BELTLINE at I-635

IRVING, TEXAS

PROJECT MANUAL

MELTON HENRY ARCHITECTURAL GROUP

BELTLINE & I-635

IRVING, TEXAS

PROJECT MANUAL

OWNER
BlueWave Express Development, LLC
1455 First Street
Suite 301
Napa, California 94559

ARCHITECT
Melton Henry Architectural Group
5100 Westheimer, Suite 425
Houston, Texas 77056
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SECTION 00100

INVITATION TO BIDDERS

PART 1 GENERAL

1.01 INVITATION

A. The bidders list for this Project has been selected by the Owner and bids will be accepted only from invited bidders. Invited bidders are requested to inform the Architect whether or not they wish to bid this Work.

1.02 WORK DESCRIPTION:

A. Construct the a new BlueWave Express Carwash located at Beltline & I-635 in Irving, Texas The Project includes the construction of:

Express Car Wash Building and interior finishes, site improvements, and sunshade structures

PART 2 THE BID

2.01 BID TYPE

TYPE OF BID: Lump Sum

BID BOND: Not required.

PAY & PERFORMANCE BOND: Required

BID RECEIVER: Everett P. Jackson
4545 Post Oak Place
Suite 140
Houston, Texas 77027

2.02 DOCUMENTS

A. Each prime Bidder will be provided with electronic files of the Drawings and Project Manual.
B. Bidders are encouraged to inspect the site prior to bidding.

2.03 DISCREPANCIES

A. If during the bidding period, a Bidder observes errors, discrepancies, ambiguities, or omissions, or requires clarification as the meaning of the Contract Documents, he shall immediately infor the Architect who in turn will send written addenda to all bidders.
B. Requests for clarifications shall be made to the Architect's office by e-mail: BWEbeltline@hotmail.com
C. Bidders communications will not receive consideration unless they are received by the Architect at least 7 calendar days prior to bid date. Architect will not issue addenda later than 5 calendar days prior to bid date.

2.04 LUMP SUM BID

A. Bids must be submitted on forms prepared by the Architect which are included in the Project Manual. Bidders will be furnished with an electronic bid form written in Microsoft Word format.
B. Bids shall be submitted in duplicate, with each copy signed by an office of the company duly authorized to commit to contracts.
C. Bidders may submit their bids electronically via the e-mail account listed above. Original hard copies must be received not later than 2 days following bid date.
D. Bid opening will be private.
E. The Owner reserves the right to reject any and all bid proposals without explanation.
F. Determination of the successful bidder will be made in private session based on all pertinent data contained in the Lump Sum Bid.

END OF INVITATION TO BIDDERS

SECTION 00300

BID FORM

BlueWave Express
1455 First Street
Suite 301
Napa, CA 94559

The undersigned, having carefully examined the Conditions of the Contract, the Drawings and the Specifications for construction of the above named Project, hereby proposes and agrees to furnish all labor, materials, equipment, plant, transportation, services, sales taxes, permit fees and other costs necessary to complete construction in strict conformity with the Conditions of the Contract, the Drawings and the Specifications, including all work specified in Addenda number and dated all as prepared by Melton Henry Architectural Group.

STIPULATED BASE BID:

Division 1:	General Conditions	$ _____
Division 2:	Site paving, walks, curbs, gutters, approaches	$ _____
Division 3:	Concrete, rebar, and Foundations	$ _____
Division 4:	Masonry	$ _____
Division 5:	Struct steel, deck, erection, and misc metals	$ _____
Division 6:	Rough Carpentry	$ _____
	Millwork	$ _____
Division 7:	Thermal Insulation, sealants, flashing and sheetmetal	$ _____
	Metal Roofing and Metal Soffit	$ _____
	TPO Roofing and insulation	$ _____
Division 8:	Doors and Frames, hardware	$ _____
	Overhead coiling doors	$ _____
	Aluminum storefront, windows, and glazing	$ _____
Division 9:	Plaster	$ _____
	Gyp board, acoustical ceilings, lightgage framing	$ _____
	Special Wall panel	$ _____
	Ceramic Tile Exterior	$ _____
	Ceramic Tile Interior	$ _____
	Painting	$ _____
	Wall base	$ _____

Division 10:	Fire Protection Specialties	$ _____
	Extruded Aluminum Canopy	$ _____
	Toilet Accessories	$ _____
Division 12	Equipment Coordination with Owner's Carwash Installation	$ _____
Division 15	Plumbing Complete	$ _____
	HVAC Complete	$ _____
Division 16	Electrical Complete	$ _____
OH & P	Overhead and Profit	$ _____
	TOTAL BASE BID	**$** _____

We propose to furnish all labor, materials, equipment, tools, construction equipment and machinery, temporary facilities and utilities and other services necessary for the construction, accomplishment and completion in a workmanlike manner for the lump sum amount of_____

(Written in cursive as dollars and cents)

($_____).

(Written in Numbers)

ALTERNATES:

Alternate #A1 _____

Alternate #B1 _____

Voluntary Alternate 1: _____

Voluntary Alternate 1: _____

If this Bid Form is accepted, the undersigned agrees to execute the required agreement, execute the bond, and commence construction within seven calendar days from date of receiving notice of acceptance of the Bid Form.

TIME OF COMPLETION:

The undersigned further agrees to complete the construction in 120 calendar days from the after the date executing the Contract.

LIST OF SUBCONTRACTORS:

The undersigned agrees, if notified of the acceptance of his or her bid form, to furnish the Owner, through the Architect, a typewritten list of the names, addresses and telephone numbers of all subcontractors with whom he or she intends to enter into contract for the execution of portions of the entire work under consideration. He or she agrees that such list must be submitted on or before the tenth calendar day following the acceptance of this Bid Form, and before execution of the Contract, that no substitutions shall be made in the employment of subcontractors without written approval having first been obtained through the Architect.

CONTRACT:

If the undersigned is notified of the acceptance of this Bid Form within thirty calendar days after the date of this Bid Form, he or she agrees to execute a Contract for the above work for the above stated compensation, in the form of the Standard Agreement as currently in use by the Owner, with modifications, if required, to make such standard form acceptable to both parties.

SUBMISSION AND ACCEPTANCE OF BID:

The undersigned declares that the preparation and submission of bid and other quotations herein contained do not obligate the Owner and the Architect in any way. The undersigned agrees and understands that the Owner assumes no obligation to enter into a contract for the work.

THE UNDERSIGNED ACKNOWLEDGES

1. That he or she understands the bidding documents, the Conditions of the Contract, the drawings, the specifications and the addenda.

2. That he or she has the equipment, technical ability, personnel and facilities to construct the Project in accord with the Conditions of the Contract, the drawings, the specifications and the addenda.

3. That he or she has visited the site and is completely familiar with all conditions affecting the proposed work described herein.

4. That the undersigned hereby certifies that he or she is licensed as a contractor by the municipality in which the project occurs, that such license is in full force and effect and that any and all subcontractors to be employed on the Project are similarly licensed.

STATUS

The status of bidder must be given, whether individual, co-partnership or corporation. If co-partnership, give full names of partners; if corporation, give State in which incorporated.

TYPE OF ORGANIZATION: _ _____
(Individual, CO-partnership, Corporation, etc)

FIRM NAME_____

NAMES OF INDIVIDUAL FIRM MEMBERS:

_____

_____

(seal)

_____

CONTRACTOR'S SIGNATURE

_____

ADDRESS

_____

LICENSE NO.

_____

TELEPHONE

DATED THIS _____DAY OF _____ , 2011

END OF SECTION

SECTION 00650

CERTIFICATES OF INSURANCE

PART 1 GENERAL

1.01 SUMMARY·

1. Contractor shall, at its own expense, provide and maintain during the entire performance period of this contract at least the kinds and minimum amounts of insurance required herein. Owner shall be named as an additional insured on Contractor's commercial General Liability and Umbrella Liability policies for any liability arising out of Contractor's performance of the Work. Each policy shall state that such insurance is primary and that any insurance maintained by Owner is excess and non-contributory.

2. Before commencing Work under this contract, Contractor shall furnish Owner with a Certificate of Insurance evidencing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting Owner's interest shall not be effective without sixty (60) days prior notice to Owner. Standard Certificates of Insurance which do not provide for Owner's status as an additional insured and mandatory advance notice of cancellation or material changes in coverage are not acceptable under this provision.

3. Contractor shall insert the substance of this Article, in subcontracts under this Contract, that require work on an installation owned or operated by, or under the control of Owner and shall require subcontractors to provide and maintain the insurance required herein.

4. Standard Insurance Schedule: Policies At all times during the term of this Contract, Contractor shall procure, pay for, and maintain with approved insurance carriers, the insurance set for the below, and shall require all subcontractors performing Work under this Contract to do likewise.

    a. Worker’s Compensation and Employers Liability Insurance

        i. Workers’ Compensation: Statutory Limits

        ii. Employers Liability: Limits Required:
        $500,000 Each Accident
        $500,000 Disease
        $500,000 Disease Aggregate

    These insurance policies must be endorsed with Waiver of Subrogation Endorsements, waiving the carrier’s right of subrogation with respect to Owner, and must also be endorsed with Master and Servant (Alternate Employer) Endorsements.

    b. Commercial General Liability (CGL)

        i. Contractor's Operations

        ii. Premises Liability

        iii. Broad Form Contractual Liability

        iv. Where there is an exposure for damage due to explosion, collapse or underground operations.

            Limits Required -Bodily Injury and Property Damage Combined:

            $1,000,000 Each Occurrence

$1,000,000 Premises Operations

$1,000,000 Products & Completed Operations

$2,000.000 General Aggregate (other than Products Complete Operations)

$1,000,000 Personal and Advertising Injury

c. Automobile Liability Insurance — (All vehicles used in Work performed) Limits Required - Bodily Injury and Property Damage Combined:
$1,000,000 Each Occurrence

d. Umbrella Liability:
An Umbrella Liability policy in the amount of $5,000,000 in excess of the primary coverage required shall be maintained by Contractor at all times during the term of this Contract. Policy coverage must be on an "occurrence" basis.

These insurance policies must be endorsed with a Waiver of Subrogation Endorsements, waiving the carrier's right of subrogation with respect to Owner. Furthermore, Owner, and its corporate affiliates will be included as an Additional Insured on the following policies.

i. Commercial General Liability Policy

ii. Comprehensive Auto/Truck Policy

iii. Umbrella Liability Policy

iv. All Risk Builders Risk Policy

Other policies as may be deemed appropriate by Contractor's Risk Management Department.

5. Special Conditions -Concerning Insurance to be furnished by Contractor, it is a condition precedent to acceptability thereof that:

a. Any policy submitted shall not be subject to limitations, condition or restrictions deemed inconsistent with the intent of the Insurance Requirements to be fulfilled by Contractors; Owner's decision thereon shall be final.

b. Approval, disapproval, or failure to act by Owner regarding any insurance supplied by Contractor shall not relieve Contractor of responsibility or liability for damages and accidents set forth therein. Neither shall the bankruptcy, insolvency, or denial of liability by the insurance company exonerate Contractor from liability.

c. No special payment shall be made by Owner for insurance that Contractor may be required to carry; all are included in the Contract Sum.

d. The insurance companies issuing the policy or policies shall have no recourse against Owner for payment of any premiums or for assessments under any form of policy.

e. Should this Contract require the use of subcontractors, it will be the sole responsibility of Contractor to verify that such subcontractors are in compliance with the provisions of this Agreement. Owner reserves the right to reject any subcontractor who cannot demonstrate proof of the insurance coverage required hereunder.

6. Any of such insurance policies may be written in combination with any of the others, where legally permitted, but none of the specified limits may be lowered thereby.

7. Proof of Insurance:

   a. When required by Owner, copies of any policies must be furnished to Owner, otherwise Owner shall require certificates only.

   b. Certificates indicating Contractor coverage to be in force shall be filed with Owner prior to commencement of the Work.

   c. All Certificates shall indicate the A.M. Best Company rating of the insurance company. A minimum rating of "A" is required.

   d. Within thirty (30) days subsequent to renewal of required coverage, Contractor shall provide to Owner a Certificate of Insurance evidencing renewal of required coverage.

8. Waiver of Subrogation: Insurers shall have no right of recovery or subrogation against Owner, it being the intention of the parties that the insurance policies shall protect both parties and be primary coverage for any and all losses covered by the above-described insurance. Therefore, all of the aforementioned insurance policies must be endorsed with the waiver of subrogation endorsement.

9. Changes to Insurance: Insurance requirements may be changed at any TIME BY owner during the term of this contract due to changes in the law, changes in Owner's policy, or increased risk due to the nature of the Work being performed.

10. Surety Requirements: Concerning bonds to be furnished by Contractor, it is a condition precedent to acceptability that the surety company shall have a minimum A.M. Best company rating of "A" or be listed by the U.S. Department of the Treasury as an acceptable surety.

ARTICLE 13
ALL RISK BUILDER'S INSURANCE

Until beneficial occupancy of the total premises pursuant to a Certificate of Occupancy issued by the appropriate local governmental agency, Contractor hall maintain an All-Risk Builder's risk policy in the amount equal to 150% of the Contract Sum. This policy shall be written in the name of Owner, subcontractor, and sub-contractors as their interests may appear with an insurer's waiver of subrogation on behalf of each of them. In no event shall the policy deductible exceed $50,000 without the review and consent of the Owner.

The policy shall insure the interest of the, Owner, Contractor and Subcontractors of all tiers, including coverage on an "ALL RISK" basis, including, but not limited to, coverage against fire, flood (any site in flood zone "A"), earthquake (in CA only), lightning, wind damage, hail, explosion, theft, vandalism, transit and off-site material, riot or civil commotion, aircraft, and other vehicles, collapse and coverage available under the equipment "Installation Floater"

The policy shall include $1,000,000 in Owner’s “soft cost” coverage, is to contain an occupancy clause, is to be written on a replacement cost, non reporting completed value forma and the standard loss deduction shall not exceed 1% coverage amount or $`15,000.00, whichever is less

Coverage must include all materials, supplies and equipment that are intended for specific installation in the Project, while such materials, supplies and equipment are located at the Project Site, in Transit or while temporarily located away from the Project Site for the purpose of repair, adjustment or storage at the risk of one of the insured parties.

The policy must be endorses (a) waiving the carrier's rights of recovery under subrogation against the Owner, its OCIP Administrator, their officers, agents and employees, and Consultant, Contractor and Subcontractor whose interest is insured under the policy and (b) so as to provide that the insurance company will not cancel such insurance without giving at least thirty (30) days prior written notice to the Owner.

ARTICLE 14
PERFORMANCE AND PAYMENT BONDS

At Owner's election, Contractor will provide Owner with performance and/or payment bonds each in full amount of the Contract Sum for the faithful performance of the contract and protection of Project subcontractors and suppliers, respectively. The performance bond shall provide for payment of all increased costs and expenses Owner may incur to enforce or complete the Contract, in accordance with the Plans and Specifications, including any legal fees, costs, and interest. The performance bond shall further provide that the Work at all times shall be free and clear of all liens of workmen, material suppliers, subcontractors, or due to any activity of Contractor. The performance and payment bonds shall name Owner as obligee and shall be on the AIA forms in effect as of the date of this Contract and with a surety company approved by Owner. The aforementioned bonds will be furnished a Owner's expense.

END OF SECTION

SECTION 00700

GENERAL CONDITIONS

PART 1 GENERAL

1.01. GENERAL CONDITIONS

A. The AIA Document A201 2007 Edition "General Conditions of the Contract for Construction" are incorporated as part of the construction documents. These General Conditions are available from the Architect.

END OF SECTION

SECTION 00800

SUPPLEMENTARY
CONDITIONS

PART 1 GENERAL

1.01 SUPPLEMENTARY CONDITIONS

A. The following Supplements alters, deletes, and adds to the General Conditions, AIA Document A201-
2007 Edition. Where any part of the General Conditions is altered or deleted by these supplements,
the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

1.02 ARTICLE 1, GENERAL PROVISIONS

A. Supplement Subparagraph 1.1.1, THE CONTRACT DOCUMENTS, as follows:

a) Items of labor, material, equipment and appurtenances shown or noted, including demolition and removal of, integration into this Project of existing buildings or physical items, are part of this contract. Work specifically noted in following manner shall be considered as not being in this Contract.

".....by
Others"
".....by
Owner"
.....by BlueWave Express LLC (BWE)
“.....by_____Contractor"
(Unless Subcontractor to this Contract) ".....by
City (County, State, etc.) of_____"
".....by_____"

B. Add the following sentence to the end of the subparagraph 1.1.1 THE CONTRACT DOCUMENTS as follows:

The Contract Documents executed in accordance with Subparagraph 1.5.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers.

C. Supplement Subparagraph 1.2.1, CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS: as follows

Add the following clause 1.2.1.1 to Subparagraph 1.2.1:
1.2.1 In the events of conflicts or discrepancies among the Contract Documents, interpretations will be based on thefollowing priorities:
1. The Agreement
2. Addenda, with those of later date having precedence over those of earlier date.

3. The Supplementary Conditions.
4. The General Conditions of the Contract for Construction.
5. Division 1 of the Specifications
6. Drawings and Divisions 2-16 of the Specifications.
7. In the case of conflicts or discrepancies between the Drawings and Divisions 2-16 of the Specifications or within either Document not clarified by Addendum, the Architect will determine which takes precedence in accordance with Subparagraph 4.2.11.
8. Consult the Architect for interpretation if the two documents are in conflict.

D. Add the following additional definitions:

"1.1.9 Specified requirements apply to all work of the same type and class even though the work "a;" may not appear.

1.1. 10 The words, "perform", "furnish", "provide", "install", "test", repair", "replace", and "remove" refer to acts which shall be performed by the Contractor.

1.1.11 The words "as shown", "as indicated" mean as drawn, detailed, schedule, noted, or reasonably required by reference in the Contract Drawings.

1.1.12 Terms "selected", "as selected", or other terms of similar meaning, shall mean selected by the Architect from referenced manufacturer and quality within price range established in Contract Documents.

1.1.13 "Project Site" or "Job Site" means "site of work under this Contract".

1.1.14"Provide" means "furnish and install" and implies being “essential to completion of the Work and to make it usable for the purpose intended".

1.1.15 “Furnish” means supply and deliver to the Project unless otherwise defined in greater details.

1.1.16 “Install”: The term install is used to describe operations at Project, from inspecting and unloading, to completion in place, ready for intended use.

1.1.17 "Required" means "as required by the Contract Documents and legal requirements".

1.1.18 "shall" means "mandatory".

1.1.19 Owner means BlueWave Express Development, LLC.

E. Add the following subparagraphs:

1.1.5.1 Drawings which form a part of the Contract Documents are as listed on the Title Sheet of the Drawings.

1.1.6.1 Specifications which form the written requirements for this Project are part of the Contract Documents and consist of Divisions and Sections as listed in the Table of Contents at the front of this book."

F. Delete Subparagraph 1.1.8-Initial Decision Maker entirely.

1.03 ARTICLE 2-OWNER

A. Delete Subparagraph 2.2.5 in its entirety and substitute the following

2.2.5 The Contractor will be provided, free of charge, one reproducible copy of the Drawings and Project Manuals. Contractor will be responsible for reproducing additional copies as contractor feels is necessary to carry of the work.

2.2.5.1 The Owner will procure and bear the cost of structural tests and special inspections as required by the applicable building code.

1.04 ARTICLE 3 -CONTRACTOR

A. Supplement Subparagraph 3.2.1, REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR as follows:

All work shall be executed according to the intention, spirit, and meaning of plans and specifications. If the Contractor discovers any obvious omission, error or conflict in plans and/or specifications, he shall request interpretation from the Architect. Otherwise, he shall at his own expense, supply the proper materials and labor to make good any damage to or defect in his work caused by such omission, error or conflict.

B. Add the following Subparagraph 3.2.4 to Paragraph 3.2.4.1

3.2.4.1 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the contractor's requests for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

C. Supplement Paragraph 3.3, SUPERVISION AND CONSTRUCTION PROCEDURES add the following subparagraph:

3.3.4 The Contractor shall employ a Professional Land Surveyor to establish all lines, grades, levels and bench marks as required for the performance of the work.

3.3.4.1 The Contractor shall verify all grades lines, levels and dimensions of the drawings and he shall report any inconsistencies to the Architect before starting his Work.

3.3.4.2 Prior to placement of concrete slab, engage surveyor to provide a Category 3, Condition slab survey, showing the slab location on the site relative to the property lines and finish floor elevation relative to established project benchmark.

3.3.4.3 The Contractor shall provide to the Owner upon completion of the Project, and as a precedent to the release of the final payment and/or retainage, an "As Built" survey of the property prepared by a Licensed Public Surveyor which, if required by Owner, must also comply with the 1997 Minimum Standard Detail Requirements and Classifications for ALTA/ASCM Land Surveys including all table A optional requirements except items 7b(2) and item 12. The survey shall include, in addition to the requirements the ALTA/ASCM requirements the matters set forth below:

1. The location of all improvements on the property in relationship to the boundaries of the property;

2. The location of all light poles, standards, signs, curbs and curb cuts in relationship to the boundary of the property and in their relationship to the major improvements constructed on the property;

3. The location of all major landscape items which have been installed on the property;

4. A representation of the striping for automobile parking spaces, including thedesignation of compact only spaces (if any), full size automobile spaces, and handicapped spaces, and including the clear reference on the survey as to the number of unrestricted parking spaces, as well as the number of handicapped parking spaces on the site;

5. A certification from the surveyor that all improvements located upon the property are located within the boundary lines of the property except as specifically and clearly identified on the survey;

6. A certification from the surveyor that the property is not within the 100 year flood plain, referencing the applicable federal or local map establishing same and establishing such elevation.

D. Supplement Subparagraph

3.4.1 LABOR AND MATERIALS, as follows:

3.4.1.1 The General Contractor shall pay for all power, water, and gas used to start up and test the performance of installed equipment and fixtures prior to Substantial Completion.

3.4.1.2 Owner's Responsibility for Utilities: Pay all permanent property assessments, impact fees and utility reservation or capacity allocation fees.

3.4.1.3 Contractor's Responsibility for Utilities: Pay all temporary utility charges, tap fees, construction fees, installation costs and water meter charges until Certificate of Substantial Completion Certificate is issued terminating General Contractor's responsibility for said charges.

E. Add the following Subparagraph 3.4.4 after paragraph 3.4.3

3.4.4 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect to evaluate the Contractor's proposed substitutions and to make agreed-upon changes in the Drawings and Specifications made necessary by the Owner's acceptance of such substitutions.

F. Supplement Subparagraph 3.7, PERMITS, FEES AND NOTICES, Add the following sentence to subparagraph 3.7.1:

3.7.1.1 Certificate of Substantial Completion: The Contractor shall secure all certificates of inspection that may be required by authorities having jurisdiction over the work, including the Certificate of Occupancy.

G. Supplement Paragraph 3.12.5, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES as follows:

3.12.5.1 Contractor shall check and verify all field measurements and shall submit scale and/or full-size shop drawings of the work for the review of the Architect with such promptness as to cause no delay in his own work or in that of any other Contractor, and in sufficient time to allow Architect at least ten days for review.

3.12.5.2 Shop Drawings must be complete in every detail, including provisions required of various trades, connections with other work, all cutting, fitting drilling and all other necessary information in accordance with the usual trade practice as required for any special purpose. Copying of the Construction Documents in any manner for use the of Shop Drawings is not permitted and shall not satisfy these requirements. Shop Drawings shall show exact layout of equipment and materials pertaining to each trade and the actual routing of all pipes, conduits and ducts, including elevations, layouts and sizes. When such drawings are required to be submitted to the Building Authorities, it shall be the duty of the Contractor to submit them to and secure the approval of the Authorities.

3.12.5.3 Contractor shall check and approve all Shop Drawings of the various trades engaged or employed by him, for measurements, size of members, materials and details to make sure they conform to the job conditions and the intent of the Contract requirements. Shop Drawings, at the time of submission to the Architect, must bear the stamp of approval of the Contractor as evidence that such drawings and details have been checked by Contractor and that he fully understands that they comply with the intent of the Contract Demands.

3.12.5.4 Shop Drawings submitted which involve deviations from the Contract Drawings shall be so noted by Contractor and at the time of submission Contractor shall request in writing the review of the Architect stating the reason for the merit of the changes.

3.12.5.5 The Architect will review and take appropriate action on shop drawings, product data, samples, and other submittals required by the Contract Documents. Such review shall be only for general conformance with the design concept and general compliance with the information given in the Contract Documents. It shall not include review of quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with the work of other trades, or construction safety precautions, all of which are the sole responsibility of the Contractor. The Architect's review shall be conducted with reasonable promptness consistent with sound professional practice. Review of a specific item shall not indicate acceptance of an assembly of which the item is a component. The Architect shall not be required to review partial submissions or those for which submissions for correlated items have not been received.

3.12.5.6 Each submittal shall bear the Architect's or his consulting Engineers stamp stating the following:

3.12.5.7 "Architect's review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Contract Documents. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site: fabrication processes and techniques of construction: coordination of his work with that of all other trades; and the satisfactory performance of his work."

3.12.5.8 Each submission of Shop Drawings shall be accompanied by a letter of transmittal listing

the drawings submitted. Shops drawing intended for the Structural Engineer or Mechanical Engineer shall be sent directly to that consultant and a copy of the transmittal faxed to the Architect. Each submittal shall have the Architect's job number on the front of the submittal.

Total quantities of shop drawings to be transmitted are as follows:

Architectural, General items:	4 copies
Architectural/Engineers:	5 copies
Architectural/BlueWave:	6 copies
Architectural/Engineers/BlueWave:	7 Copies

3.12.5.9 The Contractor shall furnish and distribute all required copies for the use of the various trades at the site.

3.12.5.10 No work shall be done until the drawings are reviewed as herein stipulated.

3.12.5.11 All Shop Drawings, brochures, layouts, specification sheets, and physical samples shall be submitted to the Architect at earliest possible time, and in no event later than thirty (30) calendar days after Contract is signed.

3.12.5.12 Faxed submittal will not be accepted.

H. Add Subparagraph 3.12.11 to

Paragraph 3.12

3.12.11 The Architect's review of the Contractor's submittal will be limited to examination of an initial submittal and one (1) resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to deduct from the contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

I. Supplement Paragraph 3.14 CUTTING AND PATCHING as follows:

3.14.3 Each section of work in these Specifications shall include all cutting, patching and installation of anchors, supports and built-in frames by that trade section as required for the proper accommodation of all work of other trades, unless specifically stated to the contrary. All work to be done by skilled workmen. The General Contractor is not relieved from responsibility as stated in Article 3 of the General Conditions of the Contract for Construction.

1.05 ARTICLE 4 ARCHITECT

A. Article 4.2.2, replace the first sentence as follows:

"Except with the consent of the Owner, the Architect will perform no more than one (1) inspection to determine whether the Work, or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections.…

B. Add Clause 4.2.2.1 to Subparagraph 4.2.1:

"The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visit made necessary by the fault, neglect or request of the Contractor.

C. Add the following subparagraph to 4.2

4.2.15 The Architect shall have the right to request from any Subcontractor at any time during the course of construction, a notarized affidavit stating the amount of monies which have been paid to the Subcontractor as of any certain stipulated date.

D. Article 4.2.5 Delete entirely.

E. Article 4.2.8 Delete the sentence:
"The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.3.4"entirely.

F. Article 4.2.9 Revise as follows:

"The Owner and Tenant shall conduct inspections to determine the date of Substantial Completion and Notify the Architect of such date for Architects site visit. Upon satisfactory review of the Work, the Architect will issue a Certificate of Substantial Completion".

1.06 ARTICLE 6 – CONSTRUCTION BY OWNER OF BY SEPARATE CONTRACTORS

A. Art 6.3 OWNERS RIGHT TO CLEAN UP, delete the work "Architect and substitute the word "Owner, change to read: "If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contractors for maintaining the premises and surround areas free of waste materials and rubbish, the Owner may clean up and allocate the cost among those responsible."

1.07 ARTICLE 7 – CHANGES IN THE WORK

A. Add the following to Article 7.1 GENERAL as follows:

7.1.4 Where the Specifications allow a material or operation to be "or equal" or "approved", it is understood that any substitution will be warranted by the Contractor to be equal in quality, service and performance to the items originally specified. Final determination and written approval of such equality must be obtained by the Contractor from the Architect prior to ordering or installing any such item.

7.1.5 For use of material other than the one specified, the Contractor shall assume the cost of and responsibility for satisfactory accomplishing all changes in work as shown, and the correction of any faults due to performance, quality of service failures.

7.1.6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be inspected, shall be accompanied by a complete itemization of costs, including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change order be approved without such itemization.

B. Add the following to subparagraph 7.1.1:

7.1.1.4 No changes in work shall be performed unless authorized in writing by Architect or Owner.

7.1.1.5 All changes in the work shall be identified by individual change proposals. Change proposals can originate by Contractor, Architect or Owner. Change proposals will be identified and numbered. Owner will either accept a proposal and convert the proposal to a contract change order, or shall reject it. Proposals may also be abandoned for just cause.

1.08 ARTICLE 9 -PAYMENTS AND COMPLETION

A. Article 9.2- Schedule of Values, replace the word Architect with the word "Owner".

B. Delete Entirely Application for Payment, Article 9.3.1.1 Payment and Article 9.3.1.2 .

C. Article 9.3.3 Delete the words "Certificates for Payment have been previously issued", and the sentence to read: "The Contractor warrants that title and all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment, all Work for which payments have bee received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors,"

D. Delete Articles 9.4, 9.4.1, 9.4.2,9.5, 9.5.1, 9.5.2, 9.5.3.

E. Delete Articles 9.6, 9.6.1, 9.6.2, 9.6.3, 9.6.4, 9.6.5, 9.6.6, 9.6.7

F. Article 9.7- FAILURE OF PAYMENT, delete and replace as follows:

"If the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount requested and approved by the Lender after Draw Request Inspection is complete, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment in the amount owning is received….."

G. Article 9.8.2 Replace the word "Architect" with the word "Owner" throughout this article.
H Article 9.8.3: Replace the word "Architect" with the word "Owner" throughout this article.

H. Add the following sentence to Paragraph 9.3.1:

9.8.3.1" The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703, Continuation Sheet. "

J. Add the following Clause 9.8.3.1 to Subparagraph 9.8.3

9.8.3.1.1 Except with the consent of the Owner, the Architect will perform no more than one (1) inspection to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections."

K. Article 9.10.1 shall read as follows: "The Owner and Tenant shall be responsible for determining that date when the Work will be complete, and shall notify the Architect of

the date, after which the Architect will inspect the work to determine conformance with the documents and issue a Certificate of Substantial Completion."

L. Deleted article 9.10.2: Replace the word Architect with the

word "Owner".

M. Add the following to Subparagraph 9.10.2:

9.10.2.1 "The Contractor shall execute the following forms attached to these Supplementary Conditions:

a) Annex "A" - SUBCONTRACTOR AND MATERIAL SUPPLIER'S RELEASE

1.09 ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

101. Supplement Subparagraph 10.2.1, SAFETY OF PERSONS AND PROPERTY as follows:

10.2.8 "The Contractor shall at all times protect excavations, trenches, and the building and equipment from damage from rain water, ground water, backing up of drains or sewers and all other water. He shall provide labor, pumps and equipment to provide this protection."

1.10 ARTICLE 11-INSURANCE AND BONDS

A. Paragraph 11.1 Contractor's Liability Insurance, Subparagraph 11.1.1, add the following:

1. "11.1.1.1. Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:

a. Premises Operations, including X-C-U.

b. Owner's and Contractor's Protection.

c. Products and Completed Operations.

d. Contractual, including specific provisions for the Contractor's obligations under paragraph 3.18.

e. Owned and Non-Owned Aircraft, Automobiles and other vehicles.

1.11 ARTICLE 12-Uncovering and Correction of Work

A. Article 12.1.1 Replace the word "Architect" with the words "Owner or Architect". B. Article 12..2.1 Replace the word "Architect" with the words "Owner or Architect".

1.12 ARTICLE 13 -TESTS AND INSPECTIONS

A. Article 13.5.1 Replace the word "Architect" with the word "Owner".

B. Article 13.5.41 Replace the word “Architect” with the word

“Owner.”

C.. Article 13.5.5 Delete entirely.

1.13 ARTICLE 14 - TERMINATION BY OWNER FOR CAUSE

A. Article 14.2.2 Delete the words “Upon certification by the Initial Decision Maker that sufficient cause exist to justify such action…”

B. Article 14.2.4, Delete the words: “The amount to be paid to the Contractor or Owners, as the case may be, shall be certified by the Initial Decision Maker, Upon application, and this obligation for payment shall survive termination of the Contract.”

1.14 ARTICLE 15 CLAIMS AND DISPUTES:

A. Article 15.1.2 Delete the following words: “and to the Initial Decision Maker…” and the words “…, if the Architect is not serving as the Initial Decision Maker.”

B. Add the following Clauses to15.1.5 CLAIMS FOR ADDITIONAL TIME, 15.1.1.5.3 and 15.1.1.5:

15.1.1.5.3 “Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days’ increase in the Contract Time claimed as a consequence of each cause of delay. The Contractor shall provide such supporting documentation as the owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.”

15.1.1.5 “The Contractor shall not be entitled to a separate increase in the Contract time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.”

C. Article 15.2 Delete entirely articles 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5, 15.2.6, 15.2.6.1and 15.2.8.

END OF SECTION

PROJECT NO. 17348
MARCH, 2011

GEOTECHNICAL INVESTIGATION
BLUEWAVE EXPRESS
I-635 AND BELTLINE ROAD
IRVING, TEXAS

Presented To:
BLUEWAVE EXPRESS LLC
(OR ITS DESIGNATED ASSIGNEE)
HOUSTON, TEXAS

March 31, 2011
Project No. 17348

BlueWave Express LLC (or its designated assignee)
4545 Post Oak Place, Suite 140
Houston, Texas 77027
ATTN: Mr. Everett P. Jackson

GEOTECHNICAL INVESTIGATION
BLUEWAVE EXPRESS
I-635 AND BELTLINE ROAD
IRVING, TEXAS

Gentlemen:

Transmitted herewith are copies of the referenced report. Should you have any questions concerning our findings or if you desire additional information, do not hesitate to call.

Sincerely,

REED ENGINEERING GROUP, LTD.
Registration Number F-3114

Derrin G. Williams
Project Geologist

Forrest Whitney Smith, P.G., P.E.
Vice President

DGW/FWS/apv

copies submitted: (3)

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INTRODUCTION

Project Description

This report presents the results of a geotechnical investigation performed for a new carwash building and associated site paving to be constructed on the southeast corner of I-635 and Beltline Road in Irving, Texas. The general orientation of the building and site is shown on the Plan of Borings, Plate 1 of the report **Illustrations**.

Authorization

This investigation was authorized by Mr. Everett P. Jackson by signature of our Proposal No. 2-21G on February 28, 2011.

Purpose and Scope

The purpose of this investigation has been to evaluate the general subsurface conditions and provide recommendations for:

- design of the foundation system;
- pavement subgrade; and
- site preparation and earthwork compaction criteria.

The investigation has included drilling sample borings, performing laboratory testing, analyzing engineering and geologic data and developing geotechnical recommendations. The following sections present the methodology used in this investigation.

Recommendations provided herein are site-specific and were developed for the project discussed in the report **Introduction**. Persons using this report for other than the intended purpose do so at their own risk.

FIELD AND LABORATORY INVESTIGATIONS

General

The field and laboratory investigations have been conducted in accordance with applicable standards and procedures set forth in the 2010 Annual Book of ASTM Standards, Volumes 04.08 and 04.09, "Soil and Rock." These volumes should be consulted for information on specific test procedures.

Field Investigation

Subsurface conditions were evaluated by four sample borings drilled to depths of 10 to 32 feet in March 2011. The locations of the borings are shown on Plate 1 of the report **Illustrations**.

Borings were advanced between sampling intervals by means of a truck-mounted drilling rig equipped with continuous flight augers. Samples of cohesive soils were obtained with 3-inch diameter Shelby tubes (ASTM D 1587). Unweathered shale was evaluated in-situ using the Texas Department of Transportation (TxDOT) cone penetrometer test.

Delayed water level observations were made in the open boreholes to evaluate ground water conditions. The borings were backfilled at completion of field operations.

Sample depth, description of materials, field tests, water conditions and soil classification [Unified Soil Classification System (USCS), ASTM D 2488] are presented on the Boring Logs, Plates 2 through 5. Keys to terms and symbols used on the logs are included as Plates 6 and 7.

Laboratory Testing

All samples were returned to the laboratory and visually logged in accordance with the USCS. The consistency of cohesive soils was evaluated by means of a pocket penetrometer. Results of the pocket penetrometer readings are presented on the boring logs.

Laboratory tests were performed to evaluate index properties, confirm visual classification, and evaluate the undrained shear strength of selected samples. Tests and ASTM designations are provided in Table 1.

TABLE 1.
TESTS CONDUCTED AND ASTM DESIGNATIONS

Type of Test	ASTM Designation
Atterberg Limits	D 4318
Moisture Content	D 2216
Soil Suction	D 5298
Unconfined Compression (Soil)	D 2166

The results of these tests are summarized on Plates 8 and 9.

The expansive characteristics of the severely weathered silty shale were also evaluated by means of two absorption pressure-swell test conducted in accordance with general procedures discussed by Johnson and Snethen[1]. Results of the swell tests are presented graphically on Plates 10 and 11.

GENERAL SITE CONDITIONS

Physiography

The site is located southeast of the intersection of I-635 and Beltline Road. The surface is covered with mowed grass with no trees. Based on review of a 2005 aerial photograph, the site once had some scattered small trees. Surface grades are flat with very little elevation change. A 2009 aerial photograph of the site is presented as Plate 12 for reference.

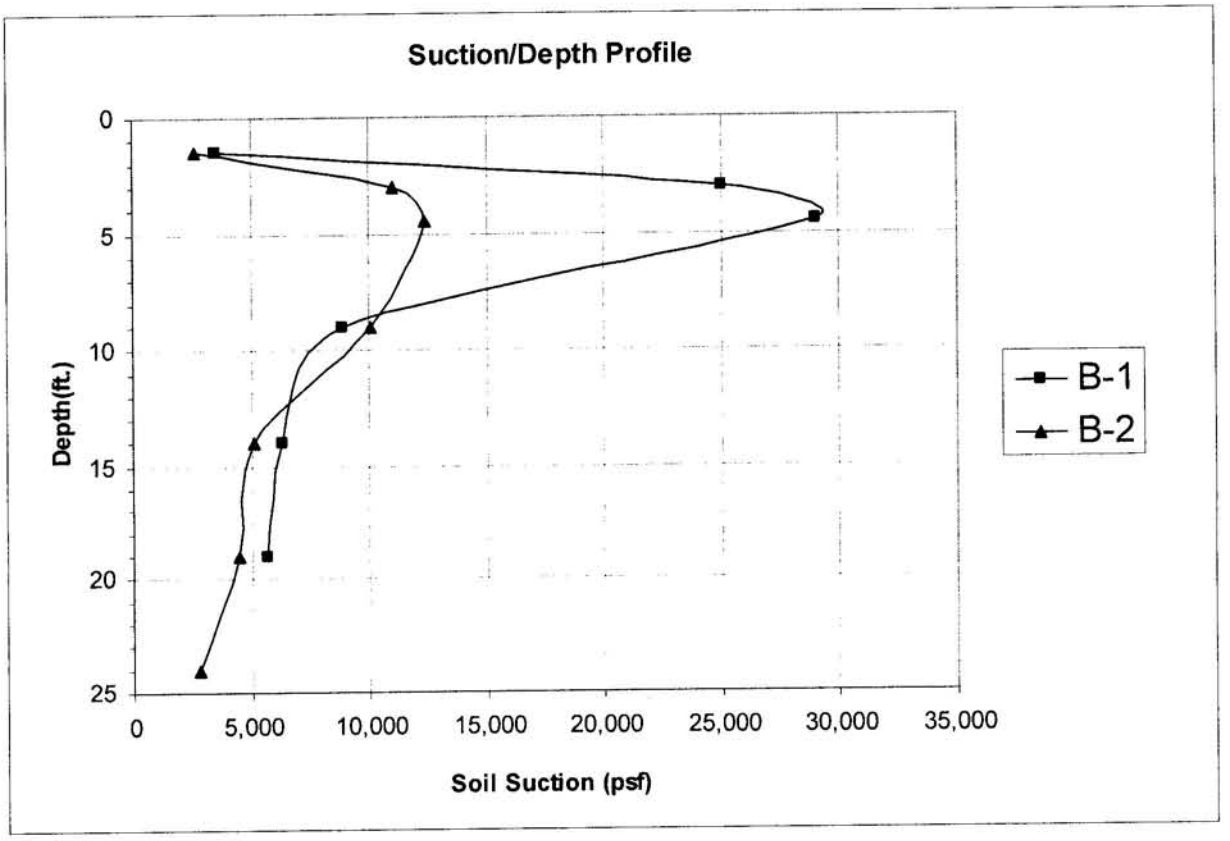
Geology and Stratigraphy

Subsurface conditions encountered in the borings consisted of Quaternary alluvial soils over residual soils and severely weathered silty shale grading to unweathered shale of the Cretaceous Eagle Ford Formation. The alluvial soils consisted of dark brown to brown, high plasticity (CH) clay with varying amounts of gravel, extending to depths of three to five feet. Below the alluvial clay, the residual soils consisted of yellowish-brown to brownish-yellow, CH silty clay. The clay and silty clay was very stiff to hard at the time of the investigation.

[1] Johnson, L.D., & Snethen, D.R. (1978). "Prediction of Potential Heave of Swelling Soil." Geotechnical Testing Journal, ASTM 1 (3), 117-124.

The severely weathered silty shale was encountered below depths of 4-1/2 to 8 feet, and possessed the engineering properties of olive-yellow, olive-brown, and light gray, hard to very stiff, CH silty clay. The two shallower borings terminated within the severely weathered silty shale. Below depths of 25-1/2 to 27 feet in the two deeper borings, dark gray, soft (rock classification), unweathered shale was encountered. These two borings terminated within the dark gray shale.

Based on the suction profiles, the upper soils and severely weathered shale were subject to seasonal drying to depths of 10 to 12 feet in March 2011. The suction profiles are provided in the following graph.



Ground Water

Ground water seepage was encountered during drilling in Boring B-1 at a depth of 20 feet. Based on post-drilling ground water information, ground water was present at depths of 13 to 14 feet at the end of the day of drilling and at depths of 12 to 13 feet two days following drilling. The ground water is perched above the relatively impermeable, unweathered shale within fractures in the overlying severely weathered silty shale. The depth to, and amount of ground water, will fluctuate with variations in seasonal and yearly rainfall.

Texas Health and Safety Code and TCEQ Comment

Pursuant to the Texas Health and Safety Code, Chapter 361, §361.538 and 30 Texas Administrative Code 330, §330.953, Reed Engineering Group, Ltd. has performed appropriate soil tests as required by these regulations to demonstrate that the subject property does not overlie a closed municipal solid waste landfill. The site observations and subsurface data do not indicate the presence of buried municipal solid waste at this site. Based on these data, development of this site should not require a Development Permit, as described in §361.532 and §§330.951-330.963, Subchapter T.

Seismic Site Classification

The site has been classified with respect to seismic design criteria contained in the 2009 International Building Code (IBC), Section 1613. The criteria require characterization of the upper 100 feet of subsurface materials. Based on the IBC criteria, the site is classified as Site Class C in accordance with Table 1613.5.2.

ANALYSIS AND RECOMMENDATIONS

Potential Vertical Movement

An analysis of the magnitude of soil movement (i.e., expansion and/or shrinkage) associated with changes in soil moisture was performed. This analysis included:

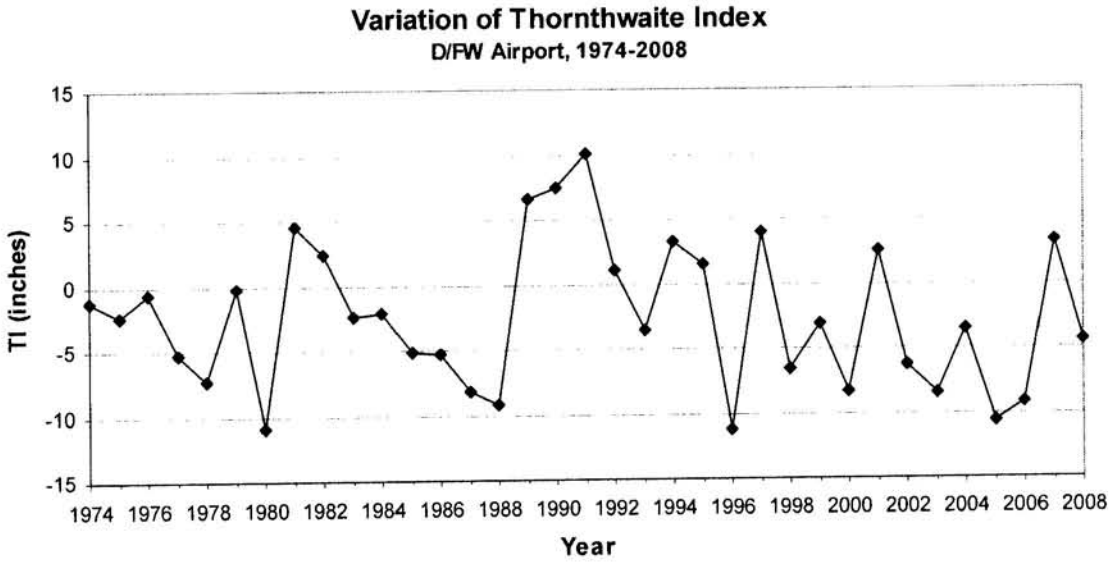
- identification of the zone of activity;
- evaluation of the expansive properties of the materials encountered in the borings;
- anticipated changes in the environmental factors that impact soil behavior associated with the construction of the proposed development; and
- development of a model to evaluate the anticipated soil movement.

Subsurface conditions consist of alluvial clays over severely weathered grading to unweathered shale. Ground water was encountered at depths of 12 to 13 feet below grade. Materials below the ground water were found to be currently moist. The zone of activity for this site and geologic environment is associated with the depth of seasonal drying of the upper soils, which is, in turn, limited by the ground water.

Historical records within the area indicate the ground water is present at about the depth noted in this study. Therefore, accounting for the capillary zone above the phreatic surface, the maximum zone of activity is considered to be at a depth of 12 to 14 feet below grade.

The actual depth of activity will be dependent upon the specific climatic conditions for any particular year. In other words, the seasonal depth varies from year to year dependent upon the length and severity of either drought or excessive rainfall. (This is similar to the "100-year

flood" concept used in hydraulic studies.) The seasonal variation can be evaluated by use of the Thornthwaite Index, I_m[2]. Calculation of I_m for Dallas/Fort Worth based on weather data at D/FW Airport from 1974 through 2008 is presented in the following graph.



The expansive properties of the upper soils were evaluated by use of the absorption-pressure swell test and the classification tests. Models used to evaluate the magnitude of movement consisted of: correlation with pressure-swell tests[3,4] and an empirical method developed by McDowell[5] and modified by the Texas Department of Transportation, TxDOT 124-E[6].

[2] Thornthwaite, C.W. (1948). "An Approach Toward a Rational Classification of Climate." Geographical Review, 38(1), 54-94.
[3] Johnson, L.D., & Snethen, D.R. (1978). "Prediction of Potential Heave of Swelling Soil." Geotechnical Testing Journal, ASTM 1 (3), 117-124.
[4] Fredlund, D., and Rahardjo, H.(1993). "Soil Mechanics for Unsaturated Soils," John Wiley & Sons, Inc., New York, N.Y.
[5] McDowell, C. "The Relation of Laboratory Testing to Design for Pavements and Structures on Expansive Soils." Quarterly of the Colorado School of Mines, Volume 54, No. 4, 127-153.
[6] "Method for Determining the Potential Vertical Rise, PVR." (1978). Texas Department of Transportation, Test Method Tex-124-E.

Based on this analysis for existing site conditions and considering the seasonal average, the magnitude of movement is estimated to be on the order of 5-1/2 to 6-1/2 inches dependent upon location. Without environmental changes associated with the proposed construction, the movement will be seasonal, i.e., upwards at the end of the dry season and into the wet season, and downwards (shrinkage) at the end of the wet season and into the dry season as the soils dry.

Considering the preceding discussion, it is intuitive to conclude that the magnitude of soil movement can be reduced by limiting the seasonal changes in soil moisture. If the soils are dry at the time of construction, they must be kept dry throughout the life of the project. On the other hand, if the soils are moist, they should be kept moist for the economic life of the structure. Based on extensive experience, it is easier to keep the soils moist than dry. Keeping the soils moist can be accomplished by the addition of landscape irrigation, construction of impermeable surfaces such as the floor and site paving and prudent watering during extended periods of drought.

General

A ground-supported, slab-on-grade foundation system is anticipated. The slab may be either reinforced with mild steel or of post-tensioned design. As stated above, potential vertical movements are calculated to be 5-1/2 to 6-1/2 inches. This movement will be seasonal, i.e., upwards following dry periods, and shrinkage after wet seasons of the year.

Remedial soil modifications will be required to reduce the swelling associated with the upper clays prior to construction of the foundation.

Subgrade Modification

Potential movements associated with heave from a dry condition to a moist condition are estimated to be on the order of 5-1/2 to 6-1/2 inches. Additional movement is possible if the clays become saturated, such as can happen from utility leaks and excessive ponding adjacent to the perimeter walls.

The most economical way of limiting the potential for post-construction movement, and the most positive from a design perspective, is to reduce the potential for heave-related movement prior to construction of the foundation. This can be accomplished by either:

- mechanically excavating the upper clays, mixing the clays with water, then recompacting the clays at an elevated moisture in controlled lifts; or
- preswelling via multiple passes of water pressure injection.

At completion of either the injection process or excavation and recompaction process, a surface seal will be required to maintain the desired moisture. Three types of surface seals can be provided:

- a minimum of 12 inches of "select" fill;
- a minimum of 6 inches of flexible base; or
- lime stabilization of the top 6 inches of soil with a minimum of 6 percent hydrated lime at completion of reworking or injection.

The specific recommendations and general procedures for each of the alternatives are presented in the following subsections. Recommendations relevant to both alternatives are presented in the **Other Considerations** subsection following the alternative discussions.

Pressure Injection Option - This option consists of performing cut and fill balance followed by injection, then providing a surface seal. The performance of an injected subgrade is dependent upon the quality of the workmanship. Therefore, water pressure injection is not recommended unless a representative of this office is present full-time to observe all injection operations.

Procedures consist of the following.

1. Strip vegetation and dispose of the organic materials in accordance with the project specifications.

2. Cut and fill balance with on-site soils to subgrade minus the thickness of the desired cap. Place and compact soils in accordance with recommendations in the **Earthwork** section.

    - Note: If insufficient on-site fill exists to achieve the proposed subgrade for the "select" fill or flexible base options, all imported fill for use below the building should consist of "select" fill or flexible base. Balance on-site soils to provide a uniform thickness of "select" or flexible base.

3. Preswell the upper clays via pressure injection with water. Perform injections to a depth of 12 feet. Guideline specifications for performance of the injection process are included in the report **Specifications**. Three guideline **Specifications** are included, one for each of the three surface treatment options.

4. Place and compact the surface moisture barrier, consisting of either:

    - 12 inches of "select" fill;
    - 6 inches of flexible base; or
    - stabilize the top 6 inches of injected soil with a minimum of 6 percent hydrated lime.

The actual number of injection passes required will be dependent upon the soil moisture conditions at the time of construction. For estimating purposes, and considering dry conditions at the time of construction, five injection passes should be anticipated.

Placement recommendations for "select" fill and flexible base are included in the **Earthwork** section. Lime stabilization should be conducted in accordance with TxDOT "Standard Specifications for Construction of Highways, Streets and Bridges," 2004 Edition, Item 260. Lime-stabilized soils should be compacted to a minimum of 95 percent of Standard Proctor density, ASTM D 698.

Injections should be extended a minimum of five feet beyond the general building lines. The injection should be increased to 10 feet beyond the building at entrances to limit the potential for differential movement between the structure and sidewalks or entrance pavement.

It is recommended that the outer limits of the injected area be stepped, from the bottom up, at one horizontal to one vertical (1H:1V) to create a transition zone between injected soils and non-injected soils. This will decrease the potential for concentrated differential movement near the outer limits of the injected area.

Excavation and Recompaction Option - As discussed above, an alternative method of pre-wetting the upper soils to reduce the potential for post-construction swell consists of excavation of the upper clays, mechanically mixing the clays with water, then recompaction of the excavated clays in controlled lifts. <u>This method of pre-wetting the soils is not effective unless the water is uniformly blended with the soil</u>. Simply wetting the surface of the soil will not achieve the required result. General procedures are as follows.

Strip vegetation and dispose of the organic materials in accordance with the project specifications.

1. Excavate a minimum of 12 feet below existing grade or a minimum of 12 feet below finished floor, whichever is greater.

2. Scarify the exposed subgrade to a depth of six inches, water as necessary and recompact to the density and moisture recommended in the **Earthwork** section.

3. Compact on-site soils in lifts as outlined in the **Earthwork** section to subgrade minus the thickness of the desired cap. Place and compact soils in accordance with recommendations in the **Earthwork** section.

    - Note: If insufficient on-site fill exists to achieve the proposed subgrade for the "select" fill or flexible base options, all imported fill for use below the building should consist of "select" fill or flexible base. Balance on-site soils to provide a uniform thickness of "select" or flexible base.

4. Place and compact the surface moisture barrier, consisting of either:

    - 12 inches of "select" fill;
    - 6 inches of flexible base; or
    - stabilize the top 6 inches of recompacted soil with a minimum of 6 percent hydrated lime.

Placement recommendations for "select" fill and flexible base are included in the **Earthwork** section. Lime stabilization should be conducted in accordance with TxDOT "Standard Specifications for Construction of Highways, Streets and Bridges," 2004 Edition, Item 260. Lime-stabilized soils should be compacted to a minimum of 95 percent of Standard Proctor density, ASTM D 698.

It is recommended that the outer limits of the excavation be benched, from the bottom up, at 1H:1V to create a transition zone between reworked soils and non-reworked soils. This will decrease the potential for concentrated differential movement near the outer limits of the excavation.

Other Considerations - The "select" fill, flexible base, or lime caps should be placed within approximately seven working days following completion of either the injection process or the excavation and recompaction operations to limit moisture loss.

Careful consideration should be given to the actual area treated with either of the two alternatives to reduce movement. The potential for post-construction heave will be reduced in the treated areas; however, areas left untreated will result in differential movement. In general, it is recommended the treated area extend beyond the building at entrances to reduce the potential for differential movement among the building, the sidewalk and entrance pavement or in areas where site paving is relatively flat because of drainage or ADA considerations.

Positive drainage of water away from the structure must be provided and maintained after construction. Re-grading may be necessary as the site undergoes initial heave.

Ground-supported foundations over expansive soils may be subject to settlement if the underlying clays dry during the life of the structure. Natural desiccation will be limited to the outer four to five feet along the perimeter where surface pavement does not abut the structure. However, roots from trees and shrubs can grow below the structure and increase the zone of desiccation. This process typically requires 8 to 10 years to develop. An effective means of limiting plant root growth is construction of a vertical moisture barrier adjacent to the

foundation or extension of paving to the perimeter of the building. If utilized, the barrier should consist of a minimum six-inch wide, five-foot deep lean concrete wall. Trees and shrubs should be planted outside the barrier.

Foundation - General

The use of a ground-supported, slab-on-grade foundation system is anticipated. The slab may be either reinforced with mild steel or of post-tensioned design.

Recommendations using design parameters for both the PTI 2nd Edition and PTI 3rd Edition criteria are presented in the following section. It is recommended that the structural engineer evaluate the required structural rigidity using both the 2nd and 3rd Edition Design Values and use the stiffer of the two designs.

Foundation Design - Monolithic "Waffle" Slab

Considering remedial earthwork as outlined in the **Subgrade Modification** section, the foundation may be designed as a conventionally reinforced or post-tensioned slab-on-grade. The foundation should be designed to resist differential "center" lift and "edge" lift movements. Estimated center lift and edge lift design stiffness values using the Post-Tensioning Institute (PTI) 2nd Edition design parameters are presented in Table 2. Estimated center lift and edge lift design values using the PTI 3rd Edition parameters are presented in Table 3. The values in Tables 2 and 3 are applicable considering a modified subgrade as outlined in the **Subgrade Modification** section.

TABLE 2. PTI 2ND EDITION DESIGN MOVEMENTS CONSIDERING A MODIFIED SUBGRADE		
Movement Mode	**Edge Moisture Variation Distance (e_m) (feet)**	**Differential Soil Movement (y_m) (inches)**
Center Lift	5.5	4.0
Edge Lift	5.0	1.7

TABLE 3. PTI 3RD EDITION DESIGN MOVEMENTS CONSIDERING A MODIFIED SUBGRADE		
Movement Mode	**Edge Moisture Variation Distance (e_m) (feet)**	**Differential Soil Movement (y_m) (inches)**
Center Lift	8.0	1.7
Edge Lift	4.0	1.3

These design values are not the maximum differential movements that could occur. Differential ground movements of greater magnitude could occur if unusually high moisture variations are allowed, such as full soil saturation due to ponding water conditions or extreme soil desiccation during summer droughts.

It is recommended that a conventionally reinforced slab be designed to conform to the current requirements of the American Concrete Institute (ACI) "Building Code Requirements for Reinforced Concrete," ACI 318. A post-tensioned slab should conform to the stiffer of the requirements of the 2nd Edition or 3rd Edition of the PTI Manual "Design and Construction of Post-Tensioned Slab-on-Grade."

It is also recommended that the foundation be designed to conform to stiffness criteria as contained in Table 6.2 of the PTI Manual. The recommended stiffness criteria (L/C_Δ) in Table 6.2 are reproduced below.

Material	Center Lift, C_Δ	Edge Lift, C_Δ
Wood Frame	240	480
Stucco or Plaster	360	720
Brick Veneer	480	960
Concrete Masonry Units	960	1920
Prefab Roof Trusses*	1000	2000

* Trusses that clearspan the full length or width of the foundation from edge to edge.

It may be possible to allow slightly greater deflection for center lift design if vertical control joints are provided at key locations along exterior masonry walls to allow for differential wall movement. The structural engineer should evaluate deflection tolerances, joint spacing and various methods available for providing vertical control joints in the exterior walls.

Grade beams should be designed for a maximum bearing pressure of 3.0 kips per square foot (ksf) and should be founded a minimum depth of 12 inches into injected or compacted and tested fill. All beams, including reinforcing, should be continuous, should not vary in cross-section and should be provided with sufficient steel reinforcement for positive and negative moment resistance.

Elements of the foundation that form cantilevers (such as bay windows or other protrusions) are vulnerable to differential movement relative to the larger areas of the foundation. As a result, these areas are vulnerable to structural damage. The structural engineer should account for the increased potential for both positive and negative bending moments at these points when performing the design.

A minimum 10-mil thick polyethylene sheet is recommended below the foundation to limit migration of moisture through the slab from the underlying clays. This is of particular importance below sections of the floor covered with carpeting, paint or tile. Penetrations and lapped joints should be sealed with a waterproof tape.

Earthwork

All vegetation and topsoil containing organic material should be cleared and grubbed at the beginning of earthwork construction. Areas of the site that will underlie fill or within the building should be scarified to a depth of 6 inches and recompacted to a minimum of 92 percent and a maximum of 98 percent of the maximum density, as determined by ASTM D 698, "Standard Proctor". The moisture content should range from +1 to +6 percentage points above optimum.

Site-excavated soils should be placed in maximum eight-inch loose lifts and compacted to the moisture and density requirements outlined above. The soils should be uniformly blended with water to achieve the required moisture content.

The final 6 inches of subgrade below pavement should be compacted to a minimum of 95 percent of Standard Proctor, at or above optimum moisture.

Areas where compaction utilizing hand-held equipment will be required, such as for site utilities, should be compacted to a density of between 95 and 98 percent of Standard Proctor, at a moisture content of between +1 to +6 percentage points above optimum.

Proper backfilling around the building perimeter will reduce the potential for water seepage beneath the structure. Fill against the perimeter of the foundation should consist of site-excavated clays, or equal, placed and compacted in accordance with the recommendations outlined above.

"Select" fill is defined as uniformly blended clayey sand with a Plasticity Index (PI) of between 4 and 15. Select fill should be placed in maximum 8-inch loose lifts and compacted to at least 95 percent of the Standard Proctor density, at a moisture content between -2 to +3 percentage points of optimum moisture.

Flexible base for use below the building slab is defined as crushed stone or crushed concrete meeting the requirements of the 2004 Edition of TxDOT, "Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges", Item 247 Grade 2, Type D or better. Flexible base should be compacted to a minimum of 95 percent of Standard Proctor density, at a moisture content between -2 to +3 percentage points of optimum moisture.

The select fill or flexible base should be placed within approximately seven working days over the injected or reworked subgrade to limit moisture loss within the underlying soils.

Pavement

Recommendations have been provided to reduce movements under the building. However, paving areas will be subject to 5-1/2 to 6-1/2 inches of potential movement if the soils are dry at the time of construction. This can cause cracking and poor drainage including ponding and reverse drainage. If movements of this magnitude are not acceptable, consideration should be given to modifying the pavement subgrade as outlined in the **Subgrade Modification** section. If performed, the pavement subgrade should be capped with lime-stabilized soil.

Concrete pavement is anticipated for both car and light truck parking and for drives and service areas.

In general, stabilization of the subgrade is <u>not</u> cost-effective when using rigid pavement and does not significantly increase the load-carrying capacity of the pavement. However, stabilization does provide a construction or working pad and may be advantageous from this perspective, especially if construction occurs during the wetter portions of the year. Stabilization is recommended if traffic speeds will exceed 30 miles per hour (mph).

The specific pavement sections will be dependent upon the type and frequency of traffic. For drives and parking subject to cars and light trucks, a 5-inch thick, 3,000 pounds per square inch (psi) compressive strength pavement section constructed over a subgrade which has been scarified and recompacted as outlined in the **Earthwork** section, should provide for unlimited repetitions over a 20-year life.

For drives and service areas subject to the equivalent of four or less loaded semi-trucks per day and within fire lanes, a minimum 6-inch thick, 3,000-psi compressive strength pavement section is recommended. The pavement should be constructed over a subgrade that has been scarified and recompacted as outlined in the **Earthwork** section.

Pavements should be lightly reinforced to control shrinkage cracks. Reinforcing should consist of the approximate equivalent of #3 bars (metric #10) at 24 inches on-center. The specific amount of steel should be determined based on spacing of expansion, construction and contraction (saw) joints.

Pavement sections should be saw-cut at an approximate spacing in feet of 2.5 to 3 times the pavement thickness expressed in inches, not to exceed a maximum spacing of 20 feet. (For example, a 5-inch pavement should be saw-cut in approximate 12.5- to 15-foot squares.) The actual joint pattern should be carefully designed to avoid irregular shapes. Recommended jointing techniques are discussed in detail in "Guide for Design and Construction of Concrete Parking Lots," published by the American Concrete Institute[7].

[7] "Guide for Design and Construction of Concrete Parking Lots" (1987). American Concrete Institute, Publication MSP 34, Silver Spring, MD.

The above sections are based on the stated analysis and traffic conditions. Additional thickness or subgrade stabilization may be required to meet the City of Irving development code.

Pavement Joints

Detailing of the pavement is beyond the proposed scope of geotechnical services. However, the following discussion is offered to assist the pavement designer and reduce the ambiguity associated with joint detailing.

There are four common types of pavement joints: contraction or saw joints, isolation joints, construction joints, and expansion joints. Each of these are defined and discussed in the following paragraphs.

Contraction Joints – Contraction or saw joints are installed in concrete to reduce the potential for random shrinkage cracks associated with drying of the plastic concrete. Concrete shrinks (contracts) at an approximate rate varying from 0.0002 inch/inch to .0008 inch/inch, dependent upon the specific water to cement ratio. The higher shrinkage is for a higher water to cement ratio. Using an average coefficient of 0.00047 inch/inch results in 0.56 inches of shrinkage per 100 feet of pavement.

The general "rule of thumb" is to space contraction joints three times the concrete thickness, where the thickness is expressed in inches and the spacing is expressed in feet, up to a maximum spacing of 20 feet. For example, a 6-inch thick pavement should have contraction joints spaced at approximately 18 feet on-center.

The joint is commonly constructed by sawing a groove to a depth of approximately 1/3 the thickness of the slab. The purpose of this groove is to create a weakened plane, thus inducing a shrinkage crack to form. The weakened plane must be constructed while the concrete remains relatively plastic, generally within the first four to six hours of placement, or else shrinkage cracks will have already formed.

A limited amount of mild steel is generally used to reduce formation of random contraction joints. The typical amount of steel is #3 reinforcing bars (metric #10) at approximately 24 inches on-center for 5- and 6-inch pavement. The spacing is typically reduced to 18 inches on-center for pavements of 7-inch thickness or greater.

Local practice is to extend the reinforcing uninterrupted through the saw joint. This practice can restrict formation of the joint, leading to an increase in the potential for shrinkage cracks occurring outside the formed joint. This practice is however, beneficial from an expansive soil perspective in that it reduces the potential for opening of un-reinforced joints associated with heave of the subgrade.

Isolation Joints – Isolation joints are placed in concrete to separate various elements. For example, an isolation joint is generally used where concrete pavement abuts the building foundation. There is generally no structural connection between the two constructed elements.

Construction Joints – Construction joints are required by the contractor to delineate various placement operations. An example of a typical construction joint is the bulkhead at the end of a pour, or the bulkhead used to delineate individual pour strips.

Transfer of stress through a typical contraction (saw) joint is a result of interlocking of the concrete aggregate in the non-sawed portion of the joint and the steel traversing the joint. Because the construction joint is formed, there is no interlocking of the concrete aggregate. For this reason, it is recommended that as a minimum, the quantity of contraction steel be doubled through a construction joint. For example, if the contraction steel is equal to #3 bars at 18 inches on-center, it is recommended that additional #3 bars be added, spaced 9 inches from the contraction steel. The added bars should be a minimum of three feet in length centered at the formed joint.

Alternatively, smooth dowels can be used to increase the amount of reinforcing through the construction joint. The amount of dowel steel varies and should be detailed by the pavement designer.

Expansion Joints – Expansion joints are used in concrete to allow for thermal expansion and or contraction. The thermal coefficient of concrete varies dependent upon the coarse aggregate from approximately 6.6 x 10-6/^{0}F for quartz to 3.8 x 10-6/^{0}F for limestone. The majority of coarse aggregate used in concrete within the North Texas region consists of limestone, therefore the lower value of the thermal coefficient is considered to be applicable. Use of 3.8 x 10-6/^{0}F results in an estimated 0.46 inches of expansion or contraction per 100 feet of concrete per 100^{0}F change in the concrete temperature. Based on the calculation presented for the average plastic shrinkage, the potential for thermal expansion (0.46 inches per 100 feet of concrete per 100^{0}F) is less than the average anticipated plastic shrinkage (0.56 inches per 100 feet of concrete).

In conclusion, the above analysis indicates that for the average construction project and where limestone is used for the coarse aggregate, the need for expansion joints is limited.

Construction Observation and Testing Frequency

It is recommended the following items (as a minimum) be observed and tested by a representative of this office during construction.

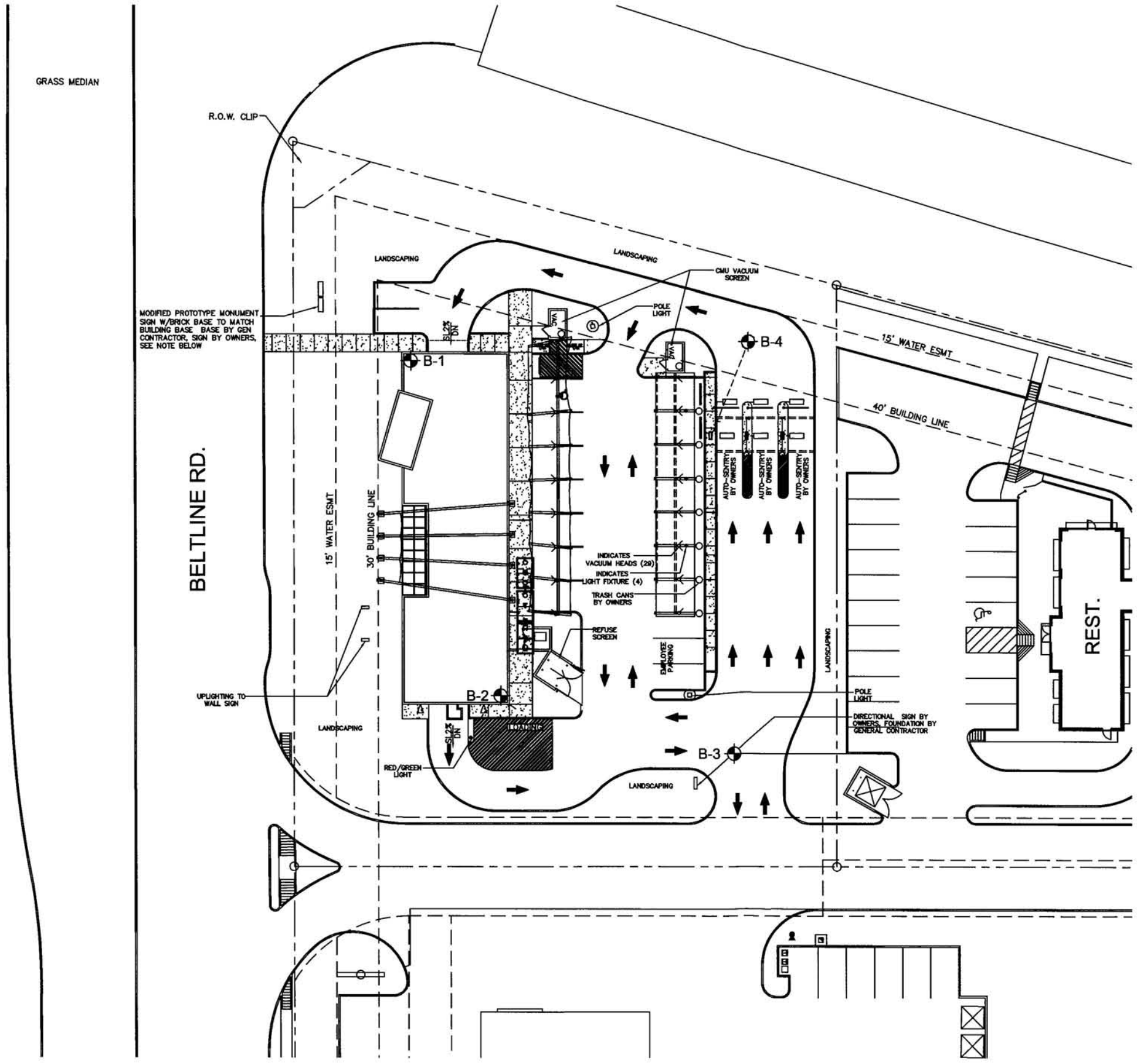
Observation:

- Fill placement and compaction.
- Pressure-injection operations.
- Foundation construction and concrete placement.

Testing:

- Earthwork
    - One test per 5,000 square feet per lift within fills below the building.
    - One test per 10,000 square feet per lift within fills in the paving area.
    - One test per 150 linear feet per lift in utility and grade beam backfill.
- Post-injection borings, one boring per 5,000 square feet of injected area.

The purpose of the recommended observation and testing is to confirm the proper foundation bearing stratum and the earthwork and building pad construction procedures.



REED ENGINEERING GROUP
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

PLAN OF BORINGS

BlueWave Express
I-635 & Beltline Road
Irving, Texas

PLATE 1

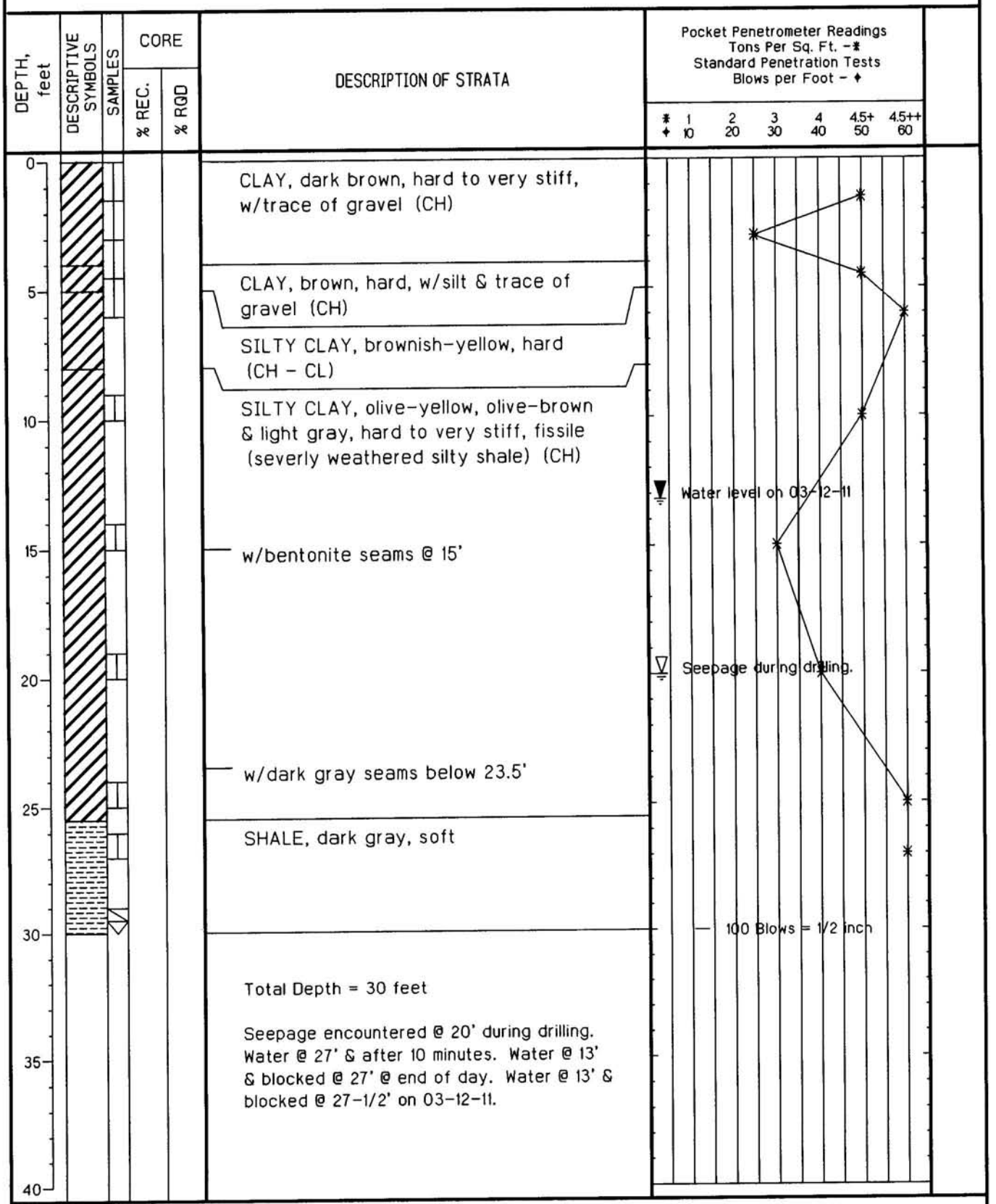
reed engineering GROUP

Project No. 17348

Date: 03-10-11

BlueWave Express
I-365 and Beltline Road
Irving, Texas

Location: See Plate 1



BORING LOG B-1

PLATE 2

GEOTECHNICAL CONSULTANTS

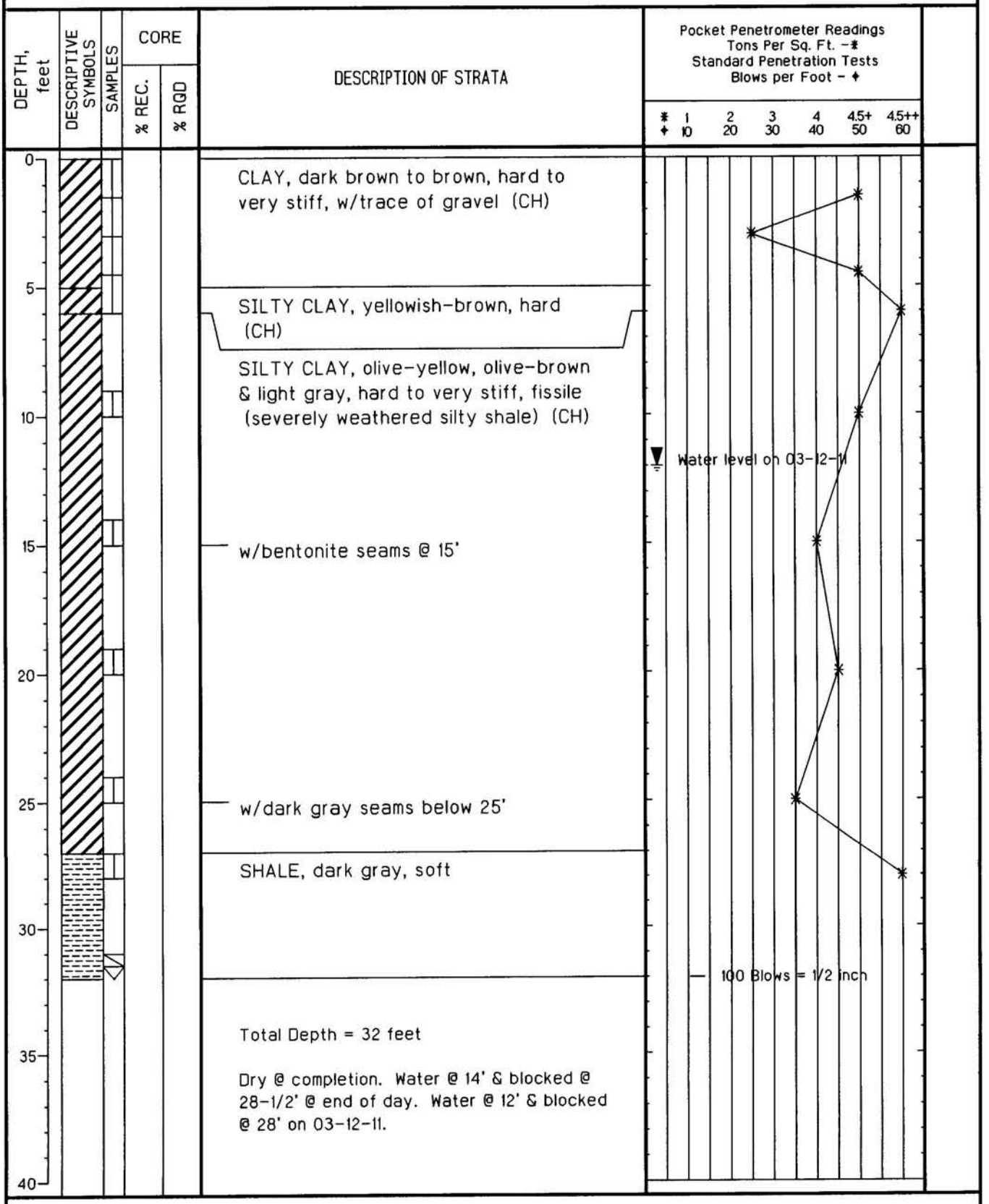
reed engineering GROUP

Project No. 17348

Date: 03-10-11

BlueWave Express
I-365 and Beltline Road
Irving, Texas

Location: See Plate 1



BORING LOG B-2

PLATE 3

GEOTECHNICAL CONSULTANTS

reed engineering GROUP

Project No. 17348

Date: 03-10-11

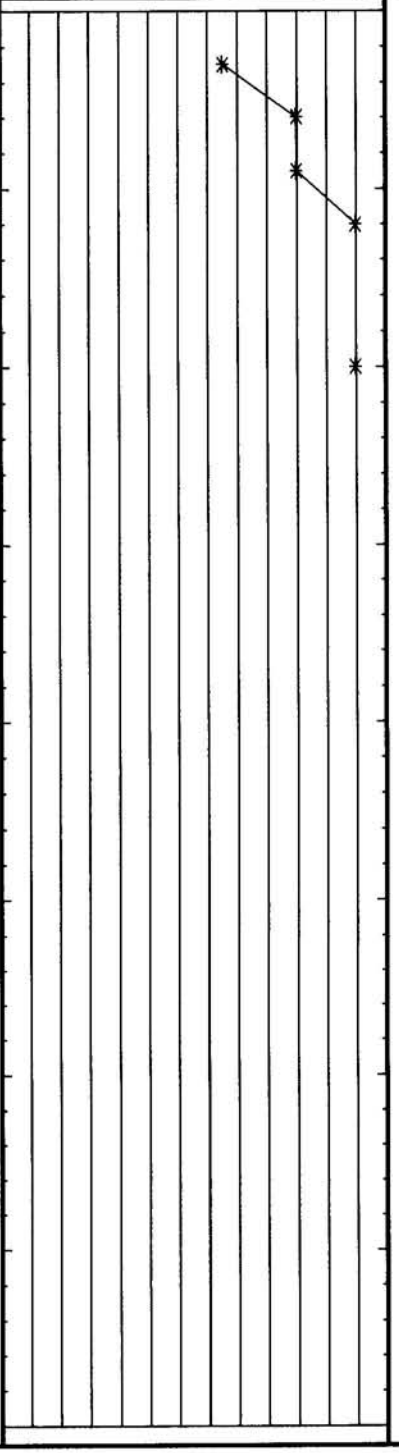
BlueWave Express
I-365 and Beltline Road
Irving, Texas

Location: See Plate 1

DEPTH, feet	DESCRIPTIVE SYMBOLS	SAMPLES	CORE % REC.	CORE % RQD	DESCRIPTION OF STRATA
0					CLAY, dark brown, very stiff to hard, w/some limestone gravel (CH)
5					CLAY, yellowish-brown, hard (CH)
10					SILTY CLAY, olive-yellow, hard, fissile (severely weathered silty shale) (CH - CL)
					Total Depth = 10 feet
					Dry after 10 minutes. Dry & blocked @ 9' @ end of day. Dry & blocked @ 9' on 03-12-11.
15					
20					
25					
30					
35					
40					

Pocket Penetrometer Readings
Tons Per Sq. Ft. - *
Standard Penetration Tests
Blows per Foot - +

*	1	2	3	4	4.5+	4.5++
+	10	20	30	40	50	60



BORING LOG B-3

PLATE 4

GEOTECHNICAL CONSULTANTS

reed engineering GROUP

Project No. 17348

Date: 03-10-11

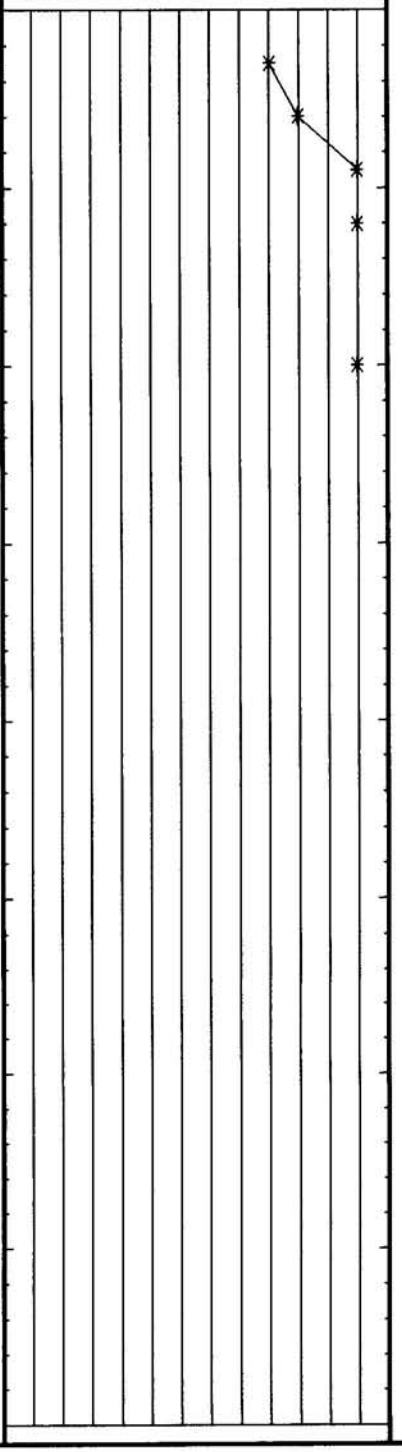
BlueWave Express
I-365 and Beltline Road
Irving, Texas

Location: See Plate 1

DEPTH, feet	DESCRIPTIVE SYMBOLS	SAMPLES	CORE % REC.	CORE % RQD	DESCRIPTION OF STRATA
0					CLAY, dark brown, hard, w/trace of gravel (CH)
					CLAY, brown, hard, w/some gravel (CH)
5					SILTY CLAY, brownish-yellow, hard (CL)
					SILTY CLAY, olive-yellow & olive-brown, hard, fissile (severely weathered silty shale) (CH)
10					Total Depth = 10 feet Dry after 10 minutes. Dry & blocked @ 9' @ end of day. Dry & blocked @ 9' on 03-12-11.
15					
20					
25					
30					
35					
40					

Pocket Penetrometer Readings
Tons Per Sq. Ft. - *
Standard Penetration Tests
Blows per Foot - ✦

*	1	2	3	4	4.5+	4.5++
✦	10	20	30	40	50	60



BORING LOG B-4

PLATE 5

GEOTECHNICAL CONSULTANTS

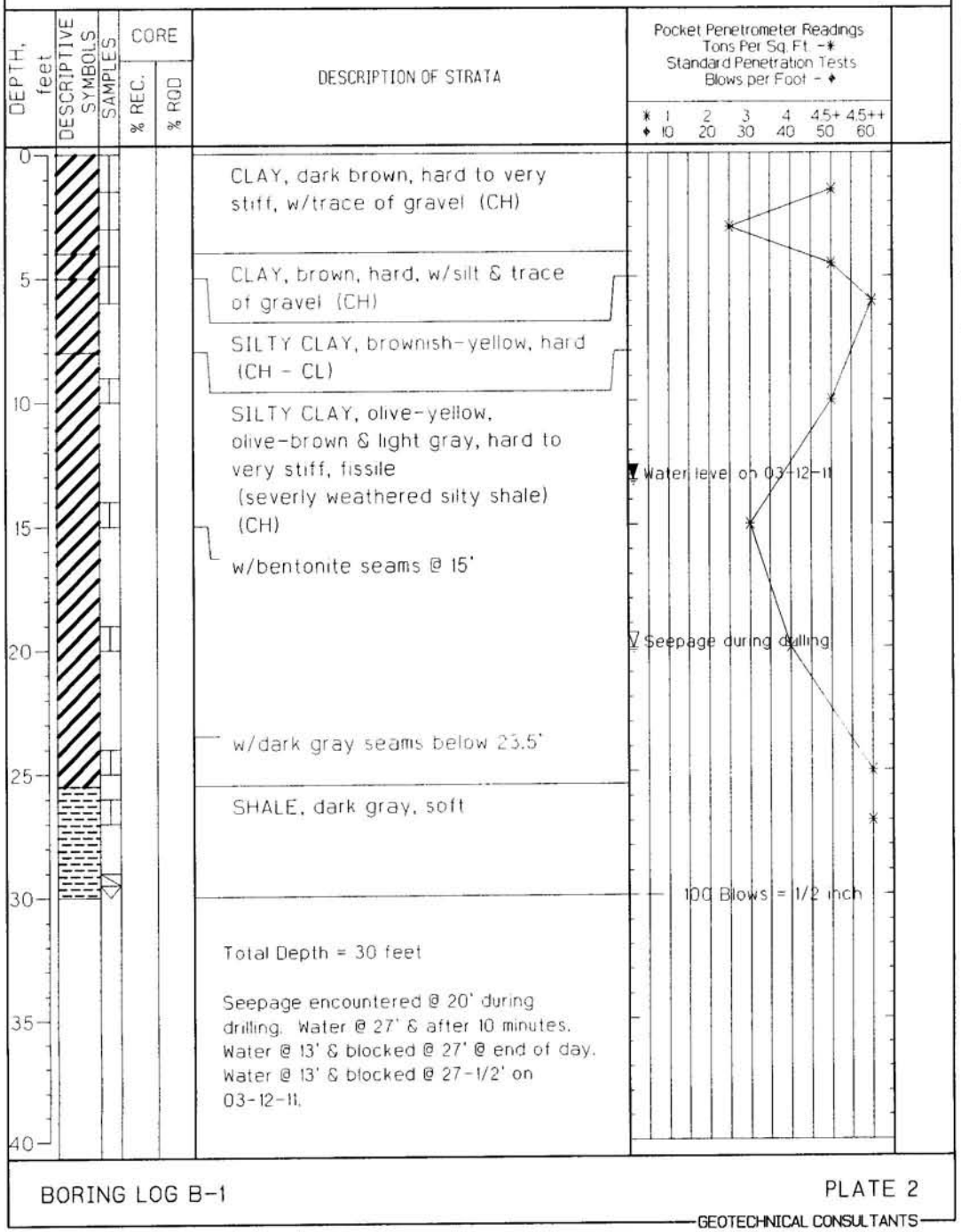
reed engineering GROUP

Project No. 17348

Date: 03-10-11

BlueWave Express
I-365 and Beltline Road
Irving, Texas

Location: See Plate 1



BORING LOG B-1

PLATE 2

GEOTECHNICAL CONSULTANTS

- Fill — Type of Fill
- CLAY (CL) (LL<50)
- CLAY (CH) (LL>50)
- SILT (ML) (LL<50)
- SILT (MH) (LL>50)
- CLAYEY SAND (SC)
- SILTY SAND (SM)
- SAND (SP-SW)
- CLAYEY GRAVEL (GC)
- GRAVEL (GP-GW)
- (weathered) SHALE (unweathered)
- (weathered) LIMESTONE (unweathered)
- (weathered) SANDSTONE (unweathered)

- UNDISTURBED (Shelby Tube & NX-Core)
- DISTURBED
- STANDARD PENETRATION TEST
- THD CONE PENETROMETER TEST

▽ = Water level at time of drilling.

▼ = Subsequent water level and date.

KEYS TO SYMBOLS USED ON BORING LOGS

PLATE 6

GEOTECHNICAL CONSULTANTS

SOIL PROPERTIES

COHESIONLESS SOILS

SPT N-Values (blows/foot)	Relative Density
0 - 4	Very Loose
4 -10	Loose
10-30	Medium Dense
30-50	Dense
50 +	Very Dense

COHESIVE SOILS

Pocket Penetrometer (T.S.F.)	Consistency
<0.25	Very Soft
0.25-0.50	Soft
0.50-1.00	Medium Stiff
1.00-2.00	Stiff
2.00-4.00	Very Stiff
4.00 +	Hard

ROCK PROPERTIES

HARDNESS	DIAGNOSTIC FEATURES
Very Soft	Can be dented with moderate finger pressure.
Soft	Can be scratched easily with fingernail.
Moderately Hard	Can be scratched easily with knife but not with fingernail.
Hard	Can be scratched with knife with some difficulty; can be broken by light to moderate hammer blow.
Very Hard	Cannot be scratched with knife; can be broken by repeated heavy hammer blows.

DEGREE OF WEATHERING	DIAGNOSTIC FEATURES
Slightly Weathered	Slight discoloration inwards from open fractures.
Weathered	Discoloration throughout; weaker minerals decomposed; strength somewhat less than fresh rock; structure preserved.
Severely Weathered	Most minerals somewhat decomposes; much softer than fresh rock; texture becoming indistinct but fabric and structure preserved.
Completely Weathered	Minerals decomposed to soil; rock fabric and structure destroyed (residual soil).

KEY TO DESCRIPTIVE TERMS ON BORING LOGS

PLATE 7

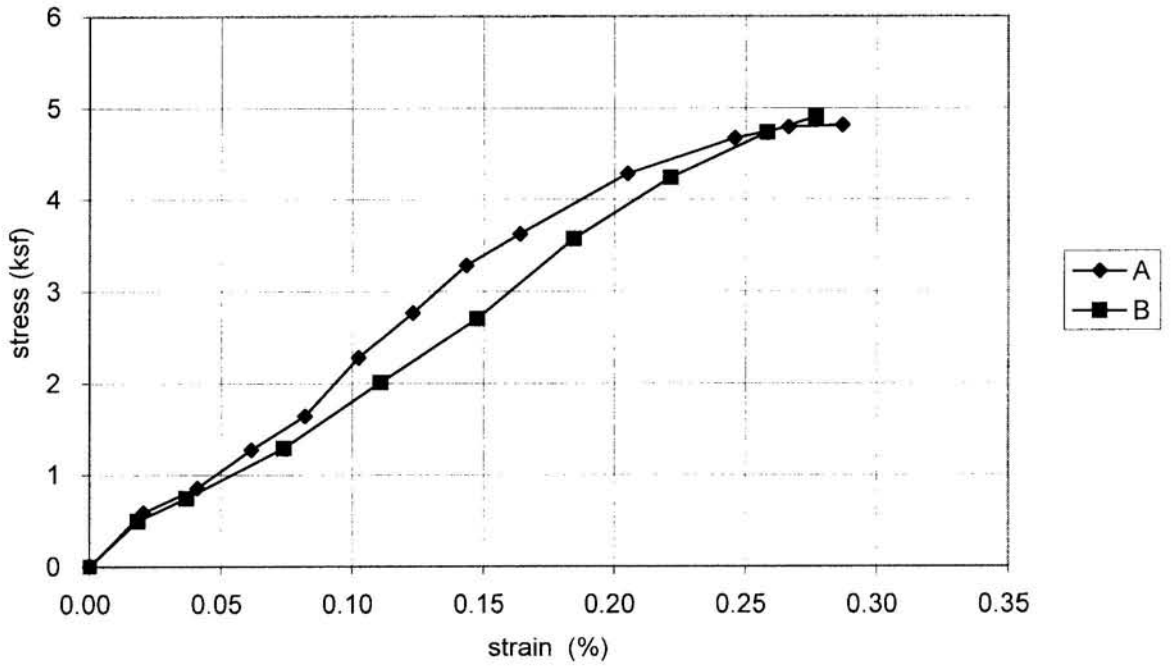
GEOTECHNICAL INVESTIGATION
BLUEWAVE EXPRESS
I-635 AND BELTLINE ROAD
IRVING, TEXAS

Summary of Classification and Index Property Tests

Boring No.	Depth (feet)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Total Soil Suction (psf)
B-1	1.5 - 3.0	27.1	--	--	--	3,530
	3.0 - 4.5	19.9	--	--	--	25,010
	4.5 - 6.0	16.6	56	22	34	29,010
	9.0 - 10.0	26.6	76	29	47	8,860
	14.0 - 15.0	30.7	--	--	--	6,290
	19.0 - 20.0	29.8	--	--	--	5,700
B-2	1.5 - 3.0	25.4	66	21	45	2,630
	3.0 - 4.5	21.7	--	--	--	11,030
	4.5 - 6.0	23.8	--	--	--	12,410
	9.0 - 10.0	25.6	77	25	52	10,030
	14.0 - 15.0	47.3	--	--	--	5,110
	19.0 - 20.0	30.5	--	--	--	4,440
	24.0 - 25.0	30.5	--	--	--	2,770

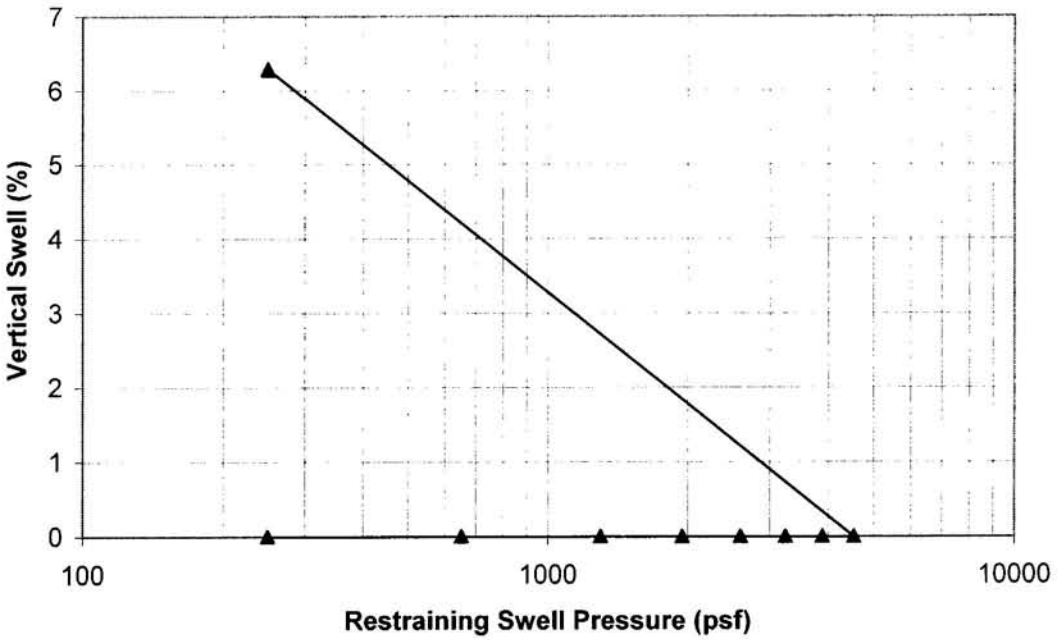
Summary of Unconfined Compression Tests

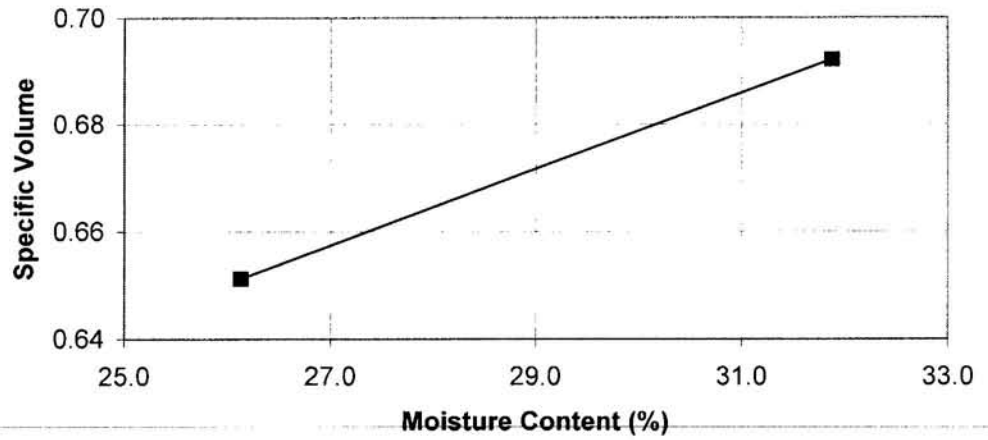
Sample Legend	Boring No.	Depth (feet)	Moisture Content (%)	Dry Unit Weight (pcf)	Unconfined Compressive Strength (ksf)
A	B-1	14.0 - 15.0	30.7	93.5	4.8
B	B-2	14.0 - 15.0	47.3	81.8	4.9



Absorption Pressure Swell Test

			Initial	Final
Project No.	17348	Moisture Content (%)	26.1	31.9
Boring No.	B-1	Penetrometer (tsf)	4.5++	2.25
Depth (ft)	9-10	Dry Unit Weight (pcf)	95.8	90.2
Liquid Limit	76	Specific Gravity	2.71	2.71
Plasticity Index	47	Void Ratio	0.765	0.876
Cs	0.088	Saturation (%)	93	99
alpha	0.71	Spec. Volume	0.65	0.69
Percent Swell	6.3	Swell Pressure (psf)	4,540	250

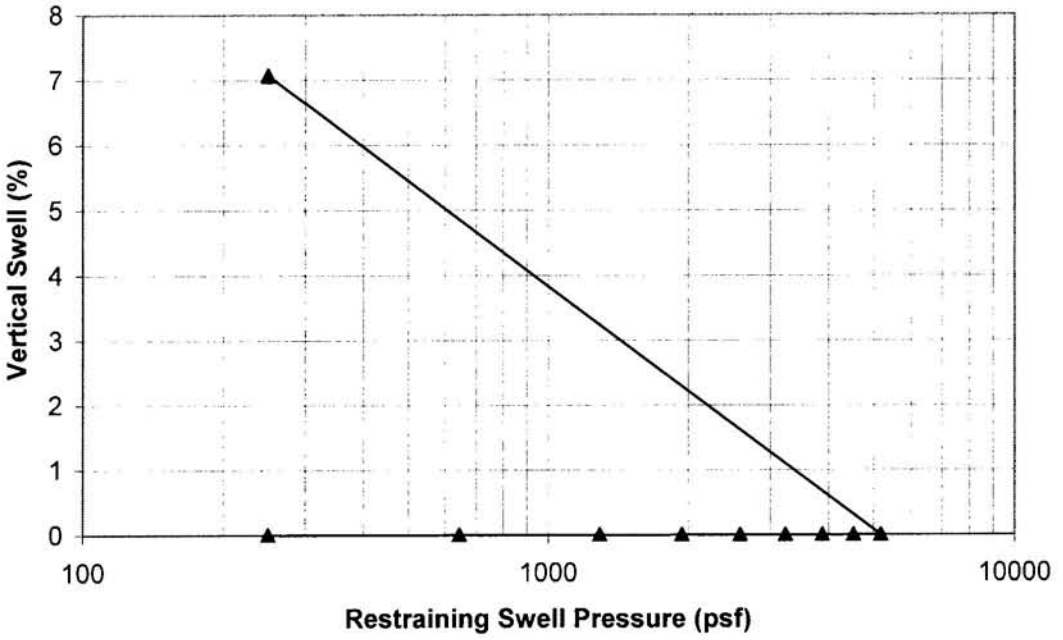


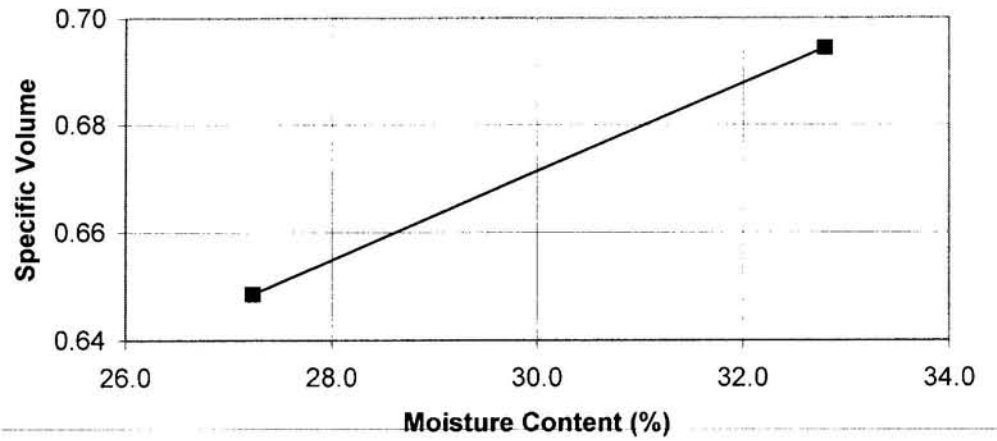


ABSORPTION PRESSURE SWELL TEST PLATE 10

Absorption Pressure Swell Test

			Initial	Final
Project No.	17348	Moisture Content (%)	27.2	32.8
Boring No.	B-2	Penetrometer (tsf)	4.5+	2.75
Depth (ft)	9-10	Dry Unit Weight (pcf)	96.2	89.9
Liquid Limit	77	Specific Gravity	2.72	2.72
Plasticity Index	52	Void Ratio	0.764	0.889
Cs	0.095	Saturation (%)	97	100
alpha	0.82	Spec. Volume	0.65	0.69
Percent Swell	7.1	Swell Pressure (psf)	5,180	250





ABSORPTION PRESSURE SWELL TEST PLATE 11

NOT TO SCALE:

2009 AERIAL PHOTOGRAPH

PLATE 12

GUIDELINE SPECIFICATIONS
SOIL MODIFICATION
WATER INJECTION W/"SELECT" FILL CAP
FOR
BLUEWAVE EXPRESS
I-635 AND BELTLINE ROAD
IRVING, TEXAS

Site Preparation

Prior to the start of injection operations, the building pad should be brought to finished subgrade, minus select fill, and staked out to accurately mark the areas to be injected. Allowance should be made for five to seven inches of swelling that may occur as a result of the injection process.

Materials

1. The water shall be potable, with added surfactant, agitated as necessary to ensure uniformity of mixture.

2. A nonionic surfactant (wetting agent) shall be used according to manufacturer's recommendations; but in no case shall proportions be less than one part (undiluted) per 3,500 gallons of water.

Equipment

1. The injection vehicle shall be capable of forcing injection pipes into soil with minimum lateral movement to prevent excessive blowback and loss of slurry around the injection pipes. The vehicle may be a rubber tire or trac machine suitable for the purpose intended.

2. Slurry pumps shall be capable of pumping at least 3,000 GPH at 100 - 200 pounds per square inch (psi).

Application

1. The injection work shall be accomplished after the building pad has been brought to finished subgrade, minus select fill, and prior to installation of any plumbing, utilities, ditches or foundations.

2. Adjust injection pressures within the range of 100 - 200 psi at the pump.

3. Space injections not to exceed five feet on-center each way and inject a minimum of five feet outside building area. Inject 10 feet beyond building at entrances.

4. Inject to a depth of 12 feet or impenetrable material, whichever occurs first. Impenetrable material is the maximum depth to which two injection rods can be mechanically pushed into the soil using an injection machine having a minimum gross weight of 5 tons.

   Injections to be made in 12-inch to 18-inch intervals down to the total depth with a minimum of 8 stops or intervals. The lower portion of the injection pipes shall contain a hole pattern that will uniformly disperse the slurry in a 360° radial pattern. Inject at each interval to "refusal." Refusal is reached when water is flowing freely at the surface, either out of previous injection holes or from areas where the surface soils have fractured.

   Fluid coming up around, or in the vicinity, of one or more of the injection probes shall not be considered as soil refusal. If this occurs around any probe, this probe shall be cut off so that water can be properly injected through the remaining probes until refusal occurs for all probes. In any event, no probe shall be cut off within the first 30 seconds of injection at each depth interval.

5. Multiple injections with water and surfactant will be required. The second injection shall be orthogonally offset from the initial injection by 2-1/2 feet in each direction. Subsequent injections shall be offset such that existing probe holes are not utilized.

6. A minimum of 48 hours shall be allowed between each injection pass.

7. Injections will be continued until a pocket penetrometer reading of 3.0 tsf or less is obtained on undisturbed soil samples throughout the injected depth. The engineer of record can waive this requirement if, in his opinion, additional injections will not result in additional swelling.

8. At the completion of injection operations, the exposed surface shall be scarified and recompacted to a density between 92 and 98 percent of maximum ASTM D 698 density, at or above optimum moisture. A minimum of 12 inches of select fill shall be placed over the injected subgrade as soon as is practical after completion of injection operations. Select fill should be placed in maximum loose lifts of 8 inches and compacted to at least 95 percent of maximum density, ASTM D 698, at a moisture content between -2 to +3 percentage points of optimum.

Observation and Testing

1. A full-time representative of Reed Engineering Group, Ltd. will observe injection operations.

2. Undisturbed soil samples will be obtained continuously throughout the injected depth, at a rate of one test hole per 10,000 square feet of injected area for confirmation. Sampling will be performed a minimum of 48 hours after the completion of the final injection pass.

GUIDELINE SPECIFICATIONS
SOIL MODIFICATION
WATER INJECTION W/LIME-MODIFIED CAP
FOR
BLUEWAVE EXPRESS
I-635 AND BELTLINE ROAD
IRVING, TEXAS

Site Preparation

Prior to the start of injection operations, the building pad should be brought to finished subgrade and staked out to accurately mark the areas to be injected. Allowance should be made for five to seven inches of swelling that may occur as a result of the injection process.

Materials

1. The water shall be potable, with added surfactant, agitated as necessary to ensure uniformity of mixture.

2. A nonionic surfactant (wetting agent) shall be used according to manufacturer's recommendations; but in no case shall proportions be less than one part (undiluted) per 3,500 gallons of water.

Equipment

1. The injection vehicle shall be capable of forcing injection pipes into soil with minimum lateral movement to prevent excessive blowback and loss of slurry around the injection pipes. The vehicle may be a rubber tire or trac machine suitable for the purpose intended.

2. Slurry pumps shall be capable of pumping at least 3,000 GPH at 100 - 200 pounds per square inch (psi).

Application

1. The injection work shall be accomplished after the building pad has been brought to finished subgrade and prior to installation of any plumbing, utilities, ditches or foundations.

2. Adjust injection pressures within the range of 100 - 200 psi at the pump.

3. Space injections not to exceed five feet on-center each way and inject a minimum of five feet outside the building footprint. Inject 10 feet beyond building at entrances.

4. Inject to a depth of 12 feet or impenetrable material, whichever occurs first. Impenetrable material is the maximum depth to which two injection rods can be mechanically pushed into the soil using an injection machine having a minimum gross weight of 5 tons.

   Injections to be made in 12-inch to 18-inch intervals down to the total depth with a minimum of 8 stops or intervals. The lower portion of the injection pipes shall contain a hole pattern that will uniformly disperse the slurry in a 360° radial pattern. Inject at each interval to "refusal". Refusal is reached when water is flowing freely at the surface, either out of previous injection holes or from areas where the surface soils have fractured.

   Fluid coming up around or in the vicinity of one or more of the injection probes shall not be considered as soil refusal. If this occurs around any probe, this probe shall be cut off so that water can be properly injected through the remaining probes until refusal occurs for all probes. In any event, no probe shall be cut off within the first 30 seconds of injection after refusal at each depth interval.

   (The 30-second criterion is not the maximum time for each depth interval but a minimum time. Additional time may be required to achieve refusal, dependent upon the contractor's equipment.)

5. Multiple injections with water and surfactant will be required. The second injection shall be orthogonally offset from the initial injection by 2-1/2 feet in each direction. Subsequent injections shall be offset such that existing probe holes are not utilized.

6. A minimum of 48 hours shall be allowed between each injection pass.

7. Injections will be continued until a pocket penetrometer reading of 3.0 tsf or less is obtained on undisturbed soil samples throughout the injected depth. The engineer of record can waive this requirement if, in his opinion, additional injections will not result in additional swelling.

8. At the completion of injection operations, the exposed surface shall be scarified and blended with a minimum of 6 percent hydrated lime, or 27 pounds of lime per square yard, to a depth of 6 inches. The subgrade shall then be recompacted to a density of between 95 and 100 percent of maximum ASTM D 698 density at or above optimum moisture.

Observation and Testing

1. A full-time representative of Reed Engineering Group, Ltd. will observe injection operations.

2. Undisturbed soil samples will be obtained continuously throughout the injected depth, at a rate of one test hole per 10,000 square feet of injected area for confirmation. Sampling will be performed a minimum of 48 hours after the completion of the final injection pass.

GUIDELINE SPECIFICATIONS
SOIL MODIFICATION
WATER INJECTION W/"SELECT" FILL OR
FLEXIBLE BASE CAP
FOR
BLUEWAVE EXPRESS
I-635 AND BELTLINE ROAD
IRVING, TEXAS

Site Preparation

Prior to the start of injection operations, the building pad should be brought to finished subgrade, minus select fill, and staked out to accurately mark the areas to be injected. Allowance should be made for five to seven inches of swelling that may occur as a result of the injection process.

Materials

1. The water shall be potable, with added surfactant, agitated as necessary to ensure uniformity of mixture.

2. A nonionic surfactant (wetting agent) shall be used according to manufacturer's recommendations; but in no case shall proportions be less than one part (undiluted) per 3,500 gallons of water.

Equipment

1. The injection vehicle shall be capable of forcing injection pipes into soil with minimum lateral movement to prevent excessive blowback and loss of slurry around the injection pipes. The vehicle may be a rubber tire or trac machine suitable for the purpose intended.

2. Slurry pumps shall be capable of pumping at least 3,000 GPH at 100 - 200 pounds per square inch (psi).

Application

1. The injection work shall be accomplished after the building pad has been brought to finished subgrade, minus select fill, and prior to installation of any plumbing, utilities, ditches or foundations.

2. Adjust injection pressures within the range of 100 - 200 psi at the pump.

3. Space injections not to exceed five feet on-center each way and inject a minimum of five feet outside building area. Inject 10 feet beyond building at entrances.

4. Inject to a depth of 12 feet or impenetrable material, whichever occurs first. Impenetrable material is the maximum depth to which two injection rods can be mechanically pushed into the soil using an injection machine having a minimum gross weight of 5 tons.

   Injections to be made in 12-inch to 18-inch intervals down to the total depth with a minimum of 8 stops or intervals. The lower portion of the injection pipes shall contain a hole pattern that will uniformly disperse the slurry in a 360° radial pattern. Inject at each interval to "refusal." Refusal is reached when water is flowing freely at the surface, either out of previous injection holes or from areas where the surface soils have fractured.

   Fluid coming up around, or in the vicinity, of one or more of the injection probes shall not be considered as soil refusal. If this occurs around any probe, this probe shall be cut off so that water can be properly injected through the remaining probes until refusal occurs for all probes. In any event, no probe shall be cut off within the first 30 seconds of injection at each depth interval.

5. Multiple injections with water and surfactant will be required. The second injection shall be orthogonally offset from the initial injection by 2-1/2 feet in each direction. Subsequent injections shall be offset such that existing probe holes are not utilized.

6. A minimum of 48 hours shall be allowed between each injection pass.

7. Injections will be continued until a pocket penetrometer reading of 3.0 tsf or less is obtained on undisturbed soil samples throughout the injected depth. The engineer of record can waive this requirement if, in his opinion, additional injections will not result in additional swelling.

8. At the completion of injection operations, the exposed surface shall be scarified and recompacted to a density between 92 and 98 percent of maximum ASTM D 698 density, at or above optimum moisture. A minimum of 12 inches of select fill or 8 inches of crushed concrete shall be placed over the injected subgrade as soon as is practical after completion of injection operations. Select fill should be placed in maximum loose lifts of 8 inches and compacted to at least 95 percent of maximum density, ASTM D 698, at a moisture content between -2 to +3 percentage points of optimum. Crushed concrete should be placed in a maximum loose lift of 9 inches and compacted to at least 95 percent of maximum ASTM D 698 density.

Observation and Testing

1. A full-time representative of Reed Engineering Group, Ltd. will observe injection operations.

2. Undisturbed soil samples will be obtained continuously throughout the injected depth, at a rate of one test hole per 10,000 square feet of injected area for confirmation. Sampling will be performed a minimum of 48 hours after the completion of the final injection pass.

May 9, 2011
Project No. 17348

BlueWave Express LLC (or its designated assignee)
4545 Post Oak Place, Suite 140
Houston, Texas 77027
ATTN: Mr. Everett P. Jackson

Re: Supplemental Geotechnical Design Parameters
Bluewave Express
I-635 and Beltline Road
Irving, Texas

Gentlemen:

Submitted here are supplemental geotechnical recommendations for the referenced project. It is understood that the car wash will have an approximate 4-foot deep "basement" to accommodate the track. Consequently, an alternative to a stiffened slab-on-grade foundation is being considered. A pier and beam foundation with a ground-supported floor is considered feasible of some floor movement is acceptable. Remedial earthwork will be required to reduce the potential movements prior to construction of a ground-supported floor.

Recommendations for this alternative are provided below.

Foundation, Straight-Shaft Piers

Foundation support for concentrated column loads should be provided by auger-excavated, straight-shaft, reinforced concrete piers. The piers should be founded a minimum of two feet into the dark gray, unweathered shale encountered at depths of 25-1/2 to 27 feet below March 2011 grades. For purposes of identification, recommended bearing and skin friction values may be used below a minimum seating depth of two feet.

Piers should be proportioned for a maximum end bearing pressure of 18.0 kips per square foot (ksf) and a maximum skin friction in compression of 3.0 ksf. The end bearing and skin friction values are applicable for portions of the piers extended below the two-foot minimum penetration recommended for visual confirmation of the dark gray, unweathered shale stratum. No portion of the pier surface area above the minimum two-foot penetration should be counted on to provide shear (skin friction) resistance.

Piers proportioned in accordance with these allowable bearing and skin friction values will have a minimum factor of safety of three considering a shear or plunging failure. The weight of the pier concrete below final grade may be neglected in determining foundation loads. Properly constructed piers should undergo negligible post-construction settlement.

Piers will be subjected to uplift associated with swelling within the upper clays. The piers should contain reinforcing steel throughout the pier shaft to resist the tensile uplift forces. Reinforcing requirements may be estimated based on an uplift pressure of 1.3 ksf acting over the top 10 feet of pier surface area. The calculated uplift value is considered a working load. Appropriate factors of safety should be applied in calculating the percent of reinforcement.

"Mushrooming," or widening of the upper portion of the pier shaft, will significantly increase the uplift pressure from the upper clays. "Mushrooms" should be removed from the piers prior to backfill operations.

Pier caps should not be used with the piers unless a minimum void of 8 inches (factor of safety of 1.3) is created below the portion of the cap extending beyond the shaft diameter.

Uplift resistance will be provided by negative friction within the dark gray, unweathered shale. Resistance to uplift can be calculated using an allowable friction of 2.0 ksf. This value should be applied for all portions of the piers extending below the minimum two foot penetration depth into dark gray, unweathered shale. Piers designed using the above value will have a minimum factor of safety of three considering a shear failure in uplift.

Due to the presence of ground water, temporary casing during pier shaft construction should be anticipated. The casing should be seated a sufficient distance into the dark gray unweathered shale to prevent infiltration of ground water and sloughing of soils into the pier shaft excavations.

Pier excavations should be dry and free of deleterious materials prior to concrete placement. In no case should the pier shaft excavations remain open for more than six hours prior to concrete placement.

Continuous observation of the pier construction by a representative of this office is recommended. Observation is recommended to confirm the bearing stratum and that the excavations are dry prior to placement of concrete.

Grade Beams

Grade beams should be constructed with a minimum void of 8 inches (Factor of Safety of 1.3) beneath them. A void is recommended to limit potential foundation movements associated with swelling of the underlying soils.

The void can be created below grade beams by use of wax-impregnated cardboard forms. Retainer boards along the outside of the grade beam will not be necessary.

Grade beams should be double-formed. Earth-forming of beams below ground is not recommended because of the inability to control the beam excavation width.

Fill on the outside of perimeter grade beams should be placed in a controlled manner. Backfill should consist of site-excavated clays, or equal, placed and compacted in accordance with the **Earthwork** section of the original report. If bedding soils must be used adjacent to the perimeter of the building, the clay/bedding soil interface should be sloped to drain away from the building. Compaction criteria are included in the **Earthwork** section of the original report.

Floor Slab

Use of a ground-supported floor is feasible, provided the risk of some post-construction floor movement is acceptable. The potential movement can be reduced by proper implementation (i.e., construction) of remedial earthwork recommended in the **Subgrade Modification** section of the original report. The risk of the potential movement occurring can be reduced by implementation of positive grading of surface water away from the building and backfilling immediately adjacent to the structure with on-site clays.

It is recommended that the subgrade below the floor slab be water injected or excavated and recompacted at an elevated moisture content as outlined in the **Subgrade Modification** section of the original report. The subgrade treatment should extend at least 15 feet beyond the general building lines. Consideration should be given to moisture treating the subgrade below the entire paving area. This will decrease the chances of a negative drainage condition around the building and water ponding adjacent to the building.

Considering proper implementation of these measures, the potential for post-construction movement associated with heave is estimated to be on the order of one inch. Additional movement is possible if the clays become saturated, such as can happen from utility leaks and excessive ponding adjacent to the perimeter walls.

Positive drainage of water away from the structure must be provided and maintained after construction. Architectural detailing of interior finishes should allow for approximately one-half to one inch of differential floor movement.

A minimum 10-mil thick polyethylene sheet is recommended below the floor to limit migration of moisture through the slab from the underlying soils. This is of particular importance below sections of the floor covered with carpeting, paint or tile. Penetrations and lapped joints should be sealed with a waterproof tape.

Ground-supported floors over expansive soils may be subject to settlement if the underlying clays dry during the life of the structure. Natural desiccation will be limited to the outer four to five feet along the perimeter where surface pavement does not abut the structure. However, roots from trees and shrubs can grow below the structure and increase the zone of desiccation. This process typically requires 8 to 10 years to develop. Use of landscaping adjacent to the building perimeter is not recommended. The paving should extend to the perimeter of the building. All joints between the building and the exterior flatwork should be sealed and maintained.

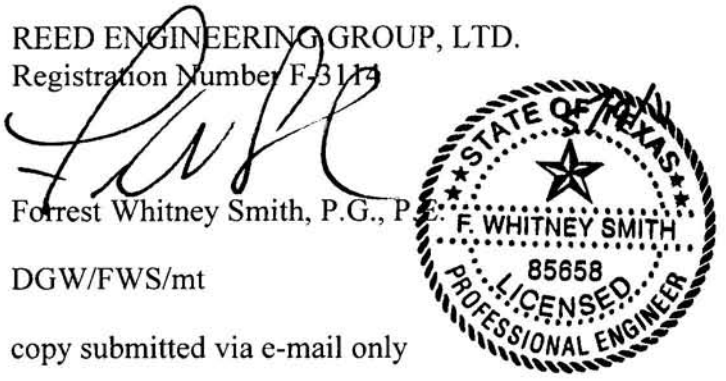
All other pertinent recommendations from the original report remain in effect.

* * *

We trust this information will be sufficient for your needs. If any questions arise, do not hesitate to call.

Sincerely,

REED ENGINEERING GROUP, LTD.
Registration Number F-3114



Forrest Whitney Smith, P.G., P.E.

DGW/FWS/mt

copy submitted via e-mail only

SECTION 01018

OWNER FURNISHED PRODUCTS

PART 1 GENERAL

1.01 BlueWave Express LLC , the Owner, retains the right to place and install, in coordination with Contractor's construction schedule, as many items and/or as much equipment a he may require during the progress of the work, before completion of the various parts of the work. This shall not in any way evidence completion of the work or any portion thereof, nor shall it signify Owner's acceptance of the work or any portion thereof.

PART 2 PRODUCTS

2.01 BY OWNER

A. Items shown or noted "By BWE" on the drawings and/or in the specifications shall be provided by BlueWave Express LLC, the Owner. The Contractor/subcontractor shall receive, to the extent of unloading at the job site as required, store and be responsible to the extent of carrying necessary insurance to cover items in case of theft, fire, loss, malicious damage and other miscellaneous damage. Included, but not inclusive, in this category are:

1. Sentry automated entry system by ICS.
2. All carwash equipment.
3. Vacuums and related piping.
4. Refuse cans.

2.02 NOT IN CONTRACT (NIC)

A. Items shown or noted "(NIC)" on the drawings and/or in the specifications shall be furnished and installed by Owner (BWE) under separate contract, except as described hereinafter. The Contractor shall coordinate into schedule and receive, unload as required, store, provide conduit power outlets and power usage, etc. as necessary for hook-ups, and be responsible to the extent of carrying necessary insurance to cover items in case of theft, fire, loss, malicious damage and other miscellaneous damage. Included, but not inclusive, in this category are:

1. Appliances
2. Furnishings such as table tops, chairs, stools, etc., and interior decor items.
3. Security System where and if specified.
4. Sound system (to include speaker attachment, cable and pulling cable).
5. Signs and Signage, including painted exterior and interior signs where and if shown on drawings.
6. Safe in office.
7. POS system (to include registers, printers, cables and pulling cables).

PART 3 EXECUTION

3.01 RECEIPT OF ITEMS

A. During the course of construction, some deliveries of equipment and miscellaneous items will be made to the job site by common carrier. Contractor shall receive and inspect items for conformance to delivery ticket(s) and for damage. If during receipt any missing or damaged items are observed, Contractor shall:

1. Make notation of any and all discrepancies on the delivery ticket(s).
2. Call delivery carrier and advise him of the problem.
3. Call the Owner's construction manager and advise of any problems.

END OF SECTION

SECTION 01030

ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes administrative and procedural requirements governing Alternates.

B. An alternate is an amount proposed by the Contractor for certain work that may be added to or deducted from the Lump Sum Contract to incorporate the Alternate into the Work.

1. The cost or credit for each alternate is the net addition to or deduction from the Lump Sum Contract to incorporate the Alternate into the Work.

C. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.

D. Notification: Immediately following commencement of the work notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

PART 2 ALTERNATES

2.01 ADDITIVE ALTERNATES

A. ALTERNATE #A1: Provide 80 mil TPO roofing membrane system with 30 year warranty in lieu of specified system.
B. ALTERNATE #A2: Provide Exterior Fabric Canopies in lieu of Pre-finished Standing Seam Roofing and Soffit Panels

END OF SECTION

SECTION 01036

CHANGE ORDER PROCEDURES

PART 1 GENERAL

1.01 GENERAL

A. General conditions of the Contract for Construction, AIA Document A201, Article 7, all paragraphs inclusive, shall govern the work of this section, with the exception that the Owner's representative shall in all cases perform and be responsible for the duties and responsibilities of the "Architect".

1.02 WORK AUTHORIZATION

A. In the event a change to the work is required by the Owner, a written 'Work Authorization" for changes to the contract will be issued by the Owner. The authorization will include actual or estimated costs for the change and a statement of responsibility for actual cost if estimated costs are used.

1.03 CONTRACTOR RESPONSE

A. Contractor shall respond with a formal typewritten "Contract Change Order", in triplicate, referencing authorization number, job name, date, specific items changed and shall indicate total amount of authorization imposed costs. Contractor will only be allowed an (8%) eight percent overhead and profit markup. Backup documentation is to be submitted with all extra costs. Two or more authorizations may be included on one change order.

END OF SECTION

SECTION 01040

COORDINATION

PART 1 GENERAL

1.01 COORDINATION

A. Coordinate construction to assure efficient and orderly installation of each part of the Work. Coordinate operations that depend on each other for proper installation, connection, and operation.
   1. Schedule operations in the sequence required to obtain the best results where installation of one part depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to assure maximum accessibility for maintenance, service, and repair.
   3. Make provisions to accommodate items scheduled for later installation.

B. Wherever necessary, prepare memoranda for distribution to each party involved, outlining procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
   1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required procedures with other activities to avoid conflicts and assure orderly progress. Such activities include, but are not limited to, the following:
   1. Preparation of schedules.
   2. Delivery and processing of submittals.
   3. Preparation of and tracking of RFI's (Request for Information)
   4. Progress meetings.
   5. Project closeout activities.

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

PART 2 PRODUCTS — (Not applicable)

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspection of Conditions: Require Installers of major components to inspect substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.

B. Coordinate temporary enclosures with inspections and tests to minimize the need to uncover completed construction.

3.02 PREPARATION

A. Clean and protect construction in progress and adjoining materials, during handling and installation. Apply protective covering to assure protection from damage or deterioration.

B. Clean and maintain completed construction as necessary through the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction to assure that no part is subject to harmful, dangerous, or damaging exposure. Such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Water or ice.
5. Solvents and chemicals.
6. Soiling, staining, and corrosion.
7. Combustion.
8. Traffic or storage of materials on completed roofing.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cutting and patching. Execute cutting, fitting or patching of work, required to:
   1. Make several parts fit properly.
   2. Uncover Work to provide for installation of ill-timed Work.
   3. Remove and replace Work not conforming to requirements of Contract Documents.
   4. Remove and replace defective Work.
   5. Remove samples of installed Work as specified for testing.
   6. Install specified Work in existing construction.

B. In addition to specified requirements, upon written instruction of Owner:
   1. Uncover Work to provide for Owner and Architect's observation of covered Work.
   2. Remove samples of installed materials for testing.

C. Do not endanger any Work by cutting or altering Work or any part of it.

D. Do not cut or alter work of another contractor without written consent of Owner.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, submit written notice to Architect, requesting consent to proceed with cutting.

B. Prior to cutting done on instruction of Owner, submit cost estimate.

C. Should conditions of Work, or schedule, indicate change of materials or methods, submit written recommendation to Owner and Architect, including:
   1. Conditions indicating change.
   2. Recommendations for alternative materials or methods.
   3. Submittals as required for substitutions.

D. Submit written notice to Owner and Architect, designating time Work will be uncovered, to provide observation.

1.04 QUALITY ASSURANCE

A. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
   1. Primary operational systems and equipment.
   2. Control systems.
   3. Communication systems.
   4. Electrical wiring systems

B. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to

perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping ductwork, vessels and equipment.
5. Noise- and vibration-control elements and systems.

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

PART 2 PRODUCTS

2.01 MATERIALS

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

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

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

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine existing conditions of Work, including elements subject to movement or damage during cutting and patching, and excavating and backfilling.

B. After uncovering Work, examine conditions affecting installation of new products.

3.02 PREPARATION

A. Prior to cutting, provide shoring, bracing and support as required to maintain structural integrity of Project. B. Provide protection for other portions of Project. Provide protection from elements.

3.03 PERFORMANCE

A. General: Employ qualified workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

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

3.04 ADJUSTING

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances and finishes.

B. Execute cutting and removal to the extent necessary.

C. Restore Work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents.

D. Refinish entire surfaces as necessary to provide an even finish.
   1. Continuous surfaces: To nearest intersections.
   2. Assembly: Entire refinishing.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including:

1. Pre-installation Conference.
2. Progress Meetings.
3. Post Installation Conference.

1.02 QUALITY ASSURANCE

A. Pre-installation Conferences: Conduct a conference before each activity that requires coordination with other operations.

1. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation shall attend. Advise the Architect of scheduled meeting dates.

a. Review the progress of other operations and preparations for the activity under consideration at each pre-installation conference, including requirements for the following:

(1) Compatibility problems and acceptability of substrates.
(2) Time schedules and deliveries.
(3) Manufacturer's recommendations.
(4) Warranty requirements.
(5) Inspecting and testing requirements.

b. Record significant discussions and agreements and disagreements, and the approved schedule.
Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.

B. Progress Meetings: Conduct progress meetings at the Project Site at regular intervals. Notify the Owner and the Architect of scheduled dates. Coordinate meeting dates with preparation of the payment request.

1. Attendees: The Owner, Architect, and other entities concerned with current progress or involved in planning, coordination, or future activities shall be represented. Participants shall be authorized to conclude matters relating to

2. Agenda: Review and correct or approve minutes of the previous meeting. Review items of significance that could affect progress. Include topics for

3. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction; secure commitments from parties involved to do so. Discuss revisions required to insure subsequent activities will be completed within the Contract Time.

4. Review the present and future needs of each entity present, including the following:
a. Time.

b. Sequences.
c. Status of submittals.
d. Deliveries and off-site fabrication problems.
e. Quality and work standards.
f. Change Orders.

5. Reporting: Distribute meeting minutes to each party present and to parties who should have been present.

Include a summary of progress since the previous meeting and report.

6. Schedule Updating: Revise the Contractor's Construction Schedule after each meeting where revisions have been made. Issue the revised schedule concurrently with the report of each meeting.

C. Post Installation Conference: Conduct a post installation conference after specific work activity, were specified.

1. Attendees: The Contractor, Installer for the work affected, Owner's Testing Laboratory (if applicable), Representative of the Manufacturer, Owner's Representative, and the Architect shall attend. Advise the Architect of scheduled meeting dates.

a. Review the completed work including intended and expected results.
b. Water or hose test of work on exterior to check for water leakage.
c. Review Warranty requirements.
d. Record significant discussions and agreements and disagreements. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section specifies administrative and procedural requirements for submittals required for performance of the Work including the following:
   1. Contractor's construction schedule.
   2. Submittal schedule.
   3. Construction reports.
   4. Shop Drawings.
   5. Product Data.
   6. Samples.
   7. Quality assurance submittals.

B. Administrative Submittals:
   1. Permits.
   2. Applications for Payment.
   3. Performance and payment bonds.
   4. Insurance certificates.
   5. List of subcontractors.

1.02 SUBMITTALS

A. Required Submittals: Provide submittals as specified in individual Specification Sections, and as the Architect or Engineer may require.

B. Submittal Procedures: Coordinate submittal preparation with construction, fabrication, other submittals, and activities that require sequential operations. Transmit in advance of construction operations to avoid delay.

C. Coordinate submittals for related operations to avoid delay because of the need to review submittals concurrently for coordination. The Architect reserves the right to withhold action on a submittal requiring coordination until related submittals are received.

D. Required Action Markings: No submittals without either the "Reviewed', "Make Corrections Noted" or, "Resubmit Corrected Copy" marking by the Owner/Architect, are permitted to be used in connection with the Work.

E. Processing: At Owner/Architect's discretion, allow 2 weeks for the initial review. Allow more time if the Owner/Architect must delay processing to permit coordination. Allow 2 weeks for reprocessing.
   1. No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.

F. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Provide a space approximately 4" x 5" on the label or beside the title block on Submittals to record the Contractor's review and approval markings and the Architect's action markings. Include the following information on the label for processing and recording action taken:
   1. Project name:
   2. Date.
   3. Name and address of the subcontractor.
   4. Name and address of the supplier.
   5. Name of the manufacturer.
   6. Number and title of appropriate Specification Section.

7. Drawings number and detail references, as appropriate.

G. Submittal Transmittal: Package each submittal appropriately. Transmit with a transmittal form. The Owner /Architect will not accept submittals from sources other than the Contractor.
H. Transmittal Form: Use Contractor's standard from. On the form, record requests for data and deviations from requirements. Include Contractor's certification that information complies with requirements.
I. Control Submittals
   1. Contractor's Construction Schedule: Prepare a horizontal bar-chart-type, contractor's construction schedule.Provide a, separate time bar for each activity and a vertical line to identify the first working day each week. Use the same breakdown of Work indicated in the "Schedule of Values". As Work progresses, mark each bar to indicate actual completion.
      a. Work Stages: Indicate important stages for each portion of the Work.

   2. Submittal Schedule: After developing the Contractor's Construction Schedule, prepare a schedule of submittals. Submit within 10 days of submittal of the Construction Schedule.
      a. Coordinate with list of subcontracts, Schedule of Values, list of products, and the Contractor's Construction Schedule.
      b. Prepare the schedule in chronological order. Provide: date for first submittal; related section number; submittal category (Shop Drawings, Product Data, or Samples); name of the subcontractor; description of the Work covered and date for the architect's final acceptance.
      c. Schedule distribution; Distribute copies of the Contractor's Construction Schedule and the Submittal Schedule to the Architect, Owner, subcontractors, and parties required to comply with submittal dates. Post copies in the field office.
         (1) When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their Work and are no longer involved in construction activities.
         (2) Updating: Revise the schedule after each meeting or activity where revisions have been made. Issue the updated schedule concurrently with the report of each meeting.

J. Shop Drawings:
   1. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the contract Documents. Any deviations from the Contract Documents that are not indicated on Submittals, and that are not commented upon by the Architect, will be considered as modifications to the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of shop drawings. Standard information prepared without specific reference to the Project is not considered shop drawings. Shop drawings shall show or be keyed into adjacent construction materials. Shop drawings shall also show locations and details of construction. On each re-submittal for shop drawings, clearly indicate revisions or changes form previous submittal. Include the following information:
      a. Dimensions.
      b. Identification of products and materials included by sheet and detail number.
      c. Compliance with standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
   2. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit shop drawings on sheets at least 8-1/2" x 11" but no larger than 24" x 36".
   3. Drawing Submittal:
      a) Option 1: Submit four (4) black-line prints until Architect's final Action" stamp is obtained.
      b) Option 2: Submit electronic file in PDF format

4. Do not use Shop Drawings without and appropriate final "Action stamp in connection with the Work.

K. Product Data: Collect Product Data into a single submittal for each element of construction. Mark each copy to shown applicable choices and options. Where Product Data includes information on several products, mark copies to indicate applicable information.

1. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required. Submittal may be made electronically in PDF format at Contractor's option.
2. Data Submittals: Unless noncompliance with Contract Documents is observed, the Submittal serves as the final Submittal.
    a) Option 1: Submit 2 copies; submit 4 copies where required for maintenance manuals. The Architect will retain one and return the other marked with action taken.
    b) Option 2: Submit electronic file in PDF format
3. Distribution: Furnish copies to installers, subcontractors, suppliers, and others required for performance of construction activities. Show distribution on transmittal forms. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
    a. Do not use unmarked Product Data for construction.

L. Samples: Submit full-size Samples cured and finished as specified and identical with the material proposed. Mount Samples to facilitate review of qualities.

1. Include the following:
    a. Specification Section number and reference.
    b. Generic description of the Sample.
    c. Sample source.
    d. Product name or name of the manufacturer. e. Compliance with recognized standards.
    f. Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture, for a check of these characteristics, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed. Where variations are inherent in the material, submit at least 3 units that show limits of the variations.
    a. Refer to other Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar characteristics.
    b. Refer to other Sections for Samples to be incorporated in the Work. Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
    c. Samples not incorporated into the Work, or designated as the Owner's property, are the Contractor's property and shall be removed from the site.
    d. Submittals: Custom Colors: Where samples are to be submitted which are to match Architect selected "custom" colors, submit several different attempts or a range of closely matching colors to the Architect for final selection.

3. Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics forms standard choices. The Owner /Architect will review and return submittals indicating selection and other action.

4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. One set will be

returned marked with the action take. Maintain sets of Samples, at the Project Site, for quality comparison.

a. Unless noncompliance with Contract Documents is observed, the submittal may serve as the final submittal.

b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

5. Distribution of Samples: Distribute additional sets to subcontractors, manufacturers, and others as required for performance of the Work. Show distribution on Transmittal forms.

M. Quality Assurance

1. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, and manufacturer's field reports required under other Sections of the Specifications.

   a. Certifications: Where certification that a product or installation complies with specified requirements is required, submit a notarized certification from the manufacturer certifying compliance. Certification shall be signed by an officer authorized to sign documents on behalf of the company.

2. Architect's Action: Except for submittals for the record or information, where action and return is required Owner /Architect will review each submittal and will mark to indicate action to be taken. Where submittal must be held for coordination, Contractor will be so advised without delay. Compliance with specified characteristics is the Contractor's responsibility.

   a. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken as follows:

   b. Unsolicited Submittals: The Architect will return unsolicited submittals to the sender without action.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART1 GENERAL

1.01 SECTION INCLUDES

A. Testing required of Contractors.
B. Contractor's quality control systems.
C. Manufacturer's field services.
D. Independent Testing Agency services.
E. Tenant shall provide Site Observation and shall report observations to the Architect or Engineer of record.

1.02 RELATED SECTION

A. Shop Drawings, Submittals, Product Data and Samples: Section 01300 Submittals.

1.03 TESTING -GENERAL

A. The term "testing" as used herein is defined as testing and/or inspection.

B. The Contractor shall provide such equipment and facilities as the Testing Agency may require for conducting field tests and for collecting and forwarding samples. The contractor shall not use any materials or equipment represented by samples until tests, if required, have been made and the materials or equipment found to be acceptable. Any product, which becomes unfit for use after acceptance shall not be incorporated into the work.

C. All materials or equipment proposed to be used may be tested at any time during their preparation or use. The Contractor shall furnish the required samples without charge and shall coordinate testing with the Architect, Engineer and Testing Agency to allow sufficient time for testing before placing orders or starting work. Products may be tested either prior to shipment or after being received at the job site.

D. Tests shall be made by an accredited testing agency with a minimum of 5 years experience in the specific type of testing to be performed. Except as otherwise provided, sampling and testing of all materials and the laboratory methods and testing equipment shall be in accordance with the latest standards and tentative methods of the American Society for Testing Materials (ASTM).

E. Where additional or specific information concerning testing methods, samples sizes, etc., is required, such information is included under this section of the Specification.

1.04 TESTING REQUIRED OF CONTRACTORS

A. The following testing shall be performed at the expense of the Contractor installing the material being tested:

1, Material or Method Substitution: Any tests of basic material, fabrication equipment or method offered as a substitute for specified items or methods on which a test may be required in order to provide its compliance with the specifications.

2. Product Performance Verification: The Supplier of products specified based on performance criteria shall, at the request of the Architect or Structural Engineer, inspect the installed product and certify conformance of the product to specified criteria under the installed conditions

3. Masonry: Submit the following tests for each class of unit and type of masonry assemblage two weeks prior to start of construction. Prepare specimens and test in accordance with all applicable Codes and standards cited therein.

    a. Tests made on individual masonry units within the last four months.
    b. Current mortar test including mortar proportions.
    c. Current grout test including grout proportions. d. Current prism test.
        (1) Include mortar and grout proportions used in test specimens.
        (2) Substantiate that each type of masonry assemblage meets or exceeds the required 28-day compressive strength (f m) .

4. Corrective measures resulting from any test that fails shall be paid for by the installing contractor and shall be subject to the following conditions:

    a. The Contractor shall immediately notify the Tenant and provide revised schedules.
    b. Quantity and nature of additional testing, if required, will be determined by the responsible consultant.
    c. All additional tests shall be taken in the presence of the responsible consultant or his representative.
    d. Proof of noncompliance will make the installing contractor liable for any corrective action which the responsible consultant feels is prudent, including complete removal and replacement of defective material.
    e. Nothing contained herein is intended t o imply that the installing contractor does not have the right to have tests performed on any material at any time for his own information and job control so long as the Owner does not assume responsibility for costs or for giving them consideration when appraising quality of materials.

1.05 TEST REPORTS

A. Reports of all tests shall be distributed by the testing agency as follows:

    1 copy – General Contractor's Project Manager
    1 copy– General Contractor's Field Superintendent
    1 copy – Applicable supplier or subcontractor
    1 copy – Owner
    1 copy —Applicable Engineer
    1 copy —Architect
    Other copies – as directed

1.06 QUALITY ASSURANCE

A. The General Contractor is to establish a quality control system and perform sufficient inspection and tests of all items of work, including that of his subcontractors, to ensure conformance to the Contract Documents for materials, workmanship, construction, finish, functional performance and identification. Contractor's quality control system is the means by which he assures himself that his construction complies with the requirements of the Contract Documents. Controls shall be adequate to cover all construction operations.

B. Pre-Construction Conference:
    1. Contractor shall schedule and conduct a pre-construction conference to review the detailed quality control and construction requirements for each of the materials and/or systems listed below, not less than 10 working days prior to commencement of the applicable portion of the work.
        a. Foundations
        b. Structural steel

c. Masonry

2. The Contractor shall require responsible representatives of each party concerned with that portion of the work to attend the conference, including but not limited to the following:
   a. Contractor's superintendent
   b. Materials supplier(s) or fabricator
   c. Installation subcontractor(s)
   d. Agency responsible for Contractor-furnished testing.
3. The Tenant, Architect, responsible Engineer and Owner's Testing Agency will be present and shall be notified by the Contractor at least 5 days prior to the schedule date of each such conference.
4. Minutes of each conference shall be recorded by the Contractor and shall be distributed by him in typed or printed form to each party in attendance within 5 days of the meeting. One copy of these minutes shall also be transmitted to the Owner's representative and to the Architect for information.

C. Records: Contractor shall maintain correct records on an appropriate form for all inspection and tests performed, instructions received from the Architect, responsible Engineer or Testing Agency, and actions taken as a result of those instructions. These records shall include evidence that the required inspections or test shave been performed (including type and number of inspection or tests, nature of defects, causes for rejection, etc.), proposed or directed remedial action, and corrective action taken. Contractor shall document inspections and tests as required by each section of the Specifications.

1.07 MANUFACTURER'S FIELD SERVICES

A. When specified in respective Specification sections, Contractor shall require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, testing, and to make appropriate recommendations.

B. Manufacturer's representative shall submit written report to the Architect and Tenant and responsible Engineer listing observations and recommendations.

1.08 INDEPENDENT TESTING AGENCY SERVICES

A. General: The Owner will employ and pay for the services of an independent Testing Agency to perform the following inspections, tests and other services. Services shall be performed in accordance with requirements of governing authorities and with requirements of governing authorities and with specified standards.

1. Contractor shall cooperate with Testing Agency personnel and shall furnish tools, samples of materials, design mixes, equipment, and assistance as requested.

2. Contractor shall provide and maintain, for the sole use of the Testing Agency, adequate facilities for the safe storage and proper curing of concrete test cylinders on the project site for the first 24 hours after casting as required by ASTM C31, Method of Making and Curing Concrete Test Specimens in the field.

3. Contractor shall build and store masonry test prisms in a manner acceptable to the Testing Agency. Prisms to be tested shall remain at the job site until moved by Testing Agency personnel.

4. Contractor shall notify Testing Agency at least 10 working days in advance of any qualification testing for welding required herein.

5. Contractor shall notify Testing Agency at least 24 hours prior to expected time for operations requiring testing or inspection services.

6. Contractor shall make arrangements with the Testing Agency and pay for additional samples and tests made for the Contractor's convenience or for retesting of failed samples.

7. Retention of an independent Testing Agency by the Owner shall in no way relieve the Contractor of responsibility of performing all work in accordance with contract requirements.

8. The Testing Agency inspector shall familiarize himself with all applicable portions of the Contract Documents pertaining to his area of investigation prior to performing his services.

B. Testing Agency Qualifications

1. For each type of inspection and testing service to be performed, the Testing Agency shall submit certification, signed and sealed by the Agency's professional engineer, of compliance with all applicable requirements of the following:

   a. ASTM E329, "Standard Recommended Practice for Inspection Agencies for Concrete, Steel and Bituminous Materials Used in Construction."
   b. "Recommended Requirements for Independent Laboratory Qualifications" published by the American Council of Impendent Laboratories.

2. Furnish evidence, satisfactory to the Architect and Structural Engineer, that all equipment to be used has been calibrated in accordance with applicable ASTM standards within the last year and is improper working order.

3. Testing and inspection services shall be performed only by trained and experienced technicians currently qualified for the work they are to perform. Documentation of such training and experience shall be submitted to the Owner, architect and Structural Engineer upon request.

C. Concrete Work:

1. Concrete inspection and testing will be made in accordance with building code requirements, and Contract
Documents, and will include the following:

   a. Testing concrete for strength, slump, air content, temperature, and unit weight.
   b. Making and testing concrete cylinders, including furnishing cylinder containers, for specimens.
   c. Inspection at the batching plant.
   d. Transporting and storing of all specimens involved in testing and inspection. Test cylinders are to be transported to laboratory no later than 24 hours after casting, nor earlier than 16 hours after casting.
   e. Inspection of mixing and placing of concrete at the site, including recording of: amount and location of concrete placement, truck number and amount of water added to each load of concrete tested, time batched, time of transit, time mixed on job, time placement was completed, method of placing concrete, and any other pertinent information.

2. Test Specimens:

   a. At least one set of four cylinders for each 100 cubic yards or fraction thereof of all concrete, but not less than one set for any one day's operations, and not less than one set of four cylinders for each 5000 square feet of surface area for walls and slabs. Surface area is the area of one face of wall or slab.

b. For concrete placed by pumping, test specimens and concrete used for determination of slump, air content, and weight are to be taken at the point of placement of concrete into the forms.
c. Samples will be obtained in accordance with ASTM C172.
d. Making, curing and subsequent handling of test cylinders, except as modified herein, shall be in accordance with ASTM 31. 'Testing shall be in accordance with ASTM C39.
e. The cylinders shall be placed in laboratory storage under moist curing conditions at approximately 70 degrees F. within 24 hours after molding, and maintained therein until tested. Tests will be as follows:

(1) One cylinder shall be tested at 7 days for information.
(2) Two cylinders shall be tested at 28 days for acceptance. The acceptance test results shall be the average strength of these two cylinders.
(3) One cylinder shall be held and not tested unless the 28-day average strength is below the specified strength or unless otherwise instructed by the Structural Engineer.

3. Test Reports: Reports of cylinder tests shall be submitted as specified herein within five days of laboratory testing. Test reports shall, as a minimum, include:

a. Project data including project name and address, concrete supplier, supplier's delivery ticket number and mix identification number, Testing Agency's test or cylinder identification number, and location of pour.

b. Results of field testing at time of sampling including date and time of sampling, amount of water added at site prior to sampling, ambient air temperature and concrete temperature, concrete slump and air content, and concrete wet unit weight. Include time concrete was batched and time when placement was finished. Include specification limits for concrete temperature, slump, air content, and indicate whether the sample conforms to these limits

c. Results of laboratory testing including date test specimens were transported to laboratory, date and age of concrete at time of testing, compressive strength of each cylinder tested, average compressive strength of each cylinder tested, and specified design strength of concrete represented by the test.

4. Additional Testing: * Contractor shall bear the cost of testing and inspection resulting as a consequence of the following:

a. Work not in compliance with the Contract Documents.
b. Testing required by the Contractor or Subcontractor such as additional cylinders for early breaks, etc.
c. Testing to verify the adequacy of work done without prior notice, without proper supervision, contrary to standard construction practice.

D. Structural Masonry:

1. Prepare test specimens in accordance with the requirements of the governing building code.

2. Tests, consisting of three prisms each made in the field from materials currently in use, shall be conducted for each 5000 square foot, or fraction thereof, of structural masonry throughout the course of construction. Not less than three such tests shall be conducted for the project.

3. Mortar and grout tests shall be conducted on materials used to construct the first set of three prisms above. In the event such tests fail to achieve the required strength, perform additional testing as required by the Structural Engineer.

4. Testing Agency shall provide special inspection complying with the requirements of the governing building code during the construction of the following work:

a. All reinforced and unreinforced masonry bearing walls.
b. All reinforced and unreinforced masonry shear walls.
c. Special inspection shall be performed by personnel experienced in masonry construction and acceptable to the building official and Structural Engineer.
(1) Observe preparation of all masonry prisms and preparation of all grout and mortar specimens.
(2) For masonry constructed by low-lift grouting techniques, observe the following on a schedule of not less than 2 times each day that masonry construction is in progress.
(a) Proportioning, mixing, and placing of mortar and grout.
(b) Placement of masonry units.
(c) Type, size and location of reinforcing, ties, and accessories.
(3) For masonry construction by high-lift grouting techniques, observe the following on a schedule of not less than once each day that masonry construction is in progress.
(a) Proportioning, mixing and placing of mortar including provision for removal of mortar fins from inside of cells to be grouted.
(b) Placement of masonry units including size and location of clean-out openings. (c) Type, size and location of joint reinforcing, ties and accessories.
(4) For masonry constructed by high-lift grouting techniques, immediately prior to the closing of clean-out openings for each section of masonry to be grouted, verify the following:
(a) All cells to be grouted are free of obstructions (including mortar fins), which would inhibit proper placement and consolidation of grout.
(b) Bottom of all cells to be grouted have been thoroughly cleaned of all loose mortar debris.
(c) Proper size, type and placement of all reinforcement in cells to be grouted including location and length of splices and provisions for maintaining proper position of reinforcing during grouting.
(5) For masonry construction by high-lift grouting techniques, continuously observe all grouting operations to verify proper slump, consolidation and reconsolidation of grout, proper height of each grout lift, and elapsed time between placement of successive lifts.

E. Structural Steel

1. During erection provide the following services:
a. Field Inspections of not less than 1 per week of the following:
1) Visual inspection of erected members and field connections for proper workmanship and to determine that members are plumb and level
2) Visual inspection of shop and field welds for proper workmanship
3) Visual inspection and ascertainment of proper installation and tensioning of bolts
4) Ascertainment that Contractor's erection procedures adequately correct for distortion and shrinkage in field welded assemblies and connections. The Testing Agency shall measure weld shrinkage at all groove welded column splices in the first four tiers and at each third tier thereafter.
b. Reports:
1) Reports of such weld measurements shall be submitted to the Architect and Structural Engineer within two days of completion of welding at each tier measured.
2) Reports of visual inspections shall be submitted to the Architect and Structural Engineer within two days of inspection.
c. Inspection of welding by the Testing Agency will be such as to assure that the work conforms to specified requirements, and will include:

(1) Ascertainment that electrodes used for manual shielded metal-arc welding and the electrodes and flux used for submerged arc welding conform to the requirements of structural specifications.

(2) Ascertainment that the approved welding procedure and the approved welding sequence are followed without deviation, unless specific approval for change is obtained from the Structural Engineer.

(3) Ascertainment that the welding is performed only by welding operators and welders who are properly certified. The Testing Agency shall witness such qualification testing of welding operators and welders, as may be required.

(4) Ascertainment that the fit-up, joint preparation, size, contour, extent of reinforcement, and length and location of welds conform to specified requirements and the contract drawings, and that no specified welds are omitted or unspecified welds added without approval of the Structural Engineer.

2. The welding inspector will have the authority to reject weldments. Such rejection may be based on visual inspection where in his opinion the weldment would not pass a more detailed investigation.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.

B. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. Submit reports of tests, inspections, meter readings, and procedures performed on temporary utilities. At the earliest time, change over from use of temporary service to use of permanent service.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

PART 3 EXECUTION

3.01 INSTALLATION

A. Use qualified personnel to install temporary facilities. Locate facilities where they will service the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

1. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

2. Conditions of Use: Keep temporary facilities clean and neat in appearance. Operate safely and efficiently. Relocate as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

B. Temporary Utility Installation: Engage the local utility company to install temporary service. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services. Obtain easements to bring temporary utilities to the site, if required.

1. Use Charges: Cost or use charges for temporary facilities will be paid for by the Contractor.

2. Temporary Water Service: Install temporary water service and distribution piping of sizes and pressures adequate for construction. Maintain service until permanent water service is in use. Sterilize piping prior to use.

3. Temporary Electric Power: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
   a. Temporary Lighting: Provide temporary lighting with local switching to fulfill security requirements and illumination for construction operations and traffic conditions.

4. Temporary Heat: Provide temporary heat for curing or drying of completed installation or for protection of installed constructions or for protection of installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations. Coordinate ventilation requirements to produce ambient condition required and minimize consumption of energy.

5. Temporary Telephones: Provide temporary telephone service for personnel engaged in construction.

6. Sanitary, Facilities: Comply with regulations and health codes for the type, number, locations, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs. Provide covered waste containers.
   a. Toilets: Install self-contained, single-occupant toilet units of the chemical type. Provide units properly vented and fully enclosed with a glass-fiber reinforced polyester shell or similar nonabsorbent material. Shield toilets to ensure privacy.

C. Support Facilities Installation: Locate field offices, storage sheds, and other construction and support facilities for easy access. Maintain facilities until near Substantial Completion. Remove prior to Substantial Completion.

1. Field Office: Provide heated and air-conditioned, insulated, weather tight temporary offices of size to accommodate personnel at the Project Site. Provide units with lockable entrances, operable windows, and serviceable finishes. Keep the office clean and orderly for use for small progress meeting. Furnish field offices with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.

2. Temporary Paving: Construct temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved area without damage or deterioration when occupied by the Owner.

3. Temporary Enclosures: Provide temporary enclosures for protection of construction from exposure, foul weather, other construction operations, and similar activities. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions.

D. Security and Protection Facilities Installation: Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion.

1. Temporary Fire Protection: Until permanent facilities supply fire-protection needs, install and maintain temporary fire-protection facilities of types needed to protect against controllable fire losses. Comply with NFPA10 and NFPA 241.
   a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell. Maintain unobstructed access to fie extinguishers.
   b. Store combustible materials in containers in fire-safe locations
   c. Prohibit smoking in hazardous fire-exposure areas.
   d. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

2. Enclosure Fence: Install an enclosure fence with lockable entrance gates.

3. Security Enclosure and Lockup: Install temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, and theft. Provide a secure lockup where materials and equipment are of value and must be stored.

E. Termination and Removal: Remove each temporary facility when the need has ended, when replaced by a permanent facility, or no later than Substantial Completion. Complete or restore permanent construction delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. At Substantial Completion, clean and renovate permanent facilities uses during the construction period.
   a. Replace air filters and clean inside of ductwork and housings.
   b. Replace worn parts and parts subject to unusual operating conditions.
   c. Replace burned out lamps.

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1.02 DEFINITIONS

A. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock.

B. "Materials" are products substantially shaped, cut, worked mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.03 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When the contractor is give the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected.

B. Nameplates: Except for required labels and operating data, do not attach manufacturer's nameplates or trademarks on surfaces exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and the stamps on concealed surfaces or, where required for observation after installation, on accessible surface that are not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage and to' prevent overcrowding construction spaces. Coordinate with installation to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

2. Deliver products in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

3. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

4. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instruction.

5. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

2. Standard Products: Where available, provide standards products of types that have been produced and used successfully in similar situations on other projects.

3. Visual Selection: Where requirements include the phrase "...as selected form manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product that complies with other requirements. The Architect will select the color, pattern, and texture from the project line selected.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions for installation of products. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SUMMARY

A. This section includes administrative and procedural requirements for contract closeout.

B. Closeout requirements for specific construction activities are included in the appropriate Specification Sections.

1.02 SUBMITTALS

A. Substantial Completion: Before requesting inspection for certification of Substantial Completion, complete the following:

1. In the Statement for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the Work claimed as substantially complete.

   a. Include supporting documentation for completion and an accounting of changes to the Contract Sum.

2. Advise the Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

4. Submit record drawings, maintenance manuals, property surveys, and similar final record information.

5. Deliver tools, spare parts, extra stock, and similar items.

6. Changeover locks and transmit keys to the Owner.

7. Complete startup testing of systems and instruction of operation and maintenance personnel. Remove temporary facilities, mockups, construction tools, and similar elements.

8. Complete final cleanup requirements, including tough-up painting and change-out of equipment filters.

9. Touch up and repair and restore marred, exposed finishes.

B. Review Procedures: On receipt of a request for review, the Architect will proceed or advise the Contractor of unfilled requirements. The Architect will prepare the Statement of Substantial Completion following review or advise the Contractor of construction that must be completed or corrected before the statement will be issued.

1. The Architect will repeat review when requested and assured that the Work is substantially complete.

2. Results of the completed review will form the basis of requirements for final acceptance.

C. Final Acceptance: Before requesting review for statement of final acceptance and final payment, complete the following:

1. Final payment request with releases and supporting documentation. Include insurance certificates where required.

2. Submit a statement, accounting for changes to the Contract Sum.

3. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolve for acceptance.

4. Submit final meter readings for utilities and similar data as of the date of Substantial Completion.

5. Submit evidence of continuing insurance coverage complying with insurance requirements.

D. Re-review Procedure: The Architect will re-review the Work upon receipt of notice that the Work has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of re-review, the Architect will prepare a statement of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or obligations that have not been fulfilled but are required.

2. If necessary, reinspection will be repeated.

E. Record Document Submittals: Do not use record documents for construction. Protect from loss in a secure location. Provide access to record documents for the Architect's reference.

F. Record Drawings: Maintain a set of prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing most capable of showing conditions fully and accurately. Give attention to concealed elements.

1. Mark sets with red pencil. Use other colors to distinguish between variations in separate categories of the Work.

2. Organize record drawing sheets into manageable sets. Bind with durable-paper cover sheets; print titles, dates, and other identification on the cover of each set.

G. Record Specifications: Maintain one copy of the Project Manual, including addenda. Mark to show variations in Work performed in comparison with the text of the Specifications and modifications. Give attention to substitutions and selection of options and information on concealed construction. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

H. Maintenance Manuals: Organize operation and maintenance data into sets of manageable size. Bind in individual, heavy-duty, 2-inch, 3-ring, binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include the following information.

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Shop Drawings and Product Data.
6. Schedule of Paint and Finishes
7. Contact Names, Addresses, Phone Numbers, and E-mail for all suppliers and subcontractors
8. Contact Names, Addresses, Phone Numbers, and E-mail for all suppliers Utilities

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 DEMONSTRATION

A. Operation And Maintenance Instructions: Arrange for each installer of equipment that requires maintenance to provide instruction in proper operation and maintenance. Include a detailed review of the following items.

1. Maintenance manuals.
2. Spare parts, tools, and materials.
3. Lubricants and fuels.
4. Identification systems.
5. Control sequence.
6. Hazards.
7. Warranties and bonds.
8. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following:

1. Startup and shutdown.
2. Emergency operations and safety procedures.
3. Noise and vibration adjustments.

3.02 CLEANING

A. Final Cleaning: Employ experienced cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Complete the following operations before requesting inspection for certification of Substantial Completion.

1. Remove labels that are not permanent labels.
2. Clean transparent materials, including mirrors and glass. Remove glazing compounds. Replace chipped or broken glass.
3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Leave concrete floors broom clean. Vacuum carpeted surfaces.
4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
5. Clean the site of rubbish, litter, and foreign substances. Sweep paved areas; remove stains, spills, and foreign deposits. Make grounds to a smooth, even-textures surface.

B. Pest Control: Engage a licenses exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

C. Removal of Protection: Remove temporary protection and facilities.

END OF SECTION

SECTION 01730

MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: To aid in continued instruction of operation and maintenance personnel, and to provide a positive source of information about products used in the Work, provide Manuals and instruction as described in this Section and in various other Sections of these Specifications.

B. Related work described elsewhere:
1. Required instruction procedures and required contents of Manuals may be amplified in other Sections of these Specifications.
2. Refer to Section 01700 Project Closeout for additional requirements

1.02 SUBMITTALS

A. Unless otherwise directed, submit three copies of each Manual compiled in accordance with the provisions of this Section.
B. Make submittals directly to the Owner/Tenant/Architect.
C. Should the Architect's review indicate required changes in the Manual promptly make such changes and submit three revised copies of the entire Manual to the Owner/Tenant/Architect at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Unless otherwise directed, prepare Instruction Manuals in the following format:
Size: 8-1/2" x 11".
Paper: White bond, at least 20 lb. Weight. Text: Neatly typewritten or printed.
Drawings: 11" in height preferable; bind in with text, foldout acceptable; larger drawings acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with the text.
Flysheets: Separate each portion of the Manual with neatly prepared flysheets briefly describing contents of the ensuing portion.
Binding: Use heavy-duty plastic or fiberboard covers with binding mechanism concealed inside the Manual;
3-ring binders are preferred; all binding shall be subject to the approval of the Architect.
Measurements: Provide all measurements in U.S. standard units such as inches and pounds.

B. Covers: Provide front and back covers for each manual, using durable material and with the following information visible on or through the front cover:

OPERATION AND MAINTENANCE INSTRUCTIONS
BlueWave Express - Beltline & I-635
(Name of Equipment system)

Manual approved by:

Owner:

Date:

C. Contents: Include at least the following data:

1. Neatly typewritten index near the front of the manual, giving immediate information as to location within the Manual of all emergency data regarding the installation.

2. Complete instructions regarding operating and maintaining all equipment involved, including lubrication, disassembly, and reassembly.

3. Complete nomenclature of all parts of all equipment.

4. Complete nomenclature and part number of all replaceable parts, name address of nearest vendor of those parts, and all other data pertinent to procurement of replacement parts.

5. Copy of all warranties issued.

6. Such other data as is required in pertinent other Sections of these Specifications.

PART 3 EXECUTION

3.01 DEMONSTRATION

A. At an appropriate time approved by the Owner, instruct Owner's operation and maintenance personnel in use of the equipment and use of the Manuals.

END OF SECTION

SECTION 01740

WARRANTIES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

1.02 WARRANTY

A. Standard product warranties are preprinted written warranties published by the individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the Warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

D. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or remove and replace to provide access for correction of warranted construction.

E. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

G. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligation, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

2. Where the Contract Documents require a Special Warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

H. Submit written warranties to the Owner/Tenant/Architect prior to the date stated for Substantial Completion. If the Owner/Tenant/Architect’s Statement of Substantial Completion designates a

commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner/Tenant/Architect within 15 days of completion of that designated -portion of the Work.

I. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

1. Refer to Divisions 2 through 14 Sections for specific content requirements and particular requirements for submitting special warranties.

2. Refer to separate design/build contracts for mechanical, electrical, plumbing, fire protection, and security system for specific content requirements and particular requirements and particular requirements for submitting special warranties.

J. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 –by-11-inch paper.

1. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.03 PART 2 PRODUCTS (Not applicable)_

1.04 PART 3 EXECUTION (Not applicable.)

END OF SECTION

SECTION 02110

SITE CLEARING

PART 1 - GENERAL

1.01 SCOPE

Extent of site clearing is shown on drawings.

Site clearing includes, but is not limited to:
Removal of existing earth fill
Removal of existing debris.
Removal of vegetation and trees.
Topsoil stripping.

1.02 REQUIREMENTS

A. Inspection of Site: Carefully examine the premises to determine the extent of work and the conditions under which it must be done. No extra payments will be allowed for claims for additional work that could have been determined or anticipated by such inspection.

B. Utilities: Support and protect any existing active sewers, water, electric, telephone and similar utilities which may remain from damage due to these operations on and adjacent to Owner's property.

C. General: Remove any buried debris encountered during the removal process. Remove existing soil to specified depths or more as may be required to achieve the specified finished slab elevations.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

A. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.

B. Damages: Promptly repair damages caused to adjacent properties by demolition operations at no cost to Owner.

C. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

D. The entire site shall be initially scarified and stripped to a depth of 6 inches. Refer to Earthwork Section 2200 for initial compaction requirements.

E. Strip soil to a depth of at least 12 inches from areas to be covered by "slab- on - grade" portions of the building.

F. Stockpile any useable topsoil for later use in landscaped areas. Stockpile and useable crushed limestone or crushed asphalt for use as backfill..

g. Dispose of unusable excess soil same as waste material, as herein specified.

H. Clearing of vegetation: Clear site of existing trees and vegetation. Completely remove stumps, roots, and other debris protruding through ground surface.

I. Remove abandoned underground piping or conduit not shown on drawings, but interfering with construction.

J. Maintain good surface drainage. Provide adequate exit points for lateral movement of water through temporary sloping and ditching.

K. Disposal of waste materials:
Remove waste materials and unsuitable and excess soil from Owner's property and dispose of off site.

END OF SECTION

SECTION 02200

EARTHWORK

PART1 GENERAL

1.01 RELATED DOCUMENTS:

A. Geotechnical Study prepared by Reed Engineering Group.
B. Earthwork requirements shall comply with the recommendations specified in the Soils Report for the Project.
C. Consult Soils Engineer for changes in requirements should unexpected soil conditions be encountered.

1.02 DESCRIPTION OF WORK:

A. Work Included:
   1.Excavation, filling, backfilling, completion and grading for building pad and overall site.
   2. Preparation of subgrade for building slab, walks, and concrete surfaced parking areas.
B. Work in Other Sections:
   1. Site clearing
   2. Concrete Paving
   3. Independent Laboratory Testing (Division 1)

1.03 QUALITY ASSURANCE:

A. Codes and Standards:
Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
B. Testing and Inspection Service:
Contractor shall engage soil testing and inspection service for quality control testing during earthwork operations.

1.04 JOB CONDITIONS:

A. Existing site is paved with approximately 4-1/2" of asphalt over a crushed limestone base of unknown thickness. The asphaltic paving and up to 6 inches of base material will be removed prior to commencement of this Contract. Under separate contract the site will be filled in 8 inch compact lifts and re-graded to match the contours and elevations indicated on the Civil Grading Plan.
B. Additional test borings and other exploratory operations that may be made by Contractor shall at not be a cost to the Owner.
C. Existing Utilities:

   1.Locate and verify existing underground utilities in the areas of work. Utilities shown on the Civil Plans are to remain in place except where indicated on the Demolition Plan. Provide adequate means of protection during earthwork operations.
   2.Should uncharted or incorrectly charted, piping or other utilities be encountered during excavation, consult the Owner's Representative and appropriate utility company immediately for directions. Cooperate with Owner and utility companies for keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility company.
   3.Do not interrupt existing utilities serving facilities occupied and used by Others, except when permitted in writing by the Others, and then only after acceptable temporary utility services have been provided.
   4. Protection of Persons and Property:
      a. Operate warning lights as recommended by authorities having jurisdiction.
      b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.05 SUBMITTALS:

A.Test reports on borrow material.

B. Field density test reports.

C. One optimum moisture maximum density curve for each type of soil encountered.

D. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

PART 2 PRODUCTS

2.01 MATERIAL CLASSIFICATIONS:

Materials for backfill shall be classified for the purpose of quality control in accordance with the Unified Soil Classification Symbols as defined in ASTM D 2487

A. CLASSIFICATIONS:

Subbase Material (Class I): Well graded sands and gravel, crushed well graded rock, little or no fines.
Plasticity Index: 0
Seive: 5% passing No. 200

Back Fill Material (Class II): Poorly graded gravel and sand, silty sand and gravel, Lsite excavated crushed limestone or crushed asphalt, ittle to moderate fines
Plasticity Index: 0 to 4
Seive: 12% to 50% passing No. 200

Select Backfill (Class III): Clayey gravel and sand, poorly graded mixture of sand, clay, and gravel.
Plasticity Index: 8 to 20
Seive: 12 to 50% passing No. 200

Impervious Fill: Lean Clay
Plasticity Index: Greater than 7
Liquid Limit: 40 or more

Pourous Fill: Clean sharp sand
Plasticity Index: 0 to 7
Clay Lumps not exceeding 2%

Select Fill: Sandy or silty clay
Plasticity Index: 8 to 20
Seive: 70% passing No. 200

Earth Fill: Clean topsoil obtained from excavation of this Project or soil of suitable character subject to approval by the Architect.

PART 3 EXECUTION

3.01 INSPECTION:

A. The contractor shall visit the site and examine the areas and conditions under which excavating, filling, and grading are to be performed. Do not proceed with the work until unsatisfactory conditions detrimental to the proper and timely completion of the work have been corrected.

3.02 EXCAVATION:

A. Excavation consists of removal and disposal of material encountered when establishing required grade elevations.

B. Unauthorized_Excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations, limits or dimensions without specific directions of Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be at the Contractor's expense.
2. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.

3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.

C. Additional_Excavation:

1. When excavation has reached required subgrade elevations, notify the Architect for inspection of conditions.
2. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace with acceptable bearing material as directed by the Architect. If random fill is encountered, remove at least 4'0" and replace with select material. Refer to Soil Report for further information.
3. Removal of unsuitable material and its replacement as directed will be paid on the basis of Changes In The Work defined in the Conditions of the Contract.

D. Stability_of_Excavation:

1. Slope sides of excavations to comply with governing codes and ordinances. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

3.03 Dewatering:

1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
2. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
3. Convey water removed from excavations and rain water to collecting or run off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits. Do not use trench excavations as temporary drainage ditches.
4. Reference geotechnical report for expected ground water conditions.

3.04 Material Storage:

A. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.
B. Locate and retain soil materials away from edge of excavations.
C. Dispose of excess soil material and waste materials as hereinafter specified.

3.05 Excavation for Structures:

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10' and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
B. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Excavate to required lines and grades providing a solid base to receive other work.
C. Where rock is encountered, carry the excavation 6" below the required elevation and backfill with a 6" layer of crushed stone or gravel prior to pipe and conduit installation.
D. Grade bottoms of trenches as indicted to provide solid bearing for the entire body of the pipe. Notching under pipe bells performed by installer of pipe.
E. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Owner’s Rep or Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

3.06 COMPACTION:

A. General:
1. Control soil compaction during construction, providing minimum percentage of density specified for each area classification. Intact limestone will not require scarification or compaction.

2. Proofroll subgrade to detect any soft spots, which if exist, should be reworked, compacted and tested.
3. All materials (either imported or onsite soils) should be placed in loose lifts not exceeding 8" in uncompacted thickness, and be compacted to a density between 92% and 98% of Standard Proctor (ASTM D 698), at a moisture content ranging between optimum to four percentage points above optimum (+0 to +4).
4. Compaction test should be taken as the fill is being placed. Each lift should be compacted, tested and approved before another lift is added. The purpose of the field density tests is to provide some indication that uniform and adequate compaction is being obtained. The quality of the fill, as compacted, is the responsibility of the contractor. Satisfactory results from the field density tests should not be considered as a guarantee of the quality of the Contractor's filling operations.

B. Moisture Control:

1.Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of solid material, to prevent free water appearing on surface during or subsequent to compaction operations.
2.Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

C. Percentage of Maximum Density Requirements:

1.Compact soil to not less than the following percentages of maximum dry density for soils which exhibit a well defined moisture density relationship determined in accordance with ASTM D 698; and not less than the following percentages of relative density, determined in accordance with ASTM D 4253 and ASTM D 4254, for soils which will not exhibit a well defined moisture density relationship.
2. Initial Scarification and Compaction: The entire site shall be scarified to at least 6 inches of depth and conpacted to 95% maximum dry density.
3. Building Slabs Compact top 12" of subgrade and each layer of backfill or fill material at 95% maximum density or 90% relative density.
4. Lawn or Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material at 90% maximum dry density.
5. Walkways: Compact top 6" of subgrade and each layer of backfill or fill material at 95% maximum dry density or 90% relative density.

D. Pavements:

1. Prior to paving, all pavement areas should be proofrolled with a compactor weighing at least 25 tons. Each strip of ground should be rolled a minimum of 3 times in rapid succession. All soft or unstable areas encountered should be either removed or reworked until a firm unyielding subgrade is achieved. This proofrolling should be performed prior to placement of additional fill.
2. All additional fill should be placed in maximum 8" lifts at optimum to plus 3 percentage points of optimum moisture and should be compacted to a minimum of 95% Standard Proctor density.
3. Soil Report: Reference geotechnical investigation report and the Civil Drawings for additional requirements. If conflict exists soil report, whichever requirement is the most restrictive, governs.

3.07 GRADING:

A. General:

1. Uniformly grade area within limits of grading under this Section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
2. Paved_Areas_and_Building_Slab_Subgrade: Make at least one field density test of subgrade for every 2000 square feet of paved area or building slab, but in no case less than 3 tests. If each compacted fill layer, make one field density test for every 2000 square feet of overlaying building slab or paved area, but in no case less than 3 tests.
3. For each strata of soil on which shallow bearing footings (not drilled Piers) will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata,

when acceptable to Architect/Engineer.

B. Grading Outside Building Lines:

1. Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:
2. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 1/8" above or below the required subgrade elevations.
3. Walks: Shape surface of areas under walks to line, grade and cross section, with finish surface not more than 1/8" above or below the required subgrade elevation.
4. Pavements: Shape the surface of the areas under pavement to line, grade and cross section, with the finish surface not more than 1/2" above or below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains.
5. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10' straightedge.
6. Compact as required above and test before preparing with a minimum of 6" thick drainage course. Conform to indicated cross section and thickness.

3.08 MAINTENANCE:

A. Protection_of_Graded_Areas:

1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
2. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

3.09 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Removal from Owner's Property:

1. Remove excess excavated material as determined by the Owner, trash, debris and waste materials and dispose of it off the Owner's property.

END OF SECTION

SECTION 02400 - SITE DRAINAGE

PART I - GENERAL

1.01 RELATED DOCUMENTS:

The provisions of the Contract and applicable requirements of Divison 1 govern this Section.

1.02 SCOPE

Furnish and install the following systems as required for the Work:
Storm water drainage from site. Refer to Civil Drawings

1.03 REQUIREMENTS

Submittals: Conform to procedures specified in Section 01300 SUBMITTALS and the requirements below.

Shop Drawings: Submit manufacturer's data showing details of fabrication and installation of the following:
Inlet grate and frame

Inspection of site: Examine the site to determine extent of work required and the conditions under which it will be done.

PART 2 - PRODUCTS

2.01 PVC Pipe:

SDR 35.

2.02 Cast metal items:
Fabricate the inlet grates and frames of cast iron conforming to ASTM A 48 for Class 20 according to the shape and dimensions shown on the Drawings and so as to be clean and perfect, free of sand, blow holes and other defects.

Cement: ASTM C 150, Type I Portland.

Aggregate: ASTM C 33 except conform to the following grading:

Sieve Size	Percent Passing
4	100
8	95 - 100
16	60 - 100
30	35 - 70
50	15 - 35
100	0 - 15

PART 3 EXECUTION

3.01 EXCAVATION & TRENCHING

3.01 General: Provide protections for the safety of all personnel. When existing utilities to be removed are in the area of these operations, provide notice in sufficient time so as to prevent interruption of service.

3.02 Trenches: Banks shall be as nearly vertical as possible. Provide uniform bearing and support for each section of the pipe on undisturbed soil. Excavate rock to a minimum overdepth of 6 inches below required trench depth. Remove wet or other unstable material to the depth required. Backfill overdepth to the proper trench depth with coarse sand, fine gravel or other approved material. Conform to the following requirements for specific systems:

3.03 Structure: Excavate subservice so as to leave at least 12 inches clear between outer surfaces and the embankment or material supporting the bank. Step or serrate slopes bounding the excavation so as to prevent any wedging action of backfill against the structure.

3.04 General: Use suitable materials from excavations. Fill to finish grade elevations of adjacent surface.

A. Material:

1. General: Suitable backfill material shall be earth, loam, sandy clay, sand and gravel, soft shale or other approved material.

2. Trenches_under_concrete_paving: Use cement stabilized sand or bank sand or approved material.

B. Placing: Deposit fill in 6 inch layers at proper moisture content to facilitate compaction. Thoroughly and carefully ram or tamp each layer until pipe has a cover of one foot. Deposit the remainder of the fill in 8 inch layers and properly tamp, water tamp or consolidate it by other approved means. Compact trenches under new sidewalks or pavements to at least 95% of maximum density at optimum moisture content determined by AASHO T90 Method A.

3.05 Protection: Properly protect existing utility lines shown on the Drawings from damage due to these operations. If damage occurs, satisfactorily repair it at no additional expense. If damage occurs to an unknown line, give immediate notification.

END OF SECTION 02400

SECTION 02505

CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete walks, ramps, parking lots, ramps, gutters and concrete curbing as indicated on the Drawings.

1.02 RELATED SECTION

A. Cast-In-Place Concrete SECTION 03300
B. Formwork; SECTION 3100
C. Reinforcing SECTION 3210

1.03 REFERENCE PUBLICATIONS AND STANDARDS A. Governing Authority:
1. Applicable standards and regulations of state and municipal agencies having governing authority over the work specified in this section shall take priority over items specified herein and shown on the drawings unless the requirements set for the herein require a superior quality work.

B. Material Standards:

1. American Society for Testing Materials (ASTM). C. Concrete Standards:
1. American Concrete Institute (ACI): ACI-617 "Standard Specifications for Concrete Pavement and Bases" ACI-
395 "Manual of Standard Practice for Detailing Reinforced Concrete.

1.04 SUBMITTALS

A. Testing Laboratory Reports:

1. Furnish three copies of the test reports to the Owner indicating results of the cylinder test.

PART 2 PRODUCTS

2.01 BASIC MATERIALS
A. Concrete:
1. As specified in CAST-IN-PLACE CONCRETE

2.02 MISCELLANEOUS MATERIALS A. Air Entraining Agent:
A. 1. ASTM CO260, Master Builders or equal.
B. Dispersing Admixture:
ASTM C-494. Master Builders or equal. C. Curing compound:
ASTM C-309, No. 40W by A.C. Horn Company or equal. D. Joint Filler:
ASTM D1751, pre-molded fiber filler, unless shown otherwise on the drawings. E. Joint Sealer:
ASTM D-1190, Code 2351.

2.03 CONCRETE MIX DESIGN

A. Contractor shall employ and pay for, as a part of the contract price, the services of an Owner-approved independent testing laboratory to determine actual design mix to be used, based on the following:

Addenda 1 1. All concrete: 3000 3600 psi at 28 days.
2.. Minimum 5 sack mix required.

PART 3 EXECUTION

3.01 INSPECTION OF SUBGRADE

A. Inspect subgrades prepared as specified elsewhere in these Specifications and report any deficiencies to the Owner before beginning work. Commencement of work shall indicate acceptance of subgrades by this Contractor.

3.02 CONSTRUCTION

A. General: Deliver and place concrete as specified in CAST-IN-PLACE CONCRETE. B. Curbs and Gutters:
1. Configurations

a. Construct to cross-sections details shown on drawings and at indicated locations. Curbs may be fully formed or pulled and troweled to configurations shown on the drawings.

2. Reinforcement

a. Reinforce as indicated on the drawings with continuous reinforcing bars lapped 30 bar diameters and securely tied at al splices. Metal chairs shall be used to hold the reinforcing steel in the proper plane.

3. Expansion Joints

a. Construct 1/2" wide expansion joints with joint filler across lengths of curb at all tangent points and at not more than twenty-foot intervals. All fixed objects, such as buildings, poles, pipes, catch basins, etc., within or abutting the concrete shall be separated from the concrete by expansion joints.

4. Finishing

a. Finish surfaces with texture as approved by the municipal jurisdiction" deep cross joints at ten foot intervals with edges smooth.

5. Joints

a. Fill expansion joints with joint filler. After concrete has set, clean the open joint above filler and fill with joint sealer in accordance with instructions of sealer manufacturer.

C. Walks:

1. Configuration

a. Construct to cross-sectional details shown on drawings and at indicated locations.

2. Sand Cushion

3.

Concrete shall be placed over a sand cushion placed on the compacted subgrade as shown on the drawings or a minimum of 2" thick if not shown on

3. Reinforcing

a. Per Site Civil Engineering.

4. Expansion Joints

a. Construct expansion joints as detailed in locations shown on the drawings.

5. Finishing

a. General: Finish surfaces not noted on the drawings to be finished with light broom surface on
sidewalks and heavier broom on the parking area. Tool joints and edges to to each section or division of the walk.

b. Finish vertical surfaces in a manner that leaves the exposed surfaces free of marks. Any damaged surfaces shall be repaired and stone rubbed to match surfaces.

D. Driveways and parking areas:

1. Configurations
a. Construct to cross-sectional details shown on drawings and at indicated locations.

2. Sub-base Configurations

a. Place concrete on subgrade as required by the Geotechnical Report.
b. Provide Lime Fly Ash stabilized subgrade if no recommendation by Geotechnical.

2. Reinforcing
a. Per Site Civil Engineering
3. Expansion Joints

a. Construct expansion joints as detailed in locations shown on the drawings.

4. Finishing

a. General: Finish surfaces not noted on the drawings to be finished to match existing. Tool joints and edges to provide a smooth border to each section or division of the walk. Finish all vertical surfaces in a manner that leaves the exposed surfaces free of "honeycombing and form marks. Any damaged surfaces shall be repaired and stone rubbed to match adjacent finished surfaces.

3.03 CURING CONCRETE

A. Apply a white-pigmented type curing compound at a uniform rate of approximately 200 .square feet/gallon, or as recommended by curing compound manufacturer as soon as the finishing operation has been completed and the concrete has lost its water sheen. The curing procedure must protect the concrete against loss of moisture and rapid temperature change for a period of not less than four days from the beginning of the curing operation and without damage to, or marking of the finished concrete surface. Traffic shall not be allowed on finished concrete for a minimum period of seven days.

3.04 TESTING

A. Independent Testing Laboratory

1. Contractor shall employ and pay for, as a part of .the contract price, the services of an Owner approved independent testing laboratory to perform concrete cylinder testing.
2. Four test cylinders shall be taken and cured by the Contractor and tested by the testing laboratory for each different class of concrete poured in any one day.
3. Cylinders shall be taken in accordance with ASTM C31, and cured and tested in accordance with ASTM C39. One set of four cylinders is required for each 50 cubic yards of concrete or less, placed in any one day.
4. Two cylinders shall be tested at 7 days, and two cylinders shall be tested at 28 days.

B. Contractor Tests

1. Slump tests shall be taken by the Contractor when cylinders are taken, and shall show maximum slump 5-inch and minimum slump 3-inch.
2. Air content by volume: 3% based on measurements made in concrete mixtures at point of discharge at job site at time slump tests are made. Air content by volume shall be determined in accord with ASTM C231.

3.05 CLEANING CONCRETE

A. Concrete approaches, sidewalks and related work shall be hosed down with water, scrubbed with fiber brushes, allowed to dry and be left broom clean and in condition acceptable to the Owner.
B. Upon completion of work of this Section remove related debris from premises.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-In-Place Concrete: Section 03300.
B. Refer to Structural Drawings

1.02 REFERENCES

A. Except as shown or specified otherwise, the Work of this Section shall conform to the requirements of Specifications for Structural Concrete for Buildings ACI 301-99 of the American Concrete Institute.

1.03 DESIGN REQUIREMENTS

A. Comply with ACI 301, Section 2.1 – Formwork and formwork accessories.

PART 2 PRODUCTS

2.01 GENERAL:
The formwork shall be designed for loads, lateral pressure, and allowable stresses outlined in Chapter 2 - Design of "Guide to Formwork for Concrete" (ACI 347-01).

2.02 MATERIALS
A. Wood framing – No. 2 Southern Yellow Pine or Construction Grade Douglas Fir, or better grade lumber.
B. Plywood: U.S. Product Standard Exterior Grade B-B Classification carrying APA grade mark. Mimimum thickness: 5/8 inch
C. Panel Forms: Dimension lumber framed, plywood faced; or metal framed plywood or metal faced.
D. Plastic Sheeting: 6 mil translucent white or black polyethylene sheets 6 feet or wider.
E. Release Agent: Non staining bond breaker that does not produce a chemical reation with the concrete mortar.
Symons Manufacturing Co.- Magicoat
Or approved Equal

PART 3 EXECUTION

3.01 CONSTRUCTION OF FORMS
A. Construct forms for slabs and grade beams outside faces with continuous dimensional lumber to a minimum depth of 11-1/2” or greater depending up integrity of trench. Brace faces lined to grade as screeds. Ramp backfill against outside of form board for additional bracing.

B. Construct forms for pavements and walks outside faces with continuous dimensional lumber or properly braced plywood or bender board to a full depth of the concrete.. Brace faces lined to grade as screeds. Ramp backfill against outside of form board for additional bracing.

c Frame recessed pit wall forms with continuous plywood panels both sides, all supported by braces and braced strongbacks as may be required by height. Provide spreaders and ties as required by height and loads.

D. Install continuous water dams at all cold joint locations.

E. Provide ¾" or smaller chamfer on all exposed external corners of concrete.

3.02 PREPARATION OF FORM SURFACES

A. Release Agent: Apply form-coating material in accordance with manufacturer's instructions.

3.03 FORM REMOVAL

A. Do not disturb any forms until the concrete has attained sufficient set to assure its surface will not be damaged. When normal cement has been used in the concrete mix, and temperature is above 50 degrees, minimum wait period before forms are stripped is 24 hours after concrete placement for slabs. For pits, leave forms in place for 5 days. A curing day shall mean any calendar day in which the temperature is above 50 degrees F. for at least 19 hours.

B. Provisions for Work of Related Contracts: Provide openings and chases in concrete formwork to accommodate Work of related contracts. Obtain information for size and location of openings, recesses and chases from subcontractor requiring such items.

C. Install metal edges where indicated on the Structural Drawings

3.03 RE-USE OF FORMS

A. Split, frayed, delaminated or otherwise damaged form facing material shall not be used.

END OF SECTION

SECTION 03210

STEEL CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Formwork: Section 03100.
B. Cast-In-Place Concrete: Section 03300.

1.02 REFERENCES

A. Except as shown or specified otherwise, the Work of this Section shall conform to the applicable requirements of the following:
   1. Specifications for Structural Concrete, ACI 301-99 of the American Concrete Institute.
   2. Manual of Standard Practice, MSP-1-01 of the Concrete Reinforcing Steel Institute.
   3. Structural Drawings

PART 2 PRODUCTS

2.01 MATERIALS

A. Bar Reinforcement: ASTM A 615, Grade 60, deformed steel bars.
B. Fabric Reinforcement: ASTM A 185, welded wire fabric, fabricated into flat sheets unless otherwise indicated.
C. Bar Supports; Either of the Following Types:
   1. Insoluble plastic, with minimum 1,500 psi tensile strength and capable of retaining fabricated shape at temperatures between 5 degrees F and 170 degrees F.
E. Tie Wire: Black annealed wire, 16-1/2 gage or heavier.
F. Steel Wire: ASTM A 82, cold-drawn plain steel wire, size No. W2.9 unless otherwise indicated. G. Reed Clips: ASTM A 185, rigid type reed clips, fabricated of W1.4 steel cross wires spaced 12 inches apart and looped at edges of flanges, and W1.4 longitudinal wire. Reinforcement shall have two longitudinal wires for flanges 9 inches to 15 inches in width, and three longitudinal wires for flanges over 15 inches in width. Cross wires shall be welded to longitudinal wire(s).

PART 3 EXECUTION

3.01 PLACING

A. QUALITY CONTROL
   1. Provide following minimum concrete cover for reinforcement (ACI 318, section 7-7)
   2. Bend bars cold.
   3. Confirm that steel is anchored and that reinforcing bars and dowels are securely tied prior to placing concrete.
   4. Conduit: Conduit in slabs shall be less that 1/3 of the slab depth in height and shall be chaired above reinforcing mats or supported on mats. Conduits shall be located 3 diameters apart, not in groups. Conduits passing through concrete sections, such as grade beams, shall be sleeved.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02505- Concrete Paving, Walks, Curbs, Gutters, and Approaches
B. Section 03100- Concrete Formwork
C. Section 03200- Concrete Reinforcing
D. Section 03360- Integrally Colored Ground and Polished Concrete

1.02 REFERENCES

A. Except as shown or specified otherwise, the Work of this Section shall conform to the requirements of American Concrete Institute (ACI) and American Society for Testing and Materials (ASTM) documents.

1. ACI 301: Specification for Structural Concrete for Buildings.
2. ACI 302.1R: Guide for Concrete Floor and Slab Construction.
3. ACI 304.2R: Placing Concrete by Pumping Methods.
4. ACI 305R: Hot Weather Concreting.
5. ACI 308.1: Standard Specification for Curing Concrete.
6. ACI 318 Building Code Requirements for Reinforced Concrete.
7. ASTM C 94/C 94M - 04: Standard Specification for Ready- Mixed Concrete.
8. ASTM C 494/C 494M - 04: Standard Specification for Chemical Admixtures for Concrete.

1.03 DEFINITIONS

A. ACI 301, Section 1.2 - Definitions:
1. Add the following definitions:
a. Cementitious Material: Cementitious materials include cement, ground blast furnace slag and fly ash.
b. Corrosion Inhibitor Admixture: A liquid admixture, calcium nitrite, that inhibits corrosion of concrete-embedded steel in the presence of chloride ions.
c. Pumped Concrete: Concrete that is conveyed by pumping pressure through rigid pipe or flexible hose.
d. Water-to-Cementitious Ratio (w/c): An equational value representing quantity in pounds of free moisture available for cement hydration divided by quantity of cementitious materials in pounds per cubic yard concrete.

1.04 SUBMITTALS

A. Submittals Package: Provide mix designs with supporting strength test record for each mix design to Owner's Rep/Architect/Structural Engineer 2 weeks prior to work..

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Acquire cement and aggregate from same source for all work.

C. Conform to ACI 305R when placing concrete during hot weather.

D. Conform to ACI 306R when placing concrete in cold weather.

E. Provide "sample panel" approx 4' x 4' of Colored/Sealed concrete for Owner's review before proceeding with remaining Colored Concrete Work.

1.06 DELIVERY

A. ASTM C 94/C 94M, Article 13.1 - Batch Ticket Information: In addition to the information required by Paragraph 16.1, also include the following:
   1. Type and brand, and amount of cement.
   2. Weights of fine and coarse aggregates.
   3. Class and brand, and amount of fly ash (if any).

PART 2 PRODUCTS

2.01 MATERIALS
A. Cement: ASTM C 150, Type I or II Portland cement.
B. Water: Potable, complies with ASTM C94
C. Aggregate: ASTM C33, angular coarse aggregate, maximum 1 ½ inch diameter.
D. Type 3 Expansion Joint Filler: Preformed, resilient, nonextruding bituminous units complying with ASTM D 1751.
E. Expansion Joint Dowels: Smooth steel expansion joint dowel with minimum 5 inch long steel dowel cap, unless otherwise indicated.

2.02 PROPORTIONING OF MIXES
A. Performance design mix: submit mix design to Architect for Engineer review, as specified in this section, minimum two weeks prior to use.
B. Strength:
1. Concrete Slabs: Minimum 3000 psi @ 28 day strength.
2. See also Structural Notes and Section 02505 - Concrete Paving for exterior paving slab structural requirements.
C. Slump for Pumped Concrete: When a water-reducing admixture is not used, maximum slump shall be 4 inches. When a water-reducing admixture is used, maximum slump shall be 6 inches and when a high-range water-reducing admixture (superplasticizers) is used, maximum slump shall be 8 inches.
D. Design Air Content for Exterior Concrete: Design air content for concrete shall be 5 percent by volume, with an allowable tolerance of plus or minus 1.5 percent for total air content, except as otherwise specified. Use air-entraining admixture, not air-entrained cement.
E. Water-Cement Ratio for Interior Slabs: a maximum water-cement ratio of 0.40. All other concrete can have a maximum water-cement ratio of 0.52.
G. Admixtures: Do not use admixtures in concrete unless specified or approved in writing by the Engineer of record.

2.03 JOINTS
A. Expansion joint caps: as specified in section 03100
B. Joint filler: as specified in section 03100
C. Thermal Break: As specified in section 03100.

2.04 PRODUCTION OF CONCRETE
A. Mixing and delivery : ASTM C94. Sampling at delivery.
B. Sampling and Delivery: Comply with ASTM C172, cylinders cured per ASTM C31. C. Retempering Concrete: Adding water to concrete on site not permitted.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION
A. Verify requirements for concrete cover over reinforcing.
B. Verify that reinforcement and other items to be cast in concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.
C. Hardened concrete, reinforcement, forms, and earth which will be in contact with fresh concrete shall be free from frost at the time of concrete placement.
D. Do not deposit concrete in water. Keep excavations free of water by pumping or by other approved methods.

E. Prior to placement of concrete, remove all hardened concrete spillage and foreign materials from the space to be occupied by the concrete.
F. Coordinate work with requirements of Section 03360 Colored Concrete

3.02 ADMIXTURE ADDITIONS AT THE SITE

A. Site additions shall be limited to high-range water-reducers, non-chloride accelerators, and corrosion inhibitors. Comply with manufacturers' printed instructions for discharge of admixtures shall be furnished.
B. All concrete with other admixture additions shall mix a minimum of 70 revolutions or 5 minutes to assure a consistent mixture.
C. Refer to the requirements of Section 03360 Colored Concrete

3.03 PLACING

A. Place concrete in accordance with ACI 304
B. Consolidate concrete, except slabs on grade, by mechanical vibration as specified and in accordance with ASI 309.
C. Ensure reinforcement, inserts, embedded parts, formed joint fillers and joint devices are not disturbed during concrete placement.

3.04 FINISHING SURFACES

A. Finish Schedule: Except where indicated otherwise on the Drawings, provide the finishes below:
   1. Rough Form Finish for concrete surfaces not exposed to view.
   2. Smooth Machine Troweled Finish for concrete surfaces exposed to view.
   3. Smooth Rubbed Finish for exterior concrete surfaces exposed to view.
   4. Special Finish for Colored Concrete, see Section 03360
   4. Grout Cleaned Finish for interior concrete surfaces exposed to view.
B. ACI 301, Section 5.3.3.3 - As-cast Finishes:
   1. Add the following to paragraph 5.3.3.3:
      Fins shall be completely removed on surfaces to receive waterproofing.

3.05 SLABS

A. ACI 302 Chapter 8.2.8.2 - Tools for jointing; Saw-cutting.
   1. Add the following paragraph:
      Early-entry dry-cut saws are preferred in place of conventional wet-cut saws.
B. ACI 302 Chapter 8.3.12
   Add the following to Conventional wet-cut saw cutting:
   Begin saw-cutting as soon as the saw will not dislodge the aggregate or ravel the edge of the saw-cut, but in no case longer than 12 hours after the slab is placed. Saw-cut a minimum of one quarter of the slab depth leaving a clean, sharp edge in the pattern shown on the Contract Documents. Provide sufficient personnel and equipment to complete saw-cutting operations within 18 hours after the slab is placed.
C. Gradient tolerances: Interior Building floor surface tolerances shall be within 1/4 inch of spot elevations indicated.

3.06 CURING AND PROTECTION

A. Curing Temperature: Maintain the temperature of the concrete at 50 degrees F. or above during the curing period. Keep the concrete temperature as uniform as possible and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceeds 5 degrees F. in any one hour and 50 degrees F. in any 24-hour period.

3.07 FIELD QUALITY CONTROL

A. ACI 301, Section 1.6.4.2 - Testing Services:
   1. Add the following paragraph: 1.6.4.2.e Strength Tests for Pumped Concrete: Prepare strength test specimens and make strength tests from concrete samples obtained at the truck discharge chute and at the end of the pump delivery line in accordance with paragraph 16.3.4.4.
B. ACI 301, Section 1.6.3.3 – Tests required of Contractor's testing agency:

1. Add the following paragraph:

1.6.3.3.c Make available to the Owner's Representatives whatever test samples are required to make tests. Furnish shipping boxes for compression test cylinders.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to the State and as accepted by the Director. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Owner's Representative before using in the work.

D. Test results will be reported in writing to the Architect, Owner's Representative, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

E. Nondestructive Testing: Impact hammer,, Windsor probe, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

END OF SECTION

SECTION 04061

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 REFERENCES
- A. Standards:
  1. Mortar: ASTM C 270, except as otherwise specified.
  2. Grout: ASTM C 476.
- B. Where proprietary CMU products require variations to this specification, comply with proprietary product manufacturer's recommendations or requirements.

1.02 SUBMITTALS
- A. Product Data:
  1. Portland Cement: Brand and manufacturer's name.
  2. Masonry Cement: Brand and manufacturer's name, and color.
  3. Lime: Brand and manufacturer's name.
  4. Sand(s): Location of pit, name of owner, and previous test data.

1.03 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, and handle materials in a manner which will insure the preservation of their quality and fitness for the Work.
- B. Store cement and lime on raised platforms under waterproof, well ventilated cover.

PART 2 PRODUCTS

2.01 MATERIALS
- A. Cement: One of the following complying with the indicated requirements:
  1. Portland Cement: ASTM C 150, Type 1, to match existing.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Sand: ASTM C 144, except that for joints less than 1/4 inch thick use sand graded with 100 percent passing the No. 16 sieve.
- D. Grout Sand: ASTM C 404.
- E. Water: Clean and free of deleterious amounts of acids, alkalis, and organic materials.

2.02 MIXES
- A. Mortar for Unit Masonry: Comply with ASTM C 270, proportion specifications, having minimum compressive strength of 2800 PSI. Color: Plain Grey.
- B. Grout: Comply with ASTM C 476 having minimum compressive strength of 2000 PSI with a slump range of 8 inches to 11 inches.

2.03 SEALING
- A. Trenwyth Astra Glaze by Trenwyth Industries, Clean the glazed surface of completed walls with a mild soap/water solution. Do not use acid or abrasives on the glazed surfaces. Apply Water Repellant Sealer to exposed interior surfaces of CMU. (Trenwyth Astra Glaze CMU is glazed on one side only. See extents of vinyl paneling in tunnel.)

PART 3 EXECUTION

3.01 INSTALLATION
- A. Refer to sections of Specifications which require mortar and masonry grout.

3.02 MORTAR SCHEDULE
- A. Where mortar types are not indicated on Drawings or specified, use types as follows:
  1. Type M for unit masonry below grade in contact with fill materials.
  2. Type S for concrete masonry units.
     a. Proportion Portland cement, lime, and sand in a 1:1:6 ratio.

END OF SECTION

SECTION 04100

FACE BRICK AND STONE VENEER

PART 1 GENERAL

1.01 DESCRIPTION
A. Face Brick work includes brick veneer
B. Stone Veneer work includes application of thin applied manufactured stone
C. Cast Stone work includes the cast concrete masonry units.
B. This section includes coordination and setting of embed plates and similar structural connections.
C. See Section 01010 – Summary of Work .
D. See Section 04061 Mortar and Grout.

1.02 QUALITY ASSURANCE
A. Work shall conform to the standards of the Masonry Institute of America and to codes having jurisdiction.
B. Do not lay units that are wet or frozen.
C. All Face Brick and Stone Veneer units shall be from a single manufacturer's production run.

PART 2 PRODUCTS

2.01 FACE BRICK
A. Type: Kiln fired clay face brick
B. Size: Nominal 3 x 3 x 10-inches Kingsize
C. Color: 500 Classic
D. Texture: Velour wire cut
E. Manufacturer:
Cloud Ceramics
Distributer: Architectural Masonry Products
9434 Kay Freeway
Suite 170
Houston, Texas 77055

2.02 STONE VENEER
A. Type: manufactured stone
B. Size: 1-1/2 inch thick
C. Color: Sierra Mountain Ledge
D. Manufacturer:
Eldorado Stone
Distributor: Headwaters Construction Materials (Palestine Concrete Tile),
2202 Chalk Hill Road
Dallas Texas 75212

2.03 CAST STONE
A. Type: Smooth faced solid cast concrete units manufactured using a mould pressed cast system
B. Sizes:
1. 2-5/8" x 5-1/2" x 24 inch long for use at exterior accent band
2. 2-5/8" x 10-1/2" x 24 inch long for use as wall caps at masonry enclosures

2.02 MORTAR PREPARATION/USE
A. See Section 04061 Mortar and Grout.

2.03 CAVITY TIES
A. Horizontal Joints:
1. Welded Wire Mesh: 16 gauge galvanized steel ½" mesh

PART 3 EXECUTION

3.01 INSTALLATION OF FACE BRICK AND CASTSTONE

A. Cut units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible. Do not install broken or chipped units
B. Bond corners and intersections
C. Lay Face Brick in a ½ running bond pattern. No other coursing will be allowed.
D. Carefully coordinate coursing with shelf angles
E. Joints shall be concave tooled.

3.02 INSTALLATION OF STONE VENEER

A. Install Stone Veneer in accordance with the manufacturer's guidelines
B. Clean face of CMU to assure bonding
C. The surface of the CMU should be moistened prior to installation of veneer units.
D. The back of each applied stone veneer unit should be entirely buttered using type S mortar.
E. The buttered veneer unit should be firmly worked into the cmu backup and slid back and forth to position it.
F. Grouting of the joints should be completed after sufficient cure time of the installed veneer units. Install grout in a manner that results in the appearance of a very deep joint or no joint.

3.03 CONSTRUCTION TOLERANCES FOR BRICK

A. Variation from Plumb: Vertical lines, surfaces or columns, walls do not exceed 1/8" in 10' nor 1/4" up to 40'. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story of 20' maximum. Vertical alignment of head joints not to exceed 1/8" in 10'.
B. Variation from Level: For bed joints, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum.
C. Variation in Mortar Joint Thickness: Do not exceed joint thickness indicated by more than plus or minus 1/8"

3.04 CLEANING

A. After mortar is thoroughly set and cured, clean masonry completely using the least harsh method possible
B. Clean the completed walls with cleaners recommended by manufacturers. Note: manufactured stone veneer products may not be cleaned using acid based cleansers.

END OF SECTION

SECTION 04200

CONCRETE MASONRY UNITS (CMU)

PART 1 GENERAL

1.01 DESCRIPTION
A. Masonry work includes concrete masonry unit (CMU) wall structures.
B. Masonry work includes coordination and setting of embed plates and similar structural connections.
C. See Section 01010 – Summary of Work .
D. See Section 04061 Mortar and Grout.

1.02 QUALITY ASSURANCE
A. Work shall conform to the standards of the Masonry Institute of America and to codes having jurisdiction.
B. Do not lay units that are wet or frozen.
C. All concrete masonry units shall be from a single manufacturer's production run.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS
A. Type: Hollow Core and Load Bearing. B. ASTM C 90 Class: Normal Weight, having minimum compressive strength of 2800 PSI.
B. Size: Nominal 8 x 16 x 8-inches
C. Color: Natural.
D. Texture: Smooth Face
D. Dry Density: 95 to 105 lbs. per cubic ft.
E. Manufacturer:
1. Headwaters Construction Materials (Palestine Concrete Tile),
2202 Chalk Hill Road
Dallas Texas 75212
2. Or Approved Equal

2.02 MORTAR PREPARATION/USE
A. See Section 04061 Mortar and Grout.

2.03 REINFORCING STEEL
A. Horizontal Joints:
1. Welded Wire Steel: 9 gauge galvanized steel, ladder type conforming to ASTA A 145
2. Deformed Reinforcing Wire conforming to ASTM A 496.
B. Vertical Reinforcing thru cells:
1. Deformed Reinforcing Bars, Grade 60 conforming to ASTM A 615.

2.04 Dry- Block Additive: Provide integral color, hollow load bearing "DRY-BLOCK", with integral water-repellent admixture, complying with ASTM C90, medium weight, as shown on the drawings.

PART 3 EXECUTION

3.01 INSTALLATION
A. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.
B. Draw blocks from more than one pallet at a time during installation. All exterior mortar shall include water-repellent additive added to each batch in the appropriate dosage rates for mortar type (M, S or N) per manufacturer's instructions.

3.02 CONSTRUCTION TOLERANCES
A. Variation from Plumb: Vertical lines, surfaces or columns, walls do not exceed 1/4" in 10' nor 1/2" up to 40'. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story of 20' maximum. Vertical alignment of head joints not to exceed 1/4" in 10'.

B. Variation from Level: For bed joints, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4” in any bay or 20’ maximum.
C. Variation of Linear Building Line: Do not exceed 1/2” in any bay or 20’ maximum, nor 3/4” in 40’or more.
D. Variation in Mortar Joint Thickness: Do not exceed joint thickness indicated by more than plus or minus 1/8”

3.03 LAYING MASONRY WALLS:

A. Pattern Bond: Lay masonry in ½ running bond. Do not use units with less than nominal 8” horizontal face dimensions at comers or jambs.
B. At Roof Parapet inside walls that receive a single ply membrane flashing, strike these joints flush.
C. Strike other joints concave.
D. Double strike all mortar joints.
E. Keep cavity in cavity walls clean of mortar drippings and debris.
F. Concrete Masonry Units:
   1. Shall be laid with full face and head joints to increase resistance to water penetration.
G. Trenwyth Products requires compliance with NCMA TEK Notes, available at www.trenwyth.com.
H. Units shall have uniform face joint dimensions of 1/4" both horizontally and vertically. Tool joints neatly after they are finger-hard to make them straight and uniform.

3.04 CLEANING

A. After mortar is thoroughly set and cured, clean masonry completely using the least harsh method possible
B. Clean the completed walls with Burnished Custom Masonry Cleaner by PROSOCO at a 3:1 solution, carefully following manufactuer's washdown instructions -- including thorough rinsing. Do not use acid or abrasives on the glazed surfaces.

END OF SECTION

SECTION 05122

STRUCTURAL STEEL

PART 1 GENERAL

1.01 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION
A. Anchor Bolts: Installed under Section 03050 or 03300.

1.02 RELATED WORK SPECIFIED ELSEWHERE
A. Fluted Steel Decks, Section 05310
B. Field Painting, Section 09900.
C. Misc Fabrications, Section 05500

1.03 REFERENCES
A. Except as shown or specified otherwise, the Work of this Section shall meet the requirements of the following:
1. Design, Fabrication, and Erection: "Specification for Structural Steel Buildings, Load and Resistance Factor Design" (LRFD), December 1, 1993, by the American Institute of Steel Construction (AISC Specification).
2. Standard Practice: Fabrication and erection practices shall comply with the "Code of Standard Practice for Steel Buildings and Bridges", June 10, 1992, by the American Institute of Steel Construction (AISC Code); and Steel Joist Institute “Standard Specifications, Load Table and Weight Tables” for types of steel joists indicated on the Structural Drawings.
3. Welding: Welding shall comply with the provisions of the "Structural Welding Code - Steel, AWS D1.1", by the American Welding Society (AWS Code).
4. High-Strength Bolting: High-strength bolting shall comply with the "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation on November 13, 1985 (Specification for Structural Joints).
5. Cleaning Steel: Comply with the appropriate specifications (SSPC SP-X) by the Steel Structures Painting Council.

1.04 DEFINITIONS

A.AISC Manual: Where reference is made to the AISC Manual, it shall mean the Manual of Steel Construction, LRFD, Second Edition, of the American Institute of Steel Construction.

1.05 All bolted connections shall have a minimum of two bolts.
A. Shop Connections: Unless otherwise indicated, all shop connections shall be welded or high strength bolted. Field connections required to be welded or fully-tensioned high-strength bolted shall meet the same requirements when fabricated in the shop.
B. Field Connections:
1. All bolted field connections need only be tightened to the snug tight condition.
C. Standard Beam Connections:
1. Standard beam connections shown on the Drawings shall be fabricated as detailed.

1.06 SUBMITTALS

A. Shop Drawings: Submit shop drawings for all structural steel required by this Contract. Machine-duplicated copies of Contract Drawings will not be accepted as shop drawings. Shop drawings shall be standard 24 by 36 inch size sheets.
1. Special Exception: Electronic submittal of Structural and Joist Shop drawing will not be acceptable for the initial submittal.
2. Failure to submit legible drawings of required size will be cause for their disapproval without review. If the drawings are not prepared by a detailer under the direct control of the fabricator, the fabricator shall stamp each drawing and initial or sign the stamp to certify review and approval of the drawings, and conformance with the fabricator's shop practice and capability.

3. Include the following in the initial submission:
   a. Drawings of proposed job standards for shop and field connections, including standard and special connections, complying with the requirements.
   b. Erection drawings indicating sizes, weights, and locations of all structural members.
   c. Anchor bolt and base plate plans.
4. Include the following in subsequent submissions:
   a. Index sheets and revised erection drawings to which erection marks have been added.
   b. Detail drawings of all structural members.
   c. Electronic submittal on PDF format will be acceptable for subsequent or final submission
5. Indicate all required shop and field welds by Standard AWS Welding Symbols in accordance with AWS A2.4.
6. Indicate shop painting requirements.
7. When shop drawings are marked "Approved as Noted", corrected re-submittal is not required.
8. Contract Drawings are not considered released for construction. Orders for materials may be placed only after approval of erection drawings or written approval of the Structural Engineer.d

B. Product Data:
1. Shop Paint: Manufacturer's name and printed product literature, including storage and application instructions.

C. Quality Control Submittals:
1. Test Reports: Submit 3 copies of each of the following:
   a. Steel manufacturer's mill test reports, covering physical and chemical tests, for all main material.
   b. Bolt manufacturer's test reports, covering physical and chemical tests, for each lot of high strength bolts supplied.
2. Certificates: Whenever any structural steel items other than main members, such as anchor bolts, base plates and detail material, are supplied either from plant stock or from a warehouse, submit 3 copies of evidence of compliance of the material with the applicable requirements of this Specification. Such evidence shall consist of certification as to the source of the material and copies of purchase orders, manufacturer's certifications or, in the case of stock material, copies of the latest mill orders or purchase orders for routine replacement of such stock material.
3. Fabricator's and Erector's Qualifications Data: Name and experience of fabricator and erector.
4. Welding Procedure Specifications: Submit procedure specifications for each joint to be welded by submerged arc or flux cored arc welding.
5. Welder's Certification: Submit each welder's welding certification for each type weld and position before fabrication.

1.07 QUALITY ASSURANCE

A. Fabricator's Qualifications: The fabricator of the structural steel shall be regularly engaged in the fabrication of structural steel, and shall be subject to the approval of the Engineer. AISC Quality Certified Fabricators (latest list issued) are approved.
B. Erector's Qualifications: The structural steel erector shall be regularly engaged in the erection of structural steel, and shall be subject to the approval of the Engineer.
C. Welders' Qualifications: Welding shall be performed only by welders, welding operators, and tackers who have been qualified by tests as prescribed in the AWS Code to perform the type of welding required.
D. Do not deviate from the requirements of the Contract Documents except where an option is specifically mentioned. The Engineer, however, may accept deviations proposed by the Contractor when it is deemed in the best interest of the State and if the deviations are consistent with sound and accepted engineering practice. Requests for deviations shall be made prior to the submission of shop drawings to preclude delay in the expeditious preparation and approval of the required shop drawings. In addition, design calculations or other data may be required to establish conformity of such deviations with the applicable Standards.

1.08 INSPECTION

A. Quality Control Inspection: Refer to Section 01400, Quality Control for requirements.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver anchor bolts and other devices which are to be embedded in cast-in-place concrete or masonry construction, for anchorage of structural steel, one week prior to the start of that Work, unless otherwise required.
B. Receiving Shop Paint: Receive paint in original, unopened containers bearing paint manufacturer's printed label.
   1. Label shall show manufacturer's name, trade name of paint, Federal Specification compliance (if applicable), shelf life, and date of manufacture.
C. Protection:
   1. Upon delivery to the site, promptly cover and protect steel items (which are not required to receive shop paint) from rusting.
   2. Store shop paint in accordance with paint manufacturer's printed instructions.

1.12 ENVIRONMENTAL REQUIREMENTS FOR SHOP PAINTING

A. Comply with the following conditions for the application of paint unless otherwise stated in the paint manufacturer's printed directions.
   1. Minimum ambient, steel surface, and paint temperatures: 40 degrees F.
   2. Maximum steel surface temperature: 100 degrees F.
   3. Maximum relative humidity: 85 percent.
   4. Surface of steel: Dry.

PART 2 PRODUCTS

2.01 MATERIALS

A. Structural Steel: See Structural Notes on Drawings.
B. Steel for Anchor Bolts, Tie Rods, Sag Rods, and other Detail Material Not Proportioned for Calculated Stress: ASTM A 36; or ASTM A 675, Grade 70.
C. Steel for Shims and Fillers: ASTM A 569.
D. High-Strength Threaded Fasteners (High-Strength Bolts): ASTM A 325 heavy hexagon structural bolts, nuts, and hardened washers.
E. Steel Pipe: ASTM A 53, Grade B.
F. Steel Structural Tubing: ASTM A 500, Grade B; or ASTM A 501. H. Weld Filler Metal:
   1. General: Weld filler metal shall be in accordance with Table 4.1.1 of the AWS Code, except as follows:
      a. Only electrode and flux combinations complying with AWS Classifications F7AX-EXXX or F7AX-EXXX-a, (a = B2, Ni1, Ni2, Ni3 or W), shall be used for submerged arc welding.
      b. Only electrode and shielding gas combinations complying with AWS Classifications E 7XT-1 or E 7XT-5 shall be used for flux cored arc welding.
   2. Weld filler metal for shielded metal arc welding which conforms to AWS Specifications A5.1 or A5.5 shall be considered to be prequalified.
   3. Weld filler metal for submerged arc and flux cored arc welding shall be qualified by performing the procedure qualification tests required under Part 1 of this Section.
H. Shop Paint (General): Steel primer selected from the following:
   1. TNEMEC 10-99 (Red), 10-99G (Green) or 10-1009 (Gray).
   2. Rust-Oleum 769.
   3. Valspar 13-R-53.
   4. Sherwin-Williams "Kromik".
I. Shop Paint for Exterior Equipment Supports (High-Ratio Water Based Zinc Silicate): Steel primer selected from the following:
   1. Inorganic Coatings IC 531
   2. Valspar 13-R-53
   3. Ameron Dimetcote 21-7
J. Bedding Mortar:
   1. Shrink-Resistant Grout (Non-Staining): Factory-packaged, non-ferrous mortar grouting compound selected from the following:
      a. Masterflow 713 by Master Builders, 23700 Chagrin Blvd., Cleveland, OH 44122 (800) 227-3350.
      b.Sonogrout by Sonneborn, Chemrex, Inc., 57-46 Flushing Ave., Maspeth, NY 11378, (800) 433-9517.

c. Five Star Grout by Five Star Products, Inc.,425 Stillson Rd., Fairfield, CT 06430, (800) 243-2206.
d. Crystex by L&M Construction Chemicals, 14851 Calhoun Rd., Omaha, NB 68152, (800) 362-3331.
e.Non-Corrosive, Non-Shrink Grout by A.C. Horn, Inc., Tamm Industries, 7405 Production Dr., Mentor, OH 44060, (800) 862-2667.

2.02 FABRICATION

A. Progress shop fabrication from "Approved" or "Approved as Noted" detail drawings only.
1. When detail drawings are "Approved as Noted", progress fabrication in strict accordance with notes thereon.
2. Fabrication progressed from "DISAPPROVED" or "RETURNED FOR CORRECTION" detail drawings will be rejected. The contractor shall have no claim for any costs or delays due to rejection of items fabricated from "DISAPPROVED" or "RETURNED FOR CORRECTION" detail drawings.
B. Finish column ends at base plates and at load carrying cap plates to a true plane square to the column, with a maximum American National Standards Institute surface roughness value of 500 microinches.
C. Pipe and Tube Columns: Cap columns with a closure plate shop welded to the top of the columns to exclude water and foreign material from entering the column.
D. Make provision for connections of other Work, including all cutting and punching of structural members where required by the Drawings, or for which information is furnished prior to approval of the shop drawings.
E. Remove extension bars or run-off plates upon the completion and cooling of groove welds. Grind the ends of the welds smooth and flush with the edges of the abutting parts.
F. Remove tack welds not incorporated into the final weld, and temporary welds. Grind affected surfaces smooth and flush.
G. Detail fillet welded joints so as to permit the welding electrode or wire to be positioned at a minimum angle of 30 degrees from the face of any material upon which weld metal is to be deposited.
H. Prepare material in accordance with Section 3 of the AWS Code. Do not use gas or air carbon-arc cutting to cut or enlarge bolt holes.

2.03 SHOP PAINTING

A. Thoroughly clean structural steel. Remove oil, grease, and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning". Remove loose mill scale, loose rust, weld slag and spatter, and other detrimental material in accordance with SSPC SP-2 "Hand Tool Cleaning", SSPC SP-3 "Power Tool Cleaning", SSPC SP-6 "Commercial Blast Cleaning" or SSPC SP-7 "Brush-Off Blast Cleaning".
B. Apply one coat of shop paint to all steel surfaces except as follows:
1. Do not paint steel members designated "NP" on the Drawings.
2. Paint steel surfaces inaccessible after assembly, except surfaces in contact, with two coats of shop paint before assembly.
3. Do not paint steel surfaces to be field welded, contact surfaces of high-strength bolted slip-critical connections, steel to be encased in cast-in-place concrete, steel receiving sprayed-on fireproofing (if recommended by manufacturer of the fireproofing material approved for use on this Project), and the top flange of beams and girders in composite construction.
4. Do not paint galvanized items which are not to be finish painted under Section 09900.
5. Apply two shop coats of High-Ratio Water Based Zinc Silicate to all exterior equipment support member surfaces.
C. Apply paint and compound to the following minimum thickness per coat:
1. Shop Paint (General): 4.0 mils wet film.
2. Shop Paint for Galvanized Steel: 3.0 mils wet film.

PART 3 EXECUTION

3.01 ERECTION

A. Erect steel in accordance with the AISC Specification, the AISC Code, the AWS Code and the Specification for Structural Joints, except as otherwise specified.
B. Prepare and place shrink-resistant grout in accordance with grout manufacturer's printed instructions.

1. Comply with manufacturer's instructions for preparation of surfaces in contact with the grout, and for curing and protection of the grout.

C. Remove extension bars and run-off plates upon the completion and cooling of groove welds. Grind the ends of the welds smooth and flush with the edges of the abutting parts.

D. Remove tack welds not incorporated into the final weld, and temporary welds. Grind affected surfaces smooth and flush.

E. Delete Paragraph M2.2. of the AISC Specification. Prepare material in conformance with Section 3 of the AWS Code. Do not use gas or air carbon-arc cutting to cut or enlarge bolt holes.

F. Do not make corrections or alterations to fabricated steel without prior written approval by the Engineer.

END OF SECTION

SECTION 05310

FLUTED STEEL DECKS

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE
A. Field Touch-up Painting: Section 09900.

1.02 REFERENCES
A. Comply with the following reference standards unless otherwise shown or specified:
1. Design: "Specification for the Design of Cold-Formed Steel Structural Members" by the American Iron and Steel Institute (AISI Specification).
2. Welding: "Structural Welding Code - Sheet Steel, AWS D 1.3", by the American Welding Society (AWS Code).

1.03 SUBMITTALS
A. Shop Drawings: Show application to project. Prepare separate drawings, coordinated with, but not superimposed on, joist drawings or structural steel erection drawings.
B. Product Data: Manufacturer's printed specifications and installation instructions.

1.04 HANDLING AND STORAGE
A. Handle and stack materials carefully in order to prevent deformation or damage. During unloading and hoisting, take extra care to prevent damage to ends and sides of individual metal deck panels. Do no place panels in direct contact with the ground. Protect panels from the elements and keep panels dry.
1. If mud, dirt, or other foreign matter is accumulated on panels, remove such accumulation completely prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fluted Steel Roof Deck and Metal Accessories: Sheet steel conforming to ASTM A 611 Grade C or ASTM A 653 SQ Grade 33, wide rib configuration, 1-1/2” depth, 22 gauge. Fluted Steel decking shall receive chemical cleaning, phosphate treatment, and baked on primer. Finish shall be evenly coated with no cracking after fabrication. Accessories shall be fabricated of not lighter than 18 US Standard Gage sheet steel.
B. Acoustical metal decks: Provide perforated acoustical metal decking in the Dry Bay only. Provide manufacturer‘s standard perforations and fiberglass flute fillers.
C. Self-Drilling Fasteners: No. 12-14 x 3/4 inch, hex washer head, self-drilling fastener with pilot point.
D. Flexible Closure Strips: Manufacturer's standard vulcanized, closed- cell, synthetic rubber closure strips.

2.02 FABRICATION
A. Furnish units in lengths to be continuous over 3 spans wherever possible. B. Steel deck shall conform to the properties noted on the Drawings:
C. Unless otherwise indicated or approved, fabricate deck for predetermined openings, and reinforce where required to maintain deck strength, alignment, and profile.
1. Small openings, as recommended by the deck manufacturer, may be field cut.
D. Accessories: Shop fabricated accessories, compatible with steel deck, as required to complete the Work, including, but not limited to, the following:
1. Sheet metal cants beneath flashings when required for roofing over steel deck.
2. Closures to close deck at ridges, valleys, and hips on roof deck slopes exceeding 1/2 inch per foot.
3. Column closures, end closures, Z closures, and cover plates.
E. Progress shop fabrication from "APPROVED" or "APPROVED AS NOTED" detail drawings only.
1. When detail drawings are "APPROVED AS NOTED", progress fabrication in strict accordance with notes thereon.

2. Fabrication progressed from "DISAPPROVED" or "RETURNED FOR CORRECTION" detail drawings will be rejected. The contractor shall have no claim against the State for any costs or delays due to rejection of items fabricated from "DISAPPROVED" or "RETURNED FOR CORRECTION" detail drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of steel deck.
B. Do not start installation of metal deck until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Coordinate installation sequence of metal deck with concrete encasement of steel beams.
C. Steel surfaces to which materials, provided under this Section, are to be welded, shall be free of paint, ice, water, oil, dirt, rust and other materials detrimental to welding.
D. Locate decking bundles to prevent overloading of supporting members

3.02 INSTALLATION

A. Install the Work of this Section in accordance with the manufacturer's printed instructions except where shown or specified otherwise.
    1. Welding shall comply with the AWS Code.
    2. Perform welding free of sharp points.
B. Place deck units on supporting steel framework and adjust to final position with ends bearing on supporting members and flutes in straight and true alignment through entire length of run before being permanently fastened. Do not stretch or contract side lap interlocks. Install temporary shoring before placing single span deck panels when required to meet manufacturer’s recommendations.
C. End Bearing: Install deck units over supporting framing with a minimum end bearing of 1-1/2 inches, with end joints as follows:
    1. Non-Composite Deck End Joints: Lapped 2 inches minimum.
D. Deck Fastening: Fasten deck units at ends and intermediate supports with arc spot welds (puddle welds) not less than 3/4 inch diameter, at 12 inches on centers, along the supporting members, unless more stringent requirements are indicated on the drawings or required by the fire resistance ratings indicated on the drawings. Weld the first and last deck flutes. Use welding washers for all deck lighter than 20 gage. Deck units may be fastened to steel supports 0.18 inches or less in thickness (cold-formed metal framing) with No.12-14 x 3/4 inch self-drilling fasteners at 12 inches on center at ends and intermediate supports.
E. Side lap fastening: Fasten side laps at intervals not exceeding 36 inches, using one of the following methods, unless more stringent requirements are indicated on the drawings or required by the fire resistance ratings indicated on the drawings:
    1. Mechanically fasten with self-drilling No.12 diameter or larger carbon steel screws.
    2. Mechanically button punch.
F. Perimeter Edge Fastening: Weld starting and finishing side edges in bearing to supporting members at 36 inches on centers maximum, unless more stringent requirements are indicated on the drawings or required by the fire resistance ratings indicated on the drawings.
G. Neatly field cut required openings, other than shop fabricated openings, after installation in accordance with the manufacturer's recommendations.
H. Closures: Install flexible closure strips to effectively seal underside of flutes where fluted decks extend over exterior walls and also above interior partitions where there are no ceilings below the fluted deck.

END OF SECTION

SECTION 05400 - LIGHT GAUGE METAL STUD

PART 1 - GENERAL

SCOPE

Furnish and install the following metal framing members complete with their accessories as required for the Work.
Interior Non-load Bearing Studs
Steel Stud Framing and Bracing

REQUIREMENTS

Component Design: Compute structural properties of studs in accordance with AISC "Specification for the Design of Cold- Formed Steel Structural Members".

PART 2 - PRODUCTS

System Components: With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, bridging, and accessories as recommended by manufacturer for application indicated, as needed to provide a complete metal framing system.

Acceptable Manufacturers:

United States Gypsum Co.
Gold Bond Bond Building Products Div., National Gypsum Co.
Chicago Metallic
Alabama Metal Industries
Super C Steel Studs, U.S. Steel

Materials and Finishes: The following are based upon U.S Gypsum Products.

Interior Partitions, Misc Framing:
2-1/2", 3-5/8", and 6" C shaped, 25 gauge steel studs, ASTM A568
U.S. Gypsum, ST25 studs, CR25 runners

Miscellaneous Framing and Suspension Systems
1-1/2 16 gauge cold rolled hanger channels
3/4" furring chanels, 20 or 25 gauge USG DWC 20, 25
Hanger Wire - minimum 12 gauge or heavier
Miscellaneous clips

Joists
6” , 25 gauge steel joists
U.S. Gypsum 60SJ20

Provide galvanized finish to all studs, joists, and metal framing components complying with ASTM A 525 for minimum G60 coating.

PART 3 - EXECUTION

ERECTION

General: Unless exceeded by the requirements below, conform to the erection procedures recommended by the manufacturer of the framing members.

INTERIOR STUD WALLS

Track: Provide continuous channel tracks as top and bottom support for studs. Secure tracks to structure as required. Provide additional fastenings and holes if necessary so that no length of runner has less than 2 fastenings. Join adjacent lengths and form corner joists by butt welding the sections together.

Studs: Space studs at 24" O.C., except space studs at 16" O.C. at walls to receive ceramic tile. Secure them to the flanges to the tracks per manufacturer's recommendation.

Prefabrication: Structural framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels to prevent damage or distortion.

Fastenings: Attach components bolting, or screw fasteners, as standard with manufacturer.
Wire tying of framing components is not permitted.

Bridging Clips: Furnish and weld metal bridge clips at bridging channel position through stud punch outs. Furnish sufficient quality to permit the attachment of the clips required for the material involved.

Set studs plumb, except as needed for diagonal bracing or required for non plumb walls or warped surfaces and similar requirements.

Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work.

Frame Door and Window Openings with vertical studs attached to each jamb of the door frame. Install with at least one additional stud 2" from each jamb stud and connect to the jamb stud with column clips. Where door does not extend to ceiling, frame head with horizontal section of runner track attached to jamb studs with stud shoes. Install jack studs over head track and secure with stud shoes. Install stiffeners as recommended by manufacturer.

STEEL STUD FRAMING AND BRACING

General: Provide continuous framing and bracing of the type and size shown on the drawings or as recommended by the manufacturer for the specific application. Provide channel tracks as top and bottom support for studs. Secure tracks to structure as required. Provide additional fastenings and holes if necessary so that no length of runner has less than 2 fastenings. Join adjacent lengths and form corner joists by butt welding the sections together. Space studs at 24" O.C or closer as required. Secure them to the flanges to the tracks per manufacturer's recommendation.

Fastenings: Attach components welding, bolting, or screw fasteners, as standard with manufacturer. Wire tying of framing components is not permitted.

Set studs plumb, except as needed for diagonal bracing or required for non plumb walls or warped surfaces and similar requirements.

Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work.

Suspended framing for gypsum ceilings: Suspend hangar channels spaced no more than 48" O.C.. Attach furring channels to hanger channels at intervals of 24" O.C. or less, assemble in accordance to manufacturer's recommendations.

END OF SECTION 05400

SECTION 05500

MISCELLANEOUS METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes Custom Elements:
   1. Water reclaim and trench edge angles, cover plates and hinges.
   2. Mechanical and electrical equipment support frames.
   3. Tube steel awning frames attached to the building.
   4. Bollards.
   5. Angle Iron corner protection on the Refuse Screen.
   6. Steel Gates at Vacuum Screens.
   7. Miscellaneous steel as indicated on the Drawings.
   8. Cast Metal Trench Covers
B. Related Sections:
   1. Section 01450, Quality Control: Weld inspections.
   2. Section 03300, Cast-In-Place Concrete: Inserts and anchors for concrete substrates.
   3. Section 03600, Grouts: Grout and anchoring cement.
   4. Section 05120, Structural Steel: Structural steel framing.
   5. Section 09900, Painting: Field painting metal fabrications.

1.02 REQUIREMENTS

A. Design Requirements:
   1. Design Manual: AISC, Manual of Steel Construction, Ninth Edition.
B. Submittals:
   1. Submit product data for factory fabricated items.
   2. Submit shop drawings for custom fabricated framing items, handrails, and railings.
C. Quality Assurance:
   1. Use welders certified by AWS for structural welding.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Substitute Manufacturers:
   1. Submit substitution requests prior to Bid Date.
   2. Comply with requirements in Section 01600, Product Requirements.

2.02 MATERIALS

A. Metal Framing Materials:
   1. Steel Plates, Shapes, and Bars: ASTM A 36.
   2. Steel Round, Square, and Rectangular Tubing: ASTM A 501, Fy = 36 KSI.
   3. Steel Pipe: ASTM A 53, Grade B, Schedule 40, Fy = 35 KSI, Type S.
B. Connectors and Primers:
   1. Standard Bolts: ASTM A 307, Grade A.
   2. High Strength Bolts: ASTM A 325, Type N, F, or SC.
   3. Welding Electrodes: E70XX.
   4. Concrete Anchors: Sup-R-Stud by Diamond, Inc., Taper Bolt by Gunnebo Fastening Corporation, Kwik-Bolt II by Hilti Fastening Systems, Inc., Red Head Wedge Anchors by ITW Ramset, Rawl-Stud by Rawlplug.
   5. Interior Steel Primer: Fabricator's standard rust inhibitive.
   6. Touch-Up Galvanized Steel Primer: Zinc rich steel primer.
C. Trench Covers
   Neenah R-4999 Series, Type D, Solid Checkered Face, bolted connection, with frame, for 8 inch wide trench

2.03 FABRICATION

A. Fabrication Requirements:
   1. Comply with AISC, Manual of Steel Construction, Ninth Edition including Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
   2. Comply with AISC, Specifications for Architecturally Exposed Structural Steel.
   3. Use welds for shop connections and bolts for field connections, except where indicated otherwise on Drawings.
   4. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
   5. Disassemble units only as necessary for shipping and handling limitation.
   6. Clearly mark units for site reassembly and installation.

B. Shop Fabrication of Welded Connections:
   1. Comply with ANSI/AWS D1.1 Structural Welding Code-Steel.
   2. Provide 3/16 inch minimum fillet welds and full penetration butt welds, unless indicated otherwise on Drawings.
   3. Grind exposed welds smooth.
   4. Shop weld bases and bearing plates to steel columns and framing members where indicated on Drawings for anchorage to concrete substrates.

C. Shop Fabrication of Bolted Connections:
   1. Fabricate anchor bolts for connecting to substrates.
   2. Drill bolt holes in steel 1/16 inch larger than nominal bolt diameter.
   3. Drill anchor bolt holes in concrete 5/16 inch larger than nominal bolt diameter.
   4. Do not thread bolts at shear plane.
   5. Install friction bolts free of paint at the friction bearing surfaces.

D. Shop Finishing, General:
   1. Shop clean steel to remove rust by Hand Tool Cleaning SR-2, Power Tool Cleaning SP-3, or Brush-Off Blast Cleaning SP-7 as published by Steel Structures Painting Council (SSPC).
   2. Remove oil and other contaminating material by Solvent Cleaning SP-1 as published by Steel Structures Painting Council (SSPC).
   3. Hot-dip galvanize, bonderize, and prime paint steel exposed to unheated concrete, masonry, or weather after fabrication with 2.0 mil minimum dry film thickness for each coat.
   4. Apply rust inhibitive metal primer to interior steel items after fabrication with 2.0 mil minimum dry film thickness for each coat.
   5. Apply two coats of prime paint to surfaces concealed after assembly.

E. Shop Finishing, Exterior Façade Elements:
   1. At exposed exterior metal façade elements including trellis's, sloping and flat canopy structures, powder coat finish.

F. Shop Weld and Bolt Inspections:
   1. Comply with requirements in Section 01450, Quality Control.
   2. Employ a testing laboratory to provide Uniform Building Code required shop inspections.

PART 3 EXECUTION

3.01 PERFORMANCE

A. Preparation:
   1. Erect temporary shoring and bracing needed for structural support for metal fabrications until structure is complete.
   2. Clean the bottom surface of base and bearing plates.
   3. Clean contact surface of structural steel prior to assembly.
   4. Furnish anchors and inserts to support metal fabrications anchored in concrete or masonry assemblies.

B. Installation of Metal Fabrications:
   1. Erect steel members in accordance with Drawings, reviewed shop drawings, AISC Manual of Steel Construction.
   2. Perform required cutting, drilling, and fitting.
   3. Set work accurately in location, alignment, and elevation, measured from established lines and levels.
   4. Align members to tolerance of one in 300 and within 1/2 inch from design dimension.

5. Install structural members to lines and elevations indicated on shop drawings.
6. Adjust location of structural members to required tolerances prior to permanent fastening.
7. Fill steel bollards with concrete and trowel top to 1/2 inch high smooth convex surface.

C. Installation of Anchor Bolts:
1. Anchor structural steel to installed concrete substrates with concrete anchors.
2. Set anchor bolts in fresh concrete with double nuts and 1/2 inch thick plywood or oriented strand board templates.
3. Drill holes in cured concrete and secure anchor bolts in anchoring cement.

D. Installation of Field Bolted Connections:
1. Install bolted connections as detailed, using not less than 5/8 inch diameter bolts.
2. Install 3/4 inch diameter A 325 N high strength bolts with threads allowed in bearing area, unless indicated otherwise on Drawings.
3. Install load indicator washers on high strength bolts, ASTM A325 F.

E. Field Finishing:
1. Remove dust and dirt prior to field finishing exposed structural steel.
2. Apply one coat of touch-up galvanized steel primer to damaged galvanized exterior steel.
3. Apply one coat of interior steel primer to damaged primed interior steel.

3.02 COMPLETION

A. Field Bolt and Weld Inspections:
1. Comply with requirements in Section 01450, Quality Control.
2. Owner will pay Independent Testing Laboratory to provide Uniform Building Code required field inspections of bolts and welds.

B. Removal of Temporary Shoring and Bracing:
1. Remove temporary shoring and bracing when structural system is complete.

C. Adjusting and Cleaning:
1. Replace damaged and defective metal fabrications.
2. Adjust alignment when members are installed more than 1/2 inch from design dimension.
3. Remove exposed pits, bumps, and irregular weld surfaces by grinding smooth and applying zinc rich steel primer.
4. Repair rejected field welds and bolted connections.
5. Touch up damaged shop primer on exposed steel after installation.
6. Clean field welds, bolted connections, and abraded areas, and apply same type primer paint as used in shop.
7. Apply touch-up galvanized steel primer to exposed exterior steel where galvanized finish is damaged.
8. Remove dirt and oil from metal items scheduled for field finishing.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Minor framing, blocking, and grounds.

PART 2 PRODUCTS

2.01 MATERIALS
A. Lumber. Manufactured, graded and grade-marked in compliance with the following grading rules:
1. Grading shall comply with latest editions and supplements of the American Lumber Standards and the Lumber Associations or agencies which are applicable, including the West Coast Lumberman's Assoc., Western Wood Products Assoc., Douglas Fir Plywood Assoc. and Southern Pine Inspection Bureau.
B. Plywood: U.S. Department of Commerce, Product Standard PS1, Structural 1, C-D grade, graded and grade-marked by the American Plywood Association.
C. Pressure Treated Plywood: ¾-inch thickness Osmose Advance Guard Wood Preservative
1. Pressure Treat in conformance with the Advance Guard Treating Manual.
2. Species: Douglas Fire, Hem-Fire, or approved equivalent.
D. Treated Lumber: plates and cant strips: #1 Southern Yellow Pine, pressure treated in accordance with Ameriacn Wood-Preserver's Association (AWPA) Standard C1.
E. Bolts: ASTM A307, Grade A, square or hexagonal head. All heads and nuts bearing on wood shall be fitted with washers.
1. Bolts, nuts and washers for use in locations subject to moisture, for outside use or in portions of the structure which are not completely enclosed, or elsewhere as shown: Galvanize in compliance with ASTM A153.
F. Nails – (common: FS FF-N-105. Size and type as required for the purpose intended.
G. Special purpose fasteners: All fasteners including, nails and screws, in direct contact with any pressure treated wood products shall be hot-dipped galvanized or stainless steel.
H. Timber connectors and other fasteners: Refer to Drawings.
I. Miscellaneous materials: As necessary to complete this work. J. Lumber Seasoning:
1. Before incorporation into the work, allow lumber to attain a state of equilibrium with the local atmosphere.
2. If wood treatment specifications state the maximum percentage of moisture con-tent at the time of treatment, comply with those requirements.

PART 3 EXECUTION

3.01 INSTALLATION
A. Workmanship: Perform Work in accordance with the best standards of practice. Accurately saw-cut and fit lumber into the respective locations, true to line, grade, and level, as shown or required, and permanently secure with nails, lag screws, bolts, hangers, or other fastenings to make the work substantial and rigid in all parts and connections.
B. Connections: Make connections between members tight, accurate and square. Place fastenings without splitting wood; pre-drill when required. Drill bolt holes same size as bolt diameter.
1. Drill holes for lag screws same as thread root diameter; and counter-bore, same depth and diameter as shank. Turn lag screws into place; do not drive. Provide bolts and lag screws with washers under every head and nut bearing on wood.
C. Attach wood nailing strips, plates, blocking, etc., as shown. Bolt attach with galvanized washers nailing strips and blocking in connection with metal, masonry and concrete.

END OF SECTION

SECTION 06400

MILLWORK

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Provide and install shop-fabricated millwork and counter tops/splashes.
B. Provide Flush Overlay style plastic laminate faced Millwork constructed with wood veneer core MDF panels with matching interior melamine surfaces, in accordance with the Drawings.

1.02 SUBMITTALS
A. Millwork Shop Drawings: Indicate Millwork locations, scale plans, elevations, clearances required, materials, finishes, accessories, filler panels and anchorage details to countertop and walls, backsplash profile, cutouts for plumbing fixtures, and methods of joining.
B. Samples: Submit samples to the Owner's Representative for approval:
1. 12" x 12" of veneer-core MDF.
2. Plastic laminate patterns and colors in manufacturer's standard chip size.
3. Edge banding materials in colors matching as closely as possible plastic laminates specified.
C. Product literature
1. Provide for each hardware item specified.
2. Clearly mark each selection with arrows to indicate selections on the page.

1.03 REFERENCES
A. American Woodworkers Institute (AWI), Custom Grade – Finish/quality standards.

1.04 QUALITY ASSURANCE
A. Comply with AWI standards for Custom grade, products and finishes specified.
B. Manufacturer's Qualification, Manufacturer shall:
1. Be able to demonstrate a minimum of 5 years of experience in the woodworking profession.
2. Have shop drawing capability in house.
3. Have installation capability in-house.

1.05 PROJECT CONDITIONS

A. Field Conditions: Field verify all measurements. Field-measure cabinets and confirm all dimensions on shop drawings before fabrication.
B. Verify Millwork can be installed in compliance with the original design and referenced standards.

PART 2 - PRODUCTS

2.01 COUNTERTOPS & SPLASHES
A. Plastic Laminate Manufacturers:
1. WilsonArt or Nevamar Decorative Surfaces.
2. Or Architect approved equivalent.
B. Plastic Laminate Materials shall:
1. be equal to NEMA No. LD-3, 0.050 inch thickness, horizontal general purpose for horizontal surfaces, and 0.028 inch thickness vertical general purpose for vertical purposes.
2. meet ANSI A161.2, Performance Standards for Fabricated High Pressure Decorative Laminate Countertops.
C. Colors/finishes: See Drawings
D. Color Coordination: Edge banding, counter edges, plastic laminate and melamine materials to be color-coordinated, see individual products.

2.03 CABINET REQUIREMENTS

A. General Panel Material: MDF veneer core, 3\4' thickness, Select Core" by Columbia Forest Products with matching melamine faces inside, plastic laminate faces on the outside, 3mm edge-banding 4 edges on doors, drawers front faces.
B. Manufacturer: Veneer Core MDF LamMates by Nevamar www.laminates.com, with plastic laminate-matching surface one side, or WilsonArt equivalent, or Architect approved equivalent.
C. Edge Banding: 3mm, color to match plastic laminate selected from manufacturer's standard colors. D. Millwork Type: Euro Style, no face frame, flush doors in accordance with the Drawings and approved Shop Drawings.
E. Base cabinet end panels stop 3-1/2 inches above the floor supported by 3/4 inch plywood or similar board.
F. Backs: MDF, 1/4 inch thick melamine faced. Securely glue and staple to ends, installation cleats and shelves in not adjustable.
G. Installation Cleats: Solid lumber, ¾ x 3-1/2 inch S4S, "C" kiln dried jointed or solid lumber, running full length of wall and base cabinet at top and bottom.
H. Wall Cabinet Bottoms: ¾- inch thick Veneer Core MDF, 3mm PVC edge banded front edge, let into dado and hot glued approved equivalent. Bottoms let into ends, installation cleats, and front frames, glued and stapled.
I. Shelves: ¾- inch thick Veneer Core MDF, Melamine faced one side, plastic laminate top side, 3mm edge banded (4), hot glued.
J. Doors: ¾- inch thick Veneer Core MDF, Flush doors, square edges with 3mm edge banded edges and hot- glued, plastic laminated face, melamine interior.
K. Base Bottoms: Plywood ¾- inch thick Veneer Core MDF with square edges with 3mm PVC edge banded front edge, let into dado and hot-glued. Bottoms let into end panels, front rails, and installation cleats supported by 3/4 inch thick pressure treated solid lumber braces at 24 inches o.c. running front to rear of cabinet.
L. Toe Kicks: 3/4 inch pressure treated solid lumber or approved equivalent.
M. Drawers:
    1 Drawer box shall be four sided with finish drawer front then attached to drawer box.
    2. Sides, backs & secondary front minimum of 11/16 inch "C" grade solid red oak lumber.
    3. Dado backs into sides, provide 1/4 inch thickness melamine drawer bottoms or approved equal, let into front, sides, back and front. All drawer parts glued, and stapled together.
    4. Provide pair of metal drawer slides at each drawer. Attach guides at rear to 3/4 inch solid lumber hanging rail with additional cleats as required and in accordance with the manufacturers installation instructions.
N. Fillers and Molding: Provide as needed. Paint finish to match cabinets fronts.

2.04 HARDWARE

A. Pulls- Mockett DP7A-26D, 3" Bow drawer pull, Satin chrome finish. www.mockett.com Phone 800-523-1269
B. Drawer Guides and Shelf Pull Out Guides:
    1. 50 kg-rated capacity side-mounted metal drawer slides.
    2. Blum Blumotion Series or approved Equivalent, full extension.
C. Hinges: Blum Clip Top Soft Close Hinges
D. Locks where indicated on the Drawings:
    1. Doors: Hafele 235.03.657 Cam Lock with Elbow Catch Hafele 245.75.000 on adjacent door where doors are paired.
    2. Drawers Hafele 235.03.755 Cam Lock
    3. Provide manufacturers recommended strike.
E. Adjustable shelf Brackets: 1/4" nickel plated spoon clips for pre-drilled holes
F. Fixed Shelf Brackets: Mockett SWS5 Metallic Silver
G. Table leg for Vanities: Mockett TLWH27 Crystallite Chrome, 27-1/8" tall Whitley table leg. .
    www.mockett.com Phone 800-523-1269

PART 3 - EXECUTION

3.01 FABRICATION

A. Counter Tops and Splashes

1. Field applied plastic laminate on 3/4" water resistant high-density particle board. Seal perimeter of countertop edges and sink cut outs. Provide continuous countertops, hairline joints at corners and at sink where required by the size of the countertop. Self-edge countertops, 1-1/4" edge.
2. Splash shall be as indicated on the drawings, with plastic laminate bonded to substrate using contact cement. At splash terminations, scribe to wall surface and sealant with paint-able white latex sealant. Seal counter-level metal inside corner with clear silicone sealant, remove residual sealant at final cleaning.

B. Fabricate Base and Upper Cabinets to dimensions and profiles indicated. Units assembled in the shop shall be as large as is practical to minimize field cutting and joining. Dadoes, rabbettes, mortises, and tenons shall be stopped at visible faces and all joints shall be glued and blind nailed (or screwed). Plain butt joints without an acceptable device for preventing separation will not be accepted.

C. Exposed screws inside of cabinets and drawers are unacceptable and shall be placed only when necessary and carefully and evenly spaced. Where exposed screws are placed in areas not easily subject to wear and tear, plastic screw caps should be employed. In higher maintenance areas, such as drawers, exposed screws shall be stainless or chrome and installed using finishing washers.

D. Coordinate with work of mechanical and electrical.

3.02 INSTALLATION

A. Set and secure Millwork in place rigid, plumb, and level.
B. Provide accurate cutouts for plumbing fixtures and pipes and for electrical outlets in splash.
C. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
D. Carefully scribe Millwork which is against other building materials, leaving gaps of 1/32 inch. E. Secure cabinets using screws through integral or attached cleats into studs.

3.03 FINAL CLEANING/TOUCHUP

A. Clean drawers and cabinets interiors thoroughly.
B. Wipe down cabinet faces.
C. Touch-up finishes as required.
D. Adjust moving or operating parts to function smoothly and correctly.
E. Remove all debris from installation.
F. Remove excess sealant at plastic laminate intersections.

END OF SECTION

SECTION 07200

INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES
- A. Batt Insulation at walls and where indicated.
- B. Rigid Insulation roof insulation, see Section 07560-Thermoplastic Roofing.
- C. Loose-fill masonry insulation at 8" concrete masonry walls where indicated.

1.02 QUALITY CONTROL
- A. Engage a company using worker who are trained and experienced in necessary craft and familiar with requirements and methods needed for proper performance of Work of this section.
- B. Surface Burning Characteristics of Exposed Rigid Insulation: When tested in accordance with ASTM E-84.
  1. Flame Spread: No greater than 25.
  2. Smoke Developed: No greater than 50.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS
- A. Foil-faced Insulation: ASTM C665, preformed glass fiber batt.
  1. CertainTeed or equivalent Tabless Speedy R Batts, R-30
- B. Rigid board roof insulation: Provide thermal break polyisocyranurate (polyiso) foam insulation blocks to separate the outer skin from the structural framework. Use roofing manufacturers' standard.
- C. Perlite loose-fill insulation.

2.02 ACCESSORIES
- A. Provide necessary accessories for proper installation of materials.

PART 3 – EXECUTION

3.01 INSTALLATION – GENERAL
- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
- B. Batts in wall cavities or against roof deck.
- C. Over metal roof decks install insulation directly to the roof deck with specified anchor system see Section 07560 Thermoplastic Membrane Roofing.
- D. In masonry cells, fill all open cells and voids in hollow concrete masonry walls where shown on drawings.

3.03 INSTALLATION – CEILING BATTS
- A. Maintain vapor retarder integrity by tightly abutting adjacent insulation.
- B. Repair punctures or tears in vapor retarder facing by taping. Follow tape Manufacturer's application recommendations.
- C. Install to bottom of steel deck using standard equipment associated with this trade.
- D. Cut and fit tightly around obstructions and fill voids with insulation.
- E. Place insulation between pipes and exterior side of assembly. Leave no gap or voids.

3.04 INSTALLATION – PERLITE LOOSE-FILL INSULATION
- A. The insulation shall be installed in the following locations:
  a. In the cores of exterior walls as indicated.
  b. In the cores of interior walls as indicated.
- B. The insulation shall be poured directly (or via a hopper) in the top of the wall at any convenient interval (not in excess of 20 ft). Wall sections under doors and windows shall be filled before sills are placed. Wall sections under concrete gap fill (top of wall condition) shall be filled before concrete gaps are filled. Rodding or tamping is not necessary.
- C. All holes and opening in the wall through which insulation can escape shall be permanently sealed or caulked prior to installation of the insulation.
- D. Insulation must remain dry. Cavity caps or other suitable means should be used as the work progresses to insure that the insulation is protected from inclement weather.

END OF SECTION

SECTION 07240

EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 -GENERAL

1.01 SUMMARY

A. Section Includes:
Exterior insulation and finish system (EIFS) exterior wall cladding system that consists of expanded polystyrene shapes (EPS) attached adhesively, mechanically, or both to the substrate; an integrally reinforced base coat; and a textured protective finish coat.

B. Related Sections:
Division 07 Section “Sheet Metal Flashing and Trim” for metal flashing.
Division 07 Section "Joint Sealants" for sealing joints in EIFS with elastomeric joint sealants.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer’s full descriptive literature and installation instructions, marked as applicable to project conditions and requirements. Include standard details and list of all accessory products. Provide comprehensive data on EPS shapes, including manufacturer if not by system manufacturer.

B. Shop Drawings: For EIFS. Include plans, elevations, sections, details of components, details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details including mechanical fasteners, and connections and attachments to other work.

C. Samples:
1. Two (2) 24-inch square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work for approval by Architect.
2. Two (2) 24 inch long full sized EPS shape of the building cornice.

D. Intent to Warrant: Submit and intent to warrant executed by authorized representative of EIFS manufacturer, indicating that manufacturer has reviewed drawings, specifications and shop drawings, conditions affecting the work and the relationship of EIFS and adjacent construction and proposes to provide warranties as referenced herein without further stipulation.

E. Certificates: Manufacturer shall submit certification that insulation provided for work of this section meets requirements as herein specified.

F. Certifications by System Manufacturer: Submit the following prior to delivery of materials to project site:
System applicator approval.
Approval of sealant system.
Expanded polystyrene insulation properties, date of manufacture, curing method and quantities shipped to job.
Certification of installed gypsum sheathing as acceptable finish system substrate.

G. Maintenance Data: At Contract closeout for EIFS to include in maintenance manuals.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have been regularly engaged in production of systems herein specified for a minimum of five years for projects of similar size and complexity. Manufacturer shall only sell and distribute system components to approved applicators.

B. Installer Qualifications: An installer who is certified in writing by EIFS manufacturer as qualified to install manufacturer's system using trained workers and have a minimum of five years for projects of similar size and complexity. .

C. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with system components; or if not, specifically approved by manufacturer in writing.

D. Applicable Standards:
Standards of ASTM International (ASTM), as referenced herein.

Exterior Insulation Manufacturer's Association (EIMA), Standard 101.86 Impact Test and other standards as referenced herein.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside, off the floor and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
Deliver materials in manufacturer's original packaging with labels intact.
Store materials indoors, in temperature range of 40 degrees F. to 80 degrees F.

1.05 PROJECT CONDITIONS

A. Weather Limitations: Maintain ambient temperatures above 40 deg F (4.4 deg C) for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

B. Install finish system when finish will not be subject to damaging effects of rain or windblown dust and debris before system finish has cured.

C. Protection:
Apply mesh and base coat to insulation within two days following board installation.
Protect fresh finish from rain, mud, dust and other physical harm or contamination.
Protect exposed edges of system from water penetration behind insulation board or finish coat.
Install flashing and seal joints as soon as possible following system installation and curing.

D. Coordinate installation of EIFS with sheathing installation to minimize exposure of sheathing to weather.

1.06 COORDINATION

A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and barrier coating of EIFS.

B. Control and Expansion Joints: Unless otherwise indicated, provide control or expansion joints only at abutment with adjacent dissimilar materials, where structural expansion joints occur in building system and as recommended by finish system manufacturer.

1.07 WARRANTY

A. Manufacturer shall provide a material and watertightness warranty for EIFS against defects in materials and against bond loss, peeling, flaking, chipping, fading, discoloration and loss of water resistance. Warranty shall cover all replacement costs, including materials and labor, due to failure of system without additional cost to Owner.

1. Warranty period shall be for five years beginning at Date of Substantial Completion.

PART 2 -PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design: Dryvit System, Inc..

B. Other Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Finestone; Degussa Wall Systems, Inc.
Parex, Inc.; a brand of ParexLahabra, Inc.
Senergy Division/Harris Specialty Chemicals.
Sto Corp.

2.02 MATERIALS

A. Compatibility: Provide adhesive, fasteners, board insulation, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and with substrates and approved for use by EIFS manufacturer for Project.

B. Adhesives shall be manufactured by system manufacturer. Bond Strength: Adhesives shall have been tested to withstand 180 psf negative pressure without loss of bond to substrate in accordance with ASTM E 330.

C. EPS Shapes: Molded, Rigid Cellular Polystyrene Board Insulation complying with ASTM C 578, Type I; EIFS manufacturer's requirements; and EIMA's "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:

1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.
3. Compressive Strength, 10 Percent Deformation: 10 psi, minimum.
4. Moisture Resistance:
   a. Water Vapor Permeance: Maximum 5.0 perms/in.
   b. Absorption: 4 percent maximum.
5. Dimensions: Provide extruded EPS shapes in longest lengths possible.
6. Dimensional Tolerances:
   a. Edges: Square within 1/32 inch per foot.
7. Minimum Density: 2 lb./cu. ft.
8. Shapes: Provide with profiles and dimensions indicated on Drawings.

D. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per ASTM E 2098; complying with ASTM D 578 and the following:

Regular Duty Mesh: Standard Plus Mesh, 5.7 oz./sq. yd.
Heavy Duty Mesh: Panzer Mesh, minimum 15 oz./sq. yd.
Detail Mesh: Detail Short Roll Mesh, 4.3 oz./sq. yd.
Corner Mesh: Corner Mesh, 7.2 oz./ sq. yd.

E. Basecoat: Primus or Primus DM.

F. Finish Coat: EIFS manufacturer's standard acrylic -based coating complying with the following:

Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
Colors: To match Sherwin Williams SW 6064 paint color.
Textures: Fine sand finish
Coating for Areas to Receive Sealant Joints: Demandit or Color Prime.

G. Water: Potable.

H. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.

I. Expansion Joint: Prefabricated, one-piece Vprofile; designed to relieve stress of movement.

J. Parapet Cap Flashing: As specified in Division 07 Section “Sheet Metal.”

2.03 ELASTOMERIC SEALANTS

A. Elastomeric Sealant Products: Provide EIFS manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in ASTM C 1481 and with requirements in Division 07 Section "Joint Sealants" for products corresponding to description indicated below:

1. Dow Corning Corp., #790 low modulus silicone sealant as specified in Division 07 Section "Joint Sealants."

B. Sealant Color: As selected by Architect from manufacturer's full range.

2.04 MIXING

A. General: Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

PART 3 -EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of EIFS.
B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected. Begin coating application only after surfaces are dry. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind EIFS and deterioration of substrates.
C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.03 EIFS INSTALLATION

A. Comply with ASTM C 1397 and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.
B. Cleaning: Ensure that substrate surfaces to receive insulation are clean and sound.
C. Placement: Install EPS shapes to fit without voids. Butt joints tight and even, but do not force or wedge boards.
D. Attachment: Provide full adhesive coverage using methods recommended by system manufacturer’s product data. Apply sufficient adhesive thickness to ensure full contact between surfaces of insulation and substrate. Mechanically attach as shown on the drawings or as required. Brace until adhesive sets to provide a tightly bonded, smooth surface.

3.04 TRIM INSTALLATION

A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, and elsewhere as indicated, according to EIFS manufacturer's written instructions. Coordinate with installation of insulation.
B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
At expansion joints in substrates behind EIFS.
Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
Where EIFS manufacturer requires joints in long continuous elevations.

3.05 BASE-COAT AND MESH INSTALLATION

A. Base Coat: Apply trowel coating of base coat to exposed surfaces of shapes in minimum thickness recommended in by EIFS manufacturer, but not less than 1/16-inch (1.6-mm) dry-coat thickness.
B. Reinforcing Mesh: Immediately embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches (204 mm) of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible. Wrap all corners and edges, overlapping edges 2-1/2 inch minimum. Wrap reinforcing mesh a minimum of 2 inches behind panels at all ends and edges, in accordance with manufacturer’s details and product data. Form corners with sharp, tight, smooth edge, within specified tolerances.

C. Where heavy duty mesh is required, apply heavy duty mesh as base layer of reinforcement. Butt joints of heavy duty mesh without overlap and stop at corners and edges without folding mesh. Apply second coating of base coat over reinforced base coat to a thickness of approximately 1/8 inch, and immediately embed standard duty mesh as specified in fresh base coat.

D. Provide heavy duty mesh on parapets and copings. Form corners with sharp, tight, smooth edge, within specified tolerances.

3.06 FINISH-COAT INSTALLATION

A. General:

Provide straight, sharp, true corners, edges, joints, reveals, grooves and other profiles indicated. Provide corner reinforcement in accordance with system manufacturer'

Finish all areas to receive sealant joint by applying base coat, embedded mesh and finish coat into joints and around terminations, in accordance with EIFS manufacturer's details.

Finish exposed edges where visible and to protect insulation from moisture.

Comply with system manufacturer's product data in all facets of work.

Finish work shall be free of projections, voids, irregularities or telegraphing of substrate

B. Finish Coat: Apply over dry, cured, reinforced base coat, maintaining a wet edge at all times, without cold joints and staging marks, for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

1. Texture: Fine sand or as approved by architect.

C. For edges and terminations to receive sealant joints, do not install finish coat at substrates to receive sealant. Stop finish coat at joint juncture to provide a smooth, uniform substrate for sealant application.

D. On an expanse, terminate work only at corners, expansion joints or distinct changes in plane. Begin only as much work on an expanse as can be completed in the same work period.

E. At overlapping of mesh reinforcement, feather out finish coat to ensure that overlap joints are indiscernible in finished work.

F. Finish Surface Tolerances:

In linear building lines, elevations and conspicuous lines and arrises: Maximum 3/16 inch in 20 feet; maximum 3/8 inch in 40 feet or more.

In surface plane, plumb and level: 1/8 inch in 10 feet in any direction when measured with a 10 foot straightedge.

Substrate joints and surface imperfections shall not be visible when surfaces are viewed from 5 feet or greater distances at typical viewing angles with surface wet or dry.

3.07 INSTALLATION OF JOINT SEALANTS

A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 07 Section "Joint Sealants" and in ASTM C 1481.

3.08 CLEANING AND PROTECTION

A. Remove temporary covering, masking materials and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

B. Protection: Provide polyethylene sheeting or other means of protecting finish from mud and dust. Protect completed work from damage, staining, dirt and debris. Maintain protection until Date of Substantial Completion.

C. Cover tops and edges indicated using materials specified in Division 07 Section "Sheet Metal Flashing and Trim." Seal joints with silicone sealant as specified in Division 07 Section "Joint Sealants."

END OF SECTION 07240

SECTION 07560

THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SUMMARY
- A. Section Includes:
  1. Vapor retarder.
  2. Rigid roof insulation.
  3. Tapered edge and cant insulation.
  5. Thermoplastic roofing membrane.
  6. Fasteners, termination strips, aluminum extrusion drip edges, and adhesive.
  7. Walking pads [between roof hatch and roof equipment.]
- B. Related Sections:
  1. Section 07600, Flashing and Sheet Metal: Metal downspouts, scuppers, counter flashing, parapet coping, and pitch pans.
  2. Section 07720 Roof Accessories
  2. Division 15000, Plumbing: Roof vents; Mechanical Exhaust Fans and HVAC equipment.

1.02 REQUIREMENTS
- A. Roof Design Requirements:
  1. U.L Rating: Class A.
  2. Wind Resistance: Factory Mutual I-90.
- B. Submittals:
  1. Submit product data for major roof system components.
  2. System components are to be of one manufacturer.
  3. Submit copy of manufacturer's standard 20 year warranty, with liability limited to original cost of installed roof. See Section 01030 Alternates for additional requirements.
  4. Submit copy of installer's 2 year watertight roofing and flashing warranty.
- C. Quality Assurance:
  1. Acceptable Applicators: Approved by membrane manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Acceptable manufacturers
  1.John Manville, Dura-Last, 60 mil, TPO (Thermoplastic Polyolefin)
  2. Carlise Sure-Weld 60 mil, TPO (Thermoplastic Polyolefin)
  3. Or approved equal
- B. Roof Insulation Manufacturers:
  1. Johns Manville, R-max, Inc.
  2. Carlisle Syn Tec polyisocyanurate

2.02 COMPONENTS
- A. Roof Insulation System:
  1. Manufacturer: Rmax Inc, Dallas Texas.
  2. Type: FA-3
  3. Base layer insulation; rigid boards, minimum density 2 lbs./cu. Ft. complying with ASTM C-1289, Type II, Class 1, Grade 2, ASTM C-1330 and ASTM D-1622, polyisocyanurate with fiberglass perforated facer sheet, 18 psi compressive strength complying with ASTM D-1621. Dimenisonal stability shall comply with ASTM D-2126-87. Provide 3” x 48” x 96: size. R-value 19 minimum (15 yr. time weighted average).
  2. Top layer coverboard: ½” x 48” x 48” wood fiberboard as approved by membrane manufacturer.
     a. Approved wood fiber insulation
        1). High density wood fiberboard.
        2). Tapered insulation boards (Fesco Board) for saddles and crickets’ sloped ½” per ft
- B. Roof Membrane Components:

1. Membrane Roofing: John Manville UltraGard SRT60 mil Fully Adheared Thermo Plastic (TPO) Membrane – Adhesive Applied

2. Base Flashing: John Manville UltraGard SRT45 FR l Thermo Plastic Membrane.
3. Termination Bar: 3/32-inch thick used to terminate adhered, reinforced membrane base flashings.

C. Roof Walking Pads:
   1. Type: Neoprene, rubber, or laminated asphaltic roof protection pads.
   2. Thickness: 1/2 inch minimum.
   3. Size: 12 by 24 inches minimum to 36 by 72 inches maximum.
   4. Acceptable Walking Pads: Traffic Pads by Conglas, J-Walk (12 by 24) by Manville.

PART 3 EXECUTION

3.01 PERFORMANCE

A. Examination:
   1. Verify layout of Work prior to beginning installation.
   2. Examine substrate before beginning installation for adequate anchorage, drainage, foreign materials, moisture and unevenness which would prevent proper roof application.
   3. Verify that Work of other trades that penetrate roof have been completed.
   4. Notify Contractor of unsatisfactory conditions.
   5. Beginning of Work constitutes acceptance of existing conditions by installer.

B. Preparation:
   1. Protect paving and building walls adjacent to hoist and kettle prior to starting Work.
   2. Lap suitable protection minimum of 6 inches.
   3. Secure protection against wind.
   4. Leave protection in place for duration of roof installation.
   5. Dry and broom clean surface before beginning Work.

C. Installation of Insulation:
   1. Lay insulation board on prepared deck, staggering joints no less than 12 inches.
   2. Secure boards with Utrafast screws (John Manville) or equivalent manufacturer recommended fastener, and plates at minimum rate of one per 2.67 square feet.
   3. Secure FesCant (John Manville)) or equivalent manufacturer approved tapered insulation at all vertical intersections with hot asphalt.

D. Installation of Roof Membrane:
   1. General:
      a. Install TPO roofing with welded hot air welding.
      b. Use hand-held welding machines or walk-behinds.
      c. After seaming, check for integrity with blunt-ended probe. Any openings or fishmouths shall be repaired with Do not undertake more TPO roofing each day than can be completed within the same day.
      d. At end of day, edge seal finished portion of roofing system. e. Remove edge seal prior to start of next days Work.
   2. Application:
      a. Start at low point, install per manufacturer's recommendations.
      b. Undertake roofing Work in dry weather only.
      c. Repair fishmouths, wrinkles, tears, buckles or other imperfections or damage by installation of an additional layer of felt set into hot bitumen. Lay full width under each felt layer.

E. Installation of Base Flashing:
   1. Install Dyna Flex base flashing per manufacturer's flashing details.
   2. Extend flashing up to coping nailer or termination bar.

3.02 COMPLETION

A. Adjusting, Cleaning, and Protecting:
   1. Repair defective felts, flashings, and cap sheets.
   2. Remove excess adhesive from adjacent finished surfaces.
   3. Remove excess materials from the site.
   4. Protect membrane assembly from exposure to construction traffic until Substantial Completion.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY
- A. Provide flashing and sheet metal including parapet caps, flashing over metal panels, and as detailed on the Drawings.
- B. Provide welded mechanical curbs for mechanical equipment.

1.02 SUBMITTALS
- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

PART 2 PRODUCTS

2.01 MATERIALS
- A. Flashing and Sheet Metal:
  1. Coping Caps
  2. Scuppers, Leader Heads and Downspouts.
  4. Metal: Paint Grip Galvanized Sheet Metal
  5. Flexible Sheet Membrane Flashing: Non-reinforced flexible black elastic sheet, 50 to 65 mils thick, synthetic rubber.
- B. Auxiliary Materials:
  1. Solder compatible with metal.
  2. Bituminous isolation coating.
  3. Mastic and elastomeric sealants.
  4. Epoxy seam sealer.
  5. Rosin-sized building paper slip sheet.
  6. Polyethylene underlayment.
  7. Reglets and metal accessories.
  8. Gutter and conductor head guards.
  9. Asphaltic roofing cement.

2.02 SCUPPERS, CONDUCTOR HEADS, AND DOWNSPOUTS, EXTERIOR
- A. Smooth rectangular, paint grip galvanized.
- B. Size and Configuration: Per Drawings
- C. Gauge: 24 Gauge minimum.
- D. Downspouts will terminate into storm drain hubs per Civil Drawings.

2.03 COPING CAPS, EXTERIOR
- A. Paint grip galvanized.
- B. Size and Configuration: Per Drawings
- C. Gauge: 24 Gauge minimum.

2.04 LOUVERS
- A. Paint grip galvanized.
- B. Size and Configuration: Per Drawings
- C. Gauge: 20 Gauge minimum

2.05 ACCESSORIES
- A. Fasteners: Galvanized steel.

B. Gutter and Downspout Anchorage Devices: SMACNA requirements.
C. Gutter Supports: Spikes and ferrules. Locate one at each rafter end, but not less than 24 inches on center.
D. Downspout Supports: Straps, minimum four per leader, concealed fasteners.

2.05 FABRICATION

A. Form components true to shape, accurate in size, square, and free from distortion or defects.
B. Form pieces in longest practical lengths.
C. Mechanical Curbs: Fabricate mechanical equipment curbs for existing and re-located mechanical equipment in accordance with SMACNA.
D. Louvers
   1. Fabricate in accordance with SMACNA Plate 103, Fig. A
   2. Form with square frame and level louvers.
   3. Provide sill flash
   4. Exposed joints shall me made by riveting or welding. Junctions at corners shall be mitered. All joints must be made water tight.
   5. Lover blades shall be pitched at 45 degree angle. Provide stiffener bar to connect blades

PART 3 EXECUTION

3.01 INSTALLATION

A. Follow recommendations of SMACNA Sheet Metal Manual. Allow for expansion. Isolate dissimilar materials.
B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
C. Restore damaged components and finishes. Clean and protect work from damage. D. Provide for thermal movement of sheet metal.
E. Provide dielectric protection in areas where dissimilar metals are adjacent to each other.
F. Downspout Supports: Straps, minimum four (4) per leader, concealed fasteners.
G. Flashing: Install flashing where shown on the Drawings.
H. Install louvers level and square. Anchor inside of openings using 2” x 2” x 1/8” galvanized brake angles full length of head, sill, and jambs.

END OF SECTION

SECTION 07610

METAL ROOFING AND SOFFIT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Preformed, prefinished metal roofing and flashings.
B. Miscellaneous trim, flashing, closures, drip flashing, and accessories.
C. Sealant
D. Fastening devices.

1.02 RELATED SECTIONS
A. Section 05120: Structural Steel Framing.
B. Section 05500: Miscellaneous metal fabrication.
C. Section 06100: Rough Carpentry.
D. Section 07631: Flashing and Sheet Metal Gutters.
E. Section 07900: Sealants.

1.03 REFERENCES
A. American Iron & Steel Institute (AISI) Specification for the Design of Coldformed Steel Structural Members.
B. ASTM A-653 & ASTM A924 Steel Sheet, Zinc-Coated (Galvanized)
C. ASTM E-1680-95 (Air Infiltration Test) *Note: Zee-Lock Double Lock also tested.*
D. ASTM E-1646-95 (Water Penetration Test) *Note: Zee-Lock Double Lock also tested.*
E. ASTM E-1592
F. Spec Data Sheet - Galvalume Sheet Metal by Bethlehem Corp.
G. SMACNA - Architectural Sheet Metal Manual.
H. Building Materials Directory - Underwriter's Laboratories, Test Procedure 580.

1.04 ASSEMBLY DESCRIPTION
A. The roofing assembly includes preformed sheet metal panels, related accessories, valleys, hips, ridges, eaves, corners, rakes, miscellaneous flashing and attaching devices.

1.05 SUBMITTALS
A. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.
B. Submit a sample of each type of roof panel, complete with factory finish.
C. Submit results indicating compliance with minimum requirements of the following performance tests:
1. Air Infiltration ASTM E-1680-95
2. Water Infiltration ASTM E-1646-95
3. Wind Uplift - U.L.90
D. Submit calculations with registered engineer seal, verifying roof panel and attachment method resists windpressures imposed on it pursuant to applicable building codes.

1.06 QUALITY ASSURANCE
A. Manufacturer: Company specializing in Architectural Sheet Metal Products with ten (10) years minimum experience.
B. No product substitutions shall be permitted without meeting specifications.
C. Substitutions shall be submitted 10 Days prior to Bid Date and acceptance put forth in an addendum.
D. No substitutions shall be made after the Bid Date.

1.07 DELIVERY, STORAGE AND HANDLING
A. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.
B. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.
C. Panels with strippable film must not be stored in the open, exposed to the sun.

D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.08 WARRANTY

A. Paint finish shall have a twenty year guarantee against cracking, peeling and fade (not to exceed 5 N.B.S. units).

B. Galvalume material shall have a twenty year guarantee against failure due to corrosion, rupture or perforation.

C. Applicator shall furnish guarantee covering watertightness of the roofing system for the period of two (2) years from the date of substantial completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Berridge Manufacturing Company, Houston, Texas.

B. Substitutions shall fully comply with specified requirements.

2.02 SHEET MATERIALS

A. Prefinished Metal shall be Hot-Dipped Galvanized - ASTM A446-85 Grade C G90 Coating A525-86 24 Gauge core steel or prefinished Galvalume - ASTM 792-86 AZ-55.

B. Unfinished Metal shall be Grade C Galvalume ASTM 792-86, AZ 55, "Satin Finish".

C. All exposed finishes shall be full strength Kynar 500 Fluoropolymer coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500 finish supplier.

Colors: Royal Blue at main building roof awning
Medium Bronze at vacuum and sentry awnings

D. Strippable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed before installation.

2.03 ACCESSORY MATERIALS

A. Fasteners: Stainless SteelCadmium Plated Steel with washers where required.

B. Sealant: As specified in Section 07900 C. Vinyl Weatherseal Insert.

2.04 FABRICATION

A. All exposed adjacent flashing shall be of the same material and finish as the roof panels.

B. Hem all exposed edges of flashing on underside, 1/2 inch.

2.05. BERRIDGE CURVED ZEE-LOCK STANDING SEAM PANEL

1. 2" high vertical legs shall be spaced at 16" on-center.
2. Panels shall be site-formed with the Berridge Model SP-21x in tandem with the ZC-21 Curver Portable Roll Former in continuous lengths.
3. Continuous Zee Rib shall be 1-3/8" wide and 2-1/8" in height. Rib shall be connected to [purlins with two #12-14 x 1" self-drilling/tapping fasteners] [Zee Clips spaced at 3'-0" on solid substraight].
4. Optional Vinyl Weatherseal (U.S. Patent 5134825) to be factory-installed over Continuous Zee Rib (not available with intermittent clips or double locked).
5. Sidelap to be mechanically seamed with a powered seamer.
6. When required, panel assembly to bear Underwriters Laboratories Label UL90, pursuant to Construction Number 312 for open framing conditions, either uninsulated or with blanket insulation; 335 or 335 (mod.) with rigid board insulation or 403 over solid substrate and applicable Fire Ratings.
7. Certification shall be submitted, based on independent testing laboratory, indicating no measurable water penetration or air leakage through the system when tested in accordance with ASTM E-1680-95 and ASTM E-1646-95.

2.06. BERRIDGE FLUSH SEAM SOFFIT PANEL

1. 3-7/8” X ½” deep X 40’ maximum length; interlocking male-female side lap; concealed fasteners; rigid embossed texture.

PART 3 EXECUTION

3.02 INSTALLATION

A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.
B. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.
C. Install starter and edge trim before installing roof, soffit, and fascia panels.
D. Remove protective strippable film prior to installation of roof panels.
E. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
F. Install sealants for preformed roofing panels as approved on shop drawings.
G. Do not allow panels or trim to come into contact with dissimilar materials.
H. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
I. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
J. Remove and replace any panels or components which are damaged beyond successful repair.

3.03 CLEANING

A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.
B. Remove all scrap and construction debris from the site

END OF SECTION

SECTION 07720

ROOF ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roof access hatches.
   2. Ladder extension safety posts.
   3. Mechanical curbs.
   4. Skylights

B. Related Sections:
   1. Section 06100, Pressure Treated Wood Blocking.
   2. Section 07600, Flashing and Sheet Metal
   3. Section 07900, Joint Sealers.
   4. Section 09900, Painting: Field painting roof hatches and roof smoke vent hatches.
   5. Section 05500, Metal Fabrications: Roof Hatch ladder

1.02 REQUIREMENTS

A. Submittals:

1. Submit product data for:
   a. Manufactured equipment curbs
   b. Roof access hatches
   c. Skylights

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Substitute Manufacturers:
   1. Submit substitution requests prior to Bid Date.
   2. Comply with requirements in Section 01600, Product Requirements.

2.02 ROOF HATCH

A. Option 1: Steel Roof Access Hatches:
   1. Fixed Wall Ladder Hatch Opening: 36 by 36 inches.
   2. Minimum Wall and Top Insulation Thickness: 1 inch.
   3. Roof Curb and Lid: Galvanized and primed steel with bottom flange, wall counter flashing, and lined and insulated lid.
   4. Minimum Lid Hardware: Pivot hinges, padlock hasps, handles, spring latch, spring operators, hold open, and air gasket.
   5. Acceptable Fixed Wall Ladder Hatches: RBS by Inryco/Milcor, 6-802 by Babcock Davis, RH-GS14-3036-00 by O'Keefe's, Inc., PLH-G by Precision Stair Corp.

B. Option 2: Aluminum Roof Access Hatches:
   1. Fixed Wall Ladder Hatch Opening: 36 by 36 inches.
   2. Minimum Wall and Top Insulation Thickness: 1 inch.
   3. Roof Curb and Lid: Minimum 11 gage aluminum with bottom flange, wall counterflashing, lined and insulated lid.
   4. Minimum Lid Hardware: Pivot hinges, padlock provision, handles, spring latch, lifting mechanism, hold open and air gasket.
   5. Acceptable Aluminum Roof access Hatches: F-50 by Bilco, PLH-A or PSRH by Precision Ladder, 6-804 by Babcock Davis.

2.03 SKYLIGHTS

A. 24” x 48” Insulated, Insulated double dome.
   1. 9 inch tall self flashing curb with thermal break, 3” mounting mounting flange
   2. Minimum 1 inch thick insulation at curb
   3. Dome: Double sealed polycarbonate white (translucent)
   4. Frame construction: white finished aluminum, .032” thick inner frame, .060” thick outer wall.

5. Unit shall be constructed having thermal breaks between dome and curb, and having integral condensation gutter.
7. Skylight dome surfaces shall be protected by plastic sheeting applied to the surface of the dome
6. Acceptable manufacturer:
   a. American Skylights, Arlington, Texas 76011, 800-772-7401
   b. Or approved equal

PART 3 EXECUTION

3.01 PERFORMANCE

A. Installation of Roof Curbs:
   1. Mechanical equipment curbs to be furnished by Mechanical Contractor.
   2. Roof vents and related curbs to be furnished and installed by Contractor.
B. Installation of Roof Access Hatches:
   1. Anchor roof hatch flange to roof deck with steel fasteners at flanges.
   2. Secure ladder extension to ladder rungs.
C. Installation of Skylights
   1. Anchor skylight flange to roof with steel fasteners at flanges.
   2. Do not remove protective plastic sheeting from dome surfaces until Substantial Completion
   3. Special Requirement: Skylights shall be water tested using a pressure hose after completion of the roofing and flashing. Any leaks will be considered a defect.

3.02 COMPLETION

A. Adjusting and Cleaning:
   1. Replace damaged and defective roof accessories.
   2. Touch-up damaged shop prime finished metal.
   3. Clean exposed surfaces of roof accessories prior to Substantial Completion.

END OF SECTION

SECTION 07900

JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and caulking materials indicated in joints fitting descriptions and locations listed below.

1. Joints on exterior of building and joints on interior of building in horizontal (traffic) concrete surfaces
   a. Multi-Part Pourable Urethane.
2. Exposed metal to metal joints:
   a. One-Part Non-Acid Curing Silicone.
3. Joints on interior of building in vertical and overhead surfaces, tops of partitions unless otherwise indicated, and joints subject to maximum movement of plus or minus 12.5 percent.
   a. Acrylic.
4. Non-moving joints on interior of building in vertical and overhead surfaces at perimeter of, hollow metal, and aluminum door frames; and other metal frames; gypsum drywall; and other interior locations; unless otherwise indicated:
   a. Acrylic-emulsion.
5. Joints in Toilet Rooms and other wet areas, and perimeter of hot pipes through non-fire-rated floors or walls:
   a. One-Part Mildew-Resistant Silicone.
6. Acoustical Sealant: Concealed acoustical sealed joints in interior partition construction and at perimeter of interior partition which abut other materials:
   a. Acoustical non-drying, non-hardening, non-skinning, non-staining, gunnable synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
7. Joint Seals and Fillers: Provide the following joint seals and fillers:
   a. Joint fillers in exterior concrete paving.
8. Reticulated filter foam.
   a. Cellular foam fillers for non-fire-rated interior drywall partitions.

1.02 RELATED SECTIONS

A. Section 02555 - Paving Joint Sealers: Sealants and joint fillers in concrete paving, and other site paving.

1.03 SUBMITTALS

A. Product data from each joint sealer and joint filler product required, including instructions for joint preparation and joint sealer application.
B. Samples for initial selection purposes in form of strips of actual products showing full range of color available, for each product exposed to view.
   acceptable adhesion to joint substrates.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi- component materials.
B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants or other causes.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealers when ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers or when joint substrates are wet due to rain, frost, condensation or other causes.
B. Joint Width conditions: Do not proceed with installation of joint sealers where joint widths are less or more, than allowed by joint sealer manufacturer for application indicated.

1.08 SPECIAL PROJECT WARRANTY

A. Warranty: Provide an exterior sealant warranty signed by Contractor and Installer that the exterior sealant installation will remain weather tight or will not lose adhesion to its sealed surfaces for a period of five (5) years.

Contractor and Installer shall agree to repair or replace exterior joint sealer work that fails to stay weathertight or loses adhesion during that period.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Standard Colors: Provide color of exposed joint sealers as selected by Architect from manufacturer's standard color.

2.02 SEALANT MATERIALS

A. Multi-Part Pourable Urethane Sealant (Self Leveling Grade): One of the following:
   1. Chem-Calk 550; Bostik Construction Products Div.
   2. Vulkem 245; Mameco International, Inc.
   3. Sonolastic SL-2; Sonnebom Chemrex, Inc.
   4. Sikaflex 2c SL; Sika Corp.

B. Multi-Part Nonsag Urethane Sealant: One of the following:
   1. Chem-Calk 500; Bostik Construction Products Div.
   2. Sikaflex 2cNS; Sika Corp.
   3. Sonolastic NP2; Sonneborn Chemrex, Inc.
   4. Vulkem 227; Mameco International, Inc.

C. One-Part Non-acid Curing Silicone Sealant: One of the following:
   1. Low/Medium Modulus ± 50 Percent Movement Capability:
      a. Dow Corning 790; Dow Corning Corp.
      b. Silpruf SCS 2000; General Electric Co.
      c. Rhodorsil 5C; Rhone-Poulene Inc.
   2. Low/Medium Modulus ± 35 or ± 40 Percent Movement Capability:
      a. Dow Corning 790; Dow Corning Corp.
   3. High Modulus:
      a. Down Coming 784; Dow Corning Corp.
      b. Dow Corning 799; Dow Coming Corp.
      c. Ultraglaze SSG 4000; General Electric Co.

D. Acrylic Sealant: One of the following:
   1. PTI 738, Protective Treatments, Inc.
   2. PTI 767; Protective Treatments, Inc.
   3. Mono; Tremco, Inc.

E. Acrylic-Emulsion Sealant: One of the following:
   1. Chem-Calk 600; Bostik Construction Products Div.
   2. Sonolac; Sonneborn Chemrex, Inc.
   3. Tremco Acrylic Latex 834; Tremco, Inc.

F. One-Part Mildew-Resistant Silicone Sealant: One of the following intended for sealing interior joints with nonporous substrate and subject to in-service exposure to conditions of high humidity and temperature extremes:
   1. OmniPlus; Sonneborn Chemrex, Inc.
   2. Dow Corning 786; Dow Coming Corp.
   3. SCS 1702 Sanitary; General Electric Co.
   4. Proglaze White; Tremco, Inc.

G. Acoustical Sealant for Concealed Joints: One of the following:
   1. BA-98; Pecora Corp.
   2. Tremco Acoustical Sealant; Tremco Inc.

3. Sheetrock Acoustical Sealant; USG.

2.03 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experienced and laboratory.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonwaxing, nonextruding strips of flexible nongassing plastic foam of material indicated below, nonabsorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Extruded or molded polystyrene is not acceptable.
   1. Extruded Polyolefin Foam: Sof Rod; Applied Extrusion Technologies, Inc.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.04 ACCESSORIES

A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicted, as determined form preconstruction joint sealer-substrate tests and field tests.
   1. If adhesion-to-Peel (ASTM C 794) is performed successfully, use same primer used in test for project.

B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaners of type which are acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.

C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.

D. Reticulated Foam Baffles: Provide suitable PVC coated reticulated foam baffles at weep hole locations; 45 psi compressed 30 to 50 percent.

E. Open-Cell Polyurethane Joint Filler for Tops of Non-Fire Rated Gypsum Board Partitions: Provide flexible, highly compressible, open-cell polyurethane foam of not less than 1.3 lbs. per cu. ft. density and not less than 2 psi compression deflection (25%), with not more than 10% compression set for 25 hours at 50% compression; ASTM D 3574 test methods. Use Williams Products, Inc. Williams Polyurethane Foam 1320 Series, or equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience.

C. Masking Tape: Use masking tape to prevent contact of sealant with adjoining surfaces.

3.02 INSTALLATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Urethane and Silicone Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Solvent-Release-Curing Acrylic and Butyl Sealant Installation Standard: Comply with requirements of ASTM C 804 for useof solvent-release-curing sealants.

D. Acrylic-Emulsion Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.

E. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated.

F. Installation of Sealant Backings: Install sealant backings to provide support of sealants during application and at position required to product the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant .movement capability.
G. Install bond breaker tape between sealants and joint-fillers or back of joints where adhesions of sealant to surfaces at back of joints would result in sealant failure.
H. Installation of Sealants: Install sealant by proven techniques that result in sealant directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
    1. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or uring begins, tool sealants to form smooth, uniform beads to eliminate air pockets and to ensure contact and adhesion of sealant to joint.

3.03 JOINT FILLER INSTALLATION

A. Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
B. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible.

3.04 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning material approved by manufacturers of joint sealers and of products in which joints occur.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Standard galvanized steel doors with insulating cores.
- B. Standard hollow metal galvanized steel frames for steel doors.

1.02 RELATED SECTIONS
- A. Section 08710 - Door Hardware: For door hardware and weatherstripping.
- B. Section 08800 - Glazing: For glass in hollow metal steel doors
- C. Section 09250 - Gypsum Board: For spot grouting frames in gypsum board partitions.
- D. Section 09900 – Painting: For field painting primed doors and frames.

1.03 SUBMITTALS
- A. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance sound ratings, profiles and finishes.
- B. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at opening, details of construction, location and installation requirements of door and frame hardware and reinforcements, and detail of joints and connections. Show anchorage and accessory items.
- C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
  1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.04 QUALITY ASSURANCE
- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Lace units on minimum 4-inch-high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/2-inch spaces between stacked doors to promote air circulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Subject to compliance with requirements, provide products by one of the following:

1. Steel Doors and Frames
   - a. Curries
   - b. Amweld Building Products, Inc.
   - c. Ceco Door Products
   - d. Steelcraft.

2.02 MATERIALS
- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569. B. Cold-Rolled Steel Sheets; Carbon steel complying with ASTM A 366, commercial quality, ASTM A 620, drawing quality, special kilned.

C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526, commercial quality, or ASTM A 642, drawing quality, hot-dip galvanized according to ASTM A 525, with a 60 or G 60 coating designation, mill phosphatized.
D. Supports and Anchors: Fabricated from not less than 0.0478-inch-thick steel sheet; 0.0516-inch-thick galvanized steel where used with galvanized steel frames.
E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.03 DOORS

A. Steel Doors: Provide 1-3/4 inch-thick doors of materials and ASNI/SDI 100 grades and models specified below, or as indicated on Drawings or schedule:
   1. Interior Doors: Grade II, heavy-duty, Model 1, full flush design, minimum 0.0478-inch-thick cold-rolled steel galvanized sheet faces.
   2. Exterior Doors: Grade II, heavy-duty, Model 1, full flush design, minimum 0.0516-inch-thick galvanized steel sheet faces.
B. Door Louvers: Provide louvers according to SDI 111 C for interior doors where indicated, with blades or baffles formed of 0.0239-inch-thick cold-rolled steel sheet set into minimum 0.0359-inch-thick galvanized steel frame and blades.
   1. Sight-Proof Louvers: Stationary louvers constructed with inverted V-shaped or Y-shaped blades., 50% free air.

2.04 FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 0.0478-inch-thick cold-rolled galvanized steel sheet.
   1. Fabricate frames with mitered or coped corners, continuously welded construction for exterior and interior applications. Provide fully welded center seam.
B. Door Silencers: Except on weather stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

2.05 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ASNI/SDI 100 requirements.
   1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
      a. Rigid polyurethane conforming to ASTM C 591. b. Rigid polystyrene conforming to ASTM C 578.
   2. Clearances: Not more than 1/8 inch at jambs and heads, except not more than ' / inch between non-fire-rated pairs of doors. Not more than 3/4 inch at bottom.
B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel sheet.
C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames".
D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-or hot-rolled steel sheet.
E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
   1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.
G. Reinforce doors and frames to receive surface-applied hardware, drilling and tapping for surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

H. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
I. Glazing Stops: Minimum 0.0359-inch-thick steel or 0.040-inch-thick aluminum.
   1. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.06 FINISHES, GENERAL
A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
B. Comply with SSPC-PA 1, "Paint Application Specification No. 1", for steel sheet finishes. C. Apply primers and organic finishes to doors and frames after fabrication.

2.07 GALVANIZED STEEL SHEET FINISHES
A. Surface Preparation: Clean surfaces with non-petroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
   1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.08 STEEL SHEET FINISHES
A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White metal Blast Cleaning) or SSPC-SP 8 (Pickling).
B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent- anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
   1. Place frames before constructing enclosing walls and ceilings.
   2. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels.
      In steel-stud partitions, attach wall anchors to studs with screws.
C. Door installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

3.02 ADJUSTING AND CLEANING
A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

SECTION 08815

FIBERGLASS DOORS AND FRAMES

PART 1 GENERAL

1.01 Scope
A. Standards for manufacturing, machining, finishing and installation of fiberglass doors unless more specifically described under other section(s).

1.02 Related work in other sections
A. Section 06100: Carpentry
B. Section 08710 Hardware
D. Section 08800: Glazing
E. Section 09900: Painting

1.03 Quality Assurances
A. All fiberglass doors shall be the products of the same manufacturer to insure uniformity of quality and appearance throughout the project.
B. The top edge of each door shall bear a quality assurance label from the manufacturer indicating the door handing and order number.

1.04 Submittals
A. Shop Drawings Submit schedules and elevations indicating door sizes, construction, swing, undercut and applicable hardware locations.
B. Product Information Submit manufacturer's product description showing compliance with specifications, finishing instructions, installation instructions, and any general recommendations the manufacturer may have for the care and maintenance of each door type.

1.05 Coordination
Contractor shall be responsible for coordination and acquiring of all necessary information from hardware manufacturers. Door supplier shall be responsible for coordinating all necessary information received by Contractor from hardware manufacturers, to facilitate door preparation for hardware installation. Contractor shall provide door supplier with two copies of hardware schedule and all necessary hardware templates. All of the above information shall be in possession of door supplier 120 days prior to desired delivery date of doors.

1.06 Delivery, Storage and Handling
A. No doors shall be delivered to the building until weatherproof storage space is available. Stack doors flat and off the floor. Protect doors from damage at all times.
B. Gel-Coated doors shall be individually wrapped in plastic bags to protect the finish from damage by contact with other doors.
C. Do not walk or place other material on top of stacked doors. Do not drag doors across one another.
D. Installer shall use all means necessary to protect doors from damage prior to, during and after installation. All damaged doors shall be repaired or replaced by Contractor at no cost to Owner.
E. Doors may be palletized at the factory in stacks of no more than 30 doors per pallet. Door edges shall be protected with heavy corner guards.

1.07 Warranty
A. All work in this Section shall be warranted (from the date of shipment) against defect in materials including the following:
1. Delamination in any degree.
2. Warp or twist of 1/4" or more in any 3'0" x 7'0" door.
3. Telegraphing of any core assembly through face to cause surface variation of 1/100" or more in a 3" span.
4. Any defect that may, in any way, impair or affect performance of the door for the purpose which it is intended.
B. Warranty Period: Fiberglass doors and frames shall be guaranteed for the life of the product against corrosion induced failure and for a period of ten (10) calendar years after the date of purchase against

defects. Doors may not be construed as being purchased any sooner than 180 days prior to Substantial Completion of the project.

C. Doors must be stored, finished, hung and maintained per manufacturer's recommendation set forth in their Warranty.

PART 2 PRODUCTS

2.01 Manufacturers

A. Listed manufacturers are believed to conform to the criteria stated for material quality standards, function and appearance. Manufacturers are still subject to meeting the requirements of this specification. Non-conforming substitutions shall not be accepted.

Oshkosh Door Company – Cor-Guard product line
Corrim
Edge Water
Or Approved Equal

2.02 Materials and Components

A. Core: Cores shall be closed cell polystyrene foam with a density of 2 pounds per square foot. Foam shall be placed into the door cavity before the door is inserted into a press.

B. Stiles and Rails: Stiles and rails shall be constructed with 2 ply solid polymers. Outside dimensions shall conform to hardware reinforcement requirements and overall door thickness of 1.75 inches. Door stiles and reinforcement selection shall be compatible with door facing material.

C. Door Face Skins: Door face skins shall consist of a Fiberglass Laminate manufactured by the Resin Transfer Molding (RTM) process. Skin thickness shall be 0.090 inches. Gel Coat and resin selection: Gel coat and resin shall be selected to withstand the installed environment. Both UV and corrosion resistance shall be considered paramount. Face sheet reinforcements shall be either type "A" or "C" glass.

D. Vision lites: These may be furnished by Door Supplier in corrosion resistant materials. The units shall be furnished either installed or as a drop in kit. Glass may be ordered directly from manufacturer.

PART 3 EXECUTION

3.01 Fabrication:

A.Fabricate all doors and accessories in strict accordance with this specification and Door Manufacturer's manufacturing specifications.

3.02 Machining and fitting:

A. All fiberglass doors shall be machined by the manufacturer or authorized manufacturer for cutouts, hinges, locks, closures and all hardware requiring routing and mortising. Doors shall be sized to allow 0.125 inches of clearance at top and each side and 5/8 inch clearance at bottom (unless specified otherwise).

3.03 Installation of Hardware

A. Contractor shall install hardware according to approved hardware schedule for proper locations.

B. Install with full threaded screw furnished by hardware manufacturer.

C. Drill proper size pilot holes for all screws.

D. Securely anchor hardware in correct position and proper alignment.

E. Adjust hardware and door for proper function and smooth operation, proper latching, without force or excessive clearance.

3.04 Finishing

A. Unfinished product shall be sanded and primed by the manufacturer and suitable for field finishing.

END OF SECTION

SECTION 08330

OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SUMMARY
A. Provide overhead coiling doors.

1.02 Related Sections:
A. Section 05500-Metal Fabrications and Section 05120 Structural Steel: Door opening jamb and head members.
B. Section 09900-Painting. Field painting.

1.03 SUBMITTALS
A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction. specific modifications, anchorage and installation methods, and hardware.
C. Shop Drawings shall include:
1. Indicate location of coil housing hood.
2. Height and width dimensions; and jamb conditions.
3. Opening sizes.
4. Details of slats.
5. Track, jambs, and hardware.
D. Detailed specification of construction and fabrication, gauge and type of metal; parts list; name, address, and phone number of installing distributor; and operating and maintenance instructions.

1.04 QUALITY ASSURANCE
A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
B. Qualifications: ISO 9001:2000 registered and minimum 5 years experience in producing doors of the type specified. .

PART 2 PRODUCTS

2.01 MATERIALS
A. Manufacturers: Cornell Iron Works, Inc., Crestwood Industrial Park, Mountaintop, PA 18707. Telephone: (800) 233-8366, Fax: (800) 526-0841.
B. Type: Standard service door, non-fire-rated.
C. Curtain:
1. Slat Material: .050 Aluminum
2. Total Slat Thickness: ½”
D. Design
1. Slat Profile: Flat-face slats.
2. Operation: Chain hoist or push-up operation.
3. Mounting: Behind the jambs, interior side.
4. Steel Finish: Polyester powder coating
5. Aluminum Finish: Mill finish.
6. Bottom Bar: Reinforced extruded aluminum to match curtain material.
7. Auxiliary Materials:
a. Helical torsion spring counterbalance. Provide wheel for applying and adjusting spring torque.
b. Hood for curtain and operating mechanism, 1.016 mm 0,040-inch aluminum with reinforced top and bottom edge.
c. Windlocks, end locks, jamb guides, and weatherstripping.
E. Operators:

1. Manufacturer’s standard chain hoist, manual.

F. Guides Fabricate with minimum 3/16 inch (4.76 mm) structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.

G. Weatherstripping:
   1. Bottom Bar: Replaceable, bulb-style, compressible EDPM gasket.
   2. Guides: Replaceable vinyl strip on guides sealing against fascia side of curtain.

H. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N).

I. Locking: Bottom bar locking device from coil or fascia side of curtain. Padlockable chain keeper on guide, padlocks by Owners.

J. Operation: Provide manufacturer’s standard chain hoist operator with endless steel chain, chain 0ocked wheel and guard, geared reduction unit, and chain keeper secured to guide.

K. At Doors 6’ wide and under, provide Manual Push-up type operator, with lift handles on bottom bar.

PART 3 EXECUTION

3.1 INSTALLATION

A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings. . Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.

B. Commencement of work by installer is acceptance of substrate, supports and accessories.

C. Install materials and systems in accordance with manufacturer's instructions and approved submittals.

D. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates

E. Install assemblies complete with all hardware, anchors, inserts, weather-stripping, and related elements of the Work

F. Test and adjust operation.

G. Provide weather-stripping and wind-locks for doors installed in exterior walls and at air-conditioned spaces.

H. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

3.2 CLEANING

A. Clean surfaces soiled by work as recommended by manufacturer.

B. Remove surplus materials and debris from the site.

3.3 DEMONSTRATION:

A. Demonstrate proper operation to Owner's Representative.

B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 08410

ALUMINUM WINDOWS AND STOREFRONTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Storefront wall framing systems.
2. Storefront Door
B. Related Sections:
1. Section 07900, Joint Sealers: Sealant materials at perimeter of framing.
2. Section 08800, Glazing: Glass and glazing sealants.
3. Section 08710, Hardware

1.02 SUBMITTALS

A. General: Prepare, review, approve, and submit specified submittals in accordance with “Conditions of the Contract” and Division 1 Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in “Conditions of the Contract.”
B. Submit shop drawings with elevations, dimensions, details, hardware, and glazing.
C. Submit Engineering for window wind loads for large scale expanses of glass. Include all connections required.

1.03 SYSTEM DESCRIPTION

A. Window Wall System Performance Requirements:
1. Uniform Load: A static air design load of 40 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

1.04 WARRANTY

A. Project Warranty: Refer to “Conditions of the Contract” for project warranty provisions.
B. Manufacturer’s Product Warranty: Submit, for Owner’s acceptance, manufacturer’s warranty for window wall systems as follows:
1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by Kawneer.

1.05 Quality Assurance

A. Qualifications:
1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.
3. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer’s installation instructions, and manufacturer’s warranty requirements.

1.06 Delivery, Storage, and Handling

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect curtainwall material against

damage from elements, construction activities, and other hazards before, during and after curtainwall installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Manufacturers: Kawneer , or approved equivalent
- B. Substitute Manufacturers:
  1. Submit substitution requests prior to Bid Date. Comply with requirements in Section 01600, Product Requirements.2.02 Source Quality Control
- C. Source Quality: Provide aluminum storefront walls specified herein from a single source.

2.03 COMPONENTS
- A. Aluminum:
  1. Material Standard: Extruded Aluminum, ASTM B 221, 6063-T5 or 6063-T6 alloy and temper.
  2. Member Wall Thickness: Each framing member shall have a wall thickness sufficient to meet the specified structural requirements.
  3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.
- B. Standard Window Wall Framing:
  1. Kawneer 1600
  2. Head, sill and mullion Size: 2-1/2 by 7-1/2 inches..
- C. Standard Punched Opening Window Framing :
  1. Kawneer 450.
  2. Head, sill and mullion Size: 1-3/4” x 4-1/2”
- D. Framing Sealants:
  1. Concealed Joints Between Framing Members and Adjacent Surfaces: CK-2, butyl calking or TS-2, tape sealant as specified in Section 07900, Joint Sealers.
  2. Exposed Joints Between Framing Members and Adjacent Surfaces: ES-2, polyurethane or ES-5, silicone rubber as specified in Section 07900, Joint Sealers.
  3. Small Exposed Joints Between Framing Members: CK-5, small joint calking as specified in Section 07900, Joint Sealers.
- E. Aluminum Finish:
  1. Interpon® D2000, AAMA 2604, Powder coating, Refer to Color Schedule on Drawings.

PART 3 EXECUTION

3.01 PERFORMANCE
- A. General: Install storefront wall framing and windows plumb, level, and true to line, without warp or rack of frames with manufacturer’s prescribed tolerances and installation instructions. Provide support and anchor in place.
- B. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
- C. Glazing: Glass shall be glazed as indicted on Drawings and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9" on center.
- D. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.
- E. Related Products Installation Requirements:
  1. Sealants (Perimeter): Refer to Division 7 Joint Treatment (Sealants) Section.
  2. Glass: Refer to Section 08800-Glass and Glazing.
  3. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual
- F. Installation of Framing Systems:
  1. Install framing plumb and level, accurately aligned, and securely anchored with concealed fasteners.
  2. Install base in full bed of polyisobutylene rubber calk.

3. Install polyurethane or silicone rubber sealant, at exposed joints between framing system and adjacent materials.

G. Installation of Glazing:
1. Set glass units on setting blocks.
2. Install gaskets, tapes, and glazing sealants as recommended by glass and sealant manufacturers..

3.02 COMPLETION

A. Adjusting and Cleaning:

1. Replace damaged and defective entrance systems.
2. Clean entrance doors and frames and storefront frames prior to
3. Remove excess sealants from glazing, doors, frames, and substrate
4. Wash and wipe dry glazing not more than seven days prior to Substantial Completion

END OF SECTION

SECTION 08710

HARDWARE

PART 1 GENERAL

1.01 WORK INCLUDED
- A. Provide hardwarefor doors.
- B. Section 06400 Millwork Woodwork: Cabinet hardware.

1.02 QUALITY ASSURANCE
- A. Access for Persons with Disabilities: Comply with Texas Accessbility Standards (TAS) and Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- B. Supplier: Recognized builders hardware supplier with minimum five years successful experience in scheduling and furnishing hardware.
  1. Provide services of architectural hardware consultant to supervise hardware supply.
- C. Products: Provide each type of hardware (hinges, pivots, locksets, latch sets, closers, trim) from single manufacturer unless otherwise indicated in Hardware Schedule.

1.03 REFERENCES
- A. ANSI A115 and Al 15W Series: Door and Frame Preparation Standards.
- B. ANSI A156.1 through Al 56.20: Standards for various hardware items.
- C. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- D. Texas Accessbility Standards (TAS)

1.04 SUBMITTALS
- A. Product Data: Submit catalog cuts for each type of hardware.
  1. Keying Schedule: Coordinate directly with Owner's Representative.
  2. Obtain Key Codes for all doors from Owner.
- B. Shop Drawings: Indicate locations and mounting heights of hardware.
- C. Supply templates to door and frame manufacturers for proper and accurate sizing and locations of cut-outs for hardware.
  1. Samples: Indicate required style and finish.
  2. Closeout Submittal: Record actual locations of installed cylinders and master key codes on Project Record Documents.

1.05 DELIVERY, STORAGE AND HANDLING
- A. Deliver hardware in manufacturer's original packages.
- B. Pack complete with necessary screws, bolts, keys, instructions, and installation template, if necessary, for spotting mortising tools.
- C. Upon delivery, furnish complete list of hardware for checking, clearly marked to correspond with marking on each package.
- D. Review list for completeness and accuracy.

1.06 MAINTENANCE
- A. Provide manufacturer's parts list and maintenance instructions for each type of hardware supplied and necessary wrenches and tools required for proper maintenance of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Refer to Drawings for hardware group locations and door types; where not fully covered in Hardware Schedule, comply with the following general requirements; inform Architect where conflicts occur.

1. Provide hardware items with accessories complete to function as intended. B. Hinges and Butts: ANSI A156.1; comply with following unless otherwise indicated.
2. Acceptable Manufacturers:
   a. Ives, Division of Ingersoll Rand
   b. McKinney Products Co., Division of Essex Industries.
   c. Hager
   d. Substitutions: Refer to Section 01630.

C. Doors 1-3/4" Thick: 4-1/2" standard weight, extra heavy weight ball or oilite bearing where over 40" wide.
1. Provide widths sufficient to clear trim projection when door swings 180 degrees.
2. Provide minimum 3 hinges to 90" high door, 4 hinges to 120" high for each door leaf, unless otherwise indicated.
3. Provide nonferrous butts with non-removable pins at exterior and locked outswinging doors, non-rising at interior doors.
4. Provide ball bearing or oilite bearing hinges at doors with closers.
5. Tips: Flat button tips with matching plug.

D. Locking Devices: Provide of metal matching specified finish; interior parts of steel and zinc-dichromate plating, to resist rusting and corrosion; do not supply plastic, die-cast or aluminum mechanisms.
1. Acceptable Manufacturers:
   a. Schlage Lock Co.
2. Type:
   a. Cylindrical Locksets: ANSI A156.2, Series 4000, Grade 1, Bored Type (cylindrical) with 6 pin-C Keyway tumbler cylinders, except where otherwise indicated in Hardware Schedule.

E. Deadbolts: ANSI A156.2 Schlage BC160P single cylinder.

F. Lockset and Latch set Design: Wrought lever Rhodes design by Schlage with rose

G. Backset: 2-3/4".

H. Strikes: Furnish standard strikes with extended lips where required to protect trim from being marred by latch bolt. Verify type of cutouts provided in metal frames.

I. Cylinders, Keys, and Keying: Hardware manufacturers shall provide for grand master, master key alike except Manager's Office ,or different keying as directed by Owner.
1. Acceptable Manufacturer:
   a. Provide cylinders by lockset manufacturer unless otherwise indicated.
2. Provide cylinders of extruded brass bar material.
3. Provide construction cylinders for doors requiring locking during construction; construction cylinders shall be removed and replaced just J prior to Owner occupancy.
4. Submit keys for final use to Owner. Provide not less than two keys for each lockset, six of each type and level of master key, two grand master keys, and 5% extra blanks. All keys shall be delivered directly to owner by Locksmith.
5. Hardware manufacturers shall key and register lock cylinders.
6. Key Control System: Provide complete key control system with identification and storage capacity suitable for Project.

J. Closers: ANSI A156.4, furnish products of one manufacturer; full rack and pinion type with steel spring and non-freezing hydraulic fluid.
1. Acceptable Manufacturers: If additional mfrs are needed, I recommend Sargent. They have one model with a cast iron body.
a. LCN Closers. Division Schlage Lock Co. /4000 Series. b. Substitutions: Refer to Section 01630.
2. Provide controls for regulating closing, latching, speeds and back check.
3. Arm types shall suit individual conditions, as approved; supply parallel-arm closers at reverse bevel doors and where doors swing full 180 degrees.
4. Mount closers on room side unless otherwise indicated.
5. Sizes: Adjustable to following maximum door operating pressures:
   a. Interior Doors: 5 pounds.
   b. Exterior Doors: 8.5 pounds.
6. Closer bodies to be constructed of cast iron.
7. Pressure relief valves not permitted.
8. Make labeled doors self-closing.
9. Closers shall be adjusted by factory representative at no cost.

10. Design: ANSI Modern Type with Cover, unless otherwise indicated.

K. Thresholds, Stops, Trim, and Miscellaneous Hardware: Provide as indicated, as specified, as included in Hardware Schedule, and as required for complete installation.
   1. Acceptable Manufacturers
      a. Ives
      b. National Guard Products
      c. Pemko Mfg. Co.
      d. Rixon-Firemark Sub., Yale Security, Inc.
      e. Trimco, Triangle Brass Mgf., Co.
      f. Zero International, Inc.
   2. Kickplates: 10” height by 1" less than door width at pairs of doors, 2” less than door width at single doors; minimum 0.050" thick.

L. Through Bolts: Through bolts and grommet nuts shall be avoided on door faces in highly visible areas, unless no alternative is possible, as directed and approved, and shall not be used for solid wood core doors.

2.02 MATERIALS

A. General: Provide complete hardware with accessories as required for doors and applications indicated.
B. Acceptable Manufacturers: Provide manufacturers specified and manufacturers listed in Hardware Schedule, with references to catalog numbers and designations.
C. Templates: Furnish templates or physical hardware items to manufacturers concerned sufficiently in advance to avoid delay in Work.
D. Reinforcing Units: Furnished by door manufacturer, coordinated by hardware manufacturer.
E. Fasteners: Furnish as recommended by manufacturer and as required to install secure hardware.
   1. Finish: Match hardware.
   2. Furnish screws for items applied on gypsum board sufficiently long to provide solid connection to framing or backing

2.03 FINISHES

A. Hardware Finish: satin chrome 26D and satin stainless 32D. See Hardware Groups.
B. Closers: Cover finished to match door operating hardware.
C. Other Items: Provide manufacturer's standard finishes to match similar hardware types on same door, and maintain acceptable finish considering anticipated use.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install finish hardware specified under this section. Coordinate with manufacturer and installation of doors and frames.
B. Fit hardware prior to painting then remove for painting of doors and frames before final installation of hardware.
C. Install hardware in accordance with manufacturer's instructions.
D. No extra cost will be allowed because of changes or corrections necessary to facilitate installation of hardware.
E. Mounting Positions
   1. Heights given are center line heights from finished floor.
      a. Locks and Latches: 38" to center of lever.
      b. Top Hinge: To jamb manufacturer's standard, but not greater than 10" from head of frame to center line of hinge.
      c. Bottom Hinge: To jamb manufacturer's standard, but not greater than 12-1/2" from floor to center line of hinge.

d. Intermediate Hinges: Equally spaced between top and bottom hinges and from each other. e. Door Leaf: 1/4" to 5/16" from stop side of door.
f. Dead Bolt: Not more than 44" from floor to operating lever.
g. Comply with recommendations of Builders Hardware Manufacturers Association, subject to approval, for heights of items not indicated.

F. ADJUSTING
After air supply is turned on, qualified hardware supplier's or manufacturer's representatives shall inspect installation and make adjustments.

1. Adjust closers, locks, and critical operational hardware.
2. Deliver instructions for maintenance and future adjustments to Owner's representative.

3.02 SCHEDULES

A. The Hardware Schedule establishes a type and standard of quality.
B. Examine Drawings and Specifications and furnish proper hardware for door openings, whether listed or not.
C. Bring omissions to attention of Architect prior to bid opening for instructions; otherwise, list will be considered complete; no extras will be allowed.
D. Hardware Groups General: Base bids on manufacturers' items specified for locks, closers and panic devices.
1. After acceptance of original bid based on items specified, other manufacturers may be presented for cost saving purposes only, or at the direct request of Owner and Architect.
2. In some cases, quantity of hinge pairs will vary with height of door (see Hardware Section Preamble). A. Locks: Schlage 6 pin series 610 locks or equivalent.

HARDWARE GROUPS

HW SET: 1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	26D	IVES
1	EA	ENTRANCE LOCK	CYLINDER W/ THUMB	26D	SCH
1	EA	SURFACE CLOSER	4110T(ADA)	689	LCN
1	EA	PULL/PUSHBAR	9190	26D	IVES
		SEALS	BY DOOR SUPPLIER		
1	EA	LATCH BOLT	BY DOOR SUPPLIER		
1	EA	THRESHOLD	425	AL	NGP
1	EA	RAIN DRIP	17A	AL	NGP
1	EA	DOOR BOTTOM	C626	AL	NGP

HW SET: 02

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	26D	IVES
1	EA	PATIO LOCK	ND30D XN12-007 RHO	26D	SCH
1	EA	SURFACE CLOSER	4110	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	26D	IVES
1	EA	WALL STOP	WS407CCV	26D	IVES
1	SET	SEALS	5050B (HEAD & JAMBS)	BROWN	NGP

HW SET: 03

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	32D	IVE
1	EA	ENTRANCE LOCK	ND92PD RHO	26D	SCH
1	EA	SURFACE CLOSER	4111	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050B (HEAD & JAMBS)	BROWN	NGP
1	EA	RAIN DRIP	17A	AL	NGP
1	EA	DOOR BOTTOM	C626	AL	NGP
1	EA	THRESHOLD	425	AL	NGP

HW SET: 04

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	26D	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO	26D	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	DOOR SILENCERS	SR64		IVES

HW SET: 5

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	32D	IVES
1	EA	ENTRANCE LOCK	DEADBOLT W/ THUMB	32D	SCH
1	EA	SURFACE CLOSER	4110T(ADA)	689	LCN
1	EA	PULL	8305	32D	IVES
1	EA	PUSH	8300	32D	IVES
1	EA	THRESHOLD	425	AL	NGP
1	SET	SEALS	5050B (HEAD & JAMBS)	BROWN	NGP
1	EA	RAIN DRIP	17A	AL	NGP
1	EA	DOOR BOTTOM	C626	AL	NGP

END OF SECTION

SECTION 08800

GLAZING

PART 1 GENERAL

1.01 SUMMARY
- A. Section Includes:
  1. Single glass glazing
  2. Glazing accessories.
- B. Related Sections:
  1. Section 08115, Fiberglass Doors and Frames
  2. Section 08410, Aluminum Windows and Storefronts

1.02 REQUIREMENTS
- A. Submittals:
  1. Shop Drawings
  2. Submit product samples of each type of glass except tempered samples not required.
- B. Regulatory Requirements:
  1. Comply with U.S. Consumer Product Safety Commission Standard 16CFR 1201.
  2. Safety glass shall comply with ANSI Z97.1. PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. PPG or substitute approved prior to Bid Date

2.02 COMPONENTS (SEE SCHEDULE ON DRAWINGS)
- A. Tempered Glass(TG):
  1. Industry Standard: ASTM C 1048.
  2. Door Light Glass: Select Quality, PPG clear, minimum 1/4 inch thick, full tempered.
  3. Storefront Glass: Select Quality, PPG clear, minimum 1/4 inch thick, full tempered
- B. Clear Float Plate (CFP)
  1. Industry Standard: ASTM C 1048.
  2. Storefront Glass: Select Quality, PPG float plate, 1/4 inch thick.

2.03 GLAZING ACCESSORIES
- A. Glazing Sealant, GS-6:
  1. Industry Standard: AAMA 808.3.
  2. Components and Composition: One, Acrylic Polymer.
  3. Acceptable Acrylic Sealants: PTI 767 by Protective Treatments, Mono by Tremco.
- B. Glazing Gaskets, GG-3:
  1. Industry Standard: ASTM C 864.
  2. Composition: EPDM or neoprene rubber.
  3. Acceptable Gaskets: Poly-Wej Gaskets and Dense Curtain Wall Gaskets by Tremco, Stanlock by Standard
- C. Setting and Edge Block Spacers, SB-1:
  1. Industry Standard: ASTM C 864.
  2. Composition: EPDM, neoprene rubber, silicone compatible rubber, or silicone compound.
  3. Acceptable Block Spacers: Full Density by F.H. Maloney, Stanlock by Standard Products, Setting and Edge Blocks by Tremco.

PART 3 EXECUTION

3.011 PERFORMANCE
- A. Installation of Glass:
  1. Install setting blocks at quarter points of framed glass.
  2. Install spacers and compression gaskets as recommended by glass manufacturer.
  3. Install gaskets on frame and stops continuous at glass face.
  4. Compress gaskets at least 25 percent of thickness with minimum finished thickness of 3/32 inch.

3.02 COMPLETION
- A. Adjusting and Cleaning:
  1. Replace broken and damaged glazing and mirror panels prior to Substantial Completion.
  2. Wash glazing panels not more than seven days prior to Substantial Completion.

END OF SECTION

SECTION 09220

PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.01 SUMMARY
- A. Related Sections:
  1. 07900 - Joint Sealants: Sealing of expansion joints between accessories; sealant materials at butt joints.

1.02 SUBMITTALS
- A. Product Data for each product specified.
- B. Samples for verification in units at least 12 inches square of each type of finish indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

1.03 QUALITY ASSURANCE
- A. Mockups: When required by the Project Manager construct panels for each type of finish and application required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
  1. Locate mockup on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
  2. Use the full system of materials, including flashing, lath, support system, and control joints, indicated for final Work.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Owner’s approval of mockups before start of plaster Work.
  5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed portland cement plaster Work.

1.04 DELIVERY, STORAGE, AND HANDLING
- A. Deliver cementitious materials to Project site in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number.
- B. Store materials inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.

1.05 PROJECT CONDITIONS
- A. Environmental Requirements, General: Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.
- B. Cold-Weather Requirements: Provide heat and protection, temporary or permanent, as required to protect each coat of plaster from freezing for at least 24 hours after application. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.
- C. Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.
- D. Exterior Plaster Work: Do not apply plaster when ambient temperature is below 40 deg F.
- E. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 - PRODUCTS

2.01 PLASTER MATERIALS
- A. Gypsum Plaster:
  1. Vertical Surfaces: 3/4” thick 3 coat system over CMU
  2. Horizontal Surfaces: 5/8” thick 3 coat system over metal lath
  1. Conforming to ASTM C 926 Specification for Application of Portland Cement Based Plaster
     a. Base Coat having 2800 psi compressive strength
     b. Finish Coat: Gauging type
- B. Grey Cement conforming to ASTM C 150, Type 1
- C. White Cement conforming to ASTM C 150, Type 1

D. Aggregate:
1. Sand conforming to ASTM C 897, sharp, clean, for base coat graded as follows:

	SIEVE	MAX %	MIN %
No.	4	0	
No.	10	10	0
No.	16	40	10
No.	30	65	30
No.	50	90	70
No	100	100	95
No	200	100	97

E. Lime conforming to ASTM C 206 Type S
F. Lath: 3.4 lb diamond mesh metal lath

2.02 COMPOSITION OF PLASTER
A. Scratch Coat
1. Portland cement plaster on metal lath or masonry
a. 1 part grey cement
b. 3/4 to 1-1/2 parts lime
c. 2-1/2 to 4 parts sand
B. Brown Coat
a. Same as Scratch coat
C. Finish Coat
a. Same as Scratch and coat, but use White Cement and White Sand

2.03 FRAMING AND SUSPENSION SYSTEMS
A. 1-1/2 16 gauge cold rolled hanger channels
B. 3/4" furring chanels, 20 or 25 gauge USG DWC 20, 25
C. Hanger Wire - minimum 12 gauge or heavier
D. Miscellaneous clips

PART 3 - EXECUTION

3.01 ACCESSORY INSTALLATION
A. General: Comply with referenced lathing and furring installation standards for provision and location of plaster accessories of type indicated. Miter or cope accessories at corners; install with tight joints and in alignment. Attach accessories securely to plaster bases to hold accessories in place and in alignment during plastering. Install accessories of type indicated at following locations:
1. External Corners: Install corner reinforcement at external corners.
2. Terminations of Plaster: Install casing beads, unless otherwise indicated.
3. Control Joints: Install at locations indicated or, if not indicated, at locations complying with the following criteria and approved by Architect:
B. Where an expansion or contraction joint occurs in surface of construction directly behind plaster membrane.
C. Distance between Control Joints: Not to exceed 18 feet in either direction or a length-to-width ratio of 2-1/2 to 1
D. Wall Areas: Not more than 144 sq. ft..
E. Horizontal Surfaces: Not more than 100 sq. ft. in area.
F. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.

3.02 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS
A. Suspend ceiling hangers from building structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with the location of hangers required to support standard suspensions system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure flat, angle, and rod hangers to. structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
5. Do not attach hangers to steel deck tabs.
6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
7. Do not connect of suspend steel framing from ducts, pipes, or conduit.
8. Wire Hangers: 48 inches o.c.

B. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.

C. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.03 PLASTER APPLICATION

A. Apply bonding agent or dash coat on CMU surfaces indicated for direct plaster application; comply with manufacturer's written instructions for application. Moist-cure dash coat for at least 24 hours after application and before plastering.

B. Finished surface shall be true and uniform in texture and hardness

C. Total thicknesses

1. For horizontal surfaces (ceilings)
   a. Base coats: ½” thick
   b. Finish coat: 1/8” thick
2. For vertical surfaces (cmu walls)
   a. Base coats: 5/8” thick
   b. Finish coat: 1/8” thick

D. Base Coats – scratch and brown coats may be machine applied at contractor’s option

E. Finish Coat

1. Apply finish coat thoroughly dry and cured base coats that have achieved full shrinkage abd have been evenly wetted by brushing or spraying. Avoid excessive use of water.
2. Apply finish coat in sufficient thickness to produce sand finish. Match the approved sample

3.04 CUTTING AND PATCHING

A. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects. Repair or replace work as necessary to comply with required visual effects.

3.05 CLEANING AND PROTECTING

A. Remove temporary covering and other provisions made to minimize spattering of plaster on other work. Promptly remove plaster from door frames, windows, and other surfaces not to be plastered. Repair surfaces stained, marred or otherwise damaged during plastering work. When plastering work is completed, remove unused materials, containers, equipment, and plaster debris.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure plaster work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 09250

GYPSUM BOARD & LIGHT GAUGE METAL STUDS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Non load-bearing steel framing members for gypsum board assemblies.
- B. Gypsum board assemblies attached to steel framing.
- C. Water-resistant gypsum board

1.02 RELATED SECTIONS
- A. Section 06100 - Rough Carpentry: Plates, blocking and furring.

1.03 QUALITY ASSURANCE
- A. Single-Source Responsibility for:
  1. Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer.
  2. Gypsum Board: Obtain each type of gypsum board and other panels products from a single manufacturer.
  3. Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.05 PROJECT CONDITIONS
- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  a. National Gypsum Co.; Gold Bond Building Products Division.
  b. Unimast, Inc.
  c. or approved equal
- B. Gypsum Board and Related Products:
  a. Georgia-Pacific Corp.
  b. National Gypsum Co.: Gold Bond Building Products Division.
  c. United States Gypsum Co.

2.02 STEEL FRAMING FOR WALLS AND PARTITIONS
- A. General: Provide steel framing members complying with the following requirements:
- B. Protective Coating: ASTM A 653, G 40 hot-dip galvanized coating.
  1. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
  2. Verify that stud manufacturer's deflection criteria is within specified tolerances for depth of stud shown, span or height of wall or partition, and for horizontal loads anticipated.
  3. Component Sizes and Spacing: As indicated but not less than that required to comply with ASTM C 754 under the following maximum deflection and lateral loading conditions:

4. Maximum Deflection:
   a. U240 at 5 lb per sq. ft.
   b. Thickness: 010179 inch nominal 25 gauge unless otherwise indicated.
   c. Thickness: 0.0329 inch nominal 20 gauge as follows:
5. For head runner, sill runner, jamb, and cripple studs at door and other openings.
   a. Where indicated.
   b. Thickness: As indicated.
   c. Depth: As indicated.
6. Deflection Track: Manufacturer's top runner complying with the requirements of -ASTM C 645 and with 2-inch-deep flanges.
7. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.03 GYPSUM BOARD PRODUCTS

A. Water-Resistant Gypsum Backing Board: ASTM C 630 and as follows:
   1. Type: Regular WR , unless otherwise indicated.
   2. Thickness: 5/8 inch, unless otherwise indicated.
   3. Widths: Provide gypsum board in widths of 48 inches.
   4. Location: toilet rooms

B. General: Standard gypsum board: ASTM C 36 and as follows:
   1. Type: Regular, unless otherwise indicated.
   2. Thickness: 5/8 inch, unless otherwise indicated.
   3. Widths: Provide gypsum board in widths of 48 inches.
   4. Location: all other areas indicated to receive gypsum board finishes

2.04 TRIM ACCESSORIES

A. Accessories for Interior Installation: Corner bead, edge trim, and control joints complying with ASTM C 1047 and requirements indicted below:
   1. Type: Regular, unless otherwise indicated.
   2. Material: Formed metal or plastic, with metal complying with the following requirement:
   3. Steel sheet zinc coated by hot-dip or electrolytic process, or steel sheet coated with aluminum or rolled zinc.
   4. Comerbead on outside comers, unless otherwise indicated.
   5. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
   6. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.

2.05 JOINT TREATMENT

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated

C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
   a. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
   b. For pre-filling gypsum board joints, use formulation recommended by gypsum board manufacturer.
   c. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
   d. For topping compound, use sandable formulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach, abut, frame around, installed hollow metal frame, cast-in-anchors, pipe or utility chases, and building structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Provide additional framing and blocking as may be necessary to frame around building structural framing, with Installer present, for compliance with requirements for

installation tolerances and other conditions affecting performance of assemblies specified in this Section. Provide additional framing and blocking as may be necessary to frame around building structural framing or pipe or utility chases. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

3.03 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Provide supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, railings, grab bars, toilet accessories, furnishing, or similar construction. Provide additional framing around building structural members, pipe and utility chases, or other special construction areas. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook", current edition.

3.04 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
   1. Where studs are installed directly against exterior walls, install asphalt felt strips or form gaskets between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceiling, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
   1. Cut studs Y2 inch short of full height to provide perimeter relief.

D. Terminate partition framing at suspended ceilings where indicated.

E. Install steel studs and furring in sizes and at spacings indicated.
   1. Space studs 16 inches o.c., unless otherwise indicated.

F. Install steel studs so flanges pointing the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.

G. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach .vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   1. Install 2 studs at each jamb, unless otherwise indicated.
   2. Install cripple studs at head adjacent to each jamb stud, with minimum Y2-inch clearance from jamb stud to allow for installation of control joint.
   3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

H. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.05 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

A. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with the location of hangers required to support standard suspensions system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure flat, angle, and rod hangers to. structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
5. Do not attach hangers to steel deck tabs.
6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
7. Do not connect of suspend steel framing from ducts, pipes, or conduit.
8. Wire Hangers: 48 inches o.c.

B. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
C. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.06 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C.840 and GA-216.
B. Install ceiling board panels across framing to minimize the number of abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
C. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints.

F. Do not stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
G. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
H. Install steel reinforcement sheet prior to installing gypsum panels.
I. Attach gypsum panels to framing provided at opening and cutouts.
J. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
K. Form control joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
L. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
1. Except where concealed application is indicated or required for sound, fire, air, or smoke rating, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow'/- to 3/8-inch- wide joints to install sealant.

M. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
1. Space screws a maximum of 12 inches o.c. for vertical applications.
2. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.07 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:
1. On ceiling, apply gypsum panels prior to wall/partition board application to the greatest extend possible and at right angles to framing, unless otherwise indicated. Fasten with screws.
2. On partition walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints. Fasten with screws.

B. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:
   1. Install water-resistant gypsum backing board panels to comply with manufacturer's installation instructions at showers, tubs, and where indicated. Install with '/-inch open space where panels abut other construction or penetrations.
   2. Install gypsum wallboard panels with tapered edges taped and finished to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

3.08 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
B. Install corner bead at external corners.
C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
   1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
   2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
   3. Install aluminum trim and other accessories where indicated. D. Install control joints at locations indicated.

3.09 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decorations.
B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape. D. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
   1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
   2. Level 2 where panels form substrates for tile and where indicated.
   3. Level 4 for gypsum board surfaces, unless otherwise indicated.
F. Use one of the following joint compound combinations as applicable to the finish levels specified:
   1. Embedding and First Coat: Setting-type joint compound.
   2. Fill (Second) Coat: Setting-type joint compound.
   3. Finish (Third) Coat: Sandable, setting-type joint compound.
G. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and-ready for decoration.
H. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
I. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.
J. Finish water-resistant gypsum backing board forming base for ceramic tile to comply with ASTM C 840 and gypsum board manufacturer's directions for treatment of joints behind tile.

3.10 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.
B. Provide final protection and maintain conditions, in a manner acceptable to Installer that ensures gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 09650

RESILIENT WALL BASE

PART 1 GENERAL

1.01 WORK INCLUDED
A. Section Includes: Resilient Wall Base
1.02 SUBMITTALS
A. Product Data: Submit product data, including manufacturer's specification summary sheet for specified products
B. Samples: Submit selection and verification samples for finishes, colors, and textures.
1.03 QUALITY ASSURANCE
A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installing work similar to that required for this project.
b. Single-Source Responsibility: Obtain resilient wall base and manufacturer’s recommended adhesive from a single supplier.
1.04 WARRANTY
A. Manufacturer's Materials Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
1. Warranty Period: 1 year limited warranty commencing on Date of Substantial Completion.
2. Limited Wear Warranty: 3 year limited wear warranty.

PART 2 PRODUCTS

2.01 RESILIENT WALL BASE
A. Acceptable Manufacturers:
1. Roppe Corporation
2. Burke-Mercer
3. Johnsonite
B. MATERIALS
1. Standard topset rubber cove base
a. Complies with ASTM F-1861 Type TS (Thermoset Vulcanized Rubber), Group 1 (Solid)
b. Contains 10% natural rubber
c. Thickness: 1/8” (3.175 mm) nominal
d. Color as selected by Architect from manufacturer’s standard colors.
e. Profile: Standard Toe (Cove base) 4" high
f. Length: coil rolls

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS
A. Compliance: Comply with manufacturer’s instructions for installation.
B. Adhesive: Manufacturers Standard Wall Base Adhesive
3.02 EXAMINATION
A. Site Verification of Conditions: Verify substrate conditions are acceptable for installing product in accordance with manufacturer's instructions.
B. Material Inspection: In accordance with manufacturer's installing requirements, visually inspect aterials prior to installing. Material with visual defects shall not be installed.
3.03 PREPARATION
A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
B. Surface Preparation, General: Prepare substrate in accordance with manufacturer's instructions.
C. Substrate: Prepare manufacturer’s recommended substrates to be smooth, rigid, flat, level, permanently dry, clean and free of foreign materials such as paint, dust, grease, oils, solvent, non-porous surfaces and all other contaminants that may interfere with adhesive bond.
3.04 INSTALLING
A. Manufacturer’s instructions for specifications on installing resilient wall base.

3.05 CLEANING

A. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.01 INCLUDES

A. Surface preparation and priming in addition to shop-priming and surface treatment specified under other Sections.
B. Painting and finishing of exposed interior items and surfaces.
C. Painting and finishing of exposed exterior items and surfaces.
D. High performance coatings in the Wash Tunnel
E. High performance coating of concrete floors
F. Painting is not required on prefinished items such switchgear, finished metal surfaces such as stainless steel, concealed surfaces such as furred areas and pipe spaces, operating parts such as valve and damper operators and sensing devices, and labels such as UL or code-required labels or equipment name, identification, performance rating, or nomenclature plates.
G. Colors, See Color Schedule on, Drawings

1.02 RELATED SECTIONS

A. Section 01340 - Alternates: Shop-priming structural steel to be field painted.
B. Section 05120 - Structural Steel: Shop-priming structural steel to be field painted.
C. Section 05500 - Metal Fabrications: Shop-priming ferrous metal.
D. Section 08110 - Standard Steel Doors and Frames: Shop-priming steel doors and frames.

1.03 DEFINITIONS

A. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.
B. “High Performance Coating” includes epoxy and high solid coatings

1.04 SUBMITTALS

A. Product data for each paint system specified, including primers.
   1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
   2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
B. Samples for initial color selection in the form of manufacturer's color charts.
C. Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrates.
   1. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
B. Field Samples: On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color, and texture are obtained; simulate finished lighting conditions for review of in-place work.
1. Final acceptance of colors will be from job-applied samples.
2. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface according to the schedule or as specified.
a. After finishes are accepted, this room or surface will be used to evaluate coating systems of a similar nature.

1.06 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg.F (10 deg.C) and 90 deg.F (32 deg.C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg.F (7 deg.C) and 95 deg.F (35 deg.C).
C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent or at temperatures less than 5 deg.F (3 deg.C) above the dew point or to damp or wet surfaces.

1.07 MAINTENANCE

A. Extra Materials: Provide one (1) gallon of extra stock for every fifty (50) gallons, or portions thereof, of finish coats applied to surfaces. Do not provide extra materials for High Performance Coatings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following, unless otherwise indicated in the systems listed at the end of this section:
   1. Sherwin Williams (SW)
   2. Benjamin Moore and Co. (Moore)

2.02 MATERIALS

A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
B. Tint or shade first, second and third coats differently.
C. Color Pigments: Pure, non-fading, applicable types of suit substrates and service indicated.
D. High Performance Clear Floor Sealer: Clear water based catalyzed epoxy , SW B70 Series Industrial Coatings
   Location: All interior concrete floors not scheduled to be pigmented concrete (SSC)
E. High Performance Coating: Sherwin Williams Industrial and Marine Coatings, Macropoxy® 646-100 Fast Cure Epoxy, color: White
F. High Perfomance Block Filler: Sherwin Williams Kem Cati-Coat HS Epoxy Filler/sealer, color: White
H. Standard Block Filler: Sherwin Williams Promar B25W25, color: white

PART 3- EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
   1. Do not begin to apply paint until satisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.02 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface protection.
      a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.

c. Before proceeding with Conveyor Trench paint, confirm surfaces are in accordance with CSP-1-2 , check PH per ASTM D 4262, followed by acid wash and cleaning with pressure washer and substantial quantities to wash fully the salts from the reaction.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
   a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
   a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10, unless otherwise specified.
   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
   d. Metal Work Imperfections: Dents, cracks, hollow places, open joints and other irregularities in metal work to be painted shall be filled with metal filler which, after setting, shall be sanded to a smooth, hard finish, in accordance with SSPC-SP-2.
5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
6. Gypsum Board: Surfaces of gypsum board shall have all damaged areas cut out and patched, cracks taped and all roughness sanded smooth. Gypsum board shall be brushed clean of dust before painting begins. No texture shall be added to paint or applied to gypsum surfaces prior to painting,

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoat to distinguish each separate coat.

3.03 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, comers, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
4. Apply materials uniformly, showing no runs, sags, "crawls, "holidays", or other defects.
5. Provide finish coats that are compatible with primers used.

6. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
7. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
8. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
9. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
10. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
11. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to life or lose adhesion.
5. Heated Items: Pipes containing heat shall not be painted until system is cold and remains old until after final coat has dried.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Spray Equipment: If spray application is to be used, use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Miscellaneous Metal Items: Access doors, plates, panel boxes, steel grilles, louvers, convector covers, registers and similar items shall be painted in colors selected. Plates and grilles in ceilings or walls shall be painted to match ceilings or walls, unless work is factory finished or noted otherwise.

E. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through (paint holidays) or other defects due to insufficient sealing.

F. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

G. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

H. Standard Block Fillers: Apply block fillers to concentrate masonry block at a rate to ensure complete coverage with pores filled. Location: all exposed CMU scheduled to receive painted finishes except interior of Wash Tunnel.

I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no bum through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

L. Completed Work: Match accepted samples of color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

M. High Performance Block Filler: apply in accordance to manufacturer’s Application Bulletin to exposed CMU surfaces in Wash Tunnel. Allow for curing times as recommended by manufacturer prior to applying finish coats.

N. High Performance Coating: apply in accordance to manufacturer's Application Bulletin to exposed CMU surfaces in Wash Tunnel after surfaces have been filled and cured. Allow for curing times as recommended by manufacturer.

O. High Performance Floor Sealer: apply in accordance to manufacturer's Application Bulletin to exposed concrete floors scheduled to receive clear sealer.

3.04 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and, other discarded paint materials from the site

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finished. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 PAINTING SCHEDULE

A. Exterior Work: Provide following paint systems.

1. Framing, Wash Tunnel Trench metal edges and covers: Semigloss sheen
   a. 1"St Coat: Sherwin-Williams Kem Kromik Universal Metal Primer.
   b. 2nd and 3rd Coat: Sherwin-Williams D.T.M.Enamel Alkyd Semi-Gloss #2.25.
2. CMU surfaces unless indicated otherwise on the Drawings:
   a. 1"St Coat: Sherwin Williams PrepRite Block Filler, Interior/Exterior B25W25 b. 2nd Coat and 3rd Coat: Sherwin Williams SuperPaint, Exterior Latex.
3. Sheet Metal (Field Applied, see Section 05500 Miscellaneous Metal Fabrications for other manufacturer coatings for specific products.)
   a. 1"St Coat: Benj Moore Chemical Resistant Metal Primer #M10. Primer not required on paint grip galvanized surfaces.
   b. 2nd and 3rd Coats: Benjamin Moore D.T.M. Acrylic Semi-Gloss #M29 (MPI Listed Product Category 141).

B. Interior Work: Provide following paint systems.

1. Exposed CMU except Wash Tunnel and other surfaces unless indicated otherwise on the Drawings:
   a. 1"St Coat: Sherwin Williams PrepRite Block Filler, Interior/Exterior B25W25
   b. 2nd Coat and 3rd Coat: Sherwin Williams SuperPaint, Exterior Latex.
2. CMU and Gypsum Board in toilet areas:
   a. 1 St Coat: Sherwin-Williams Prep-Rite High Build Interior Latex Primer/Surfacer for Masonry1 St Coat: Sherwin-Williams Prep-Rite Latex Primer/Surfacer for Drywall. b. 2nd & 3rd Coats- Sherwin-Williams Waterbased Tile-Clad II Epoxy Finish
3. Gypsum Board Systems: Eggshell (satin) at walls and semigloss sheen at ceilings:
   a. 1 St Coat: Sherwin-Williams Prep-Rite High Build Interior Latex Primer/Surfacer B28W601.
   b. 2nd and 3rd Coat: Interior latex or acrylic latex emulsion, Sherwin-Williams ProGree 200 Low VOC Egg-Shel B20-600 Series.
4. Conveyor Trench Epoxy Paint:
   a. 1 St Coat: Euclid Chemical Duraltex a. 2"d Coat Euclid Duralkote 240
5. Concrete Floors:
   a. Prepare concrete surfaces to be coated in accordance with manufacturer's requirements. Surfaces must be clean, dry, and free of all dust, grease, dirt, and other foreign materials to assure adequate adhesion.
   b. 1 st and 2nd coats: SW B70 clear epoxy using a roller and brush in tighter spaces. Allow curing time between coats
6. Wash Tunnel Exposed CMU surfaces:
   a. Prepare CMU surfaces to be coated in accordance with manufacturer's requirements. Surfaces must be clean, dry, and free of all dust, grease, dirt, and other foreign materials to assure adequate adhesion. Mortar should have cured for at least 28 days prior to application.

b. 1 st coat: Sherwin Williams Kem Cati-Coat HS Epoxy Filler/sealer using a roller and brush in tighter spaces. Allow curing time between coats. Second coat may be required to fill voids and provide continuous substrate.

c. 2nd coat: Sherwin Williams Industrial and Marine Coatings, Macropoxy® 646-100 Fast Cure Epoxy, using a roller and brush in tighter spaces. Allow curing time between coats.

d. 3rd coat: same as 2nd coat, airless spray application concurrent with steel roof structure.

7. Wash Tunnel Ceiling and Exposed structural steel surfaces:
   a. Prepare surfaces to be coated in accordance with manufacturer's requirements. Surfaces must be clean, dry, and free of all dust, grease, dirt, and other foreign materials to assure adequate adhesion.
   b. 1 st coat and 2nd coat: Sherwin Williams Industrial and Marine Coatings, Macropoxy® 646-100 Fast Cure Epoxy, using airless spray application. Allow curing time between coats.
8. Exposed Structural Steel,Metal Framing, and Steel Deck (exposed): Semigloss sheen
   a. 1"St Coat: Sherwin-Williams Kem Kromik Universal Metal Primer.
   b. 2nd and 3rd Coat: Sherwin-Williams D.T.M.Enamel Alkyd Semi-Gloss #2.25.

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END OF SECTION

SECTION 10520

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY
- A. Contractor provided and installed fire extinguishers where indicated on the Drawings.

1.02 SUBMITTALS
- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.03 QUALITY ASSURANCE
- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers that have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Standards: UL and FM listed products, NFPA 10. PART 2 PRODUCTS

2.01 MATERIALS
- A. Manufacturers: Owner Provide and selected.
- B. Mounting: Surface-mounted.

PART 3 EXECUTION

3.01 INSTALLATION
- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Install fire extinguishers in mechanical and service areas with wall-hung brackets at locations and heights indicated and acceptable to authorities having jurisdiction.
- C. Install fire extinguishers in on wall where indicated at heights acceptable to authorities having jurisdiction.
- D. Restore damaged finishes. Clean and protect work from damage.

END OF SECTION

SECTION 10530

EXTRUDED ALUMINUM CANOPY

PART 1 GENERAL

1.01 WORK INCLUDED
A. Furnish a complete extruded aluminum canopy walkway cover system including labor as shown on drawings
1.02 SUBMITTALS
A. Shop Drawings bearing the seal of a registered structural engineer showing required live and wind loads for the project.
1.03 QUALITY ASSURANCE
A. Comply with governing codes and regulations. Provide products of acceptable manufacturers that have been in satisfactory use in similar service for five years.
B. Installation shall be done by the manufacturer of the aluminum canopy to assure single source responsibility for the work. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
1.04 WARRANTY
A. Provide one year warranty against defects in materials, workmanship, and installation. Warranty shall commence at date of substantial completion.

PART 2 MATERIALS

2.01 MANUFACTURERS
A. AVadek, 9201 Winkler, Houston, Texas 77017, 713-944-0988
B. Or approved equivalent by architect prior to bidding
2.02 COMPONENTS
A. All components shall be 6061-T6 or 6005-T5 Alloy extruded aluminum
B. Beams, and deck shall be sized by manufacturer and shall meet the engineering requirements of the
C. Finish: Clear anodized
D. Fasteners shall be concealed as much as is possible. Material shall be stainless steel or specially coated to provide for long life durability.

PART 3 – EXECUTION

3.01 FABRICATION
A. Beams shall be heliarc welded.
B. The canopy deck is to have welded end closures at the deck terminations.
C. The canopy shall be fabricated to drain through the beams and exit canopy through scuppers in the face of the awning.
D. Flashing shall be .040 aluminum fabricated to prevent leakage between the canopy and adjacent structures.
30.2 INSTALLATION
A. Install the canopy in strict accordance with the manufacturer’s recommendations.
B. Erect canopy after masonry, stucco, and tile work in vicinity is completed and washed down.
C. Install beams straight and true.
D. Install flashing as required.
E. Thoroughly clean canopy after installation.

END OF SECTION

SECTION 10800

TOILET ACCESSORIES

PART 1 GENERAL

1.01 INCLUDES:
A. Accessories for toilet rooms.
B. Grab bar and mirrors.
1.02 ADMINISTRATIVE REQUIREMENTS
A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.
1.03 SUBMITTALS
A. See Section 01300 Submittals for requirements
B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Bobrick.
B. Or approved equal
2.02 MATERIALS
A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
2.03 FINISHES
A. Unless noted otherwise, all accessories shat be type 304 stainless steel
2.04 TOILET ROOM ACCESSORIES – the following are based on Bobrick selections
A. Grab Bars: B-5806 Stainless steel, 1-1/4 inches (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches (38 mm) clearance between wall and inside of grab bar.
1. Length and configuration: As indicated on drawings.
B. Toilet Tissue Dispenser: B-288 Multi-roll Dispenser
C. Paper Towel Dispenser: B-262 Surface mounted, multi-fold dispenser
D. Metal Framed Mirror: B-290 24” wide x 48” tall, 304 ss frame, 1/4” Q1 polished mirror
E. Soap Dispenser: B-822 Deck mounted 34 oz capacity

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify exact location of accessories for installation.
3.02 INSTALLATION
A. Install accessories in accordance with manufacturers' instructions.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings

END OF SECTION

SECTION 12053

EXTERIOR FABRICS

PART 1- GENERAL

1.01 DESCRIPTION
A. The scope of work includes fabrics associated with Sunscreens and Awnings.

1.02 RELATED SECTIONS AND DOCUMENTS
A. Section 01600-Materials and Equipment.
B. Section 01030-Alternates

1.03 SUBMITTALS
A. Submit product data, including installation instructions, on fabrics.
B. Submit copies of warranties and cleaning instructions.

PART 2 PRODUCTS

2.01 FABRIC

A. Manufacturer: Cooleroo Commercial 95 as manufactured by Gale Pacific Limited . (The product is manufactured in Australia by Gale Pacific Limited ACN 082 263 778 (“Gale Pacific”), an ISO9002 accredited company.)
B. US Distributor Address: Gale Pacific Inc, PO. Box 951509, Lake Mary, Floreida 32795-1509
C. Description: 100 percent flame retardant High Density Polyethylene.
D. Weight: 9 oz per yard.
E. Knit Pattern: Lock Stitch.
F. Color: Navy Blue
G. Warranty: 10 years
H. Flamability:
1. Meets NFPA 701-99 test method 2, Test Report 756, Magill Laboratories, Inc, P.O. Box 267, One Railroad Street, Slatersville, Rhode Island 02876
2. Meeting ASTM E-84-06 Test Number 3829-3112, Oct 16, 2006 a. Roll Width: 9’-10”

PART 3 EXECUTION

3.01 COORDINATION
A. Coordinate with awning structure manufacturer as required to provide fabrics specified.

3.02 INSTALLATION
A. Install fabric in accordance with manufacturer’s current written specifications, recommendations, and instructions.
B. Install fabric taunt and tensioned to avoid sag.

3.03 COMPLETION
A. At completion, clean fabric as required and in accordance with current written cleaning instructions.
1. Remove loose threads and selvedge.
a. Re-tension fabrics where directed by the Owner’s Representative.

END OF SECTION

SECTION 15010

GENERAL PROVISIONS

PART 1 - GENERAL

1.01 CONTRACT CONDITIONS:

A. Work of this Section is bound by the General Conditions, Supplementary Conditions and Division 1, bound herewith, in addition to Division 15 and accompanying Architectural, Structural, Mechanical and Electrical Drawings. It is the intent of these specifications and the drawings to provide complete and workable mechanical systems.

B. Reference to "The Contractor" in these Specifications refers to the Subcontractor performing the work under his respective sections and as shown on the drawings.

1.02 SCOPE OF WORK

A. It is the intent of these specifications to provide complete and workable plumbing, fire protection and heating, air-conditioning, ventilation and exhaust systems.

B. The Architectural Floor Plans show quantity and exact locations of plumbing fixtures, and Architectural Reflected Ceiling Plans show quantity and exact location of registers and grilles.

1.03 CODES, RULES AND REGULATIONS:

A. All work and materials shall conform to latest revision of local and state codes and utility company requirements, including International Building, International Plumbing, International Mechanical and all federal and other applicable laws and regulations. Whenever indicated, material, workmanship, arrangement or construction is of higher quality or capacity than that required by the above codes, the drawings and/or specifications shall govern. Should there be any direct conflict between codes and the drawings and/or specifications, the codes, rules and regulations shall govern. All machinery and equipment shall comply with the Occupational Safety and Health Act of 1970, as currently revised, as interpreted for equipment manufacturer requirements. All equipment provided shall be installed per manufacturer recommendations. See "Letter of Conformance" this section.

1.04 SAFETY:

A. In accordance with the contract documents, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work.

B. This requirement will apply continuously and not be limited to normal working hours.

C. The duty of the Architect and Engineer to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of

the Contractor's safety measures, in, on or near the construction site.

1.05 WORKING DRAWINGS.

A. The working drawings are generally diagrammatic. They do not show every offset, bend, or elbow required for installation in the space provided. All locations for mechanical work shall be checked and coordinated with the architectural, structural, electrical drawings and existing conditions such as beams, trusses, joists, conduits, devices, etc.

B. Contractors shall visit the site prior to bidding and make necessary investigation to inform and familiarize themselves thoroughly with site conditions and review architectural, structural, mechanical and electrical Drawings which may affect completion of his work. During bidding and construction, call to the attention of the Architect or Engineer any error, conflict or discrepancy in the plans, specifications or existing conditions. During construction, do not proceed with anyquestionable items of work until clarification of it has been made. The Architect as required may supply supplemental details and plans and they will become part of the contract documents.

C. Where equipment is shown, dimensions have been taken from typical equipment of the class indicated.

D. Carefully check the drawings to see that the equipment under consideration for installation will fit the space provided and that all connections may be made thereto without impairment of area requirements and of code required clearances.

E. Follow routings of pipes and ducts as closely as practicable. Provide clearance and headroom.

Utilize spaces efficiently so that adequate accessibility is maintained for future maintenance and repair.

F. Work installed without adequate access shall be redone to the satisfaction of the Architect.

G. The locations of existing mains, valves, ducts, etc., are shown as close as can be determined from existing drawings and on the site inspections, but must be verified by the Contractor at the site prior to bidding.

H. The Contractor shall do all necessary work to receive or join with the work of other trades, cut new services into existing mains, extend piping and make all necessary connections as required to prevent interruption of service in any area. The work hereunder shall be coordinated with the work of all other trades to provide adequate clearance for installation and maintenance of all mechanical equipment. The mechanical drawings and specifications are arranged for convenience only and do not necessarily determine which trades perform the various portions of the work. Priority of work shall be coordinated as follows: 1) Sanitary and storm drain pipe, 2) ductwork, 3) electrical conduits, 4) domestic hot and cold water pipes.

1.06 SUBSTITUTION OF MATERIALS:

A. Prior acceptance (acceptance meaning "by Architect") for product substitution is required on equipment not listed by name before bid date. Data submitted to contain

specifications, performance data and dimensions. All equipment manufacturers must be listed in specification by name. If not listed by name, prior acceptance is required. However, all manufacturers listed by name and found acceptable shall meet requirements of the specifications and equipment schedule. Requests for prior acceptance will be considered only if they are accompanied with a "Product Evaluation" questionnaire.

B. Upon request, suppliers of HVAC equipment shall furnish the full and partial capacity and stand-by inputs and outputs of all equipment and components of applied systems as required by State of Texas Energy Code.

1.07 SHOP DRAWINGS AND SUBMITTALS:

A. Submit Shop Drawings and/ or Submittals on equipment data for HVAC, plumbing equipment, etc., for acceptance prior to fabrication and/or construction. Provide to the Architect for review in accordance with *Section 01300 SUBMITTALS* before equipment is ordered and before commencing work and within 30 days after award of contract. Where number or symbol on the drawings designates equipment, the submittal shall also show this number or symbol.

B. All specified features and performance data must be specifically noted on the submittal.

C. Contractor agrees that Shop Drawing submittals processed by the Engineer are not change orders; that the purpose of Shop Drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.

D. Contractor further agrees that if deviations, discrepancies or conflicts between Shop Drawings and Specifications are discovered either prior to or after Shop Drawing submittals are processed by the Engineer, the Design Drawings, specifications and manufacturer's installation instructions shall control and shall be followed.

1.08 RECORD DRAWINGS:

A. Provide two copies of record drawings showing all deviations from contract drawings.

B. Keep a clean set of mechanical prints on job at all times for recording (with indelible ink) as-built conditions. Transfer this information to new clean prints at completion of job. Drawings shall be accurate, neat and finished in appearance when delivered to the Architect.

C. Record invert elevations and locate underground piping, etc., both inside and outside of the building by dimensions to foundation walls and/or building column center lines, and finished floor elevations.

D. Drawings shall be accurate, neat and finished in appearance when delivered to the Architect and shall show accurate dimensions from building lines and depth for all stubouts and other lines run outside of building.

1.09 WARRANTY:

A. Provide warranty per General Conditions. Furnish written warranty to Owner for period of one year (with an additional 4-year parts only warranty on air-conditioning compressors) covering all defects in material and workmanship. Should any trouble develop during this period due to defective materials or faulty workmanship, the contractors shall furnish all necessary labor and materials and correct the trouble promptly and without any additional cost to the Owner. Warranty starts when the Architect as complete and operational accepts system

B. Upon notice from either the Owner or Architect, the Contractor whose work is in default will promptly make good any defects that may arise within the time dated guarantee period at no extra expense to the Owner or Architect, and he shall make good any resultant damage done to any part of the building or to any property of the Owner at no additional expense to either the Owner or Architect.

C. The Contractor is responsible for all work installed by him and shall protect it from all damage until contract is completed and materials and apparatus he furnished have been tested and accepted.

D. The Owner reserves the right to make temporary or emergency repairs as necessary to keep the equipment in operating condition without voiding the warranty contained herein nor relieving the Contractor of his responsibilities during the warranty period.

1.10 PERMITS AND FEES:

A. Refer to General and Supplementary Conditions for payment of water and sewer service connection fees. Mechanical subcontractor shall arrange and pay for plumbing and heating and fire protection permits and inspections required by Governing Authorities.

B. Certificates of inspection shall be obtained by the Contractor from public authorities having jurisdiction and delivered to the Owner before final acceptance.

C. Each trade shall consult the local building departments, utility companies, and Owner prior to the commencement of work to ascertain the existence and location of existing underground utilities. Existing services shall be protected against damage and interruption of use, and shall be re-routed as may be necessary to accomplish the new work. Materials and installation for re-routing shall be as specified for new work.

1.11 CHANGE ORDERS:

A. All supplement cost proposals by the Contractor shall be in accordance *with Section 01036 CHANGE ORDER PROCEDURES* and shall be accompanied by a complete itemized breakdown of labor and materials. No exception will be made. At the Engineer's request, the Contractor's estimating sheets for supplemental cost proposals shall be made available to the Engineer. Labor must be broken out and allocated to each item of work as requested. The Engineer must approve all Change Orders. See General Conditions for OH & P Mark-up.

1.12 WORK INCLUDED BUT REIMBURSED BY OWNER:

A. Should rock or hardpan, other than any shown on Drawings and as defined

hereunder, be encountered, Owner will pay extra for removal and take credit for earth excavation omitted in accordance with General Conditions.

B. Should quicksand, other than any shown on Drawings and as defined hereunder, be encountered, Owner will pay for de-watering or removal in accordance with General Conditions.

C. Should wells, cisterns, tanks, cesspools, etc., other than any shown on Drawings, be encountered, Owner will pay for removal or filling as directed by Engineer and in accordance with General Conditions.

D. Rock: Material that cannot be removed with on-yard shovel, with backhoe equipped with ripper, with pick and shovel, or with 200HP crawler fitted with normal excavating equipment. Ripper attachment as might be hooked into seam is not considered "normal" excavating equipment.

1.13 DEFINITIONS:

A. Following is a list of abbreviations generally used in this Division:
1. American Association of State Highway Officials
2. American Gas Association
3. ASHRAE-American Society of Heating, Refrigeration and Air-Conditioning Engineers
4. American Society of Mechanical Engineers
5. American Society for Testing and Materials
6. American Water Works Associations
7. Construction Specification Institute
8. Heating-Ventilating and Air Conditioning
9. International Building Code
10. International Mechanical Code
11. National Fire Protection Association
12. National Electrical Manufacturers Association
13. National Electric Code
14. Public Health Service
15. SMACNASheet Metal and Air Conditioning Contractors National Association, Inc.
16. Uniform Building Code
17. Underwriter's Laboratories, Inc.
18. Uniform Mechanical Code
19. Uniform Plumbing Code

PART 2 - PRODUCTS

2.01 SUPPLEMENTARY CONDITIONS:

A. Anything mentioned in the specifications and not shown on the drawings or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. Specifications have precedence over drawings.

2.02 MATERIALS:

A. The contract shall be based upon furnishing all materials as specified. All materials and equipment used for construction shall be new, American made, unless accepted by the

Architect otherwise and the latest products as listed in printed catalog data and shall be UL or AGA approved or acceptable by state, county and city authorities. Equipment supplier is responsible for obtaining state; county and city acceptance on equipment not U.L. approved.

B. All fixtures and equipment of a kind shall be the standard product of one manufacturer.

C. Trade names and manufacturer's names denote the character and quality of equipment desired and shall not be construed as limiting competition.

2.03 VALUE ENGINEERING:

A. The Contractor selected, at his option after award of a contract and if acceptable by Code, may submit an alternate price to change specified material which will result in a cost saving to the Owner. All variances from the Specifications must be brought to the attention of the Architect and accepted by him in writing. Said Value Engineering shall be submitted to the Architect within 10 calendar days of the award of the Contract.

PART 3 - EXECUTION

3.01 TEMPORARY HEAT AND VENTILATION

A. Comply per State of Texas Code, and Division 1.

3.02 OBSERVATION:

A. All work and materials subject to review at any and all times by Architect, Engineer and/or authorized representative. Contractor shall notify the Architect a minimum of two days prior to testing any piping system, which must be witnessed and accepted before it is covered up, enclosed or insulated. If an authorized observer finds any material or work not conforming to these specifications, within three days after being notified, remove materials from premises. If material has been installed, entire expense of removing and replacing shall be borne by Contractor.

3.03 SUPERVISION AND WORKMANSHIP:

A. Constantly supervise work covered by these specifications. Verify all conditions on job site and lay out work accordingly.

B. The Contractor shall furnish and install any and all additional supports, piping, wiring, ducts and accessories as may be required for the proper installation and operation of the manufacturer's equipment submitted for approval.

3.04 CODES AND PERMITS:

A. Should the documents indicate a condition which will conflict with the rules and regulations, the Contractor shall refrain from installing that portion of the work until he receives direction from the Architect.

B. Any work installed in violation of the governing codes will be removed and correctly installed by the Contractor.

3.05 TESTS AND SITE OBSERVATIONS:

A. Tests:

1. General: Provide 48-hour notice of tests to be witnessed. a. 15400: Sewer, vent, water and gas pressure tests.

B. Site Observations
   1. Prior to covering below grade piping
   2. Prior to covering in-wall piping
   3. Prior to installation of ceiling

3.06 BUILDING OCCUPANCY:

A. Owner reserves the right to occupy space as available in building to install equipment in the space, but said occupancy for the purpose of installing equipment shall not indicate that Owner has accepted such space or any part of building as being completely finished until acceptance in writing is provided by the Architect.

B. Mechanical equipment warranty start date begins upon:
   1. Architect's issuance of building area substantial completion for which mechanical equipment serves.
   2. Owner's move-in "beneficial use and occupancy of building" and/or "acceptance" in writing by the Architect.

3.07 COMPLETION REQUIREMENTS:

A. Provide 3 copies of Operating and Maintenance manuals per the following: Upon completion of the work and adjustment of all equipment, all systems shall be tested by the Contractor for proper operation to demonstrate to the Owner's Representative that all equipment furnished and installed or connected under the provision of these specifications functions mechanically in the manner specified and required by the equipment manufacturer.

B. Adjustment, operation, etc. Adjust all controls under Section 15910 and equipment for proper operation. Adjust all regulators, faucets, etc. Open and close all shutoff and control valves several times to insure tight glands. Furnish the services of a qualified man for a period of not less than 2 hours at the job site to instruct the maintenance personnel, correct any defects or deficiencies, demonstrate to the satisfaction of the Architect that the entire system is operating in a satisfactory manner and complies with all requirements of any other trades or subcontractors that may be required to complete the work.

C. Thirty days prior to this demonstration, the Contractor shall deliver to the Owner/Tenant/Architect three copies of Operating and Maintenance Manuals, including the following operating and maintenance material. Reviewed copy will be returned to the mechanical subcontractor for corrections as noted. All three copies to be corrected. Submit corrected copies to General Contractor for inclusion in Owner's maintenance manual per Division 1 and include the following:
   1. Format: Loose-leaf, 3-ring binder with index tabs for identifying system components, enclosure material size 8-1/2 x 11.

2. Copy of 1-year warranty and extended warranty (such as domestic water heaters, gas heat exchangers, and air conditioning and heat pump unit compressors), issued on equipment installed.
3. Manufacturer's description of each fixture and item of equipment actually installed on the job.
4. Provide list for each type of equipment and fixture, name and address of the nearest vendor with replacement parts.
5. Written equipment operating sequence and maintenance instructions for each item of equipment requiring inspection, lubrication or service, describing and scheduling the performance of such maintenance.
6. Valve list with valve size, location, normal positions and functions.
7. Copy of record drawings for plumbing; fire protection and HVAC systems.
8. Record wiring diagram for equipment and control system showing as-built conditions.
9. Neatly typed index at the front clearly identifying information in the binder. Provide emergency information (such as water main shut-off and drain valves), include procedure for protecting system from freezing during power failure.
10. Tag all valves with brass disc and chain. Use no duplicate numbers. Submit list for review by the Architect of valve numbers to be used prior to fabrication of discs.

3.08 ACCEPTANCE:

A. The system shall not be considered for acceptance until the contractor has completed his work and demonstrated to the representative of the Owner that installation is in strict compliance with specifications, drawings and manufacturer's installation instructions, particularly in reference to the following:
   1. Testing.
   2. Cleaning.
   3. System balancing and balancing logs.
   4. Instruction and operating manuals.
   5. Training of operating personnel.
   6. As-built drawings.
   7. Guarantee certificates.
   8. Start-up and test document.
   9. Letter of Conformance.

3.09 LETTER OF CONFORMANCE:

A. Mechanical subcontractor to forward letter and copies of extended warranties with a statement in the letter that all mechanical items were installed in accordance with the manufacturer's recommendations. If the manufacturer's recommendations for installation have not been followed, the Contractor shall so state give the reasons why and he shall warn the Architect of any condition which may impair the functioning of the apparatus or void the manufacturer's warranty. Include letter of conformance and warranties in operating and maintenance manuals.

3.10 SEISMIC RESTRAINTS:

A. Provide restraint for the water heater, and all other plumbing equipment shall be braced or anchored to resist a horizontal force acting in any direction.

B. Where anchorage details are not shown on the drawings, the field installation shall be subject to approval of the project structural engineer.

C. The seismic bracing and anchorage of equipment and piping shall be per “Guidelines for Seismic Restraints of Mechanical Systems” published by SMACNA and 2000 UMC Earthquake Design.

END OF
SECTION

SECTION 15050

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Basic materials and methods outline products and methods used for other sections of this Division.

B. All materials shall consist of current production, state of the art technology. Outdated equipment, materials or "old inventory" not allowed.

1.2 SUBMITTALS:

A.Provide letter listing manufacturers and model numbers for the following equipment and materials:

1. Piping materials.
2. Valves.
3. Strainers.
4. Pipe hangers.

B.Provide shop drawings for the following equipment and materials:

1. Backflow Preventor. PART 2 - PRODUCTS

2.1 PIPING MATERIALS.

A. Cast iron soil pipe: No-hub cast iron pipe conforming to ANSI Standard A-112.5.2 or cast iron pipe with compression-type gasket fittings. Fittings shall conform to Commercial Standard CS-188-66. Clamp-all, MG, Ideal or Anaco Husky (required below grade) and shall conform to the latest revision of ASTM C564.

B. ABS Pipe: Material Standard ASTM D2661-73, "Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Drain, Waste and Vent Pipe and Fittings" with Supplemental Standard IAPMO PS 17-71, published by the International Association of Plumbing and Mechanical Officials. Usage must be acceptable to local governing authority (above grade only).

C. Steel pipe: Schedule 40 pipe, black and galvanized. Size 4" and smaller conform to ASTM A120 and UMC 15-2. Size larger than 4" conform to ASTM A53. Fittings size 2" and smaller shall be screwed fittings. Welded fittings "black only" (larger than size 2") shall conform to ANSI B16.9. Black acceptable for chilled & hot water, steam and steam condensate. Galvanized acceptable for vent and storm piping.

D. Copper tube: Hard-drawn copper, Types K, L and M conforming to ANSI H23.1, "Mueller", "Reynolds", or "Anaconda". Fittings shall be wrought or forged copper solder joint fittings conforming to ANSI B16. Use Silvabrite 100 lead-free solder on domestic hot and cold water system.

2.2 VALVES:

A. General: Manufacturer not listed by name and model number requires prior acceptance before installation. Unless otherwise accepted, all like valve models shall be the same manufacturers, such as all Gates and Globe (Nibco) and etc. See valve schedule on drawings.

B.Gate valves:

1. Screwed bronze body: Jenkins #370, Nibco #124, Grinnell #3030.
2. Flanged iron body: Nibco Model 6170, Grinnell 6020.

C.Ball valves: Bronze body, Nibco or Flowset.

D. Globe valves:

1. Bronze body: Nibco Model T-235, Grinnell 3240.
2. Iron body: Grinnell 6200, Jenkins #613.

E. Check valves: Bronze body. Nibco T-413, Grinnell 3300 or Jenkins #92-A.

2.3 BACKFLOW PREVENTER:

A. Reduced Pressure Type (RPBP): Beeco, Grinnell, Febco, Neptune, Hersey, or equal code acceptable reduced pressure double check Backflow Preventor. Prior acceptance required for manufacturers not listed. Backflow Preventor installed inside building. Provide a 12 x 16 x 8 deep pan under backflow Preventor; drain with 1-1/2" drain to nearest floor drain. Required on domestic water make- up to hot water heating system and laboratory fittings.

2.4 WATER PRESSURE REGULATOR:

A. B & G #12, Armstrong RD50, McAlear, Spence, Cash Acme Type B, Thrush or equal.

2.5 STRAINERS:

A. Water systems: Y-pattern, 125 psi working pressure. Body material to match pipe material. Monel or brass strainer with minimum screening area 500% greater than pipe. Provide each strainer with cock for blow down. Crane, Sarco, Dunham-Bush, McAlear, Armstrong, Stockham, Hoffman, Mueller, Illinois Style B.

2.6 UNIONS:

A. Steel pipe union: 150 lbs. malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe as manufactured by
Walworth 7685, Crane, Grinnell, or acceptable equal.
B. Copper pipe union: 200 psi working pressure. Bronze body. Solder ends.
C. Insulating unions: 250 psi working pressure. Pipe ends and material to match piping. Electric current below 1% of galvanic current.Gasket material as recommended by manufacturer. EPCO, clear flow or acceptable substitution.

2.7 PIPE SLEEVES:

A. Minimum 20-gauge galvanized steel in concrete, 18 gauge in all other construction. Ample clearance around pipe for insulation, Adjusto-Crete or equal. Sleeve to extend 1" above floor.

2.8 ESCUTCHEONS:

A. Brass material, chrome plated finish. Sizes sufficient to cover all pipe openings thru wall, floor or ceiling. Set screw or spring to secure to pipe. B & C, Grinnell, Figure 13, Elcen, Crane or equal.

2.9 BUILDING PIPING PENETRATIONS:

A. Provide Thunderline Corp. Link Seal or acceptable equal at all outside wall penetrations.

2.10 FLASHING:

A. Where pipe, ducts and other work by the Contractor pass through the roof or exterior walls, the Contractor shall provide foam rubber insulation and caulk to provide a weatherproof installation.

2.11 PIPE HANGERS AND SUPPORTS:

A. General: Architects to review location before drilling in concrete, structural steel or wood for installation of hangers.
B. Pipe hanger for pipe size 3" and smaller: Adjustable malleable iron, split ring hanger, black, (UL listed for fire lines) Mason No. 199, Figure 239, Superstrut M7175 malleable, C710 clevis, Grinnell, Secur Strut and Hanger Co. or equal.
C. Pipe hanger for pipe larger than size 3” Adjustable steel clevis type hanger, black, UL listed. Fee and Mason No. 239 or 103, Superstrut #C710.

2.12 MOTORS:

A. Provide motors having starting and running characteristics consistent with torque and speed requirements of driven machinery. NEMA standard design "A" or "B". Tested in accordance with IEEE Std. 112, Method B, as defined by NEMA-1.23. Motors shall be of ample size to operate continuously at proper load and speed without causing noise, vibration or temperature rise in excess or rating. Minimum service factor shall be 1.15. Motor horsepower, without service factor, shall not exceed power requirements of driven equipment and drive loss. Motors shall be of sufficient size as to be non-overloading through entire capacity range of driven equipment.
B. Select motors 1/3 horsepower and smaller for 120 volts, single phase, 60-cycle operation. Provide capacitor start and run type, 40 degrees C continuous rise, open-drip-proof type with internal thermal protection.

C. Select motors 1/2 horsepower and larger for 208 volt, 3 phase, 60-cycle operation, or as noted on equipment schedule. Voltage must be verified with electrical contractor prior to ordering equipment.
D. Provide squirrel cage-type NEMA design B with "E" frame motors, low current inrush and normal starting torque quiet operating, 40 degrees continuous rise. Motors exposed to extremes of temperature shall be suitable for such service.
E. Provide internal overload protection on all single phase motors.
F. Bearing: Ball-type permanently lubricated, except in-line pumps specified with bronze sleeve bearings.
G. Manufacturer: Motors shall be Wagner, Reliance, General Electric Lincoln Century or US Motors. Each motor shall have the manufacturer's identifying nameplate permanently attached.

2.13 STARTERS:

A. Manufacturer: Allen Bradley, Cutler Hammer, Furnace, Square "D", or acceptable equal.
B. Provide surface-mounted, magnetic starter with reset button, Hand-Off-Auto switch in cover. Starters located on roof to be weatherproof construction.
C. Starters shall have thermal overload protective devices on all "line" legs. Size all overload heaters as recommended by motor or equipment manufacturer for service and location. Provide "hand-Off-Auto" switch at each starter for units controlled by time clocks, by-pass timers or wall switches per Section 15900. Provide 120-volt electric/magnetic coil in each starter, where motor is to be controlled from a wall switch.

2.14 GUARDS:

A. Provide guards over all rotation equipment. Guards to be in accordance with State code and OSHA requirements.

PART 3 - EXECUTION

3.1 PIPE AND PIPE FITTINGS:

A. General: Run all piping parallel to the building structure and support it sufficiently to prevent sagging. Install all piping where possible so as to vent and drain. Support all piping independently so that the equipment does not carry its weight.
B. Unions: Install unions in all non-flanged pipe connections to apparatus and adjacent to all screwed control valves, traps and appurtenances requiring removal for servicing, so located that piping may be disconnected without disturbing the general system. Provide dielectric couplings, unions or flanges between galvanized steel and copper pipe or tubing.
C. Screwed joints: Shall have the pipe ends reamed, dope or tape applied to male threads only, with the exception of brass to brass joints which shall be made with teflon tape only. After jointing, no more than two threads shall remain exposed.
D. Flanges: Shall be steel for screwed and welded piping. Gaskets shall be 1/16" thick, graphite or equal, ring type, coated with graphite and oil to facilitate making a tight joint.
E. Braze solder type joints: Canfield's lead free solder for domestic water and drains or on wrought copper fittings, applied in strict accordance with the manufacturer's recommendations. Clean copper tubing and fittings thoroughly with steel wool before applying the flux. Remove all copper tubing burrs, ream to full bore and true and round all joints. Apply heating uniformly to securepenetration of the rod, and leave a full bead around the entire circumference of the joint to show proper penetration and sealing. Under no circumstances will the softer solders be allowed.
F. No-hub cast iron pipe: Conform to Texas State Plumbing Laws or Cast Iron Soil Pipe Institute recommendations.

3.2 VALVES:

A. Install valves on each side of all equipment and where shown on drawings. Full size of pipe unless otherwise indicated. Provide neat appearance and easy grouping with all parts easily accessible. Valve stems shall be installed in horizontal or upright position only (no exceptions).
B. Valve application:

Service	Valve Type	Pressure Rating
Domestic Service	Gate*	125 psi

*On valves 1-1/4" and smaller, ball valves may be used.

3.3 PIPE SLEEVES:

A. General: Lay out work in advance of pouring concrete and furnish and set sleeves necessary. The cost of cutting or patching made necessary as a result of this operation shall be borne by the Contractor.
B. Wall sleeves: Exterior wall sleeves shall be cast iron, flush with wall on both sides. Sleeves shall be large enough to allow for caulking and made watertight. Caulking shall be from outside using oakum and lead or Thunderline Corp. Link Seal.
C. Floor sleeves: Provide sleeve on pipe passing through concrete floors. Extend sleeve one inch above finished floor. Caulk all pipes passing through concrete floor with Thunderline Corps. Link Seal.

3.4 STRAINERS:

A. Install where indicated on drawings. In mechanical rooms, provide blow off drain to floor drain or other acceptable location.

3.5 ESCUTCHEONS:

A. Install on all exposed pipes passing through walls or floors.

3.6 UNIONS:

A. Pipe unions: Install where indicated on drawings on each side of all pieces of equipment to permit easy removal of the equipment.
B. Insulating union: Place in piping systems where two dissimilar metals come in contact.
C. Provide stainless steel nipple at domestic hot water tank openings.

3.7 PIPE HANGERS AND SUPPORTS:

A. General: Provide adjustable hangers on all pipes, 3" and above ridged at hanger with sheet metal saddled, complete with adjusters, swivels, rods, etc. Size hangers to clear insulation and guides. On hot pipelines where expansion and contraction occurs, provide swivel joint at top or bottom of hanger rod. Provide hanger within three feet of all changes in direction. Branches 5 feet or longer shall have separate hanger.
B. Plumbers tape: Not permitted as pipe hangers.
C. Hangers and supports: All hangers and supports, unless otherwise noted on the drawings, shall be the following manufacturer and model:

Pipe ring hanger:	Elcen #89
Side beam clamp for wood joist:	Grinnell 202
Trapeze hanger :	Superstrut A1200
Vertical risers:	Grinnell 261
Pipe saddles :	Grinnell 167

D. Hanger spacing:

Pipe	Spacing
Cast Iron Soil Pipe	at each joint and at intervals not to
Copper Tubing 1-1/4" and smaller	5 feet
Copper Tubing 1-1/2" and larger	10 feet
Steel Pipe 1" and smaller	7 feet
Steel Pipe 1-1/4" and larger	10 feet

E. Hanger rods:

Pipe Sizes	Rod Size
1/2" to 2"	3/8"
2-1/2" to 3"	1/2"
4" and larger	5/8"

3.8 PIPE, EQUIPMENT AND VALVE IDENTIFICATION:

A. Equipment: Each new piece of equipment shall bear a permanently attached, plastic engraved identification plate listing the name and equipment number, such as "supply fan SF-1"; submit listing for acceptance before plates are made, Seton or equal.
B. Pipe markers: Each piping system shall be provided with color-coded pipe markers in plain block letters, Quick-Apply or equal.
Letters 1" high for pipe size through 4" and 1-1/4" high for pipe sizes over 4". Lettering shall be positioned so that it can be easily read from the floor, with a minimum of one per room, at each shut off valve, and at 25' on center. Lettering on paralleled groups of pipes, etc. shall be neatly lined up. Wording of markers shall show direction of flow and correspond to the equipment designations used in piping legend and reviewed by the Architect. Pipe markers are required in mechanical spaces and above accessible ceilings. No lettering required above inaccessible ceilings and in walls. Label all new and existing piping in remodeled areas, Seton or equal.

System and Legend	Color	Backgrounds	Letter
Domestic Cold Water	Selected*	Green	Black
Domestic Hot Water	Selected*	Yellow	Black
Domestic Hot Water Return	Selected*	Yellow	Black
Storm Drain	Selected*	Green	Black
Sanitary Sewers	Selected*	Green	Black
Vent	Selected*	Green	Black

* "Selected" piping color is color as selected to match the area.

C. Valve tag: Tag all valves with 3/4" brass disc and chain. Start with next successive number from existing valve charts. Use no duplicate numbers in mechanical systems. Tags manufactured by F. R. Inskipt Company. Mechanical tag system by C. H. Hanson, Seton or acceptable equal.
D. Valve directory: Submit in duplicate for review by the Architect, listing all numbered valves, size, location, normal position and function. After acceptance, put one copy in each maintenance manual.

3.9 CUTTING AND PATCHING:

A. Cutting and patching performed by the General Contractor and included in his bid shall include but not be limited to:
    1. Saw cutting of existing concrete and/or masonry walls.
    2. Saw cutting of existing roof deck.
    3. Patching concrete floors.
    4. Casework counter top openings.
B. Cutting and patching performed by the Mechanical Contractor and included in his bid shall include but not be limited to:
    1. Saw cutting and trenching new and existing concrete floors.
    2. Cutting and patching of new or existing interior gypsum board and or plaster/partitions.
    3. Cutting and trimming openings in case work for installation or connection of plumbing fixtures. The casework supplier shall cut countertop openings for sinks.
    4. Cutting and patching of finish ceilings.
C. Cutting and patching shall be performed by skilled craftsmen in the trade of the work to be performed. Holes, which are cut oversize in complete work, shall be filled back in. Refinishing shall match existing adjacent finish and shall be acceptable to the Architect.

D. When masonry or concrete construction must be penetrated, furnish and install a steel pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish. Provide escutcheons. If sleeves are not provided, core drill all penetrations.
E. Locate all concealed utilities to eliminate any possible service interruption or damage. F. No extra will be allowed for lack of proper coordination.

3.10 PAINTING:

A. Ferrous metal: After completion of mechanical work, all exposed ferrous metal surfaces outside, in mechanical rooms, such as hangers, hanger rods, equipment stands, traps, pipes, valves, unions, flanges, etc., shall be thoroughly cleaned and painted with one coat primer and one coat of black asphalt varnish or black enamel suitable for hot surfaces.
B. Fabricated steel: All damage to structural steel finishes or the finishes of any other trades damaged by cutting, welding or patching shall be repaired to match original. Work shall be in accordance with Division 9.
C. Exposed piping: Exposed piping in finished spaces (other than mechanical room) to be painted under Painting Work, Division 9.
Exposed piping in mechanical rooms to be painted by mechanical contractor per Item A above. Insulated pipe not painted.
D. Sheet metal duct work: All exposed duct work (except in mechanical room) primed and painted as specified in Section - Painting. E. Paint inside of all ducts visible through grilles and registers with a flat black enamel; see Section 15800.
F. All equipment enclosures, condensing units, air-conditioning units, fans, fan units, and similar manufactured items shall be given one coat of suitable protective priming paint. Such equipment as is normally furnishedwith acceptable finish as the manufacturer's standard need not be additionally painted except all damaged paint surfaces shall be touched up to match existing. All new roof-mounted supply fans to be prime coat and enamel painted by manufacturer.

3.11 CUTTING STRUCTURAL MEMBERS AND FRAMING:

A. Not permitted unless shown on drawings or acceptable in writing by the Architect. Where cutting or core drilling is permitted, reasonable care is to be taken to verify and avoid conduit and piping locations within the cutting area.

3.12 ACCESSIBILITY:

A. General: The installation of valves, shock absorbers, thermometers, cleanout fittings, dampers, damper motors, and other specialties requiring frequent reading, adjusting, inspection, repairing, removal or replacement shall be conveniently and accessibly located with reference to the finished building. Thermometers and gauges shall be installed so as to be easily read.
B. Furnish access panels for location where indicated and where required to provide access to valves and other appurtenances. Doors shall be 22" x 22" non-rated and 24" x 24" rated walls and ceilings sizes unless indicated or accepted otherwise. Trades installing the wall or ceiling shall make installation. Inland Steel Products, Milcor Model DW, Elmdor, or fire-rated type for installation in fire- rated walls and ceilings.
    1. For use with plastered or drywall ceilings - Style "B".
    2. For use with plastered drywall or tiled walls - Style "K".
    3. Where access panels are to be used in conjunction with acoustical tile ceilings or plastered drywall and/or tiled walls, panels are to be designed for the thickness of the adjacent material used as well as its fire rating.
    4. Access panels are to be furnished with continuous hinges, flush tamper-proof metal cam locks and painted with factory-primed coat of white, rust-inhibitive paint.

3.13 WIRING:

A. General: Wiring within equipment shall be U.L. accepted and in accordance with the requirements of the NEC. Wiring external to equipment provided in accordance with Section 15910 and Division 16.

B. Connection wiring: Line side power wiring up to equipment terminals shall be by electrical sub-contractor per Division 16. Load side wiring within equipment shall be by equipment manufacturer or supplier.
C. Equipment disconnects provided by electrical subcontractor per Division 16.
D. Starters and motor speed controller: Starters provided by electrical sub-contractor per Division 16. Motor speed controller provided by equipment supplier per Section 15050 and mounted by electrical subcontractor. All motor speed controllers to be of the same manufacturer (no exceptions). Power wiring connections by electrical subcontractor per Division 16 and control wiring by control subcontractor per Section 15900. See equipment schedule for new and existing motors.
E. Control wiring for mechanical equipment shall be furnished under Section 15910, Controls, for:
1. Automatic temperature control wiring.
2. Equipment control wiring.
3. Interlock wiring.
F. Wherever possible, all interconnect wiring within or on a piece of equipment shall be ordered with the equipment, unless shown or specified otherwise. An electrician licensed to perform the type of work shall perform all field wiring.
G. Motor protection: Provide properly rated motor overload and under voltage protection and all manual or automatic motor operating device for all mechanical equipment.

3.14 CLEANING:
A. Cleaning per Sections 15450, 15650, and 15800.

3.15 EQUIPMENT PROTECTION:
A. Keep all pipe openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect all piping; duct work, fixtures, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Keep all motors and bearings in a watertight, dustproof cover during installation. Any such fixture, equipment or apparatus damaged prior to final acceptance of the work shall be restored to its original condition or replaced by the Contractor at no additional cost to the Owner.
B. Protect all bright finished shafts, bearing housings, and similar items until in service; no rust will be permitted.
C. Equipment and materials stored on the job site shall be protected from the weather covered or otherwise suitably protected at the direction of, and to the satisfaction of the Architect. If coverings become torn, they shall be replaced until the equipment is connected and operating.

3.16 LOCATION AND POSITIONING EQUIPMENT:
A. Observe all safety codes and regulations and good common practice in locating and installing mechanical equipment and material so that complete installation presents the least possible hazard. Maintain adequate clearances for repair and service to all equipment. Installation of any equipment with less than minimum clearances will not be accepted.

END OF SECTION

SECTION 15250

MECHANICAL INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Provide all labor, material, equipment and services necessary for the installation of thermal and acoustical insulation for piping and ductwork, as shown on the drawings or specified herein.

B. Do not damage or attempt to remove any material suspected of containing asbestos. In the event insulated piping and/or sprayed or toweled-on fireproofing, sprayed acoustical material and similar materials are uncovered during cutting and patching operation, notify the Architect immediately.
Do not proceed with the work in such areas until so instructed by the Architect. See Division 1.

C. RELATED WORK SPECIFIED ELSEWHERE:
1. General Provisions, Section 15010.
2. Pipe Supports Basic Materials and Methods, Section 15050.

D. DESCRIPTION:
1. Description of system: Insulation required for this work includes, but is not necessarily limited to:

E. Domestics cold and hot water and storm piping.

F. Supply ductwork.

G. Return and exhaust ductwork.

1.02 QUALITY ASSURANCE:

A. Quality of workmanship: Use sufficient journeyman insulators and supervisors in the execution of this portion of the work to insure proper and adequate installation of insulation throughout.

1.03 SUBMITTALS:

A. Submittals shall include, but not be limited to:
B. Data to show compliance with flame and smoke rating
C. Product data.
1. Manufacturers' recommended installation data.

1.04 PRODUCT HANDLING:

A. Protection: Use all means necessary to protect insulation materials before, during, and after installation.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary.

1.05 FIRE HAZARD CLASSIFICATIONS:

A. Insulation materials shall have composite fire and smoke hazard ratings as tested by procedures indicated in NFPA 255 and UL 723, not to exceed a flame spread index of 25 and a smoke developed index of 50.

B. Accessories such as adhesives, cement, etc., shall be provided with a component rating as listed above.

C. Products or their shipping cartons shall have identification of the flame spread and smoke developed index.

1.06 CODE COMPLIANCE:

A. Insulation materials and insulation thickness specified does not relieve contractor from compliance with Texas State Energy Code.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Armstrong, Schuller International Inc., Owens Corning, Certain-Teed, Saint Gobain, Pittsburgh Corning, Knauf, or acceptable equal.

B. PIPING INSULATION - ABOVE GRADE:

1. Fiberglass sectional pipe insulation: Thermal conductivity of 0.24 BTU-in per sq. ft. per hour at 75 F mean temperature. Minimum density of 3.5 lbs. per cubic foot. Jacketed with white barrier laminated of aluminum foil and white Kraft-reinforced with glass fiber strands. Jacket shall have factory-supplied, self-sealing lap.
2. Insulation covers for pipe fittings and pipe: PVC-preformed, molded insulation covers. Zeston Ceel-Co "Ceel-Tite 1000 Series" or acceptable equal.
3. Foam rubber pipe insulation: Armaflex, Aerotube or Ultrafoam thermal conductivity of 0.25 at 75 degrees F. (for use within walls or above ceilings only). Obtain fire marshal's acceptance on product to be installed.
4. Rigid phenolic foam sectional pipe insulation: Continuously-molded, chemically neutral, rigid phenolic foam with thermal conductivity of 0.23 BTU-in. per sq. ft. per hour at 75 degrees F mean temperature with factory-applied, vapor-barrier jacket (for use within walls only).

2.02 DUCT INSULATION:

A. General: All duct insulation to be U. L. labeled for use intended. U. L. Class 1 with fire hazard classifications per 1.5.

B. Fiberglass duct wrap: Thermal conductivity of 0.32 BTU-in per sq. ft. per hour at 75F mean temperature. Minimum density of 0.6 lb. per cu. ft. Factory-applied, flame-retardant, foil-reinforced Kraft vapor barrier.

C. Acoustical duct liner: Thermal conductivity for 1" liner of 0.26 BTU-in per sq. ft. per hour at 75 F mean temperature. Minimum density of 1.5 lbs. cu. ft. shown shaded on drawings. Based on a No. 6 mounting in accordance with test method. ASTM-C-423 liner shall have sound absorption coefficients as follows:

1. Thickness Sound Absorption Coefficients at frequencies of:

2.	Frequencies	125	250	500	1000	2000	4000
3.	1-inch	. 23	. 54	. 65	. 83	. 70	. 86

D. PIPE HANGERS AND SUPPORTS:
   1. See Section 15050, Part 3.

PART 3 - EXECUTION

3.01 INSULATION THICKNESS:

A. General: Insulation shall be applied in strict accordance with the manufacturer's recommendations. Foam rubber and rigid phenolic foam for use within walls and above Sheetrock ceilings only.

B. Above Grade:
   1. Domestic cold water and storm pipe (above grade and inside building, overflow drainpipe not insulated): Cover with 1" fiberglass sectional pipe cover or 1/2" foam rubber to control condensation. Contractor's option: Concealed storm pipe 1-1/2" foil face blanket fiberglass 1 lb. /cu. ft.
   2. Domestic hot water pipe: Cover with 1" fiberglass sectional pipe through 2" and 1-1/2" thick on pipe size 2-1/2" and larger.
   3. Supply ducts: Cover with 1-1/2" duct wrap or 1" fiberglass duct except where noted on the drawing for duct to be lined. Fiberglass ductwork not acceptable on this project.
   4. Lined ducts: Line with 1" acoustical duct liner as noted or shaded on the drawings and per Section 15200. Lined duct and plenums to be sheetmetal, fiberglass duct not acceptable.
   5. Return and exhaust ducts: Insulate return duct above ceiling in attic and in crawl space with 1-1/2" duct wrap; however, return and exhaust ducts lined where noted on the drawings. Exhaust duct not insulated except where noted to be lined.
   6. Exposed supply and return ducts: Not insulated except where noted to be lined.
   7. Handicap lavatories: Cover P-trap and hot water supply with 3/8" minimum foam rubber insulation.

C. INSTALLATION:
   1. Insulation shall be continuous through walls, floors, partitions, except where noted otherwise.
   2. Fiberglass sectional pipe insulation: Apply insulation to pipe and seal with self-sealing lap.
      Use self-butt strips to seal butt joints. Insulate all fittings, valves, and unions with single or multiple layers of insulation and cover to match pipe or use pre-formed, PVC-molded insulation covers or Gasco "humped aluminum elbow covers". Domestic hot water only, valve bodies and unions not insulated.
   3. Foam rubber pipe insulation: Install in strict accordance per manufacturer's recommendations.
   4. Phenolic foam sectional pipe insulation (for use within walls only): For pipe service temperatures below 50 degrees F, including dual-temperature lines, the vapor-barrier jacket laps are to be sealed with one of these methods: Accotherm Lap-Seal tape, Armstrong 520 contact adhesive, or conventional

Lab-Seal adhesive. For pipe service temperatures above 50 degrees F, secure jacket laps with outward-clinching staples positioned approximately 3" apart. Insulate fittings with mitered sections of Accotherm, or with the same methods specified under "Fiberglass Sectional Pipe Insulation."

5. Optional: Insulate fittings with insulating cement to the thickness on adjacent piping. Trowel the coat to a smooth, even finish. Then cover the fittings with 8 oz. canvas and "Arabol Lagging Adhesive" on exposed fittings. On concealed fittings, cover cement with crinoline cloth while cement is wet, smoothing the surface and sealing the cloth with the hand. Upon completion of insulating, finish all exposed jacketing with 2 coats of white paint or Gasco "humped aluminum elbow covers".
6. Duct wrap: Cover supply and outside air ducts except ducts internally lined or fiberglass duct (see thickness above) and where noted on the drawings not to insulate. Wrap tightly with all circumferential joints butted and longitudinal joints overlapped minimum of two inches. Adhere insulation with self-sealing laps on longitudinal and circumferential laps.

END OF
SECTION

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Provide all labor, materials, equipment and services necessary to furnish and install a complete plumbing system as shown on the drawings and specified herein. The work includes, but is not necessarily limited to:

1. Soil, waste and vent piping, including cleanouts and drains.
2. Domestic cold water piping, including thermal insulation, rough in and connection to existing service and thermal insulation for piping.
3. Domestic hot water piping, including rough in and connection to existing service and thermal insulation for piping.
4. Plumbing fixtures and trim, including all rims (Hudee type) for sinks and lavatories in casework or counters, chair carriers (as required), drinking fountain, drains, cleanouts, floor sinks, and related fixtures shown on the Drawings.
5. Trap primers, water hammer arrestors, expansion tanks, oil/sand seperators, grit tanks, and sample wells.
6. Condensate drain and water piping system for mechanical equipment.
7. Rough-in and final connection to equipment and fixtures relocated or provided under other sections by the Owner and under other divisions of the work.
8. Testing, balancing and adjusting of all equipment, piping and automatic valves.
9. Pipe markers and identification of piping and equipment
10. Flashing and counter-flashing of roof and wall penetrations required by installation of work of this section.
11. Furnishing and installation of access doors required for work furnished by this section.
12. Instructions and maintenance manuals for equipment furnished by this section.
13. Re-route, install new, remove existing, reconnect existing utility services to be affected by site work and new construction.
14. All stands and supports for equipment requiring them.
15. Furnishing and installing of all sleeves, inserts and anchorage required for the installation, which are embedded in work of other trades. All piping in concrete shall be sleeved, wrapped and sealed.
16. Project record documents.

1.2 WORK INCLUDED BUT SPECIFIED ELSEWHERE:

A. Mechanical General Provisions, Section 15010.
B. Basic Materials and Methods, Pipe Supports, Section 15050.
C. Mechanical Insulation, Section 15250.
D. Rough-in and final connection to fixtures, drains and cleanouts, Section 15450.

1.3 SUBMITTALS:

A. Provide shop drawings or product data for:
   1. Piping material; forward a letter listing material to be used.
   2. Valves.

B. Record Drawings: Prepare and submit record drawings per Section 15010 with special attention to locating each pipe, valve, fixtures, and other plumbing items precisely to scale and listing all invert elevations, rate of fall, and other pertinent data.

1.4 PRODUCT HANDLING:

A. Protection: Use all means necessary to protect plumbing materials before, during, and after installation.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Architect and at no additional cost to the Owner.

1.5 JOB CONDITIONS:

A. Review Architectural and Plumbing Drawings and comply with fixture locations and details affecting plumbing work.

B. Coordinate works with work of other trades to avoid conflict.

C. Protection: Keep pipe openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping and fixtures, against dirty water, chemical or mechanical damage both before and after installation.

1.6 WARRANTIES:

A. One-year warranty per Section 15010.

B. Water Heater: Manufacturer standard five-year warranty. PART 2 - PRODUCTS

2.1 MATERIALS:

A. Piping:

1. Piping quality per Section 15050, Basic Materials and Methods.
2. Galvanized steel pipe: Schedule 40, waste, vent and storm above grade, or DWV copper, where accepted by governing authority.
3. Cast Iron Soil Pipe: No-hub; waste, vent and storm piping to five feet outside building lines.
4. Copper pipe: Domestic cold and hot water, Type K below grade and Type L above grade with lead-free Allstate or Duzall flux solder. Contractors option where Code approved, PEX piping, Wirsbo or approved equal. Provide a minimum separation of 1-inch between hot and cold PEX piping.
5. PVC Pipe: Sanitary vent piping where approved by local Code. B. Piping insulation: See Section 15250.

B. Air Chamber: Not acceptable on this project. See shock absorbers.

C. Shock Absorbers: Acceptable manufacturers are Zurn, Wade, Smith, Josam or Precision Plumbing Products, Inc. Provide 1/2" or as recommended by Plumbing and Drainage Institute Standard WH201.

D. Traps: Provide (17 gauge above grade and cast iron traps below grade) traps on fixtures connected to the sanitary system except for fixtures having integral traps, seal at least 2" but not more than 4".

E. Valves: See Section 15050, Basic Materials and Methods, for valves inside building.

F. Flashing: Flash openings in roof with 4-lb. sheet lead in one piece. Contractor's option: "Semco" #1100-2, Chloraloy Nobleflex or Stoneman.

G. Escutcheons: Brass, chrome plated.

H. Exposed Piping and Tubing: Red brass, chrome plated. J. Unions: See Section 15050.

2.2 ALL OTHER MATERIALS:

A. All other materials not specifically described but required for a complete and operating facility shall be new, first quality of their respective kinds, and subject to the acceptance by the Architect.

PART 3 - EXECUTION

3.1 WORK INCLUDED BUT REIMBURSED BY OWNER: A. See Section 15010.

3.2 INSTALLATION:

A. General: Do not cover up or enclose work until it has been properly and completely inspected and accepted by the governing authority. Should any of the work be covered up or enclosed prior to all required inspections and acceptances, uncover the work as required and, after it has been completely inspected and accepted, make all repairs and replacements with such materials as are necessary to the acceptance of the Governing Authority and acceptance by the Architect and at no additional cost to the owner. Provide hangers per Section 15050 and support piping per Uniform Mechanical Code.

B. Waste: Connect to available public sewer. Verify depth, size and location before starting work.

C. Storm Drain: Route as indicated on the Drawings. Verify location and elevation before starting work.

D. Water: Connect five feet outside building as shown on the drawings. Bury water pipe outside building minimum of 24" and 12" inside building.

E. Flashing: Extend 18" from center of drawings or pipes under roofing or siding in all directions. Extend upper edge at least 12" above roof turned over and down into vent or sleeve for at least 1".

F. Structural Members: Cut center of steel studs as required for mechanical installation, being careful not to cut edges. Cut wood studs as required for mechanical installation, being careful to leave 1/2" edges. Do not cut or drill beams, girders, joists (review limitation with joist manufacturer on cutting plywood web), or similar structural members except as accepted in writing by the manufacturer or Architect.

G. Layout: Lay out the piping systems in careful coordination with the Drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system. Follow the general layout shown on the Drawings in all cases except where other work may interfere. Lay out all pipes to fall within partition, ceiling, or roof cavities and to not require furring other than that shown on the Drawings. Complete installation to present a neat orderly appearance. Do not block opening or passageways with piping. Run piping parallel to wall of building unless otherwise indicated. Keep piping free from contact with structure or installed equipment. Provide hangers to support weight of pipe and contents. Grade drain piping 1/4" per foot.

H. Excavation and backfill inside building lines: Each trade shall do all excavation required for his underground piping services, and equipment, and subsequent backfilling. See Section 15050, Cutting and Patching. Dig trenches straight and true to line and grade, with bottom of trench free from rock points and with pipe cushion consisting either of undisturbed natural soil or compacted fine sand. Provide a minimum depth of 12" cover below finished grade wherever conditions will permit. Where field conditions require variation from these minimums, secure acceptance by the Architect before proceeding with the variance. All such variances shall be performed at no additional cost to the Owner. Backfill promptly upon receipt of all necessary acceptances, using sand compacted in 8" layers. All fill material shall be free from 2" and larger rocks, large clods, roots, and other foreign substances and shall be compacted in 8" layers per Division 2. Remove all excess excavated trench material from the site or dispose of it as directed by the Architect. Jetting will not be permitted. Rain drain and waste piping to be placed on class "B" crushed rock bedding and backfilled through the pipe zone (to above top of pipe) with 1-1/2" crushed rock. Provide shoring, sheeting and/or bracing of trenches whenever necessary to prevent caving. Provide and maintain ample means and equipment to remove water entering the trench during placement of pipe and backfilling.

I. Each Contractor shall provide all barricades and warning signs that are required or reasonably necessary to prevent accidents or injury to workmen or others on the job site, or damage to property. See Section 15010, Safety.

J. Valves:
   1. Provide valves per Section 15050 at equipment and on branch pipe connections to mains. Install valves in accessible locations.
   2. Provide valve at hot and cold-water connection to hot water heater.
   3. Provide valves for draining entire domestic water system.

K. Vents: Install vents in sanitary drainage system with flashing as specified.

L. Trap Primers: See Section 15450; provide primer on each floor drain and hub drain per code.

M. Waste System Drainage: Install new waste piping and connect to existing piping. New piping shall be installed to drain with existing waste piping system.

3.3 TESTS:

A. Testing:
   1. Test piping systems per State of Texas Plumbing Code, (2000 UPC) before concealing, insulating or backfilling over any piping.
      Provide 48 hours advance notice of test to Architect. Disconnect equipment and devices, which may be damaged by test pressure. Plug or cap lines for testing.
      Test entire systems to the satisfaction of the governing authority.
   2. Test equipment: Furnish all test pumps, gauges, equipment and personnel required and test as necessary to demonstrate the integrity of the finished plumbing installation to the acceptance of governing authorities.
   3. Test system for leaks:

Domestic system: 100-psi water for 6 hours.
Drainage system: 10 foot static pressure of water on highest joint for two hours, or during freezing conditions test 5 psi air pressure for 24 hours.

B. Re-test below grade piping after backfilling and before concrete slab has cured. Repair all leaks that develop during backfilling and re-test.

C. Valves: Test all valve bonnets for tightness. Test operates all valves at least once from closed-to-open-to-closed position while valve is under test pressure. Test all automatic valves for proper operation at the settings indicated. Test pressure relief valves at least three times and replace if fails to re-seat properly.

3.4 STERILIZATION OF DOMESTIC WATER PIPES:

A. Clean water systems as required by Texas State Board of Health.

1. After preliminary purging of the system, chlorinate the entire potable water system in accordance with American Water Works Association procedures AWWA-C 601.54 for flushing and disinfecting water mains, and in accordance with all other pertinent codes and regulations.
2. Upon completion of the sterilization, thoroughly flush the entire potable water system.
3. When sterilization is complete, arrange with the pertinent authorities to collect test samples for bacteriological analysis.
4. Chlorinate only when the building is unoccupied and valve off tight from existing system.
5. Deliver reports of analysis to the Architect.

3.5 SHOCK ABSORBER SCHEDULE:

A. See Drawings for Shock Absorber Schedule.

3.6 CLEANING UP:

A. Prior to acceptance, thoroughly clean exposed portions of the plumbing installation, including work of Section 15450, removing labels and traces of foreign substances and using only a cleaning solution acceptable to the manufacturer of the plumbing item and being careful to avoid damage to finished surfaces.

END OF SECTION

SECTION 15450

PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Provide all labor, materials, equipment and services necessary to furnish and install a complete plumbing system as shown on the
Drawings and specified herein. The work includes, but is not necessarily limited to:

1. Soil, waste and vent piping, including cleanouts and drains.
2. Domestic cold water piping, including thermal insulation, rough in and connection to existing service and thermal insulation for piping.
3. Domestic hot water piping, including rough in and connection to existing service and thermal insulation for piping.
4. Plumbing fixtures and trim, including all rims (Hudee type) for sinks and lavatories in casework or counters, chair carriers (as required), drinking fountain, drains, cleanouts, floor sinks, and related fixtures shown on the Drawings.
5. Condensate drain and water piping system for mechanical equipment.
6. Rough-in and final connection to equipment and fixtures relocated or provided under other sections by the Owner and under other divisions of the work.
7. Testing, balancing and adjusting of all equipment, piping and automatic valves.
8. Pipe markers and identification of piping and equipment
9. Flashing and counter-flashing of roof and wall penetrations required by installation of work of this section.
10. Furnishing and installation of access doors required for work furnished by this section.
11. Instructions and maintenance manuals for equipment furnished by this section.
12. Re-route, install new, remove existing, and reconnect existing utility services to be affected by site work and new construction.
13. All stands and supports for equipment requiring them.
14. Furnishing and installing of all sleeves, inserts and anchorage required for the installation, which are embedded in work of other trades. All piping in concrete shall be sleeved, wrapped and sealed.
15. Project record documents.

1.2 WORK INCLUDED BUT SPECIFIED ELSEWHERE:

A. Mechanical General Provisions, Section 15010.
B. Basic Materials and Methods, Pipe Supports, Section 15050.
C. Mechanical Insulation, Section 15250.
D. Rough-in and final connection to fixtures, drains and cleanouts, Section 15450.

1.3 SUBMITTALS:

A. Provide shop drawings or product data in accordance with Section 01340 for:
    1. Piping material; forward a letter listing material to be used.
    2. Valves.
B. Record Drawings: Prepare and submit record drawings per Section 15010 with special attention to locating each pipe, valve, fixtures, and other plumbing items precisely to scale and listing all invert elevations, rate of fall, and other pertinent data.

1.4 PRODUCT HANDLING:

A. Protection: Use all means necessary to protect plumbing materials before, during, and after installation. B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Architect and at no additional cost to the Owner.

1.5 JOB CONDITIONS:

A. Review Architectural and Plumbing Drawings and comply with fixture locations and details affecting plumbing work.

B. Coordinate works with work of other trades to avoid conflict.

C. Protection: Keep pipe openings closed by means of plugs or caps to prevent the entrance of foreign matter.

Protect piping and fixtures, against dirty water, chemical or mechanical damage both before and after installation.

1.6 WARRANTIES:

A. One-year warranty per Section 15010. PART 2 - PRODUCTS

2.1 MATERIALS:

A. Piping:

1. Piping quality per Sections 15050 and 15400.

B. Piping insulation: See Section 15250.

C. Air Chamber: Not acceptable on this project. See shock absorbers.

D. Shock Absorbers: Acceptable manufacturers are Zurn, Wade, Smith, Josam or Precision Plumbing Products, Inc. Provide 1/2" or as recommended by Plumbing and Drainage Institute Standard WH201.

E. Traps: Provide (17 gauge above grade and cast iron traps below grade) traps on fixtures connected to the sanitary system except for fixtures having integral traps, seal at least 2" but not more than 4".

F. Valves: See Section 15050, Basic Materials and Methods, for valves inside building.

G. Flashing: Flash openings in roof with 4-lb. sheet lead in one piece. Contractor's option: "Semco" #1100-2, Chloraloy, Nobleflex or Stoneman.

H. Escutcheons: Brass, chrome plated.

I. Exposed Piping and Tubing: Red brass, chrome plated. J. Unions: See Section l5050.

2.2 ALL OTHER MATERIALS:

A. All other materials not specifically described but required for a complete and operating facility shall be new, first quality of their respective kinds, and subject to the acceptance by the Architect.

PART 3 - EXECUTION

3.1 WORK INCLUDED BUT REIMBURSED BY OWNER: A. See Section 15010.

3.2 INSTALLATION:

A. General: Do not cover up or enclose work until it has been properly and completely inspected and accepted by the governing authority. Should any of the work be covered up or enclosed prior to all required inspections and acceptances, uncover the work as required and, after it has been completely inspected and accepted, make all repairs and replacements with such materials as are necessary to the acceptance of the Governing Authority and acceptance by the Architect and at no additional cost to the owner. Provide hangers per Section 15050 and support piping per Uniform Plumbing and Mechanical Code.

B. Waste: Connect to available public sewer. Verify depth, size and location before starting work.

C. Storm Drain: Route as indicated on the Drawings. Verify location and elevation before starting work.

D. Water: Coordinate water location and installation of connection to main with the serving utility. Verify conditions and connection point before starting work. Bury water pipe outside building minimum of 24" and 12" inside building.

E. Flashing: Extend 18" from center of drawings or pipes under roofing or siding in all directions. Extend upper edge at least 12" above roof turned over and down into vent or sleeve for at least 1".

F. Structural Members: Cut center of steel studs as required for mechanical installation, being careful not to cut edges. Cut wood studs as required for mechanical installation, being careful to leave 1/2" edges. Do not cut or drill beams, girders, joists (review limitation with joist manufacturer on cutting plywood web), or similar structural members except as accepted in writing by the manufacturer or Architect.

G. Layout: Lay out the piping systems in careful coordination with the Drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system. Follow the general layout shown on the Drawings in all cases except where other work may interfere. Lay out all pipes to fall within partition, ceiling, or roof cavities and to not require furring other than that shown on the Drawings. Complete installation to present a neat orderly appearance. Do not block opening or passageways with piping. Run piping parallel to wall of building unless otherwise indicated. Keep piping free from contact with structure or installed equipment. Provide hangers to support weight of pipe and contents. Grade drain piping 1/4" per foot.

H. Excavation and backfill inside building lines: Each trade shall do all excavation required for his underground piping services, and equipment, and subsequent backfilling. See Section 15050, Cutting and Patching. Dig trenches straight and true to line and grade, with bottom of trench free from rock points and with pipe cushion consisting either of undisturbed natural soil or compacted fine sand. Provide a minimum depth of 12" cover below finished grade wherever conditions will permit. Where field conditions require variation from these minimums, secure acceptance by the Architect before proceeding with the variance. All such variances shall be performed at no additional cost to the Owner. Backfill promptly upon receipt of all necessary acceptances, using sand compacted in 8" layers. All fill material shall be free from 2" and larger rocks, large clods, roots, and other foreign substances and shall be compacted in 8" layers per Division 2. Remove all excess excavated trench material from the site or dispose of it as directed by the Architect. Jetting will not be permitted. Rain drain and waste piping to be placed on class "B" crushed rock bedding and backfilled through the pipe zone (to above top of pipe) with 1-1/2" crushed rock. Provide shoring, sheeting and/or bracing of trenches whenever necessary to prevent caving. Provide and maintain ample means and equipment to remove water entering the trench during placement of pipe and backfilling.

I. Excavation and backfill under concrete or paved areas: Same as above except all trench backfill shall be crushed rock or sand filled in 8" lifts and compacted per Section 02200.

J. Each Contractor shall provide all barricades and warning signs that are required or reasonably necessary to prevent accidents or injury to workmen or others on the job site, or damage to property. See Section 15010, Safety.

K. Valves:
   1. Provide valves per Section 15050 at equipment and on branch pipe connections to mains. Install valves in accessible locations.
   2. Provide valve at hot and cold-water connection to hot water heater.
   3. Provide valves for draining entire domestic water system.

L. Vents: Install vents in sanitary drainage system with flashing as specified.

M. Trap Primers: See Section 15450; provide primer on each floor drain and hub drain per code.

3.3 TESTS:

A. Testing:
   1. Test piping systems per State of Texas Code, (2000 UPC) before concealing, insulating or backfilling over any piping. Provide 48 hours advance notice of test to Architect. Disconnect equipment and devices, which may be damaged by test pressure. Plug or cap lines for testing. Test entire systems to the satisfaction of the governing authority.

2. Test equipment: Furnish all test pumps, gauges, equipment and personnel required and test as necessary to demonstrate the integrity of the finished plumbing installation to the acceptance of governing authorities.
3. Test system for leaks:
   Domestic system: 100-psi water for 6 hours.
   Drainage system: 10 foot static pressure of water on highest joint for two hours, or during freezing conditions test 5 psi air pressure for 24 hours.

B. Re-test below grade piping after backfilling and before concrete slab has cured. Repair all leaks that develop during backfilling and re-test.

C. Valves: Test all valve bonnets for tightness. Test operates all valves at least once from closed-to-open-to-closed position while valve is under test pressure. Test all automatic valves for proper operation at the settings indicated. Test pressure relief valves at least three times and replace if fails to re-seat properly.

3.4 STERILIZATION OF DOMESTIC WATER PIPES:

A. Clean water systems as required by Texas State Board of Health.
1. After preliminary purging of the system, chlorinate the entire potable water system in accordance with American Water Works Association procedures AWWA-C 601.54 for flushing and disinfecting water mains, and in accordance with all other pertinent codes and regulations.
2. Upon completion of the sterilization, thoroughly flush the entire potable water system.
3. When sterilization is complete, arrange with the pertinent authorities to collect test samples for bacteriological analysis.
4. Chlorinate only when the building is unoccupied and valve off tight from existing system.
5. Deliver reports of analysis to the Architect.

3.5 SHOCK ABSORBER SCHEDULE:

A. See Drawings for Shock Absorber Schedule.

3.6 CLEANING UP:

A. Prior to acceptance, thoroughly clean exposed portions of the plumbing installation, including work of Section 15450, removing labels and traces of foreign substances and using only a cleaning solution acceptable to the manufacturer of the plumbing item and being careful to avoid damage to finished surfaces.

END OF SECTION

SECTION 15630

HEATING-COOLING EQUIPMENT

PART 1 - GENERAL

1.1 START-UP AND TEST:

A. All air-conditioning equipment shall be installed per manufacturer's recommendation and started and checked by the manufacturer's factory-trained service personnel. Any problems arising with the equipment shall be corrected by the manufacturer. The factory-trained service personnel shall fill out the factory performance report checklist on the operation of each, package air-conditioning condensing unit. Checklist shall then be forwarded to the Architect (see Section 15010, Completion Requirements and Start-Up Report).

1.2 SINGLE SOURCE:

A. For ease of maintenance and parts replacement, use like equipment of a single manufacturer.

1.3 SUBMITTALS:

A. Provide shop drawings or product data for the following equipment:
   1. Air-conditioning, Horizontal Electric Furnace.

1.4 WARRANTY:

A. Air-conditioning compressors 5-ton and smaller shall have an additional four-year warranty covering parts only.

B. Replace all parts proving defective during warranty, including the replacement of lost refrigerant and repair of leaks, to the acceptance by the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 PIPING:

A. General: See Section 15650; all pipe, fittings, and similar items shall be in accordance with the requirements of Section 15050.

B. Cooling coil drain: Galvanized steel pipe or Type "M" copper per Section 15050. On draw-through units, provide trap with 1" water seal in condensate pipe.

2.2 PACKAGE ROOF UNIT (AC):

A. Manufacturers: Carrier, or approved equal:
   1. The substitution submittal must include revised details of the roof drawings affected by substitution.
   2. Manufacturer responsible for all design and construction changes including engineering redesign, additional submittal review, coordination drawings, reprocessing of permits, structural costs, screening costs, and all other costs caused by the substitution.
   3. The substitution must not have adverse affect on other trades or the construction schedule.

B. Startup, warranty and maintenance, Unit manufacturer shall provide startup, and two hours of owner training. Manufacturer to provide one year full warranty including parts, diagnosis labor, repair labor, and refrigerant. Provide five year full replacement compressor warranty less labor to effect replacement.

C. Performance, Unit shall be selected at the heating, cooling and dehumidification capacity as scheduled on the drawings; with EER, IPLV at or greater than values scheduled; with MOP, fan BHP, and weight at or less than values scheduled.

D. Electrical, Units shall be UL listed and label as a complete assembly. Provide single control panel with weatherproof control panel, single point electrical connection, suitable overload protection for each branch circuit, contactors for each motor & compressor, fused control power transformer. Provide wiring diagrams, affixed to access door.

E. Corrosion protection, condenser coil shall include uniform thickness of protection coating. Coating shall be thermally set and be uniform in thickness. Coating to be TechniCoat 10-1 epoxy-modified phenolic coating,. Alternatively a black epoxy vinyl layer maybe bonded to aluminum fin stock prior to fin stamping. Adjust unit performance for effect of protective coating. The unit casing panels shall be assembled with prepainted metal, coated on both sides, for additional resistance to corrosive environment.

F. Controls, factory controls to include contactors, 24 volt transformer, and refrigeration safeties for unit operation with a programmable thermostat.

PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. Install all equipment in the location indicated on the Drawings and as reviewed on the submittals.

B. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways. Check each piece of equipment in the system for defects, verifying that all items function properly, and that all adjustments have been made.

3.2 CLEAN UP:

A. Prior to acceptance, thoroughly clean exposed portions of the heating and cooling equipment, removing all shipping labels and traces of foreign substance.

B. Run supply fans before grilles and registers are installed and before ceilings and walls are painted. Room surfaces soiled from construction dust in duct work shall be cleaned or repainted at no additional cost to Owner.

END OF SECTION

SECTION 15800

AIR DISTRIBUTION

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Description of the System:
   1. Heating, ventilating, and air conditioning required for this work is indicated on the drawings and includes, but is not necessarily limited to, the following.
   2. Heating and cooling equipment specified in Section 15630.
   3. Filters.
   4. Exhaust fans.
   5. Duct dampers, grilles, registers and diffusers.
   6. All other items required for a complete, ready-for-service, heating, ventilating and air-conditioning system as shown and specified and meeting equipment manufacturer's installation requirements.

B. Description of work: The work covered by this section consists of furnishing all labor, materials and equipment necessary in connection with ventilating and air-moving devices, complete and ready for service, as shown and specified and meeting equipment manufacturer's installation requirements for a complete and operational system.

1.2 QUALITY ASSURANCE:

A. Codes and standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in "Duct Manual and Sheet Metal Construction for Ventilating and Air-Conditioning Systems" and "Fiberglass Construction Standards", as published by the Sheet Metal and Air-Conditioning Contractors National Association.

B. Submittals:
   1. Provide shop drawings or product data for:
      a. Duct specialties.
      b. Exhaust fans.
      c. Filters.
      d. Flexible duct.
      e. Louvers.
      f. Registers, grilles and diffusers.

C. Provide record drawings per Division 1 and Section 15010. During progress of the work, maintain an accurate record of all changes made in the heating, ventilating and air-conditioning system, location each item of ductwork and equipment precisely. Upon completion of the installation, transfer all record data to three blue- line prints of the original design drawings.

1.3 PRODUCT HANDLING:

A. Protection: Use necessary means to protect the materials of this section before, during and after installation and to protect the installed work and materials of other trades.

B. Replacements: In the event of damage, immediately make all necessary repairs and replacements.

1.4 WARRANTY:

A. Reference Section 15010.

1.5 SINGLE SOURCE:

A. For ease of maintenance and parts replacement, use equipment of a single manufacturer.

PART 2 – PRODUCTS

2.1 MATERIAL AND FABRICATION:

A. The Architect reserves the right to reject any submittals which contain equipment from various manufacturers and to require that source of materials be unified to the maximum extent possible.
B. Belt drive fan units require drive change during air balancing of the system; drives and belts are to be furnished by unit manufacturer or representative.

2.2 DUCTWORK:

A. General: Provide metal and fiberglass ductwork per 2000 Uniform Mechanical Code and SMACNA.
B. Low pressure sheet metal ducts:
   1. Supply, exhaust and return air ducts: Construct from galvanized sheet metal to conform to 2003 International Mechanical Code, ASHRAE Guide and shall be constructed to meet SMACNA requirements in Section 7, "HVAC Duct Construction Standard - Metal and Flex Hose," 1985. Contractor's option: Joints Ductmate or Lockforner, Lock-Air.
   2. Transverse joints: Ductmate or WDCI proprietary duct connection systems will be accepted. Ductwork constructed using these systems will refer to the manufacturer guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint reinforcements. TDC/TDF/T-24 shall be constructed as SMACNA T-24 flange. Use of these joints systems shall be limited as follows:

Duct Size	Operating Pressure
0 - 48"	0 - 2" w.g.

   3. Longitudinal seams: Pittsburgh Lock shall be used on all longitudinal seams. All longitudinal seams will be sealed with a mastic sealant. Snaplock is not acceptable.
   4. Duct wall: All interior ducts shall be constructed with G-60 or better-galvanized steel LFQ chem treat or oil coat. Exterior ductwork or duct exposed to high humidity conditions (i.e. kitchen exhausts) shall be G-60 or better galvanized steel LFQ chem treat or oil coat.
C. Low pressure fiberglass duct not used on this project.
D. Low pressure flexible duct:
   1. Air duct material per UL-181, Class 1 with spring steel spiral-bonded to integral seamless air seal, wrapped with 1-1/2" fiberglass insulation (K2.25 @ 75F) with vapor barrier outer jacket. Provide impervious, smooth, non-perforated interior vinyl liner. Individual lengths of flexible duct shall contain factory-fabricated steel connection collars. Maximum working pressure of 6" w.g. Maximum length 5 ft. Installation according to manufacturer's recommendations. (Use of flexible duct is contractor's option.) FAM C Series, Genflex CPC-25, PPG Industries, Themaflex, Clevaform or acceptable equal.

2.3 LOUVERS:

A. Provide extruded aluminum Ruskin ELF375D or Carnes L-30F louvers with screen on interior of sizes shown on drawings. Ruskin, Dowco, Louvers and Dampers, Inc., Wonder Metal, Cesco or acceptable equal. Ruskin ELFM-6375 combination louver motorized damper contractor's option for locations where motorized dampers are required behind louvers. Provide access door for cleaning bird screen.
B. Wall cap: Provide Nutone aluminum Model 837-AL wall cap or acceptable equal.

2.4 REGISTERS, GRILLES AND DIFFUSERS:

A. Manufacturers: Agitair, Titus, Carnes, Krueger, Price, J & J or acceptable equal.

B. Performance: Unit sizing is based on air being introduced at 25F temperature differential and being diffused at the 5-foot level to not greater than 1.5 F. Units are also selected so as not to exceed the NC-curves as outlined in Section 15200. Guarantee the above performance factors, replacing all diffusers as required.
C. Plaster frames: Provide plaster frames for all grilles and registers installed in plaster walls or ceilings. Provide aluminum frame if outlet is aluminum.
D. Types: As scheduled on the drawings.

2.5 ROOF EXHAUST FAN:
A. Construction: Centrifugal fan, belt or direct drive as scheduled on the drawings, spring or rubber vibration isolators, disconnect switch, bird screen and backdraft damper.
B. Roof cap: Fiberglass standard color as selected or aluminum. C. Capacity: See schedule on drawings.
D. Manufacturer: Greenheck, Jenn-Aire, Aerovent, Cook, Acme, Penn, Exitaire, ILG, Breidert or acceptable equal. Drive change during air balancing of the system; fan manufacturer or representative shall furnish drives and belts.

2.6 CEILING EXHAUST FAN:
A. Nutone, Broan, Penn Zephyrette, Pace DD, Breidert, Greenheck, Cook, Acme, Greenheck or acceptable equal. Capacity as schedule on the drawings. Provide Nutone 838AL wall cap of acceptable equal.

2.8 FILTERS:
A. Manufacturer recommended filter size: 1" fiberglass filters, with inside filter and rail gasketed hinged access door.
B. Provide two complete sets of 1" filters for each fan system; one set used during construction. Second set shall be installed prior to system balancing.

2.9 ACCESS PANELS IN WALLS AND CEILINGS:
A. See Section 15050, Basic Materials and Methods.

2.10 ROOF VENTS:
A. Standard type: Furnish and install Cook Type PR, Jenn Aire, ILG, or acceptable equal to match roof exhaust fan hoods. Sizes shown on drawings.

2.11 OTHER MATERIALS:
A. All other materials not specifically described or listed but required for a complete and proper installation of the work of this section shall be as selected by the Contractor and subject of the review of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS:
A. Inspection: Prior to work of this section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
B. Verify that the work of this section may be installed in accordance with pertinent codes and regulations and the reviewed shop drawings.
C. Discrepancies: Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved. Contractor authorizing to proceed prior to resolving discrepancies will correct the discrepancy at no cost to the Owner and Architect.

3.2 INSTALLATION OF EQUIPMENT:

A. General: Install equipment where indicated on the drawings and per manufacturer's instruction. Avoid interference with structure and the work of other trades; do not cut into load-carrying members.
B. Inspection: Check each piece of equipment in the system for defects, verifying that parts are properly furnished and installed, that items function properly and that adjustments have been made.

3.3 INSTALLATION OF DUCTS:

A. Fabrication: Fabricate and install ducts in accord with the drawings and the referenced standards. On sheet metal ducts, cross-break or kink flat surfaces to prevent vibration and pulsation.
B. Duct layout:
   1. Duct sizes shown on the drawings are net dimensions inside the insulation; wherever obstructions require a change in duct shape, maintain equivalent areas.
   2. Make duct elbows right angle type with air foil elbow turns or make elbows with a radius of 1-1/2 times the duct width. Furnish and install sheet metal doors in ducts where shown on the drawings and at each other point where required for access such as at fire dampers.
   3. Take special care to install exposed ducts straight with supports to prevent sagging. Install manufactured fittings to maximum appearance of installations. See special details on drawings.
C. Taping: Tape all low-pressure duct joints with duct tape in concealed spaces.
D. Duct hangers and supports: Hang ducts with strips of 18 gauge galvanized steel 1" wide. Anchor ducts securely to structure in such a manner as to prevent transmission of vibration per SMACNA and per International Mechanical Code. See drawings for additional details. Flexible ducts shall be supported at or near mid-length with 2" wide 28 Ga. steel hanger collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets. The maximum length connected to terminal outlets shall be five feet to seven feet. Flexible ducts may be used to cross-seismic joints without offsets.

3.4 INSTALLATION OF GRILLES, REGISTERS AND DIFFUSERS:

A. Install and connect all grilles, registers and diffusers in the locations indicated on the drawings, securely anchoring each item in place and sealing with rubber gaskets to prevent leakage.
B. Paint inside of all ducts visible through grilles and registers with flat black enamel.

3.5 DAMPERS:

A. General: Provide volume or splitter dampers as shown on Drawings. Provide each damper with an adjustment and locking quadrant device as manufactured by Durodyne, Young Regulator Co., and Ventlock and as outlined under volume dampers.
B. Integral Volume Dampers: Provide as specified in this Section Part 2, and to be the standard product of the grille manufacturer. C. Splitter Dampers (SD): Not used on this project.
D. Volume Dampers (VD): Construct of material two gauges heavier than duct in which installed. Single plate up to 12" wide, multiple over 12" wide. Hem both edges 1/2" and flange sides 1/2". Use Young or acceptable equal damper accessories. #60 bearing set with #403 regulator for dampers up to 24" long; for dampers over 24" long, use #660 3/8" rod, #656 end bearing and #403 regulator. Above solid ceilings, provide #660 or #661 rod extensions and #301 or #315 concealed damper regulators as required. Manufacturers: Duro-Dyne, Ventlock, and Young Regulator Company, or acceptable equal.

3.6 CLEANING:

A. Ductwork: Remove debris and trash from ductwork and vacuum clean ducts where accessible.

B. Run supply and exhaust fans before grilles and registers are installed and before ceilings and walls are painted. Room surfaces soiled from construction dust in ductwork shall be cleaned or repainted at no additional cost to Owner.
C. Remove shipping labels and other tags.

3.7 TESTING AND BALANCING OF AIR SYSTEM:.
A. Balancing subcontractor to bid direct to general contractor; see Section 15950.

END OF SECTION

SECTION 15910

CONTROLS and INSTRUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION:
A. Description of system:
1. Low voltage electric system, complete with required transformers with circuit protection, connected to electrical system at points indicated or required and as approved.

1.2 SUBMITTALS:
A. Provide shop drawings and product data for the following:
1. Drawings: Provide six copies of complete control diagram including written description of control sequences.
2. Devices and equipment:
a. Room thermostat.
b. Humidistat
c. Motorized damper.
d. Damper operators.
3. Include record wiring drawings showing installed condition and operating changes made during start-up in each Operating and Maintenance Manual.

1.3 DURING WARRANTY PERIOD:
A. Within thirty days prior to the warranty expiration date, the control subcontractor shall visit the job site and check calibration, operation, and adjustment of all temperature, pressure and humidity sensors, valves, dampers, thermostats and other devices installed by the control subcontractor. Repair or replacement of defective control equipment shall be done as required at no charge to the Owner.
B. Submit a letter to the Architect signed by the control subcontractor certifying that this work has been completed.
C. Attach a copy of the service report signed by the Owner's representative.

1.4 CONTROL MAINTENANCE CONTRACT:
A. Within thirty days prior to the warranty expiration date, the control subcontractor shall submit a price to the Architect indicating the cost per year of providing a yearly preventative maintenance check (twice yearly in May and October) which shall include calibration, adjustment, repair or replacement or all devices furnished under the original temperature control contract. This shall include lubrication and adjustment of valve packings and damper linkages as well as calibration of temperature, pressure, and humidity sensors, relays, thermostats and other control devices. This quotation shall also include emergency service. Cost of replacement parts and devices is not to be included.

PART 2 - PRODUCTS

2.1 ROOM THERMOSTATS:
A. Wall-mounted Programmable thermostat with sub-base and with heat anticipation automatic change over and standard F. dial range with thermometer one-stage heat, two-stage cooling. Stat to have Heat/Auto/Cool and continuous fan switches.

2.2 ROOM HUMIDISTAT:
A. Wall-mounted adjustable (40 to 60%) Humidistat with sub-base; Carrier, Honeywell or approved equal.

2.3 WIRING:

A. Shall be in accordance with Electrical Division 16000 of these specifications and all applicable codes. It shall be the responsibility of the control subcontractor to study the mechanical and electrical project drawings and specifications and provide all wiring relating to the control system not furnished therein. This wiring includes contactors, relays, etc., and incidental power wiring (i.e., time clock wiring, power when run through the stat, transformer, etc.).

2.4 MOTORIZED DAMPERS:

A. Furnished hereunder installed under Section 15800. Honeywell opposed-blade type with 16 gauge galvanized sheet steel frame and double 22-gauge galvanized sheet steel blades. Frame dampers zinc-plated steel with square blade pins and oil-impregnated sintered bronze or nylon bearings. Blades shall be gasketed for maximum 1/2 percent leakage.

2.5 DAMPER OPERATORS:

A. Honeywell or equal. Size operators to operate dampers properly against system pressures, and pressure differentials and velocities. Damper operators sized for 150 percent of damper forces normally encountered.

2.6 RELAYS:

A. Relays shall be provided where required or as shown on the plan to meet the operating sequence where not internal to the manufacturers' equipment.

B. Relays or contactors shall be furnished with required coil voltage and contact amperage rating for use specified in the drawing and manufacturer's equipment.

C. Mount relays in a single control cabinet with hinge door and latch, Honeywell or acceptable equal.

D. The control cabinet shall contain the relays and numbered terminal strips for connection of all relay and field wiring. Mount the cabinet on a painted plywood panel securely attached to the wall framing. Mount the time clock, transformer and motor contactors (if required) on the plywood adjacent to the control panel.

PART 3 - EXECUTION

3.1SEQUENCE OF EQUIPMENT OPERATION: A. Package Roof unit:

1. Programmable thermostat to control occupied time, unoccupied time, heating/cooling in sequence. OA damper open during occupied hours and closed during un-occupied hours. Humidistat to control HumidiMizer to maintain space at 50% RH.
2. Exhaust fans: See equipment schedule for additional control sequence.

END OF SECTION

SECTION 15950

TESTING AND BALANCING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 TESTING AGENCY:

A. At the completion of the job, perform the testing and balancing of the air distribution and heating by an independent test and balance agency who specializes in this work. Testing agency shall be a member of the Associated Air Balance Council. Testing agency shall comply with ASHRAE recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

B. Testing agency to be hired directly by the General Contractor.

1.2 TOOLS, EQUIPMENT AND INSTRUMENTS:

A. All instruments used by the balancing agency shall have been calibrated within a period of six months and proof of such calibration shall be submitted to Architect upon request.

1.3 SUBMITTALS:

A. Submit:

1. Submit three copies of balancing report on forms which have been reviewed by the Architect. Include copies with Completion Requirements per Section 15010. Forward one copyofthebalancingreportdirectlytothemechanicalengineerforreviewpriorto demonstration of mechanical systems to owner; seeSection 15010, Completion Requirements.

B. Provide with the report twocomplete sets of marked balancing drawings showing air opening numbers and flow station numbers that correspond to the numbering system in the balancing logs. Include drawings and logs with completion requirements per Section 15010.

PART 2 - PRODUCTS:

2.1 BALANCING FIRMS:

A. Balancing agencies desiring approval shall make request in accordance with Instructions to Bidders. Requests shall include list of completed projects and samples of balancing forms to be used on the project.

B. Balancing agency shall patch and or plug all test holes in insulation, ductwork and housings which have been cut of drilled for testing purposes.

PART 3 - EXECUTION

3.1 TESTING PROCEDURES:

A. Air system:

1. Identify and list: Size, type and manufacturer of all air handling equipment and air distribution devices. Use manufacturer's published ratings on all equipment to make required calculations. Verify that all air filters are clean prior to making air tests; see Section 15800, "Air Filters".
2. Record: Nameplate data and actual running amperes for each fan motor.

3. Test, adjust and record:
   a. Each diffuser, grille, and register to within minus ten or plus ten percent of design requirements and make all changes in dampers as required to obtain the design air quantities.
   b. Identify each grille, diffuser, register and outside air intake louver as located on the as-built drawings and marked on the balancing drawings.
   c. Static pressure, suction and discharge of each supply, return and exhaust fan.
   d. System for design minimum outside air and return air.
   e. Entering and leaving air dry bulb temperature for heating for the heating cycle of each heating coil.
   f. Entering and leaving air dry bulb and wet bulb temperatures for the cooling cycle of each cooling coil.
   g. Verify and record that interlocks for exhaust fans from light switch, and O.A. dampers, are correct.
4. Make all changes in the pulleys, belts, and dampers as required to obtain the design air quantities. Where required, new drives shall be furnished by the fan manufacturer or his representative per Section 15630 and 15800.

B. Water System Plumbing:
1. General:
   a. Identify and list size, type and manufacturer of all equipment tested hereunder.
   b. Complete system air balance before water balancing begins.
   c. Verify that strainers are clean before water balancing begins. Open all valves to full open position.
2. Check rotation of water pumps.
   a. Record pump operating suction and discharge pressure.
   b. Test and record actual flow in GPM for each water pump.
3. Record nameplate data and actual full load amps for all motors.

C. HVAC Controls & Equipment Report:
1. Work with HVAC Contractor to verify that all controls are operating per 15910, "Sequence of Equipment
   Operation":
   a. Room stats.
   b. Interlocks.
   c. Motorized dampers.
   d. All O.A. dampers.
2. Fill out appropriate areas of equipment performance report in cooperation with start-up person, one report for each unit and forward with air balancing report.

END OF SECTION

SECTION 16010

GENERAL PROVISIONS

PART 1 GENERAL

1.01 CONTRACT DOCUMENTS

A. The General Conditions and General Requirements listed in Index to Specifications apply to the work of Division 16.

1.02 SCOPE:

A. Provide all labor, materials, equipment, transportation, and services necessary to supply, install, complete, adjust, make operable and balance systems indicated on Division 16 contract documents.

B. Review all contract documents for reference to work to be provided by Section 16. Include all such work in base bid.

1.03 DRAWINGS:

A. Electrical Drawings: Drawings are diagrammatic, home runs may be regrouped or rerouted for a more economical installation if desired. Do not alter circuit functions or switching arrangements. The Architect reserves the right to make minor changes in the locations of equipment without additional charge provided such request is made prior to rough-in. (Plus or minus 6'-0".)

B. Architectural and Mechanical Drawings: Check Architectural Drawings to coordinate location of outlets and switches with cabinets or other requirements. Check Architecture for door swings. Locate switches on the lock side of doors. Locate outlets in or above back-splash above countertops. Before submitting his bid, the Contractor shall familiarize himself with the Architectural and Mechanical plans. Locations of equipment shown on those plans govern. Coordinate the installation of the electrical systems including (but not limited to) panels, disconnects, boxes, conduits, lights, and devices, so as to prevent space use conflicts.

C. Uncompleted Items: Outlets or equipment shown on the plans with no supply conductors or conduit indicated shall be completed as required.

D. Items not Understood or Omitted: Prior to bidding, refer to the Architect all items in the plans and/or specifications that are in conflict, not understood or incomplete so that addenda may be issued to make corrections or clarifications. Equipment shown on the plans or listed in the specifications shall be included as if called for on both.

1.04 SPECIFICATIONS:

A. Materials:

1. The specifications describe the quality of materials desired by written description and catalog number. Materials listed are those desired and shall be used unless written permission has been granted to use equal or better quality materials by other manufacturers.
2. Approval to use materials of other manufacturers shall in no way reduce the standards of quality set by the specifications. If materials installed do not meet the standards set by the

specifications, they shall be removed and replaced with specified materials without additional cost to the Owner.

B. Installation: The specifications list the method of installation to be followed and types of materials to be used. The type of materials used shall fit the application. Materials improperly installed or of a type not suitable for the application shall be removed and replaced with suitable materials without additional cost to the Owner.

1.05 "AS BUILT" DRAWINGS:

A. Electrical Contractor shall provide to the Owner two red line drawing reflecting all deviations from original electrical design.

Drafting shall be neat, readable and complete.

1.06 AS EQUAL SUBMITTALS:

A. Provide the Electrical Engineer and Architect each with one copy of CSI Substitution Request Form and one set of catalog cuts of the submittal equipment. Faxed submittals shall not be accepted. "Approved for bidding" does not constitute an unqualified approval of the product. All conditions of quality, function, size, safety, style and appearance shall be as specified.

1.07 APPROVAL OF SHOP DRAWINGS:

A. Approval of shop drawings does not remove the Contractor's requirements to comply with the intent of the Contract Documents. For shop drawing submittals that alter design conditions, electrical requirements, dimensions, functions, manufacturer, model, type, style, installation requirements, etc., it shall remain the responsibility of the Contractor to make all necessary adjustments, alterations, supply changes, trade coordinations, etc., required to provide complete and operable systems. Any deviations from Contract Specifications shall be clearly noted in bold letters as such.

1.08 SUBMITTAL DATA:

A. Provide the Architect with six (6) bound and labeled brochures of catalog cuts or shop drawings of all items that are to be provided for the project. Each brochure shall include a cover sheet indicating Project name, Architect, Engineer, and Contractor's name, address, telephone and fax numbers. Each brochure shall contain a complete set of all types of material to be provided under this Contract. Partial submittals will not be accepted and will be returned as disapproved. Items not bound in brochure form will not be accepted. Four (4) copies shall be retained for the Owner-Architect-Engineer and two (2) copies shall be returned for the Contractor and the Supplier of Equipment. Make corrections and alterations as noted on returned drawings without additional charge where proposed materials do not conform to specifications or project requirements.

B. Submittals should include at a minimum the following (Plus any product that differs from specified product): Conduits and Fittings

Conductors Fittings Outlets & Plates Switches & Plates
Occupancy Sensors, if required
Disconnects
Fuses
Motor Control Center (With Shop Drawings)
Panelboards (With Shop Drawings)
Circuit Breakers
Contactors
Time Clocks & Photo-cells
Lighting Fixtures, Poles and Associated Control Equipment

1.09 TEMPORARY FACILITIES:

A. Provide temporary electrical power for construction purposes as required.

1.10 WORKMEN:

A. Employ a sufficient number of journeymen electricians and supervisors to insure orderly completion of the work.

1.11 INSPECTIONS AND TESTS:

A. All electrical work shall be inspected before concealment. Uncover work concealed and not inspected if so directed by jurisdiction having authority or Project Engineer.
B. Test all service entrance equipment, feeders and branch circuits, etc., for shorts and grounds prior to energizing. Service entrance and feeders shall be meggered to ground.
C. All systems shall be tested, adjusted and balanced for proper operation. The Owner and/or his official representative shall be instructed in their use and shown all controls and operating procedures. The operation of the systems shall be demonstrated in the presence of the Owner and Architect.
D. Provide the Owner with five (5) sets of all operating and maintenance manuals and instructions necessary to properly operate and maintain the systems.
E. Test all mechanical equipment connected to insure proper rotation and phasing.
F. Check the horsepower of all motors connected against the size of heater elements in the starters. If they do not match, notify the motor supplier to provide the correct size and type.

1.12 DEFINITIONS AND ABBREVIATIONS:

A. NEC: National Electrical Code.
B. EMT: Electrical Metallic Tubing.
C. WP: Weatherproof.
D. AWG : American Wire Gauge.
E. CONTRACTOR: In this Division of the Specifications refers to the Electrical Contractor.
F. FURNISH: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
G. INSTALL: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.
H. PROVIDE: Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

PART 2 PRODUCTS Not Applicable.

PART 3 EXECUTION Not Applicable.

END OF SECTION

SECTON 16025

CODES AND STANDARDS

PART 1 GENERAL

1.01 MATERIALS

A. All materials shall be listed by the Underwriters Laboratory and bear the seal wherever standards of approval have been established and such service is normally provided by them. Adhere to all local requirements for materials approval. All conduits, boxes and fittings shall be manufactured in the United States.

1.02 UTILITY REQUIREMENTS:

A. Comply with all rules, regulations and requirements of the local serving utility and coordinate all service entrance and metering requirements with them before installation. Make all negotiations with the utility company and pay all connection charges or fees. If requirements are substantially different from those shown, notify the Architect so that corrective action can be taken.

1.03 PROJECT SITE:

A. Visit the project site and determine local conditions that affect this portion of the contract.

1.04 CODES AND REGULATIONS:

A. Install electrical work in strict conformance to the rules and regulations of legally constituted bodies having jurisdiction over the construction and use of the facility and the National Electrical Code latest edition.

1.05 PERMITS:

A. Arrange and pay for all permits and inspections of the work done. Work shall not be concealed until inspections have been made. Turn over certificates of inspections to the Architect.

1.06 WARRANTY:

A. The Contractor shall and hereby, does warrant that all materials (except specified otherwise) are new, free from defect, of current standard manufacture and design, of the quality, rating and type as shown or specified; and that any defect existing within the warranty period, due to improper or defective materials or workmanship, shall be corrected and resulting damage repaired without additional cost to the Owner.

1.07 WARRANTY PERIOD:

A. One (1) year after substantial completion and/or occupancy.

PART 2 PRODUCTS Not Applicable.

PART 3 EXECUTION Not Applicable.

END OF SECTION

SECTION 16100
BASIC MATERIALS & METHODS

PART 1 GENERAL

1.01 GENERAL

A. Materials listed set type and quality standards for the project. Materials listed are those desired. Materials approved as "equal" shall not change quality or intent of Contract Documents. If "approved" materials are not found equal to specified items upon visual inspection or test, they shall be removed and replaced with specified materials without additional cost. Sole decision as to "as equal" acceptability shall reside with the Engineer.

1.02 MATERIALS IDENTIFIED:

A. All materials shall be new, of current standard manufacture and design, and U.L. listed for intended application.

1.03 MATERIALS NOT LISTED:

A. Provide all items such as relays, signal transformers, etc., that are necessarily part of the finished system and required for logical functioning of the system.

1.04 UNAPPROVED MATERIALS:

A. Remove and replace with specified materials if so directed by Architect, without additional cost to Owner.

1.05 WORKMANSHIP:

A. Shall be best standards of industry and shall conform to specification methods. Unworkman-like work shall be removed and replaced at no additional cost.

1.06 COORDINATION OF WORK:

A. Coordination with plumbing lines, heating and ventilating duct work, etc., to eliminate space use conflicts.

PART 2 PRODUCTS

2.01 CONDUITS: All wiring shall be in conduit.

A. Rigid Metal Conduit: Hot dipped galvanized steel. General Electric, Republic, U.S. Steel, National or equal.
B. Electrical Metallic Tubing: Seamless, sheradized or hot dipped galvanized steel.
C. Rigid Plastic Conduit: (PVC) Polyvinylchloride. UL approved. Baldwin, Corlon or approved equal. For underground use only. Use only where code allows.
D. Flexible Metallic Conduits: Shall contain separate grounding conductor, galvanized steel armour. Maximum length 72".
   Not approved for general wiring.
   1. Dry Locations: Columbia, Triangle or equal.
   2. Wet Locations or Exposed to Weather: Liquid tight, neoprene or vinyl jacket. Anaconda Sealtite, Type UA or equal.

E. "MC" type cable:
1. Approved only for 20 amp branch circuits where allowed by code.
2. Galvanized steel armour.
3. Insulated green ground conductor, minimum size #12 AWG.
4. Final home runs shall be EMT and separate conductor in Common Areas.
5. Manufacture: AFC Cable System, Inc., Type MC.

F. Fittings:
1. Rigid Conduits:
a) Bushings - Insulating type with grounding lugs where required.
2. EMT and Flexible Conduit: Fittings - All steel set screw type, pre-insulated. Fittings with die cast aluminum or pot metal components are not acceptable. Steel City or approved substitution.

2.02 CONDUCTORS:

A. Copper: Solid #12 AWG minimum size up to #10 AWG. Stranded for sizes #8 and larger. Fire alarm and signal circuits to be stranded.

B. Aluminum: Minimum size #1 AWG, stranded. Where substituted for copper shall have equivalent ampacity and voltage drop. Resize conduits as required. ALCAN Stabiloy XHHW Alloy AA-8030, or Southwire XHHW Alloy #AA-8178 only.

C. Insulation:
1. General: Type THWN, THHN, XHHW.
2. Recessed Fixtures, baseboard heaters or other high ambient temperature locations. Type THHN.
3. Underground to Parking Lot Lights: Service to parking lights shall be Type THWN in conduit.
4. Aluminum: XHHW.

2.03 OUTLET BOXES:

A. Steel, as best suited for the job intended. 4 inch square by 1-1/2 inches or more depth for general use. Device covers shall match finish to be applied to walls. For concrete block use square shouldered device covers so that box can fit into block cavity. Steel City, RACO or approved substitution.

2.04 PULL AND JUNCTION BOXES:

A. General Use: Steel, with baked enamel finish and screw covers. NEMA 1 enclosures. Alwalt or approved substitution.

B. Exterior Use: Cast aluminum with threaded conduit hubs and water tight screw covers.

C. Installation:
1. Junction boxes and pull boxes shall be installed so that they are accessible at all times. The Contractor shall be required to provide sufficient pull boxes to conform to Code requirements whether shown or not. If a box is required in inaccessible place, provide access panel.

2.05 SWITCHES AND RECEPTACLES:

A. Switches and receptacles shall all be of the same manufacturer, style and type.

B. Switches: 20 ampere, 120/277 volt, mechanically quiet type, ivory handle. Specification grade. Federal Spec. #W-S-896d.

Manufacturer	SPST	3 Way
Hubbell	CS1221-I	CS1223-I
P & S	20AC-1-I	20AC-3-I
AH	1991-I	1993-I
Leviton	1221-2-I	1223-2-I

C. Receptacles:

1. Duplex Convenience Outlets: 20 ampere, 120 volt, 2 wire with U-slot ground. Ivory. Shall be of same
manufacturer as switches. Reference Hubbell #CR5252-I. 20 ampere, 120 volt where noted. Reference Hubbell CR5352-I. Provide 20 amp receptacle on all dedicated circuit receptacles.
2. Provide GFIC type receptacle where shown on drawings or required by NEC or UBC. "Feed through" protection not allowed. Reference Hubbell GF5262-I.
3. Specialized Outlets: As indicated on Drawings.

D. Occupancy Sensors: Wall switch type, line voltage, Watt Stopper WS-200, or as approved. H. Trim:
1. General: Single piece stainless steel in all areas. Non-magnetic chrome-nickel alloy #302.
2. Weatherproof: Hubbell #WP26M (horizontal #WP26MH) (cast aluminum).
3. Use standard sizes in all locations except on masonry or block walls. Use Type SO plates.

2.06 SAFETY SWITCHES:

A. Horsepower dual rated, type heavy duty non-fusible for general use. Provide with compression lugs where connecting aluminum conductors. General use NEMA 1. Exterior use rain tight NEMA 3R. Provide fusible disconnect switches where indicated or specified. Fusible safety switches shall incorporate factory installed rejection clips for use with Class "RK1" and "RK5" fuses. Switch doors shall be interlocked with handle to prevent opening when switch handle is in the "on" position. Identify all disconnects with permanent lamicoid label indicating load (equipment) served. 3/8" minimum letter height.

2.07 FUSES:

A. Motor circuits, U.L. Class "RK5" time delay. Non-motor circuits U.L. Class "RK1". Gould-Shawmut, Bussman, Economy, Littelfuse or as approved. Provide one spare set for each size and class supplied.

2.08 SINGLE PHASE MOTOR DISCONNECTS:

A. Provide manual motor starting switches with melting alloy type thermal overload relay protection for all fractional horsepower, single phase motors.

2.09 CONTACTORS:

A. For control of branch circuits. 30 ampere, multiple pole, mechanically latched, with coil clearing contacts. Number of poles as shown on the drawings. Square D Class 8903, LXG series, or equal in ASCO, G.E., Siemens, or as approved.

2.10 TIME CLOCKS:

A. Digital type for control of mechanically held contactors Astronomic for Lighting controls or RC switches. 24 hours, 365 day program type. Holiday capability and battery back-up. Single pole, double throw. Tork DZS100(120V).

2.11 PHOTO-ELECTRIC CONTROLLERS:

A. Tork #2101. Size at 150% or connected load

2.12 SUPPORTING DEVICES:

A. Conduits:
1. Single: Securely support raceway within 3 feet of every 90 degree bend, outlet box, junction box, device box, cabinet, conduit body, and other termination with approved straps, clamps, or hangers. Space supports every 10 feet maximum. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
a) Expansion shields in concrete or solid masonry.
b) Toggle bolts on hollow masonry units.

c) Wood screws on wood.
d) Metal screws on metal.

2. Multiple: Kindorf Channels with approved conduit straps or clips. Spaced 10'-0" on centers.

B. Kindorf Channel installed exposed to the weather (any exterior use) shall be galvanized.

PART 3 EXECUTION

3.01 MOUNTING HEIGHTS:

A. Devices shall be as follows unless indicated otherwise by specified note on the drawings. Devices shall be located above or below top of wainscoting, adjacent to tackboards or bulletin boards and shall not cut through metal trim or be located in tackboards. Coordinate with Architectural Drawings prior to rough-in. Verify all heights prior to rough-in.

Control switches for lights, fan, etc.	45" to center line from floor
Convenience outlets typical wall mount:	18" to center line from floor
Convenience outlet wall mount over counter	45" to center line from
floorTelephone/Data outlets typical wall mount:	18" to center line from floor
Telephone/Data outlet wall mount over counter	45" to center line from floor
Panel Boards	78” top of trim to floor

3.02 RACEWAYS AND CONDUITS:

A. Routing: Run concealed except where detailed as exposed or where surface metal raceways are specified; or by written permission where it is difficult or impractical to conceal.

B. Outlet and Switch Box Placement:
1. In stud walls back-to-back boxes are not allowed. Separate boxes in adjacent rooms by a minimum of one stud.
2. Outlet and Switch Box Placement: Provide box extensions as required to bring metallic box flush with final wall surface.

C. Materials: All conduits above grade shall be metal unless indicated otherwise. Size non-metallic conduits to accommodate grounding conductors. Sizes shown on the drawings are for metal conduits unless shown otherwise.

D. Minimum Sizes:
1. Power: 3/4 inch.
2. Lighting: 3/4 inch.

E. Usage:
1. Electrical Metallic Tubing: Use where exposed on ceilings, above suspended ceilings, in attics, hollow cavity walls or cavities of block walls. Not approved for wet or damp areas, burial, exterior areas, or casting in concrete.Maximum size two (2) inches. Conduit in hollow cavity of block walls being filled with concrete shall be rigid steel instead of EMT.
2. Rigid Galvanized Steel Conduits: Use where raceways are cast into concrete, solid masonry, exposed on walls, exposed to weather or in hazardous areas requiring liquid tight, dust tight or explosion proof wiring.
3. Flexible Metallic Conduits: Use to connect electrical apparatus subject to vibration, such as motors, fans, etc., and to connect recessed lighting fixtures in suspended ceiling installations. Maximum length 72". Not approved for general wiring.

4. Surface metal raceways may be used only where specified or by prior approval for remodel work where it is not practical to conceal wiring.
5. PVC Conduit: Where code use permits, raceways in tunnel and machine room shall be PVC schedule 40..Raceways buried directly in the earth may be rigid Sch. 40 polyvinylchloride (PVC) sized to accommodategrounding conductors.
6. MC Cable: Where code use permits, approved for 20 amp branch circuits. Not approved in tunnel or machineroom or anywhere exposed to moisture.

F. Installation:

1. Cut ends of all conduits square and ream. Make all joints water tight. Fittings shall be compatible with conduit used, secured water tight, and form a smooth transition from conduit to fitting. Make all bends with no flattening or wrinkling with a bender designed for use with the conduit used.
2. Make up conduit installed underground water tight and sealed. Conduit containing water shall be pumped dry and swabbed. If water is infiltrating and cannot be removed, then reroute conduits as directed without additional charge.
3. Conduits encased in concrete shall be securely attached and anchored to prevent movement during pouring, tamping and vibration of the concrete. Ends shall be sealed with factory seals. Replace conduits containing concrete as directed by Architect.
4. Conduits may be run in concrete slabs or floors as listed below with a minimum of 2 inches concrete over conduits. Boxes shall be flush and of sufficient depth to allow connecting conduits without disturbing reinforcing steel.

Slab Thickness	Maximum Conduit Diameter
2"	None
2 1/2"	1/2"
3 1/4"	3/4"
3 1/2 - 5"	1"

5. Conduits run beneath the vapor barrier under concrete floor slabs are classified as underground and shall be PVC.
6. Swab out all conduits clean and dry before conductors are installed.
7. Mark the location of all conduits stubbed out for future use with brass screw in concrete foundation directly above conduit and 12" above finished grade.
8. Run in neat rows with smooth uniform bends. Support multiple runs from Unistrut hangers in all exposed areas, spaces above ceilings or risers. Diagonal, crossed or haphazard, non-supported runs will not be allowed.
9. Service entrance ducts shall be spaced a minimum of 3 inches between outer walls of conduits. Use plastic "Duct Donut" underground spacers placed 7 1/2 feet apart.
10. All conduit penetrations of fire rated walls, ceilings or floors shall be sealed with specified fire barrier putty. The amount of caulking shall be in relation to the rating of the surface being penetrated. Comply with requirements of the Product Manufacturer and local codes. Maintain rating of penetrated item.
11. Sealing of Conduit Penetrations: Seal around conduit penetrations through walls or floors between conditioned (heated) and unconditioned spaces.

3.03 WIRES AND CABLES:

A. Marking and Coding:

1. Wiring shall be color coded to conform to standard practices of the industry.
2. 120/208 volt system shall be solid colors with white neutral.
   A-Phase - Black
   B-Phase - Red
   C-Phase - Blue
3. 277/480 volt system shall be solid colors with grey neutral.
   A-Phase - Brown

B-Phase - Orange
C-Phase - Yellow

4. All control wiring shall be labeled and tagged with each conductor identified.
5. Power feeders using all black insulating wiring shall have phase identified with permanent phase markings at all terminations and splices.
6. Identify all feeder or branch circuit loads in the same panelboards.

B. Insulation Value:
1. All wire contained in the same raceway shall have an insulation value to match the highest voltage between conductors of all circuits contained therein.

C. Products:
1. Pulling: Use pulling compounds as recommended by the wire manufacturer; do not exceed recommended pulling tensions; leave sufficient pigtails at each j-box or cabinet for make up.
2. Aluminum Conductors: All splices, terminations or connections shall be made with compatible fittings and non-oxide conductive paste. Oxide inhibitors to be applied to aluminum conductors immediately after insulation is removed. Apply listed oxide inhibiting compound with wire brush and ensure complete coverage of all exposed aluminum.

END OF SECTION

SECTION 16400

SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.01 GENERAL

A. General Conditions and General Requirements as listed in Index to Specifications apply to work under this Section.

1.02 WORK DIVISION:

A. Utility Company: Provision, installation, connection and energization of all primary cables, pad mounted transformer and meter.

B. Electrical Contractor: Provision, installation, connection and energization of all systems from the secondary bushings of the transformer to and including the building and site work. Provision and installation of all trenching, backfilling, primary conduit and transformer pad. Refer to the drawings.

C. Verify exact utility company requirements with the serving utility company. PART 2

PRODUCTS

2.01 CONDUITS:

A. Underground Feeder: Schedule 40 PVC with long sweep rigid steel elbows wrapped with Scotch #51 tape.

B. Above Grade Feeders: Rigid galvanized steel or EMT. Refer to Section 16100 for conduit usage.

2.02 CONDUCTORS:

A. Services and Feeders: Stranded copper sized as shown on the drawings (substituted aluminum shall have equal ampacity and voltage drop).

2.03 C.T. ENCLOSURE AND METER BASE:

A. Provide NEMA 3R C.T. enclosure, sized as shown on drawings and in compliance with serving utility company specifications and requirements.

B. Provide meter base per serving utility company specifications and requirements.

2.04 MOTORCONTROL CENTER:

A. Requirements: Provide service rated main circuit breaker motor control center. Consult Electrical Drawings for details and motor control center arrangements.

B. Construction:

1. Cabinets: Free standing, dead front, code gauge galvanized steel with factory finish of baked enamel or lacquer.
Provide adequate wireways, pulling space at bottom for pulling in conductors, and other details as required.
2. Bus Work: Copper per industry standards. Braced for 100000 AIC.
3. Motor starters. Combination fused starter, 480V, FVNR, NEMA Type 12 rated, 1 N.O./1 N.C. auxiliary contacts,
Type 1B-D wiring, HOA switch, with lockable (lock off) handles. 0-10 hp: COMPAC 6 Combination Starter, Size 1.10.1 hp to 25 hp, Model 6, Size 2.
4 Fuses (for motor starters and equipment fused disconnects):
a) Fusible switches with full load interrupting capacity. Sizes as required for equipment (motor) served.
b) Fuses: (0-600amp). U.L. Class RK5, time delay. U.L. Class J for COMPAC 6 starters. Provide one spare set for each size provided.
5. Circuit Breakers: For Main Service Disconnect and dry type transformer service provide thermal magnetic, bolted to bus molded case circuit breaker. Consult the schedule on the drawings for frame and trip sizes. Clearly marked to show "ON", "OFF" or "TRIPPED". Minimum AIC ratings shall be U.L. Series Rated at 65,000amperes at 480 volts.
6. Wire Terminals: Bus Work - Hydraulic compression type terminals shall be used for all bus connections.
7. Control Transformer(s): Provide complete 480:24 volt control transformer(s) as required for starter control.
8. Manufacture: Square D Model 6 Motor Control Center, 480 V, Class 8998 or as approved.

C. Spare Motor Starter: Where "spare" is indicated, provide ready to use COMPAC 6 or Mod 6 starter as indicated by “SparHP” indicated. Do not provide fuses in spare starters.

D. Labeling:

1. Provide a lamicoid engraved permanent label on Main Switchboard indicating "MAIN SWITCHBOARD",Electrical Contractor's name, Electrical Engineer's name ("HGE Consulting, INC.") and year of installation.
2. Provide lamicoid engraved permanent labels on all main and submain (new and old) circuit breakers and switches indicating load served.

2.04 PANELBOARDS:

A. Cabinets: Code gauge galvanized or pickled steel with factory finish of baked enamel or lacquer. For surface mounting as shown. Dead front safety type. Hinged doors with keyed alike locks, with lift latch for opening. Boxes shall be 5-3/4 inches deep by 20 inches wide by length as required. Wireways shall be a minimum of 6 inches wide top and bottom, 5 inches each side.

B. Bus Work: Hard drawn copper for all panelboards. Wire terminals shall be compression type with non-oxide conductive paste for accepting aluminum conductors.

C.Future Provision: Where "space" or provision is called for, provide all necessary hardware so the spare is ready to accept circuit breaker (or switch as applicable) without additional hardware.

D. Circuit Breakers: Common trip, single handle. Minimum AIC ratings shall be U.L. Series Rated at 65,000 amperes at 480 volts or U.L. Series Rated at 65,000 amperes at 240 volts.

1. General Use: Molded case, thermal magnetic, bolted to bus, amperage and poles as indicated in Panel Schedules.

2. Ground Fault Circuit Interrupter Type: Provide for exterior building outlets, wet location outlets, hazardous locations, and for all circuits where indicated; and in addition, where required by UBC,OSHA or NEC.
3. H.I.D. Lighting Circuit Use: Provide "H.I.D." rated circuit breakers for all H.I.D. lighting branch circuits.
4. HACR Type Circuit Breakers: Provide HACR rated circuit breakers on all heat pump and air conditioner branch circuits.
5. Appliance Circuit Lock-offs: Provide padlock lockable circuit breaker handle lock-offs for all circuits serving permanently installed appliances over 300VA or 1/8 hp per NEC 422-21.

E. Panelboard Types:
1. 225 amperes or less: Square D NQOD, NEHB or equal.
2. 400 amperes or more: Square D I-Line or equal.

F. Labeling: Label all circuits showing load served in Panelboard Schedule. Typewritten only. Panel Schedules shall reflect final room names, not names shown on plans. Provide permanent lamicoid label on Panel.

G. Manufacture shall be same company as Service Motor Control Center. Mount panelboards with top up 6'-6" and anchor securely to building structure.

PART 3 EXECUTION

3.01 TRENCHING:

A. Provide trenching, backfill and compacting for all primary, secondary and telephone service. See drawings for details.
Depth of trenching is relative to final grade.

3.02 TRANSFORMER BASES:

A. Provide reinforced concrete transformer bases for all transformers as indicated on the plans. Coordinate with Utility Company for pad specifications.

3.03 SERVICES:

A. Primary, secondary and telephone services to the building shall be underground.

3.04 BRANCH CIRCUIT:

A. All branch circuits shall be run concealed where possible, except in tunnel and machine room.

B. In general, branch circuits shall contain three phases and a neutral for 120/208 volt or 277/480 volt, three phase, four wire systems. Branch circuits shall be on opposite phases to balance neutral loads.

C. Home runs shall conform to the following:
1. 277/480 volt circuits where load is more than 3000 watts and run is more than 100 feet, minimum wire size shall be #10 AWG copper.
2. 120/208 volt circuits where load is more than 2000 watts and run is more than 50 feet, minimum wire size shall be #10 AWG copper.

D. Extend the branch circuit from the panelboard to the disconnect, mount the starter (where applicable) and wire through to the final connection of the apparatus to be connected.

3.05 LOW VOLTAGE CABLES (70 VOLTS OR LESS):

A. In inaccessible, concealed spaces run cables in raceway. In accessible, unfinished areas cables may be run exposed without raceway.

B. Run exposed cables parallel to or at right angles to building structure lines. Do not run exposed cables on floors or in such a way that they obstruct access to, operation of, or servicing of equipment. Keep cables 6 inches minimum from hot water pipes.

C. Support cables every 3 feet with permanent clips, straps, staples, or tie wraps approved for application and which will not cause cables to be pinched or deformed.

D. Securely attach clips and straps with nails or screws. Do not use wire or tape to support cables.

E. Bundle only cables of same systems together.

3.06 CONTROL WIRING:

A. Provide all control wiring associated with equipment or systems provided and included as part of this Division. Unless specifically indicated, control wiring associated with the function and control of heating, ventilating, exhaust, hydronic pumping, water heating equipment or operation of dampers or similar is not covered under this Division.

3.07 RECEPTACLES:

A. Provide the correct type and style of receptacle for phase and voltage of device to be connected.

3.08 ACCESS PROVISION:

A. Walls: Where required for passage of open wiring provide conduit sleeves through walls, 50% spare capacity minimum.

3.09 EQUIPMENT PROVIDED BY OTHERS:

A. It shall be the responsibility of the Electrical Contractor to verify nameplate data on all Mechanical Equipment prior to rough-in. Where direct connection is to be made to equipment, provide code disconnect as required. Provide all disconnects as indicated on drawings.
   1. Provide fusible disconnects for refrigeration and/or air conditioning compressor motors, motors without overload protection, and as specified or shown on the drawings.
   2. Provide non-fuse disconnects for motors having overload protection, equipment not in site of panelboards, or as required otherwise by code authority.
   3. Starters for HVAC equipment shall be furnished with equipment and installed under Division 16 work unless specified otherwise.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 GENERAL

1.01 GENERAL

A. General Conditions and General Requirements as listed in Index to Specifications apply to work under this Section.

B. Provide a complete grounding system as shown and as required by the NEC and the local enforcing authority with common grounding point at the main distribution center.

PART 2 PRODUCTS

2.01 CONDUCTORS:

A. Main System Ground: Bare stranded copper per N.E.C.

B. Bonding Jumpers: Copper minimum size #2 in switchboards and switchboard rooms. C. Bonding Conductors, Equipment: Copper per NEC requirements. Green insulation.

2.02 GROUND CLAMP:

A. Code approved.

PART 3 EXECUTION

3.01 INSTALLATION:

A. Where underground metallic water piping is installed the cold water system shall be used as the main system ground. Bond to a minimum size 2 inch metal cold water pipe, 20 feet of which must be in contact with the earth.

B. Provide a concrete encased grounding electrode system to conform to Section 250-50c NEC. Bond to main cold water ground. This is in addition to, and not in lieu of, the cold water ground.

C. Where a vapor barrier prevents direct contact with earth of the concrete encased electrode provide (2) 5/8” x 8’ copper clad grounding electrode.

D. Bond all drainage, sprinkler system plumbing, communications conduits, and all electrical distribution systems to ground as required by NEC.

E. Provide 2-5/8” x 8’ copper clad ground rods, 10 feet apart. Bond to System Ground.

END OF SECTION

SECTION 16500

LIGHTING FIXTURES

PART 1 GENERAL

1.01 GENERAL:

A. General Conditions and General Requirements as listed in Index to Specifications apply to work under this Section.

B. Provide new lighting fixtures typical in each location of type indicated. Provide with new lamps of wattage as shown. Letter designates fixture type. UL approved.

C. All exterior lighting fixtures shall be UL approved for wet locations and bear the label.

PART 2 PRODUCTS

2.01 BALLASTS:

A. Voltage: All ballasts shall be 120 volts for both interior and exterior lighting fixtures unless noted otherwise.

B. Fluorescent: Shall be electronic ballast, ETL-CBM certified, UL approved, low heat, low noise, class P. "A" sound rated, 10% maximum harmonic distortion, Program Start, “mvolt”. Advance, Howard Industries, Triad by MagnaTek, Osram/Sylvania. Ballasts shall be compatible with T-8, 32 watt rapid start energy saver lamps. Provide number of ballasts in each fixture as required for multilevel switching where indicated on Drawings.

C. H.I.D.: Two piece, capacitor and choke, securely mounted and supported for ease in maintenance and service. Protect against moisture and condensation. Individually fused on securely mounted fuse clips. Type FRN cartridge fuses.

D. Execution: Factory installed in lighting fixtures where possible. All ballasts shall be easily accessible for service and maintenance.

2.02 LAMPS:

A. Incandescent Lamps: 130 volt, pear shaped, medium base, inside frosted, 2000 hour.

B. Fluorescent Lamps: Rapid start, 3500 K, 48 inch T-8, 32 watt or as noted and required for fixtures less than 48 inches long.
C. H.I.D. Lamps: Wattage and type as specified with lighting fixtures.
D. Execution: All incandescent lamps shall be new at time building is turned over to the Owner. All lamps shall be new when installed. They shall arrive at the jobsite in new, unbroken cases and be installed in fixtures after mounting. All lamps shall be wiped free of construction dust at completion of the project.

2.03 LIGHTING FIXTURES:

A. Refer to Lighting Fixture Schedule on Drawings

PART 3 EXECUTION

3.01 INSTALLATION:

A. Recessed lighting fixtures shall be set parallel to building lines, flush, aligned, with no light leaks. Where they are set in suspended ceilings, plaster or tile rings shall be provided and fixtures shall be connected to junction boxes with 60 inches of flexible conduit. Junction boxes shall be set away from opening to allow fixture to be dropped out. See details on drawings. Coordinate with ceiling diffusers and sprinkler head.

B. Fixtures run in continuous rows shall be mounted at a uniform height unless shown otherwise. Align both horizontally and vertically.

3.02 ANCHORING AND SUSPENDING:

A. Recessed fluorescent fixtures installed in suspended ceilings shall be supported independent of the ceiling system by the Electrical Contractor. Provide and install #12 iron wire from two opposite corners of the fixture to the building structure. Install four seismic clips in addition to the wire supports.

B. Surface mounted fixtures shall be anchored to or supported from outlined members or from bridging between structural members as outlined above. Anchors shall conform to specified types found in other sections of this Specification. Provide ceiling spacers as required.

C. All anchors shall support the weight of the fixture plus 150 lbs.

D. All building bracket type fixtures shall be securely mounted to outlet boxes or secured to buildings with approved anchors. E. Parking lot fixtures shall have concrete bases (see details). Anchor bolts shall be extended above concrete bases sufficient height to permit double nutting for pole support and leveling. The weight of the pole shall bear on the bottom nuts and not on the concrete base materials. Grout around top of base after the poles are set and leveled.

F. All exterior lighting poles shall be bonded to building ground with a hardwire copper ground conductor equal in size to the power conductors serving the exterior lighting fixtures.

G. The surfaces of all fixtures and lenses, interior and exterior, shall be wiped free of construction dust at the completion of the project.

H. Noisy Ballast: Replace any and all ballasts (fluorescent or H.I.D.) deemed excessively noisy by the Architect at no additional cost to the Contract.

3.03 CONTROL OF EXTERIOR LIGHTING:

A. Control exterior lighting with lighting contactor, time clock and photo-electric cell.

B. Install time clock and contactor inside building adjacent to serving panel to control exterior lighting.

C. Locate photo cell outside building under soffit and away from any light source and direct sunlight. Wire photo cell and time clock in series to control lighting contactor for photo cell “ON” and time clock “OFF” operation.

END OF SECTION

SECTION 16700

COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 GENERAL:

A. General Conditions and General Requirements as listed in Index to Specifications apply to work under this Section.

1.02 SYSTEMS INCLUDED UNDER THIS SECTION:

A. Duct System for Telephone/Data System

PART 2 PRODUCTS

2.01 DUCT SYSTEM FOR TELEPHONE/DATA SYSTEMS:

A. Provide a roughed-in conduit system only with finish trim on all outlets.
B. Wiring and equipment shall be provided and installed by others.
C. Products:
1. Products shall conform to those specified in other sections of the Specifications.
2. Conduits: Run conduit from each telephone/data outlet to accessible ceiling space (provide access sleeves through walls above ceilings to provide continuous pathway to Telephone Board). 1" C. for each outlet. See Section 16100. Service entrance - 4 inch diameter PVC Sch. 40 with 200# nylon pull rope.
3. Boxes: See Section 16100.
4. Power: Provide power to the telephone equipment as shown.
5. Mounting Board: 3/4" x 4' x 8' sheet of plywood (fire-rated, A/B Grade) painted with two coats of non-flammable gray paint.
6. The Electrical Contract shall provide a #6 bare wire copper grounding conductor to the telephone entrance point, and MDF ground bus, from main building ground bus.
7. Provide ground bus in MDF. Chatsworth #19622-010.(Pre-drilled with stand offs).
8. Provide #6 ground conductor from MDF ground bus to each telephone or data rack and telephone switch.

END OF SECTION