NORTHERN COLORADO

44 Years
in Business

Local relationships with over 2,500 subcontractors



In Depth
PRECONSTRUCTION
Services

BIDDER CONTACT:

NAME: David Sandlin, President

ADDRESS: 1212 Riverside Ave. Suite 130

Fort Collins, CO 80550

PHONE: 720.425.1189

EMAIL: d.sandlin@saundersheath.com

CULTIVATING INDUSTRY RELATIONSHIPS

Just as we have with clients, Saunders Heath has created lasting relationships with subcontractors. Because we treat our industry peers with respect, our subcontractor relationships are a key differentiator that helps Saunders Heath's teams to include the most qualified and reputable subcontractors in the state. Based on our market position, management approach and prompt payment, we enjoy an outstanding reputation among the subcontractor community — and their highly competitive pricing reflects this.

SAFETY

A Team Effort from the Start – Saunders Heath dedicates a team of full-time personnel with expertise in safety, compliance and environmental management. Safety at Saunders Heath is supported by an integrated campaign — Safety, It's on Me. Safety behaviors are important, and it starts with the accountability of each person on our project sites and in our offices. In the past two years, we have completed over three million manhours of work without a lost time incident.

CONSTRUCTION

No Shortcuts, Just Follow Through – Saunders Heath's construction approach is about team work, open communication and commitment to an exceptional client experience. Saunders Heath's project managers and superintendents are partners with full on-site authority, supported by a vast network of in-house resources. The Saunders process is designed to identify, plan, communicate and solve project challenges — large or small with equal focus.

One of the key differentiators of Saunders Heath is our long-term relationships with numerous area subcontractors. The competitive pricing and field performance from the subcontractors reflects this relationship.

BREAK THE MOLD.

Saunders Heath cares about our client's mission, collaborates with an honest approach, achieves project commitments and contributes to the communities where we build. Our corporate social responsibility (CSR) focus is integrated into our strategic plan and is reflected in our annual CSR report – published eight years in a row. Saunders Heath recognizes that investing in our people, focusing on safety, improving business processes and reducing environmental impact adds value in our industry.

Photo: Estes Park Riverwalk. Saunders Heath completed the construction on this extremely popular riverwalk in.

EXPERIENCE

HORSETOOTH INFORMATION CENTER AND PARK RANGER OFFICE

Horsetooth Reservoir South Bay | Larimer County, Colo.

The Horsetooth Area Information Center provides guests a centralized location to talk to rangers, purchase parking passes and make camping reservations at Colorado's third busiest reservoir. The new two-story 11,839-square-foot information center is located at the reservoir's South Bay between the camping grounds and day-use area. The space includes office space, meeting rooms, a public porch with a view of the reservoir, information about recreation, the history of the area and the Colorado-Big Thompson Water project, wildlife, fisheries and more.

In addition to the Information Center, the project also included a 3,313-square-foot shop building and 1,920-square-foot storage building for use by park rangers and maintenance staff.

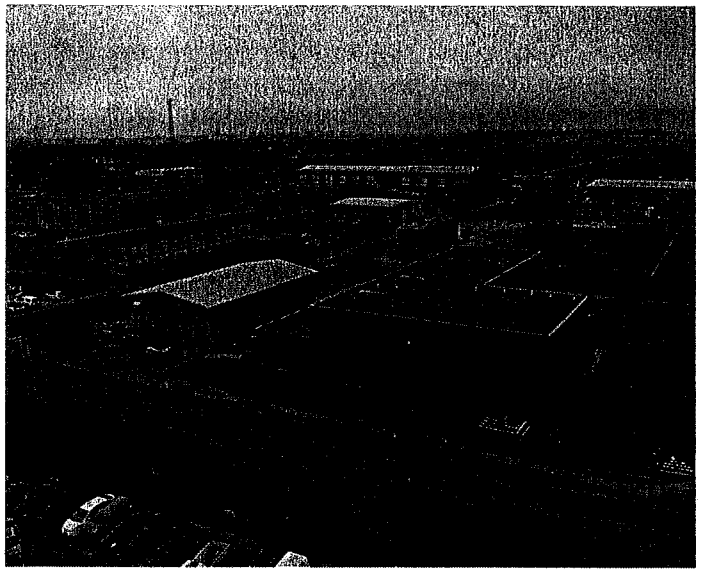
Constrained by the banks of reservoir and existing structures, the site for the new Horsetooth Area Information Center provided many challenges. The existing soils were found to be unsuitable under most of the building pads at depths of nearly 12-feet and massive boulders were unearth during excavation.

In partnership with the owner, geotechnical contractor and Saunders Heath's subcontractors, the team was able to keep the project moving along with daily testing and balancing the import/export of the soils. Additionally, with the site being at a main entrance to the popular reservoir, safety of the public was a top priority. Signage was critical to direct the public, and daily communication with local staff for road closures and dangers of an active construction site ensured the safety for everyone.

Owner: Larimer County
Architect: The Architects Studio
Schedule: January 2016 - September 2016
Contract Value: $4,415,960

CDOT KOA CAMPUS PHASE I, II & III

18500 E. Colfax Ave. | Aurora, Colo.



Owner: Colorado Department of Transportation

Architect: Phase I: CDOT
Phase II: Richard Weingardt Consultants
Phase III: CDOT

Schedule: August 2016 - March 2020

Contract Value: Phase I: $10,457,002
Phase II & III: $14,169,084

Through a hard bid process Saunders Heath was selected as the CMGC for this two-phased construction project at the CDOT KOA Campus in Aurora, Colorado.

Phase I includes the construction of three pre-engineered metal buildings, A sand shed, for sand and salt storage, an addition of three work bays to the mechanic shop, a new 8-bay light duty vehicle maintenance, a Mag-Chloride storage tank, and fuel station. The site consisted of all utilities to be installed, and a large detention pond dug, that drains to Sand Creek.

Phase II consisted of tying in five new structures into Phase I's infrastructure system. Three of the five buildings are Pre-Engineered Metal Building (PEMB) structures, one CMU block & Steel structure, and one wood frame structure. The three metal buildings are for equipment & truck maintenance, the CMU & Steel structure is a street sign manufacturing building, and the wood frame is a storm water management classroom and training facility. The site consists of a storm water training structure, car charging stations and two storm water detention ponds for the 30 acre site.

Phase III, the final phase of the construction on the KOA campus, was the reconstruction of the Best Management Practices (BMP) testing and training ground on site. Additional site work for access to the site from Tower Road with aprons and curb and gutter were completed in this phase as well as site lighting and hardscapes. The onsite storm water detention pond grading and outfall structure tie ins were completed as well.

The project also consists of a metal building remodel, that was retrofitted with two overhead doors and an office area and storage buildout. New support structure and insulation was installed in the existing walls.

The project team used BIM 360 for quality control, safety, and equipment checking and maintenance. Blue Beam Vue was utilized for drawing and specifications access to subcontractors through the use of iPads.

The site remained open to CDOT for maintenance and continued work.

RAINDANCE WELCOME CENTER AND COVERED BRIDGE

2191 Covered Bridge Pkwy | Windsor, Colo.

Saunders Heath and VFLA worked together to complete the welcome center, covered bridge and uncovered bridge for the new Raindance housing development in Windsor, Colo. The 5,260-square-foot welcome center houses both the sales office where potential home buyers can receive information on community amenities, builder information and availability, as well as a full service restaurant and bar. Outdoor seating is located on both the north and south sides of the building. A large turf area on the north side of the building is available for weddings, concerts and events.

The bridges serve as the main entrance and exit from the Raindance development. The scope of worked included all site, utilities, structural, mechanical, electrical, finishes and landscaping.

Owner: Water Valley Land Company, LLC
Architect: VFLA
Schedule: June 2018 - March 2019
Contract Value: $3,048,000

INSURANCE

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 10/29/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER IMA, Inc. - Colorado Division 1705 17th Street, Suite 100 Denver CO 80202	CONTACT NAME: IMA Denver Team PHONE (A/C, No, Ext): 303-534-4567 FAX (A/C, No): E-MAIL ADDRESS: DenAccountTechs@imacorp.com
INSURED HEATCON1 Heath Construction, LLC dba SaundersHeath 1212 Riverside, Suite 130 Fort Collins CO 80524	INSURER(S) AFFORDING COVERAGE — NAIC # INSURER A : The Cincinnati Insurance Compa — 10677 INSURER B : The Continental Insurance Comp — 35289 INSURER C : *Pinnacol Assurance — 41190 INSURER D : INSURER E : INSURER F :

COVERAGES **CERTIFICATE NUMBER:** 890433270 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY			EPP0576035	4/30/2020	4/30/2021	EACH OCCURRENCE	$ 1,000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 500,000
	X BI/PD DED:$5,000						MED EXP (Any one person)	$ 10,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PERSONAL & ADV INJURY	$ 1,000,000
	POLICY X PRO-JECT LOC						GENERAL AGGREGATE	$ 2,000,000
	OTHER:						PRODUCTS - COMP/OP AGG	$ 2,000,000
								$
A	AUTOMOBILE LIABILITY			EBA0576035	4/30/2020	4/30/2021	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	X HIRED AUTOS ONLY / X NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
A	X UMBRELLA LIAB X OCCUR			EPP0576035	4/30/2020	4/30/2021	EACH OCCURRENCE	$ 5,000,000
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$ 5,000,000
	DED RETENTION $							$
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N			3096125	10/1/2020	10/1/2021	X PER STATUTE OTH-ER	
	ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N (Mandatory in NH)	N/A					E.L. EACH ACCIDENT	$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000
B	Excess Second Layer Liability			6080918517	4/30/2020	4/30/2021	Each Occurrence Aggregate	$5,000,000 $5,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Professional Liability Coverage: Policy #PCADB50115310420
Effective Date: 04/30/20-04/30/21 Insurer: Berkley Assurance Co
$10,000,000 Aggregate; $10,000,000 Each Claim; $50,000 SIR; Claims Made

Pollution Liability Coverage: Policy #PCADB50115310420
Effective Date: 04/30/20-04/30/21 Insurer: Berkley Assurance Co
$10,000,000 Limit; $50,000 SIR; Includes Mold

See Attached...

CERTIFICATE HOLDER

For Information Only

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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REFERENCES

ALPINE LUMBER SILVERTHORNE

Contact: Mr. Hamid Taha
303.451.8001 • htaha@alpinelumber.com
Contract Value: $8,387,000

Description: Currently under construction, this project will provide Alpine Lumber with a new facility to supply Summit County with high quality lumber and building materials. The 9 acre property, bordered on the north by the Blue River, will be for an indoor and outdoor lumber yard. The lumber yard features a 26,000-square-foot PEMB, as well as two storage structures totaling 12,000-square-feet of storage space. Within the main building is an 11,000-square-foot retail show room, a 14,000-square-foot indoor lumber yard with a truck drive through, and two stories of office space.

ESTES PARK PARKING GARAGE

Contact: Mr. Greg Muhonen, Director of Public Works
970.402.7400 • gmuhonen@estes.org

Contract Value: $7,256,000

Description: The Estes Park Parking Structure is a three-level, 412 stall 120,146 square foot parking garage that provides convenient access to the desired destinations in the highly visited downtown shopping area in Estes Park, Colo. The project consisted of demolition of the existing parking lot, construction of a new parking structure and parking lot to increase the parking spaces from 102 to 412 while also tying in the surrounding aesthetics of Estes Park.

HORSETOOTH INFORMATION CENTER

Contact: Mr. David Bragg, Project Manager Larimer County
970.494.8125 • dbragg@larimer.org

Contract Value: $4,415,000

Description: The Horsetooth Area Information Center provides guests a centralized location to talk to rangers, purchase parking passes and make camping reservations at Colorado's third busiest reservoir. The new two-story 11,839-square-foot information center is located at the reservoir's South Bay between the camping grounds and day-use area. *Reference the project sheet under experience for more detailed information.*

CDOT KOA CAMPUS PHASE I,II, III

Contact: Ms. Hope Wright, Property Management
720.237.6173 • hope.wright@state.co.us

Contract Value: $24,000,000

Description: Awarded through a Hard-Bid process, the project consisted of a phased construction of eight maintenance and vehicle buildings along with all site infrastructure and renovations of existing buildings on the CDOT KOA Campus in Aurora, Colo. *Reference the project sheet under experience for more detailed information.*

SCHEDULE

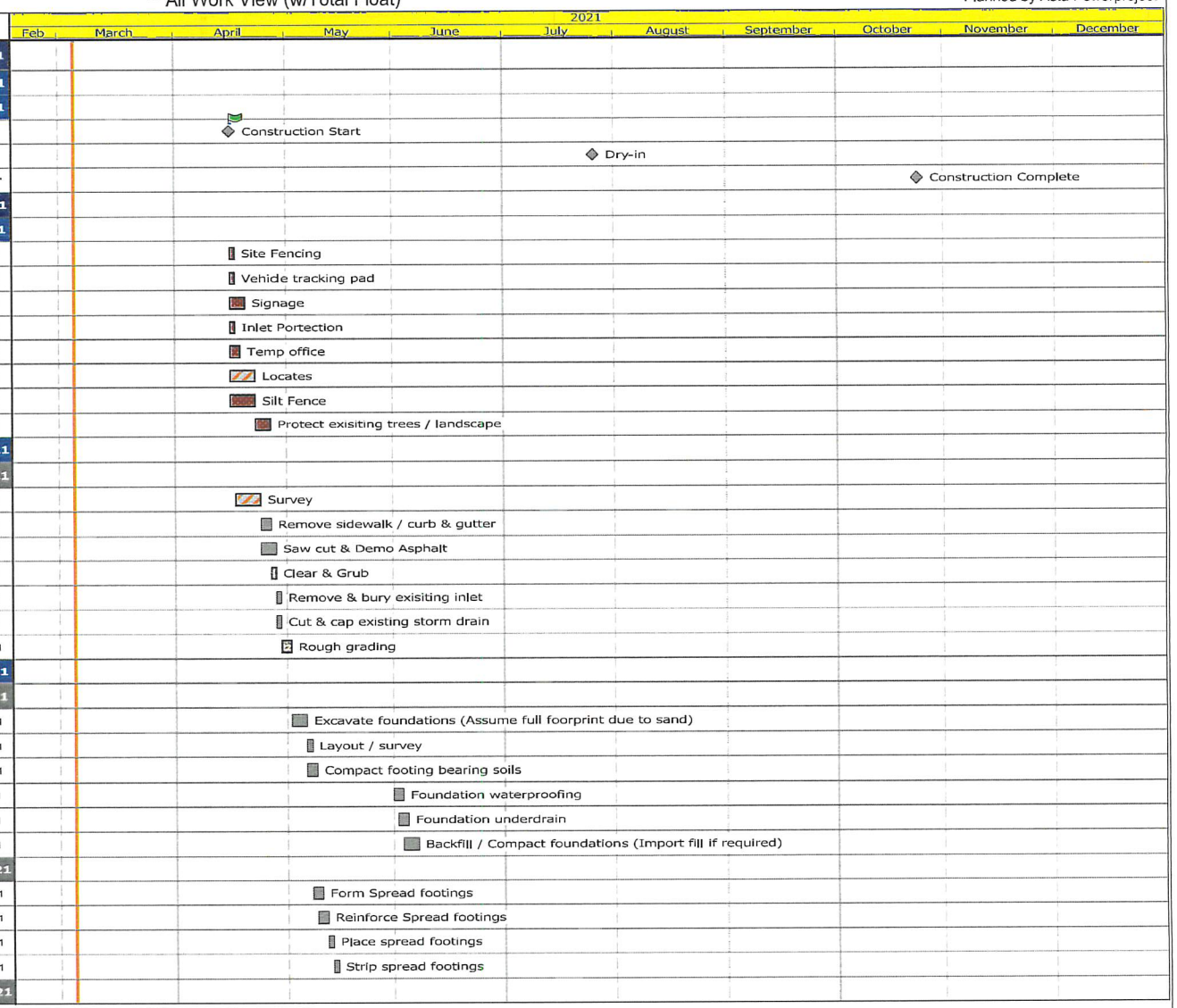
Frisco Marina

** All Work View (w/Total Float)

Printed: 3/4/2021

Planned by Asta Powerproject

Line	Name	OD	Start	Finish
	PROJECT MILESTONES	**171d**	**Feb 23 21**	**Oct 22 21**
	Pre-Construction Milestones	**0d**	**Feb 23 21**	**Feb 23 21**
	Construction Milestones	**133d**	**Apr 16 21**	**Oct 22 21**
4	Construction Start	0d	Apr 16 21 *	Apr 16 21
5	Dry-in	0d	Jul 26 21	Jul 26 21
6	Construction Complete	0d	Oct 22 21	Oct 22 21 *
	CONSTRUCTION	**142d**	**Apr 16 21**	**Nov 04 21**
	Mobilization	**8d**	**Apr 16 21**	**Apr 27 21**
9	Site Fencing	1d	Apr 16 21	Apr 16 21
10	Vehicle tracking pad	1d	Apr 16 21	Apr 16 21
11	Signage	3d	Apr 16 21	Apr 20 21
12	Inlet Portection	1d	Apr 16 21	Apr 16 21
13	Temp office	2d	Apr 16 21	Apr 19 21
14	Locates	5d	Apr 16 21	Apr 22 21
15	Silt Fence	5d	Apr 16 21	Apr 22 21
16	Protect exisiting trees / landscape	3d	Apr 23 21	Apr 27 21
	Site work / Utilities	**11d**	**Apr 19 21**	**May 03 21**
	Site prep	**11d**	**Apr 19 21**	**May 03 21**
19	Survey	5d	Apr 19 21	Apr 23 21
20	Remove sidewalk / curb & gutter	2d	Apr 26 21	Apr 27 21
21	Saw cut & Demo Asphalt	3d	Apr 26 21	Apr 28 21
22	Clear & Grub	1d	Apr 28 21	Apr 28 21
23	Remove & bury exisiting inlet	1d	Apr 29 21	Apr 29 21
24	Cut & cap existing storm drain	1d	Apr 29 21	Apr 29 21
25	Rough grading	2d	Apr 30 21	May 03 21
	Foundations	**32d**	**May 04 21**	**Jun 17 21**
	Foundation Earthwork / Misc	**24d**	**May 04 21**	**Jun 07 21**
28	Excavate foundations (Assume full foorprint due to sand)	3d	May 04 21	May 06 21
29	Layout / survey	1d	May 07 21	May 07 21
30	Compact footing bearing soils	2d	May 07 21	May 10 21
31	Foundation waterproofing	2d	Jun 01 21	Jun 02 21
32	Foundation underdrain	2d	Jun 02 21	Jun 03 21
33	Backfill / Compact foundations (Import fill if required)	3d	Jun 03 21	Jun 07 21
	Spread footings	**5d**	**May 10 21**	**May 14 21**
35	Form Spread footings	2d	May 10 21	May 11 21
36	Reinforce Spread footings	2d	May 11 21	May 12 21
37	Place spread footings	1d	May 13 21	May 13 21
38	Strip spread footings	1d	May 14 21	May 14 21
	Foundation wall - Pour 1	**6d**	**May 17 21**	**May 24 21**



SAUNDERS Heath

Owner:

Progress Period (Data Date): 2/8/2021

Start Date: 2/23/2021
Finish Date: 11/4/2021

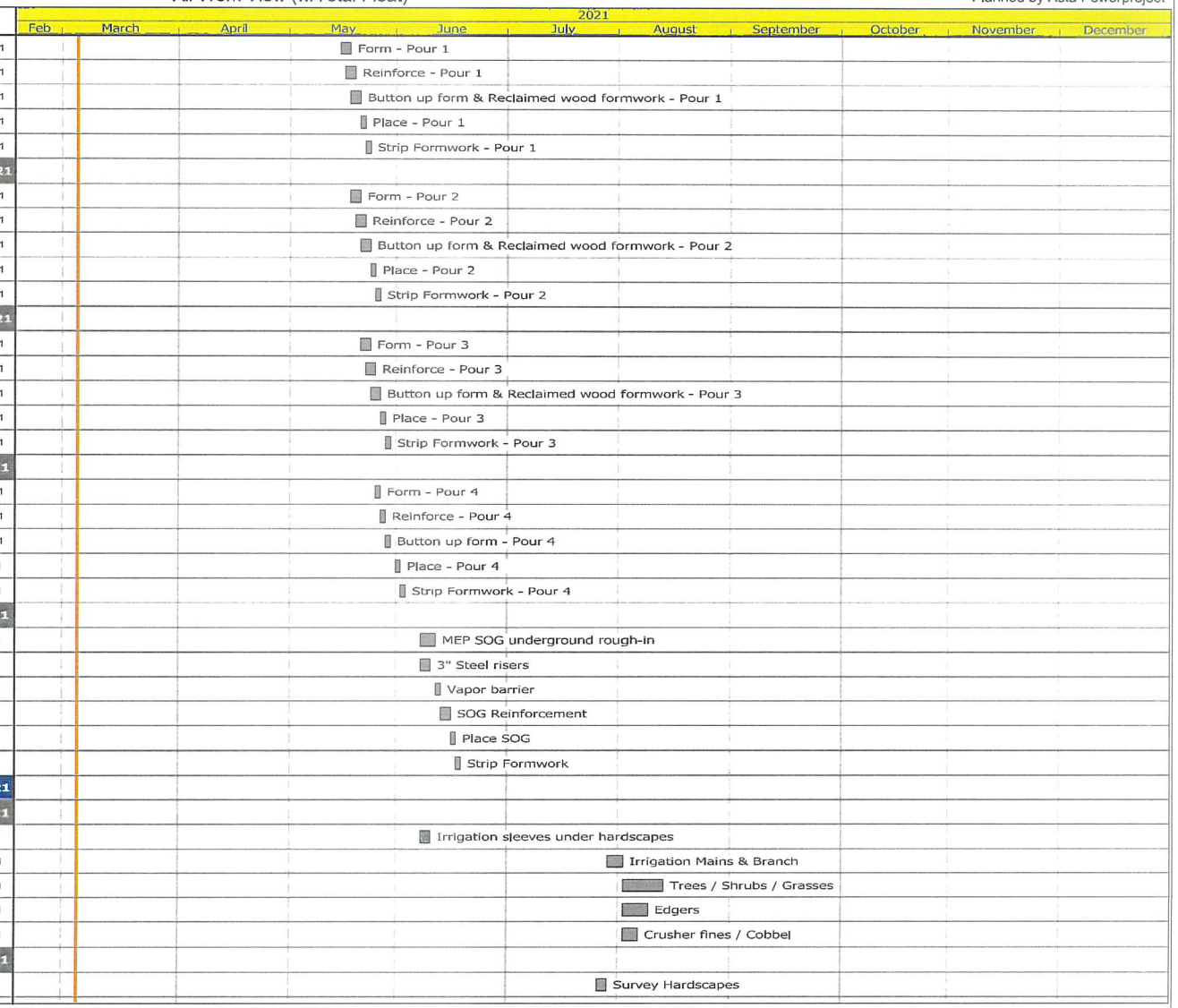
Frisco Marina

** All Work View (w/Total Float)

Printed: 3/4/2021

Planned by Asta Powerproject

Line	Name	OD	Start	Finish
40	Form - Pour 1	2d	May 17 21	May 18 21
41	Reinforce - Pour 1	2d	May 18 21	May 19 21
42	Button up form & Reclaimed wood formwork - Pour 1	2d	May 19 21	May 20 21
43	Place - Pour 1	1d	May 21 21	May 21 21
44	Strip Formwork - Pour 1	1d	May 24 21	May 24 21
	Foundation wall - Pour 2	**6d**	**May 19 21**	**May 26 21**
46	Form - Pour 2	2d	May 19 21	May 20 21
47	Reinforce - Pour 2	2d	May 20 21	May 21 21
48	Button up form & Reclaimed wood formwork - Pour 2	2d	May 21 21	May 24 21
49	Place - Pour 2	1d	May 25 21	May 25 21
50	Strip Formwork - Pour 2	1d	May 26 21	May 26 21
	Foundation wall - Pour 3	**6d**	**May 21 21**	**May 28 21**
52	Form - Pour 3	2d	May 21 21	May 24 21
53	Reinforce - Pour 3	2d	May 24 21	May 25 21
54	Button up form & Reclaimed wood formwork - Pour 3	2d	May 25 21	May 26 21
55	Place - Pour 3	1d	May 27 21	May 27 21
56	Strip Formwork - Pour 3	1d	May 28 21	May 28 21
	Foundation wall - Pour 4	**5d**	**May 26 21**	**Jun 02 21**
58	Form - Pour 4	1d	May 26 21	May 26 21
59	Reinforce - Pour 4	1d	May 27 21	May 27 21
60	Button up form - Pour 4	1d	May 28 21	May 28 21
61	Place - Pour 4	1d	Jun 01 21	Jun 01 21
62	Strip Formwork - Pour 4	1d	Jun 02 21	Jun 02 21
	SOG	**8d**	**Jun 08 21**	**Jun 17 21**
64	MEP SOG underground rough-in	3d	Jun 08 21	Jun 10 21
65	3" Steel risers	2d	Jun 08 21	Jun 09 21
66	Vapor barrier	1d	Jun 11 21	Jun 11 21
67	SOG Reinforcement	2d	Jun 14 21	Jun 15 21
68	Place SOG	1d	Jun 16 21	Jun 16 21
69	Strip Formwork	1d	Jun 17 21	Jun 17 21
	Hardscapes / Landscaping	**56d**	**Jun 08 21**	**Aug 25 21**
	Landscaping	**47d**	**Jun 08 21**	**Aug 12 21**
72	Irrigation sleeves under hardscapes	2d	Jun 08 21	Jun 09 21
73	Irrigation Mains & Branch	3d	Jul 29 21	Aug 02 21
74	Trees / Shrubs / Grasses	8d	Aug 03 21	Aug 12 21
75	Edgers	5d	Aug 03 21	Aug 09 21
76	Crusher fines / Cobbel	3d	Aug 03 21	Aug 05 21
	Hardscapes / sidewalks	**22d**	**Jul 27 21**	**Aug 25 21**
78	Survey Hardscapes	2d	Jul 27 21	Jul 28 21



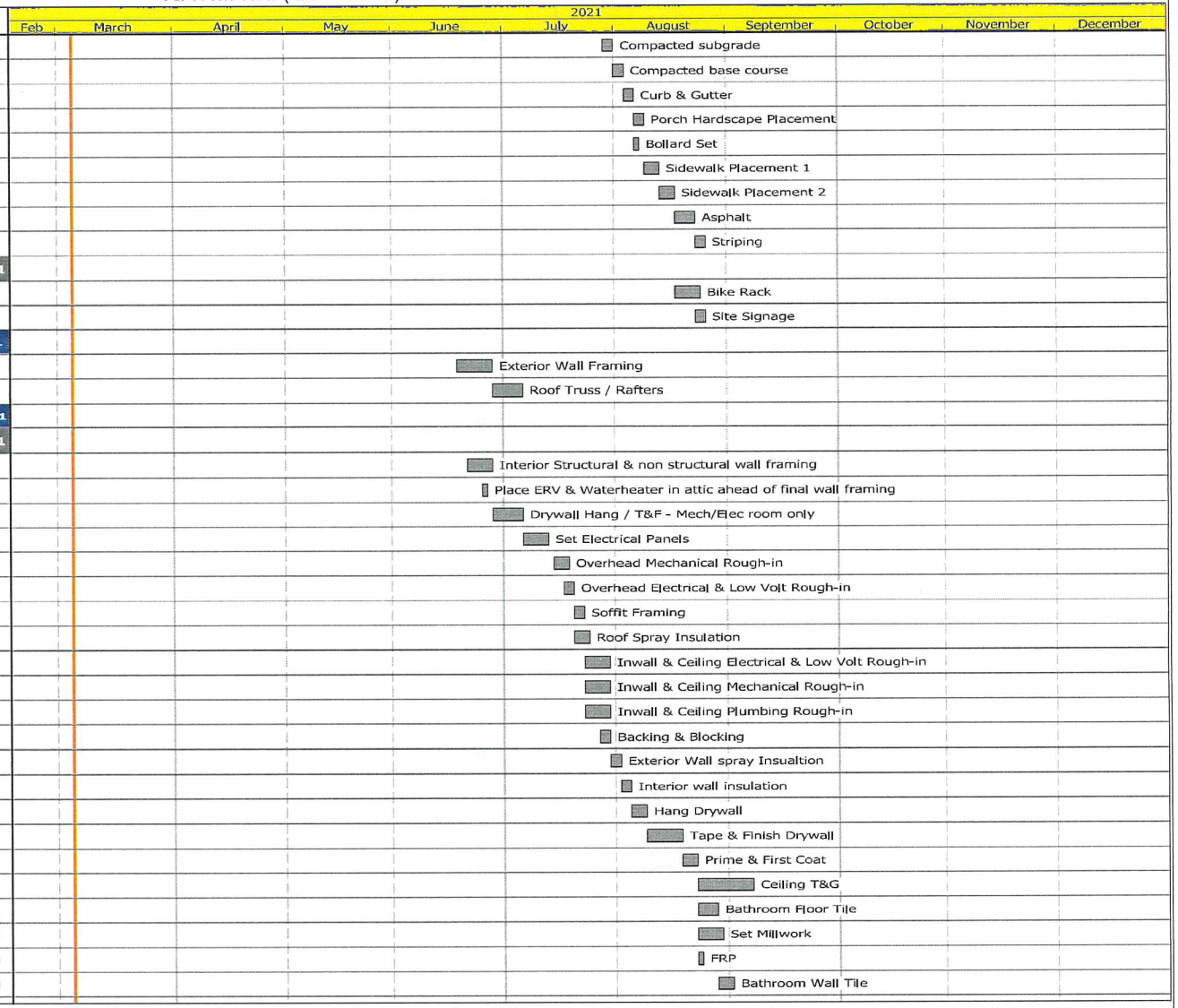
Frisco Marina

** All Work View (w/Total Float)

Printed: 3/4/2021

Planned by Asta Powerproject

Line	Name	OD	Start	Finish
79	Compacted subgrade	2d	Jul 29 21	Jul 30 21
80	Compacted base course	2d	Aug 02 21	Aug 03 21
81	Curb & Gutter	2d	Aug 04 21	Aug 05 21
82	Porch Hardscape Placement	2d	Aug 06 21	Aug 09 21
83	Bollard Set	1d	Aug 06 21	Aug 06 21
84	Sidewalk Placement 1	3d	Aug 10 21	Aug 12 21
85	Sidewalk Placement 2	3d	Aug 13 21	Aug 17 21
86	Asphalt	4d	Aug 18 21	Aug 23 21
87	Striping	2d	Aug 24 21	Aug 25 21
	Site accessories	**6d**	**Aug 18 21**	**Aug 25 21**
89	Bike Rack	5d	Aug 18 21	Aug 24 21
90	Site Signage	2d	Aug 24 21	Aug 25 21
	Structure	**12d**	**Jun 18 21**	**Jul 06 21**
92	Exterior Wall Framing	7d	Jun 18 21	Jun 28 21
93	Roof Truss / Rafters	5d	Jun 29 21	Jul 06 21
	Interior Finishes	**96d**	**Jun 22 21**	**Nov 04 21**
	Interior buildout	**69d**	**Jun 22 21**	**Sep 28 21**
96	Interior Structural & non structural wall framing	5d	Jun 22 21	Jun 28 21
97	Place ERV & Waterheater in attic ahead of final wall framing	1d	Jun 25 21	Jun 25 21
98	Drywall Hang / T&F - Mech/Elec room only	5d	Jun 29 21	Jul 06 21
99	Set Electrical Panels	5d	Jul 07 21	Jul 13 21
100	Overhead Mechanical Rough-in	3d	Jul 15 21	Jul 19 21
101	Overhead Electrical & Low Volt Rough-in	2d	Jul 19 21	Jul 20 21
102	Soffit Framing	2d	Jul 21 21	Jul 22 21
103	Roof Spray Insulation	3d	Jul 21 21	Jul 23 21
104	Inwall & Ceiling Electrical & Low Volt Rough-in	5d	Jul 23 21	Jul 29 21
105	Inwall & Ceiling Mechanical Rough-in	5d	Jul 23 21	Jul 29 21
106	Inwall & Ceiling Plumbing Rough-in	5d	Jul 23 21	Jul 29 21
107	Backing & Blocking	2d	Jul 28 21	Jul 29 21
108	Exterior Wall spray Insualtion	2d	Jul 30 21	Aug 02 21
109	Interior wall insulation	2d	Aug 03 21	Aug 04 21
110	Hang Drywall	3d	Aug 05 21	Aug 09 21
111	Tape & Finish Drywall	7d	Aug 10 21	Aug 18 21
112	Prime & First Coat	3d	Aug 19 21	Aug 23 21
113	Ceiling T&G	10d	Aug 24 21	Sep 07 21
114	Bathroom Floor Tile	4d	Aug 24 21	Aug 27 21
115	Set Millwork	5d	Aug 24 21	Aug 30 21
116	FRP	1d	Aug 24 21	Aug 24 21
117	Bathroom Wall Tile	3d	Aug 30 21	Sep 01 21



SAUNDERS Heath

Owner:

Progress Period (Data Date): 2/8/2021

Start Date: 2/23/2021
Finish Date: 11/4/2021

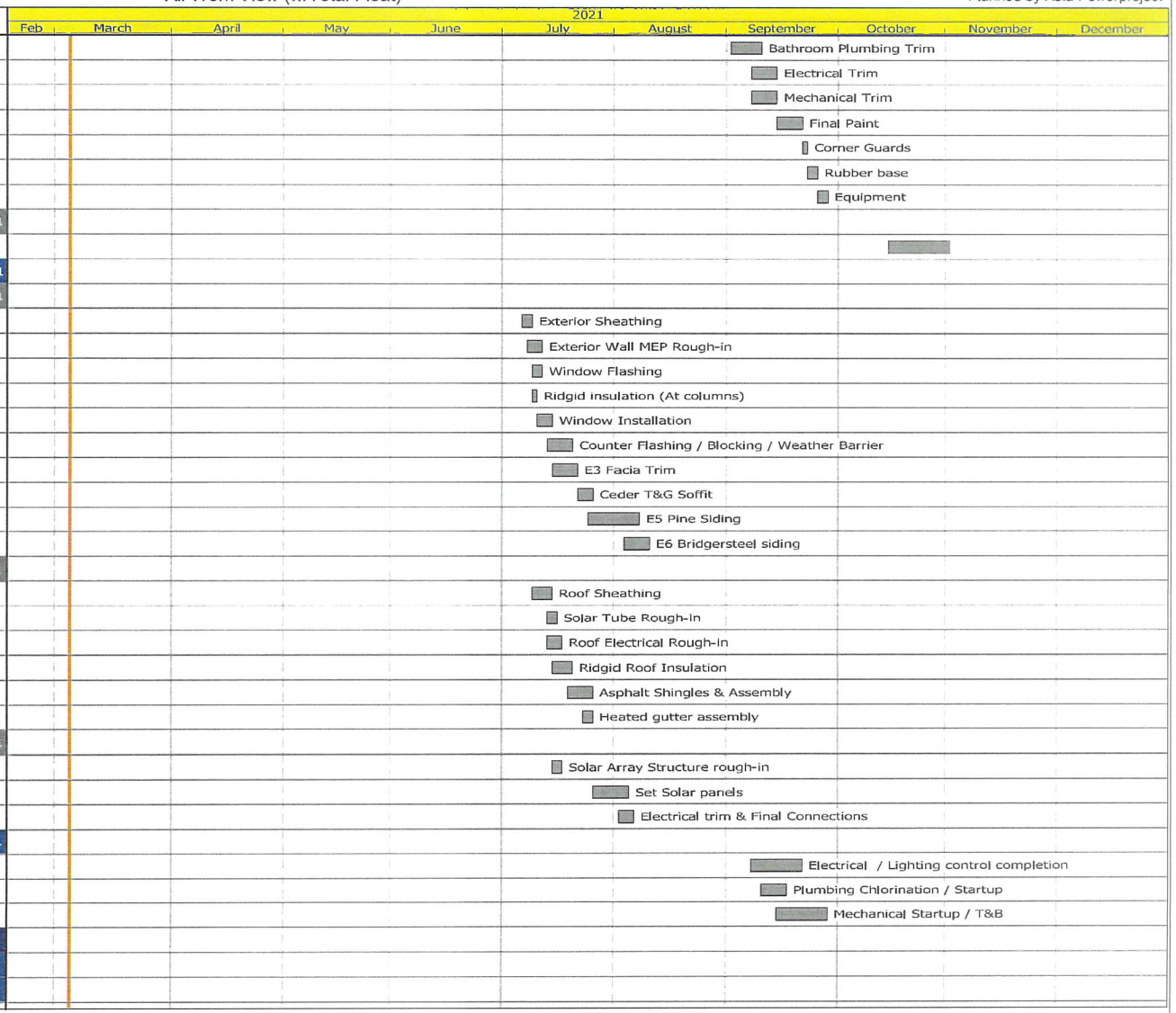
Frisco Marina

Printed: 3/4/2021

** All Work View (w/Total Float)

Planned by Asta Powerproject

Line	Name	OD	Start	Finish
118	Bathroom Plumbing Trim	5d	Sep 02 21	Sep 09 21
119	Electrical Trim	5d	Sep 08 21	Sep 14 21
120	Mechanical Trim	5d	Sep 08 21	Sep 14 21
121	Final Paint	5d	Sep 15 21	Sep 21 21
122	Corner Guards	1d	Sep 22 21	Sep 22 21
123	Rubber base	2d	Sep 23 21	Sep 24 21
124	Equipment	2d	Sep 27 21	Sep 28 21
	FFE	**15d**	**Oct 15 21**	**Nov 04 21**
126	Owner FFE	15d	Oct 15 21	Nov 04 21
	Exterior Facade	**25d**	**Jul 07 21**	**Aug 10 21**
	Exterior Wall assembly	**25d**	**Jul 07 21**	**Aug 10 21**
129	Exterior Sheathing	2d	Jul 07 21	Jul 08 21
130	Exterior Wall MEP Rough-in	3d	Jul 08 21	Jul 12 21
131	Window Flashing	2d	Jul 09 21	Jul 12 21
132	Ridgid insulation (At columns)	1d	Jul 09 21	Jul 09 21
133	Window Installation	3d	Jul 12 21	Jul 14 21
134	Counter Flashing / Blocking / Weather Barrier	5d	Jul 14 21	Jul 20 21
135	E3 Facia Trim	5d	Jul 15 21	Jul 21 21
136	Ceder T&G Soffit	3d	Jul 22 21	Jul 26 21
137	E5 Pine Siding	10d	Jul 26 21	Aug 06 21
138	E6 Bridgersteel siding	5d	Aug 04 21	Aug 10 21
	Roof Assembly	**12d**	**Jul 09 21**	**Jul 26 21**
140	Roof Sheathing	4d	Jul 09 21	Jul 14 21
141	Solar Tube Rough-in	2d	Jul 14 21	Jul 15 21
142	Roof Electrical Rough-in	3d	Jul 14 21	Jul 16 21
143	Ridgid Roof Insulation	4d	Jul 15 21	Jul 20 21
144	Asphalt Shingles & Assembly	5d	Jul 20 21	Jul 26 21
145	Heated gutter assembly	2d	Jul 23 21	Jul 26 21
	Solar Array	**16d**	**Jul 15 21**	**Aug 05 21**
147	Solar Array Structure rough-in	2d	Jul 15 21	Jul 16 21
148	Set Solar panels	7d	Jul 27 21	Aug 04 21
149	Electrical trim & Final Connections	3d	Aug 03 21	Aug 05 21
	MEP Start-Up / Commissioning	**15d**	**Sep 08 21**	**Sep 28 21**
151	Electrical / Lighting control completion	10d	Sep 08 21	Sep 21 21
152	Plumbing Chlorination / Startup	5d	Sep 10 21	Sep 16 21
153	Mechanical Startup / T&B	10d	Sep 15 21	Sep 28 21
	PROJECT CLOSEOUT	**46d**	**Aug 26 21**	**Oct 29 21**
	Final Inspections	**35d**	**Aug 26 21**	**Oct 14 21**
	Punchlist / Turnover	**25d**	**Sep 27 21**	**Oct 29 21**



Frisco Marina

Printed: 3/4/2021

** All Work View (w/Total Float)

Planned by Asta Powerproject

Line	Name	OD	Start	Finish
157	Pre-Punchlist all spaces (SCI)	5d	Sep 27 21	Oct 01 21
158	Punchlist corrections	5d	Oct 04 21	Oct 08 21
159	Punchlist all spaces	5d	Oct 11 21	Oct 15 21
160	Punchlist corrections	5d	Oct 18 21	Oct 22 21
161	Owner training	10d	Oct 18 21	Oct 29 21
162	Substantial Completion	0d	Oct 22 21	Oct 22 21

Subcontractor

SCI | Survey / Locates | Earthwork | Landscaping | SCI Punch | Architect

SAUNDERS Heath

Owner:

Progress Period (Data Date): 2/8/2021

Start Date: 2/23/2021
Finish Date: 11/4/2021

BID BOND

COLORADO BID BOND

BOND NO. BID BOND
AMOUNT OF BOND: $ Five Percent of Total Amount Bid (5%)

KNOW ALL MEN BY THESE PRESENTS, that Heath Construction, LLC dba Saunders *, hereinafter called the PRINCIPAL, and Travelers Casualty and Surety Company **, a corporation duly organized under the laws of the State of CT and SD, having its principal place of business at One Tower Square, Hartford, CT 06183 and *** in the State of CT and IL, and authorized to do business in the State of Colorado, as SURETY, are held and firmly bound unto the Town of Frisco, hereinafter called the OBLIGEE, in the sum of Five Percent of Total Amount Bid DOLLARS ($ ---5%---), for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

THE CONDITION OF THIS BOND IS SUCH THAT:

WHEREAS, the PRINCIPAL is herewith submitting his Bid for:

Frisco Bay Marina Office Building and Civil Construction, Frisco, CO
(Describe project)

said Bid, by this reference thereto being hereby made a part hereof; and

WHEREAS, the OBLIGEE has required as a condition for receiving said Bid that the PRINCIPAL furnish the OBLIGEE with security as provided herein;

NOW, THEREFORE, if the PRINCIPAL shall, within sixty (60) days after Bid Opening:

(A) On the prescribed forms presented to him for signature, enter into a written Formal Contract with the OBLIGEE in accordance with his Bid as accepted, give Performance and Payment Bonds with good and sufficient Surety or Sureties as is required upon the forms prescribed in the Contract Documents, and deliver the certificates of insurance required by the Contract Documents, or

(B) Pay to the OBLIGEE the said sum of this bond as liquidated damages, and not as a penalty,

*Heath, 1212 Riverside Avenue, Suite 130, Fort Collins, CO 80524
**of America and Western Surety Company
***151 North Franklin Street, Chicago, IL 60606

THEN, this obligation shall be void and of no effect; otherwise to remain in full force and effect.

Signed and sealed this 5th day of March, 20 21.

PRINCIPAL Heath Construction, LLC dba Saunders Heath
By: _____

SURETY Travelers Casualty and Surety Company of America and Western Surety Company
By: _____
Attorney-In-Fact Amy Coonts

IMA
1705 17th Street, Suite 100
Denver, CO 80202
Phone 303.534.4567

TRAVELERS

Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company are corporations duly organized under the laws of the State of Connecticut (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint **Amy Coonts** of **DENVER**, **Colorado**, their true and lawful Attorney-in-Fact to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **17th** day of **January**, **2019.**

State of Connecticut

City of Hartford ss.

By: _____
Robert L. Raney, Senior Vice President

On this the **17th** day of **January**, **2019**, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of said Companies by himself as a duly authorized officer.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission expires the **30th** day of **June**, **2021**

_____
Anna P. Nowik, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, **Kevin E. Hughes**, the undersigned, Assistant Secretary of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which remains in full force and effect.

Dated this **5th** day of **March**, **2021**.

_____
Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, please call us at 1-800-421-3880.
Please refer to the above-named Attorney-in-Fact and the details of the bond to which this Power of Attorney is attached.

TRAVELERS

SURETY BOND SEAL ADDENDUM
TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA

Due to logistical issues associated with the use of traditional seals during the COVID-19 pandemic, Travelers Casualty and Surety Company of America ("Travelers") has authorized its Attorneys-in-Fact to affix Travelers' corporate seal to any bond executed on behalf of Travelers by any such Attorney-in-Fact by attaching this Addendum to said bond.

To the extent this Addendum is attached to a bond that is executed on behalf of Travelers by its Attorney-in-Fact, Travelers hereby agrees that the seal below shall be deemed affixed to said bond to the same extent as if its raised corporate seal was physically affixed to the face of the bond.

Dated this 16th day of March, 2020.

Travelers Casualty and Surety Company of America

By: _____
Robert L. Raney, Senior Vice President

Western Surety Company

POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That WESTERN SURETY COMPANY, a South Dakota corporation, is a duly organized and existing corporation having its principal office in the City of Sioux Falls, and State of South Dakota, and that it does by virtue of the signature and seal herein affixed hereby make, constitute and appoint

Sarah Finn, Sheryll Shaw, Jennifer L Clampert, Brandi J Tetley, Michael Lischer Jr, Nicole L Mc Collam, Kristen Moore, David Dondlinger, Amy Coonts, Danielle Waring, Individually

of Denver, CO, its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on its behalf bonds, undertakings and other obligatory instruments of similar nature

- In Unlimited Amounts -

and to bind it thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of the corporation and all the acts of said Attorney, pursuant to the authority hereby given, are hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the By-Law printed on the reverse hereof, duly adopted, as indicated, by the shareholders of the corporation.

In Witness Whereof, WESTERN SURETY COMPANY has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed on this 19th day of February, 2021.

WESTERN SURETY COMPANY

Paul T. Bruflat, Vice President

State of South Dakota } ss
County of Minnehaha }

On this 19th day of February, 2021, before me personally came Paul T. Bruflat, to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Sioux Falls, State of South Dakota; that he is the Vice President of WESTERN SURETY COMPANY described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporation and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporation.

My commission expires
June 23, 2021

J. MOHR
NOTARY PUBLIC
SOUTH DAKOTA

J. Mohr, Notary Public

CERTIFICATE

I, L. Nelson, Assistant Secretary of WESTERN SURETY COMPANY do hereby certify that the Power of Attorney hereinabove set forth is still in force, and further certify that the By-Law of the corporation printed on the reverse hereof is still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said corporation this 5th day of March, 2021.

WESTERN SURETY COMPANY

L. Nelson, Assistant Secretary

Form F4280-7-2012

Go to www.cnasurety.com > Owner / Obligee Services > Validate Bond Coverage, if you want to verify bond authenticity.

Authorizing By-Law

ADOPTED BY THE SHAREHOLDERS OF WESTERN SURETY COMPANY

This Power of Attorney is made and executed pursuant to and by authority of the following By-Law duly adopted by the shareholders of the Company.

Section 7. All bonds, policies, undertakings, Powers of Attorney, or other obligations of the corporation shall be executed in the corporate name of the Company by the President, Secretary, and Assistant Secretary, Treasurer, or any Vice President, or by such other officers as the Board of Directors may authorize. The President, any Vice President, Secretary, any Assistant Secretary, or the Treasurer may appoint Attorneys in Fact or agents who shall have authority to issue bonds, policies, or undertakings in the name of the Company. The corporate seal is not necessary for the validity of any bonds, policies, undertakings, Powers of Attorney or other obligations of the corporation. The signature of any such officer and the corporate seal may be printed by facsimile.

CNA SURETY

Digital Seal Authority and Enforceability

This communication is being provided on behalf of all CNA Surety companies, including **Western Surety Company, Continental Casualty Company, The Continental Insurance Company, American Casualty Company of Reading, Pennsylvania,** and **National Fire Insurance Company of Hartford** (collectively and individually referred to as "CNA Surety").

The use of an electronic image of the corporate seal of any CNA Surety company (the "Digital Seal") and the attachment of the Digital Seal to any surety bond issued by a CNA Surety company is authorized. Each CNA Surety company acknowledges and agrees that the Digital Seal may be affixed to any CNA Surety bond and relied upon to the same extent as if a raised corporate seal were physically attached to the bond.

Delivery of a digital copy of this Digital Seal Authority and Enforceability notice, executed electronically, to an Obligee or Obligee's representative shall constitute effective execution and delivery of this notice and shall have the same legal effect as delivery of a tangible original of the notice with my original "wet" signature.

In Witness Whereof, this has been executed by the Vice President and Surety General Counsel for each of the CNA Surety companies.

Dated this 31st day of March, 2020.

Rosemary Quinn
Vice President and Surety General Counsel on behalf of

Western Surety Company

The Continental Insurance Company

Continental Casualty Company

National Fire Insurance Company of Hartford

American Casualty Company of Reading, Pennsylvania

PROTECTING ASSETS.
MAKING A DIFFERENCE.

February 23, 2021

Gabe Dunbar
Heath Construction, LLC dba Saunders Heath
1212 Riverside Avenue, Suite 130
Fort Collins, CO 80524

RE: **Town of Frisco, Colorado**
Frisco Bay Marina Office Building and Civil Construction, Saunders Project No. 21031009

Dear Gabe:

Enclosed is the bid bond for the referenced project. The specifications for this project reference a two-year maintenance/warranty requirement on workmanship and materials. The first year of warranty is included in the cost of the performance/payment bonds. The rates for the second year of warranty are as follows.

First $7,500,000.00	$1.25 per thousand
Over $7,500,000.00	$1.10 per thousand

Please be sure to add this additional cost when calculating bond premium for your bid. Please give me a call if you have any questions.

Good luck on your bid!

Thank you,

Amy Coonts
Surety Account Manager

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK

EXHIBIT A TO CONSTRUCTION AGREEMENT

GENERAL CONDITIONS

ATTACHMENT N

ADDENDA 1 THROUGH 3

PROJECT DISCLOSURE

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK PROJECT

REQUEST FOR PROPOSALS (RFP)

ADDENDUM #1

This Addendum, dated February 5, 2021, is to address the schedule outlined in the published RFP as it pertains to the Request for Information (RFI) deadline dates listed in the RFP. Due to the delay in producing the specifications manual for this project, the Town finds it necessary to amend and extend the deadline for RFI's to be submitted and for the deadline for the RFI's to be answered.

Therefore, the deadline for RFI's to be submitted will be changed from February 10, 2021 at 3:00PM to February 17, 2021 at 3:00PM and the deadline for the RFI's to be answered by the Town will be changed from February 17, 2021 at 3:00PM to February 24, 2021 at 3:00PM. No other dates or times are changed by this addendum.

Additionally, this Addendum, dated February 5, 2021, adds the document titled "FRISCO BAY MARINA PHASE 2.1 – PROJECT MANUAL", dated February 5, 2021, to the official project record and states that the Town has made it available for immediate review by all known prospective bidders, through the previously shared link to the project folder.

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL WORK PROJECT

REQUEST FOR PROPOSALS (RFP)

ADDENDUM #2

This Addendum #2, dated February 24, 2021, is to add and remove certain Contract and RFP documents within the official project folder. Due to revisions made to the project drawings and project manual, the Town finds it necessary to produce this addendum to add newly revised documents to the project folder as well as remove obsolete files from the project folder.

Therefore, the following documents are added to or removed from, as indicated, the project folder and official contract documents;

FBM – PRICING REV.1 – 2.24.21 – **ADDED** TO PROJECT FOLDER / CONTRACT DOCUMENTS

PLAN SET – 1.15.21 – **REMOVED** FROM PROJECT FOLDER / CONTRACT DOCUMENTS

FBM – PHASE 2.1 PROJECT MANUAL REV.1 – 2.24.21 – **ADDED** TO PROJECT FOLDER / CONTRACT DOCUMENTS

FBM – PHASE 2.1 PROJECT MANUAL – **REMOVED** FROM PROJECT FOLDER / CONTRACT DOCUMENTS

FBM – OFFICE BID FORM – 2.24.21 – **ADDED** TO PROJECT FOLDER / CONTRACT DOCUMENTS

FBM – OFFICE/CIVIL RFP – FINAL BID QUESTIONS RESPONSE – 2.24.21 – **ADDED** TO PROJECT FOLDER / CONTRACT DOCUMENTS

END OF ADDENDUM

FRISCO BAY MARINA

OFFICE BUILDING & CIVIL CONSTRUCTION

REQUEST FOR PROPOSALS (RFP)

ADDENDUM #3

This Addendum #3, dated March 3, 2021, is to insert additional language and information into the Invitation to Bid section of the Contract Documents. The Town will be conducting the public bid opening virtually due to COVID-19 restrictions currently in place. Due to this, the Town sees the need to provide all potential bidders further instructions for the submittal of bids and to provide all potential bidders a link to the virtual meeting to be held on Friday, March 5, 2021 at 2:00PM MST.

Additional bidding instructions to be added to the Invitation to Bid are as follows:

1. The following information must be included in the subject line of the message: "FBM – OFFICE BUILDING & CIVIL CONSTRUCTION" – (insert bidder/ company name here).
2. All proposals must be in a PDF format and attached to the message.
3. All proposals shall have the bid form as the cover sheet of the proposal to facilitate a more efficient virtual bid opening.
4. Proposals will be opened on a screen that will be shared will all attendees and the bidders name and total proposal amount will be read aloud.
5. A bid tabulation report will be generated and placed in the project folder no later than 12:00PM MST Monday, March 8, 2021.
6. All bids must be received via electronic email to jeffg@townoffrisco.com no later than 12:00PM MST Friday, March 5, 2021.

Information to attend the Bid Opening is as follows:

https://zoom.us/j/93053120570?pwd=T0xvc0crVnJXMWNUZjB5bDhpdVVmZz09

Meeting ID: 930 5312 0570

Passcode: 869077

Find your local number: https://zoom.us/u/achlNvBlyB

Project(s) Disclosure

The construction plans for the Frisco Bay Marina contain; utilities, lift station, civil construction and office building. It should be known by all prospective bidders that the selected contractors will have to know these plans to the best of their abilities and knowledge, in the event that two contractors are working on site at the same time.

It is the duty of the Town of Frisco, to distribute this information to prospective bidders, in an effort to pinpoint any areas where two contractors may interact throughout the course of any of the three projects which are being advertised.