

CITY OF PARAGOULD
FIRE STATION NO. 1
PARAGOULD, AR

Prepared for:

CITY OF PARAGOULD
PARAGOULD, ARKANSAS

May 2019



**ETC ENGINEERS & ARCHITECTS, INC.
1510 SOUTH BROADWAY
LITTLE ROCK, AR 72202**

PROFESSIONAL CERTIFICATIONS

<p>Seal</p>  <p>A circular seal for a Registered Professional Engineer in the State of Arkansas. The seal contains the text: "STATE OF ARKANSAS", "REGISTERED PROFESSIONAL ENGINEER", "No. 12940", and "SHAWKAT M. ALI". There is a handwritten signature in blue ink over the seal and the date "05-13-19" written below it.</p>	<p>Seal</p>  <p>A circular seal for a Registered Architect in the State of Arkansas. The seal contains the text: "REGISTERED ARCHITECT", "GERALD AVERY", "License Number 4544", and "STATE OF ARKANSAS". There is a handwritten signature in blue ink over the seal and the date "05.13.2019" written below it.</p>
<p>Seal</p>  <p>A circular seal for a Registered Professional Engineer in the State of Arkansas. The seal contains the text: "STATE OF ARKANSAS", "REGISTERED PROFESSIONAL ENGINEER", "No. 9529", and "WILLIAM RAY ANDREWS". There is a handwritten signature in blue ink over the seal and the date "5/13/19" written below it.</p>	<p>Seal</p>
<p>Seal</p>	<p>Seal</p>

PARAGOULD FIRE STATION NO. 1 INDEX TO SPECIFICATION

DIVISION ZERO - BIDDING REQUIREMENTS AND CONTRACT DOCUMENTS

00000	Cover Sheet
00001	Professional Certification Sheet
00002	Index to Specifications
00003	Advertisement for Bids
00004	Information for Bidders
00005	Bid Proposal
00006	Bid Bond
00007	Agreement
00008	Notice to Proceed
00012	Arkansas Statutory Payment and Performance Bond
00700	General Conditions
00800	Supplementary General Conditions

DIVISION 1 - GENERAL REQUIREMENTS

01000	General Requirements
01010	Summary of Work and Procedures
01020	Special Conditions
01030	Allowances
01200	Project Meetings
01300	Submittals
01310	Substitution Request Form
01370	Schedule of Values
01400	Quality Control
01410	Environment Protection
01453	Structural Tests and Special Inspections
01500	Construction Facilities and Temporary Controls
01526	Trench Safety Systems
01630	Substitutions
01700	Contract Closeout
01710	Cleaning
01720	Project Record Documents
01730	Operating and Maintenance Data
01740	Warranties and Bonds
01750	Release of Lien Form
01780	Closeout Submittals

DIVISION 2 - SITEWORK

02010	Subsurface Conditions
02110	Site Preparation
02200	Earth Work
02210	Grading
02220	Excavating, Backfilling and Compacting
02221	Trenching and Backfilling

02232	Subgrade
02233	Aggregate Base Course
02511	Concrete Sidewalks and Curbs and Gutters
02513	Portland Cement Concrete Paving
02669	Potable Water System
02720	Storm Drainage System
02722	PVC Corrugated Pipe
02730	Sanitary Sewer System
02760	Field Molded Sealants for Sealing Joints in Rigid Pavements
02763	Pavement Markings
02810	Irrigation System
02920	Lawns and Grasses

DIVISION 3 - CONCRETE

03300	Concrete Work
-------	---------------

DIVISION 4 - MASONRY

04200	Concrete Unit Masonry
04110	Pre Blended Mortar
04150	Masonry Accessories
04210	Structural Brick Masonry Units
04212	Brick Masonry

DIVISION 5 - METALS

05120	Structural Steel Framing
05400	Cold-Formed Metal Framing
05500	Metal Fabrications and Miscellaneous Metal Work

DIVISION 6 - WOOD, PLASTICS, AND COMPOSITES

06100	Carpentry
06151	Wood Roof Decking
06220	Millwork

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07110	Sheet Membrane Waterproofing
07150	Masonry Water Repellant
07190	Water Repellants
07210	Insulation
07214	Spray Foam Insulation
07220	Roof Insulation
07274	Commercial Building Wrap
07410	Metal Siding Panels
07411	Standing Seam Metal Roof
07600	Flashing and Sheet Metal
07900	Joint Sealants

DIVISION 8 - DOORS AND WINDOWS

08110	Metal Doors and Frames
08110.1	Tornado-Resistant Doors and Frames

08200	Wood Doors
08330	Sectional Overhead Alum. Glass Doors
08410	Aluminum Framing
08710	Hardware
08800	Glazing
08901	Aluminum Swinging Doors

DIVISION 9 - FINISHES

09250	Gypsum Board Assemblies
09300	Tile
09510	Acoustical Ceiling Systems
09678	Resilient Wall Base
09680	Carpeting
09700	EPOXY 335 Spec
09900	Painting

DIVISION 10 - SPECIALTIES

10165	Plastic Laminate Toilet Partitions
10800	Toilet Accessories
10990	Miscellaneous Specialties

DIVISION 11 - EQUIPMENT

None

DIVISION 12 - FURNISHINGS AND SEATING

None

DIVISION 13 - SPECIAL CONSTRUCTION

13100	Pre-Engineered Metal Building System
-------	--------------------------------------

DIVISION 14 - CONVEYING SYSTEMS

None

DIVISION 15 – MECHANICAL

15010	Basic Mechanical Requirements
15110	Piping
15120-SM	VALVES
15140	Mechanical Supporting Systems
15160	Mechanical Systems Insulation
15180	Testing, Balancing & Adjusting
15210	Plumbing Equipment
213260	Standpipe and Sprinkler Systems
233521	Sliding Balancer Track Straight Rail Vehicle Exhaust Removal System

DIVISION 16 - ELECTRICAL

16010	Basic Electrical Requirements
16111	Conduit & Accessories
16120	Wire & Cable
16141	Wiring Devices

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-150302CPAG

16420	Service Entrance
16461	Dry Type Transformers
16470	Panelboard
16476	Circuit Breakers
16510	Lighting Fixtures
16721	Fire Alarm & Smoke Detection System
263213	Generator Specifications
263223	Automatic Transfer Switch

END OF INDEX TO SPECIFICATIONS

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number–150302CPAG

ADVERTISEMENT FOR BIDS

The City of Paragould will receive sealed bids at 301 West Court, Paragould, Arkansas 72450 for the Construction of Paragould Fire Station No. 1, Paragould, AR, Greene County, until 2:00 P.M. on June 04, 2019 at which time and place all bids will be publicly opened and read aloud.

A non-mandatory Pre-bid meeting will be held on May 14, 2019, at 1:00pm, at 301 West Court Street, Paragould, Arkansas 72450. Prospective bidders are encouraged to attend this meeting.

The Information for Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Forms of Bid Bond, Performance and Payment Bond and other contract documents may be examined at the following locations:

ETC Engineers & Architects, Inc.
1510 S. Broadway
Little Rock, AR 72202

Paragould City Hall
301 West Court Street
Paragould, AR 72450

Southern Reprographics, Inc.
Plan Room Services
901 W. 7th St.
Little Rock, AR 72201

Copies of the Contract Documents may be purchased from ETC Engineers & Architects, Inc., 1510 S. Broadway, Little Rock, AR 72202, (501) 375-1786, at a cost of four hundred fifty dollars (\$450.00), non-refundable.

A certified check or bank draft, payable to the order of the City of Paragould, negotiable U.S. Government bonds (at par value), or satisfactory bid bond executed by the bidder and an acceptable surety in an amount equal to five (5%) of the total bid shall be submitted with each bid.

The City hereby notifies all bidders that this contract is subject to applicable labor laws, non-discrimination provisions, wage rate laws and other federal laws including the Fair Labor Standards Acts of 1938. The Work Hours Act of 1962 and Title VI of the Civil Rights Act of 1964 also apply.

Attention is called to the fact that not less than the minimum salaries and wages as set forth in the contract documents must be paid on the project, and that the contractor must ensure that employees and applicants for employment are not discriminated against because of their race, color, religion, sex or national origin.

The City reserves the right to reject any or all bids or to waive any informality in bidding. Bids may be held by the City for a period not to exceed Sixty (60) days from the date of opening of bids for the purpose of reviewing the bids and investigating the qualifications of bidders prior to awarding the contract.

Mayor Mike Gaskill
City of Paragould

SECTION 00004 - INFORMATION FOR BIDDERS

1. PROJECT SITE

The construction of the City of Paragould – Paragould Fire Station No.1 to be accomplished by the contract is located in the City of Paragould, Greene County, Arkansas.

Work consists of the following: 21,670 sf of fire station building including six-bay apparatus room, grading, drainage, concrete driveway, parking lots, sidewalks etc.

2. NO-NMANDATORY PRE-BID CONFERENCE

A non-mandatory Pre-bid meeting will be held on May 14, 2019, at 1:00pm, at 301 West Court Street, Paragould, Arkansas 72450. Prospective bidders are encouraged to attend this meeting.

3. RECEIPT AND OPENING OF BIDS

The City of Paragould (OWNER) invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids may be hand delivered to the City of Paragould, at City Hall, 301 West Court Street, Paragould, Arkansas 72450, at the time shown on the "Advertisement for Bid", and then at said place publicly opened and read aloud. Alternatively, bids may be mailed to The City of Paragould, 301 West Court Street, Paragould, AR 72450 to be received before the Bid opening date. The envelopes containing the bids will be prepared as indicated below.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 60 days after the actual date of the opening thereof.

4. PREPARATION OF BID

These contract documents include a complete set of bidding and contract forms which are for the convenience of bidders and are not to be detached from the contract documents, filled out or executed.

Each bid must be submitted on the prescribed bid form as well as accompanied by a Bid Bond. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and the foregoing certifications must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

At the time of bid opening, the envelope containing the bid and bid bond will be opened and read aloud for the purpose of qualifying the bid. After all bids and required contract documents

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-150302CPAG

have been thoroughly checked by the owner, the successful bidder will be announced and personally informed. Should a low bidder fail to execute all required documentation qualifying his bid, the bid may be rejected and the next lowest bidder awarded the work if he has qualified.

Envelope will be clearly marked as follows:

FROM: _____
(Name of Concern)

ADDRESS: _____
(Street or P.O. Box)
(City, State, Zip Code)

TO: City of Paragould
Mayor Mike Gaskill

Construction of: Paragould Fire Station No. 1

To Be Opened: _____

5. SUBCONTRACTS

The bidder is specifically advised that any person, firm or other party to whom it is proposed to award a subcontract, this contractor must possess a current Arkansas Contractors License * and must be able to obtain bonding, and must be acceptable to the owner.

6. FACSIMILE MODIFICATION

Any bidder may modify his bid by facsimile at any time prior to the scheduled opening time for receipt of bids, provided such facsimile is received by the owner prior to the opening time, and, provided further, the owner is satisfied that a written confirmation of the facsimile modification with the signature of the bidder was mailed prior to the bid opening time. The facsimile should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the owner until the sealed bid is opened. If written confirmation is not received within **two (2) days** from the bid opening time, no consideration will be given to the facsimile modification.

7. METHOD OF BIDDING

Method of bidding for the project will be as follows:

The proposal is defined as a "Lump Sum Contract". All bids are lump sum and to include all cost associated with the project for a complete turnkey construction.

Bidders must satisfy themselves of the accuracy of the estimated quantities in the bid schedule by examination of the site and a review of the drawings and specifications including Addenda.

After bids have been submitted, the bidder shall not assert that there was a misunderstanding concerning the quantities of work or the nature of the work to be done. No alternate bids will be considered unless alternate bids are specifically required by the contract documents.

8. QUALIFICATIONS OF BIDDER

The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish the Owner all such information and data for this purpose as the owner may request. The owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids shall not be accepted.

9. BID SECURITY

Each bid must be accompanied by a certified check of the bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the owner, in the amount of 5% of the bid. Such check or bid bond will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining check or bid bond will be returned promptly after the owner and the accepted bidder have executed the contract, or, if no award has been made within 60 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of this bid.

10. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful bidder, upon his failure or refusal to execute and deliver the contract and bonds required within ten (10) days after he has received notice of the acceptance of this bid, shall forfeit to the owner, as liquidated damages for such failure or refusal, the security deposited with his bid.

11. TIME OF COMPLETION

Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" and to fully complete the project within **Three Hundred and Thirty (330)** consecutive calendar days for thereafter.

12. LIQUIDATED DAMAGES FOR DELAY IN COMPLETION

As actual damages for any delay in completion of the work which the Contractor will be required to perform under the Contract are impossible to determine, the Contractor and his Sureties will be liable for and shall pay to the Owner the sum of \$300.00 as fixed, agreed and liquidated damages for each calendar day of delay from the date stipulated pursuant to the preceding paragraph.

13. CONDITIONS OF WORK

Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provision of his contract. Insofar as possible, the contractor in carrying out his work must employ such methods or means as will not cause any interruption of or interference with the work or any other contractor.

14. ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to ETC Engineers & Architects, Inc. at 1510 South Broadway, Little Rock, Arkansas, 72202 RE: the **Paragould Fire Station No. 1**. To be given consideration, the request must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instruction will be in the form of written addenda to the contract documents which, if issued, will be mailed by certified mail with return receipt requested or sent by facsimile to all prospective bidders (at the respective addresses or fax numbers furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.

15. SECURITY FOR FAITHFUL PERFORMANCE

Simultaneously with his delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bonds shall be a duly authorized company satisfactory to the owner. The use of Arkansas Performance and Payment Bond (14-604 Arkansas Statutes, Rev. 1/76) is mandatory.

16. POWER OF ATTORNEY

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

17. NOTICE OF SPECIAL CONDITIONS

Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

1. Construction Schedule and Periodic Estimates
2. Payments to Contractor
3. Equal Employment Opportunity
4. Certification of Compliance with Air and Water Acts
5. Work by Others

6. Layout of Work
7. Construction Sequence, Maintenance of Traffic, and Maintenance of Access to Individual Properties
8. Contract to Check Plans and Schedules
9. Maintenance Bonds
10. Testing Laboratory Services

18. LAWS AND REGULATIONS

The bidder's attention is directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

19. METHOD OF AWARD - LOWEST QUALIFIED BIDDER

If at the time this contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed the amount of funds available to finance the contract, the contract will be awarded on the base bid only. If such bid exceeds such amount, the owner may reject all bids.

20. OBLIGATION OF BIDDER

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of this bid.

21. SAFETY STANDARDS AND ACCIDENT PREVENTION

With respect to all work performed under this contract, the contractor shall:

- a. Comply with the safety standards provisions of applicable laws, building and construction codes and the Manual of Accident Prevention in Construction: published by the Associated General Contractors of America, the requirements of the Occupation Safety and Health Act of 1970 (Public Law 91-596 and the requirement of Title 29 of the Code of Federal Regulations, Section 1518 as published in the Federal Register, Volume 36 No. 75, Saturday, April 17, 1971).
- b. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
- c. Maintain at his office or other well-known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or a doctor's care of persons (including employees), who may be injured on the job site.

22. ARKANSAS STATE LICENSING LAW

- a. Attention of bidders is particularly called to the requirements that all bidders must be in compliance with the requirements of Act 150 of 1965 of the State of Arkansas, effective June 3, 1965, which is the current Arkansas State Licensing * Law for Contractors.
- b. Each bidder submitting a bid to the owner for any portion of the work contemplated by the documents of which bidding is based shall execute and include in the submission of the bid, a certification substantially in the form herein provided to the effect that he has a current Arkansas State Contractor's License* in compliance with the requirements of the aforementioned law.

23. SCHEDULE OF DRAWINGS

INDEX OF SHEETS

X1-COVER, LOCATION MAPS, & INDEX

CIVIL PLANS

C1-EXISTING CONDITIONS/TOPO
C2-SITE & UTILITY PLAN
C3-GRADING, DRAINAGE, & EROSION CONTROL PLAN
D1-CONSTRUCTION DETAILS
D2-CONSTRUCTION DETAILS
D3-CONSTRUCTION DETAILS
D4-CONCRETE JOINT LAYOUT & DETAILS

STRUCTURAL & ARCHITECTURAL PLANS

S1.0-STRUCTURAL NOTES
S1.1-FOUNDATION PLAN
S1.2-FOUNDATION PLAN II
S1.3-FOUNDATION DETAILS
S1.4-ROOF FRAMING PLAN - SOUTH
S1.5-ROOF FRAMING PLAN - NORTH
A0.0-KEY NOTES
A0.1-KEY NOTES
A1.0-OVERALL KEY FLOOR PLAN
A1.01-APPARATUS ROOM FLOOR PLAN
A1.1-REFLECTED CEILING PLAN
A1.02-ADMINISTRATION FLOOR PLAN
A1.2-ROOF PLAN
A1.03-MEZZANINE LEVEL FLOOR PLAN
A2.0-OVERALL EXTERIOR ELEVATIONS
A2.1-EXTERIOR ELEVATIONS
A2.2-EXTERIOR ELEVATIONS
A2.3-EXTERIOR ELEVATIONS
A3.1-APPARATUS ROOM BUILDING SECTIONS

A3.2-APPARATUS ROOM BUILDING SECTIONS
A3.3-ADMINISTRATION BUILDING SECTIONS
A3.4-ADMINISTRATION BUILDING SECTIONS
A3.5-ADMINISTRATION BUILDING SECTIONS
A4.1-WINDOW TYPES
A4.2-MILLWORK
A4.3-ENLARGED TOILET PLANS
A4.4-INTERIOR ELEVATIONS
A4.5-INTERIOR ELEVATIONS
A5.1-DOOR DETAILS
A5.2-APPARATUS ROOM WALL DETAILS
A5.3-APPARATUS ROOM WALL DETAILS
A5.4-APPARATUS ROOM WALL DETAILS
A5.5-APPARATUS ROOM WALL DETAILS
A5.6-APPARATUS ROOM WALL DETAILS
A5.7-ADMINISTRATION WALL DETAILS
A5.8-ADMINISTRATION WALL DETAILS
A5.9-ADMINISTRATION WALL DETAILS
A5.10-ADMINISTRATION WALL DETAILS
A5.11-ADMINISTRATION WALL DETAILS
A5.12-DETAILS
A5.13-DETAILS
A5.14-DETAILS
A6.0-DOOR TYPES & SCHEDULE

PLUMBING, MECHANICAL, & ELECTRICAL PLANS

P-1.1 PLUMBING PLAN - AREA A
P-1.2 PLUMBING PLAN - AREA B
P-1.3 PLUMBING RISERS
P-1.4 PLUMBING SCHEDULES
R-1.1 RADIANT FLOOR PLAN - AREA A
M-1.1 HVAC PLAN - AREA A
M-1.2 HVAC PLAN REFRIGERATION - AREA B
M-1.3 HVAC PLAN AIR - AREA B
M-1.4 HVAC SCHEDULES
E0.1-ONE-LINE DIAGRAM, NOTES, SYMBOLS, PANEL SCHEDULE
E1.1-APPARATUS ROOM ELECTRICAL PLAN
E1.2-MEZZANINE LEVEL ELECTRICAL PLAN
E1.3-ADMINISTRATION ELECTRICAL PLAN
E2.1-APPARATUS ROOM LIGHTING PLAN
E2.2-MEZZANINE LEVEL ELECTRICAL PLAN
E2.3-ADMINISTRATION LIGHTING PLAN
E3.1-PANEL SCHEDULES
E4.1-DATA PLAN

END OF SECTION 00004

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-150302CPAG

BID PROPOSAL

Bid Time: _____
Bid Date: _____, 2019
Location: City Hall
City of Paragould
301 West Court Street
Paragould, AR 72450

FROM: _____

BID TO: **City of Paragould**

PROJECT: **Paragould Fire Station No. 1**

Gentlemen:

1. The undersigned bidder, in compliance with your request for bids for the above referenced project, having examined specifications, related documents, and site of the proposed project, hereby proposes to construct the **Paragould Fire Station No. 1** as described in the specifications contained in this solicitation for bids. These prices entered under "Total Bid" are for a complete turnkey project inclusive of all labor and materials and are to cover the specified equipment and delivery charges as stipulated in the scope of work. Having carefully examined the Contract Documents for this project, as well as the premises and all conditions affecting the proposed construction, the undersigned proposes to provide all labor, materials, services, and equipment necessary for, or incidental to, the construction of the project in accordance with the Contract Documents including the general conditions within the time set forth, for the lump sum base Total Base Bid of:

\$ _____)

Dollar Amount Is To Be Shown Numerically.

_____)

Dollar Amount Is To Be Shown Alphabetically.

2. Ark. Code Ann. § 22-9-212 requires the contractor to indicate on this bid form the cost of Trenching Safety Systems. FAILURE TO SHOW THIS COST WILL INVALIDATE THE BID. (NOTE THIS COST SHALL BE INCLUDED IN THE ABOVE BASE BID)

(_____)

Dollar Amount Is To Be Shown Numerically.

3. DEDUCTIVE ALTERNATIVES

NONE.

4. Completion Date: Bidder agrees that the work will be complete and ready for final payment in accordance with the Contract Documents within **Three Hundred and Thirty (330)** consecutive calendar days.
5. The undersigned, in compliance with the Contract Documents for the construction of the above named project, does hereby declare:
- a. That the undersigned understands that the Owner reserves the right to reject any and all bids and to waive any formality.
 - b. If at the time this contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed the amount of funds available to finance the contract, the contract will be awarded on the base bid only. If such bid exceeds such amount, the owner may reject all bids or accept one or more deductive bid alternates to determine the lowest base bid.
 - c. That if awarded the Contract, the undersigned will enter into an Agreement, on a form identical to the form included in the Contract Documents and execute required performance and payment bonds within Seven (7) days after receipt of the Intent to Award, will commence work within Five (5) days after the date of the Notice to Proceed, and will complete the Contract fully within **Three Hundred and Thirty (330)** consecutive calendar days for thereafter. Should the undersigned fail to fully complete the work within the above stated time, he shall pay the Owner as fixed, agreed and liquidated damages and not as a penalty, the sum of **Three Hundred Dollars (\$300)** for each calendar day of delay until the work is completed or accepted.
 - d. The undersigned further agrees that the bid security payable to Owner and accompanying this proposal shall become the property of the Owner as liquidated damages if the undersigned fails to execute the Contract or to deliver the required bonds to the Owner within Seven days from receipt of the Intent to Award as these acts constitute a breach of the Contractor's duties.
 - e. That this bid may not be withdrawn for a period of 60 days after the bid opening.
 - f. The undersigned understands that the Owner's intent is to construct all facilities proposed within the limits established by the funds appropriated for the project.
 - g. The names of subcontractors and the nature of the work to be performed by each one

have been included on the Bid Form.

- h. The undersigned agrees to pay all prevailing hourly wage rates prescribed and mandated by Ark. Code Ann. § 22-9-301 et. seq., if the bid exceeds \$75,000 or the undersigned agrees to pay all prevailing hourly wage rates mandated by the Davis-Bacon Wage Rates and any other applicable federal regulations.
- i. Bids submitted by a Joint Venture/Joint Adventure shall be signed by representatives of each component part of the Joint Venture. The licenses of each component part of the Joint Venture shall also be listed in the bid submittal. Therefore, joint venture bidders shall indicate at least two (2) signatures and two (2) licenses numbers on the Bid Form. Exception: Joint Ventures who have been properly licensed with the Arkansas Contractors Licensing Board as a Joint Venture need only to indicate the joint venture license number on the Bid Form. Joint Venture Bidders shall indicate at least two (2) signatures on the bid form even if they are licensed as a joint venture.

6. The following documents are attached to and made a condition of this Bid.

a. Bid security.

7. The undersigned acknowledges receipt of and inclusion as a part of the Contract.

8. Documents the following addenda:

No. _____ Dated _____

No. _____ Dated _____

No. _____ Dated _____

No. _____ Dated _____

9. LISTING OF ALL SUBCONTRACTORS INCLUDING MECHANICAL, PLUMBING, ELECTRICAL AND ROOFING SUBCONTRACTORS

All subcontractors including mechanical, plumbing, electrical and roofing subcontractors shall be listed regardless of qualifications, licenses or work amount.

Indicate the Name(s) and Address, of each entity performing the listed work:

MECHANICAL (Indicative of HVACR):

_____ License No: _____

Is the amount of work \$20,000.00 or over: Yes ___ No ___

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-150302CPAG

ELECTRICAL & LIGHTING SUBCONTRACTOR:

License No: _____
Is the amount of work \$20,000.00 or over: Yes ___ No ___

PLUMBING:

License No: _____
Is the amount of work \$20,000.00 or over: Yes ___ No ___

ROOFING AND SHEET METAL (Indicative of roofing applications):

License No: _____
Is the amount of work \$20,000.00 or over: Yes ___ No ___

Respectfully Submitted:

Name of Bidder (Typed or Printed)

Address

BY: (Signature and Title)

Contractor's License Number or Contractor's
(Joint Venture) License Number(s)

Telephone Number Fax Number

Federal ID Number or SSN#

Date of Bid

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____
_____ as Principal, and _____
_____ as Surety, are hereby held and firmly bound unto, City of Paragouldt, as OWNER
in the penal sum of five percent (5%) for the payment of which, well and truly to be made, we
hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and
assigns. Signed this _____ day of _____, 2019.

The condition of the above obligation is such that whereas the Principal has submitted to the
City of Cabot a certain BID, attached hereto and hereby made a part hereof to enter into a
contract in writing, for the Construction of the **Veteran's Memorial Recreation Center
Expansion**.

NOW THEREFORE

- (a) If said BID shall be rejected, or in the alternate.
- (b) If said BID shall be accepted and the Principal shall execute and deliver a
contract in the Form of Contract attached hereto (properly completed in
accordance with said BID) and shall furnish a BOND for his faithful performance
of said contract, and for the payment of all persons performing labor or furnishing
materials in connection therewith, and shall in all other respects perform the
agreement created by the acceptance of the said BID.

then this obligation shall be void, otherwise the same shall remain in force and effect; it being
expressly understood and agreed that the liability of the Surety for any and all claims hereunder
shall, in no event, exceed the penal amount of the obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety
and its BOND shall be in no way impaired or affected by any extension of time within which the
OWNER may accept such BID; and said Surety does hereby waive notice of any such
extension.

IMPORTANT Surety companies executing bonds must appear on the Treasurer Department's
most current list (Circular 570, as amended) and be authorized in accordance with Section 22 of
the General Conditions to transact business in the State of Arkansas.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals,
and such of them as are corporations have caused their corporate seals to be hereto affixed
and these presents to be signed by their proper officers, the day and year first set forth above.

Principal

Surety

By: _____

Seal

AGREEMENT

THIS AGREEMENT made this _____ day of _____, 2019, by and between _____ (a corporation organized and existing under the laws of the State of Arkansas) hereinafter called the "Contractor" and the **City of Paragould, 301 W. Court Street, Paragould, AR 72450** hereinafter called the "Owner".

WITNESSETH:

That the Contractor and the Owner for the consideration stated herein mutually agrees as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work described in Bid Form and as required for the construction of the **Paragould Fire Station No.1** in strict accordance with the Contract Documents prepared by ETC Engineers & Architects.

ARTICLE 2. The Contract Price: The stipulated contract price is _____ . The Owner will pay the contractor, because of his performance of the Contract, for the total quantities of work performed at the lump sum and unit prices stipulated in the Proposal, subject to additions, and deductions as provided in the Section entitled "CHANGES IN THE WORK" under GENERAL CONDITIONS.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within **Three Hundred and Thirty (330)** calendar days thereafter (except as modified in GENERAL CONDITIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and **agreed, and not in the nature of a penalty, the sum of Three Hundred (\$300) dollars** for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

- a. This Agreement
- b. Addenda
- c. Advertisement for Bids
- d. Information for Bidders
- e. Bid

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number–150302CPAG

- f. General Conditions
- g. Supplemental General Conditions
- h. Technical Specifications

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached to herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner and authorized to do business in the State of Arkansas.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in six (6) counterparts, each of which shall be considered an original on the day and year first above written.

ATTEST:

CONTRACTOR

(Contractor)

By: _____
(Title)

Paragould _____
(Owner)

By: _____
(Mayor)

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-150302CPAG

NOTICE TO PROCEED

To:

Date:

Project: **Paragould Fire Station No. 1**

You are hereby notified to commence WORK in accordance with the Agreement dated _____ on or after _____, and you are to complete the work within _____ consecutive calendar days thereafter. All required documentations such as Agreement, Performance Bond and Insurance should be submitted to the Engineer before or at the Pre-Construction conference meeting.

The date of completion of all WORK is therefore _____:

ETC Engineers & Architects, Inc.:

By:

Title: Project Manager

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____ this the _____ day of _____, 2019.

Contractor:

By:

Title:

Arkansas Statutory Payment and Performance Bond

We _____, as Principal,
hereinafter called Principal, and _____ authorized to do business in the State
of Arkansas, as Surety, hereinafter called Surety, are held and firmly bound unto _____
_____ as Oblige, hereinafter called Owner, in the amount of _____
_____ Dollars (\$ _____), for the payment whereof
Principal and Surety bind themselves, their heirs, personal representatives, successors and assigns, jointly and
severally, by these presents.

Principal has by written agreement dated _____ entered into a contract with Owner for

_____ which contract is by reference made a part hereof and hereinafter referred to as the Contract.

THE CONDITION OF THIS OBLIGATION is such that if the Principal shall faithfully perform the Contract on his part and shall fully indemnify and save harmless the Owner from all cost and damage which he may suffer by reason of failure to do so and shall fully reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any such default, and further, that if the Principal shall pay all persons all indebtedness for labor or materials furnished or performed under said Contract, failing which such persons shall have a direct right of action against the Principal and Surety, jointly and severally, under this obligation, subject to the Owner's priority, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

No suit, action or proceeding shall be brought on this bond outside the State of Arkansas. No suit, action or proceeding shall be brought on this bond except by the Owner after six months from the date final payment is made on the Contract, nor shall any suit, action or proceeding be brought by the Owner after two years from the date on which the final payment under the Contract falls due.

Any alterations which may be made in the terms of the Contract, or in the work to be done under it, or the giving by the Owner of any extension of time for the performance of the Contract, or any other forbearance on the part of either the Owner or the Principal to the other shall not in any way release the Principal and the Surety or Sureties, or either or any of them, their heirs, personal representatives, successors or assigns from their liability hereunder, notice to the Surety or Sureties of any such alteration, extension or forbearance being hereby waived.

In no event shall the aggregate liability of the Surety exceed the sum set out herein.

Executed on this _____ day of _____, 20__

Principal

Surety Agent

Attorney-in-Fact

SECTION 00700 - GENERAL CONDITIONS

ARTICLE 1 -- GENERAL PROVISIONS

1.1 DEFINITIONS

- 1.1.1 Contract Documents: Contract Documents consist of Agreement with Proposal and Bid Bond attached; Bonds; General and Supplementary Conditions; Specifications; Drawings; Addenda issued prior to execution of the Contract; other documents listed in the Agreement; and modifications issued after execution of the Contract, signed by both parties.
- 1.1.2 Contract: The Contract Documents form the Contract for construction. The Contract Documents will not be construed to create a contractual relationship between the [Architect] [Engineer] [Landscape Architect] [Design Consultant] and Contractor, between the Owner and a subcontractor, between the Owner and [Architect] [Engineer] [Landscape Architect] [Design Consultant], or between entities other than the Owner and Contractor; however, a contractual relationship does exist between the Contractor and the agency referred to as Owner.
- 1.1.3 Work: Construction and services required by the Contract Documents whether completed or partially completed, include tools, labor, equipment, supplies, transportation, handling, and incidentals provided by the Contractor.
- 1.1.4 Project: The total improvement program described in the Contract Documents.
- 1.1.5 Drawings: Graphic and textual portions of the Contract Documents showing the design, location, and dimensions and size of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
- 1.1.6 Specifications: Written requirements for materials, equipment, systems, standards, and workmanship for the Work, and performance of related services.
- 1.1.7 Project Manual: Volume which may include the bidding requirements, forms, contracting requirements, and the Technical Specifications.
- 1.1.8 Owner: The person or entity identified as such in the Contract Agreement, referred to throughout the Contract Documents as singular in number. The term Owner means the Owner or the Owner-authorized representative.
- 1.1.9 Owners Representative: A designated representative of the Owner will perform all duties and obligations hereinafter assigned to the Owner.
- 1.1.10 Contractor: The person or entity identified as such in the Contract Agreement, referred to throughout the Contract Documents as singular in number. The term Contractor means the Contractor or the Contractor-authorized representative.
- 1.1.11 {Architect} [Engineer] [Landscape Architect] [Design Consultant] [A] [E] [LA] [DC]: The person or entity identified as such in the Agreement, lawfully licensed to practice architecture or engineering and under contract to Owner to provide design service, advice, and consultation, referred to throughout the Contract Documents as if singular in number. The term [A] [E] [LA] [DC] means the {Architect} [Engineer] [Landscape Architect] [Design Consultant] [Owner] or the authorized representative.

- 1.1.12 Subcontractor: Any person, firm, or corporation with a direct contract with the Contractor who acts for or in behalf of the Contractor in executing a portion of the Work. The term subcontractor is referred to as singular in number and means the subcontractor or the subcontractor-authorized representative.
- 1.1.13 Inspector: A duly authorized representative of the [Architect] [Engineer] [Landscape Architect] [Design Consultant], designated for detailed inspection of materials, construction, workmanship, and methods of construction.
- 1.1.14 Site: The particular location of that part of the project being considered.

1.2 INTENT

- 1.2.1 The intent of the Contract Documents is to set forth the standards of construction, the quality of materials and equipment, the guarantees that are to be met, and to include items necessary for proper execution and completion of the Work. The Contract Documents are complementary and what is required by one will be as binding as if required by all. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable as necessary to produce indicated results.
- 1.2.2 Organization of the Specifications into divisions, sections, and articles, and arrangement of Drawings will not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.
- 1.2.3 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 CAPITALIZATION

- 1.3.1 Terms capitalized in the Contract Documents include those which are specifically defined, the titles to numbered sections and articles, identified references to paragraphs, and the titles of other published documents.

1.4 INTERPRETATION

- 1.4.1 Whenever in these Contract Documents the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like import are used, it shall be understood that the order, direction, requirement, permission, or allowance of the Owner and [Architect] [Engineer] [Landscape Architect] [Design Consultant] is intended.
- 1.4.2 Whenever in these Contract Documents the word "product" is used, it shall be understood that the materials, systems, and equipment will be included.
- 1.4.3 Whenever in these Contract Documents the word "provide" is used, it shall be understood that it means to "furnish and install".
- 1.4.4 The Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an", but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

ARTICLE 2 -- OWNER

2.1 LAND

2.1.1 The Owner will provide the lands shown on the Drawings upon which the Work shall be performed. The Owner will provide a right-of-way for access to the project site.

2.1.2 The Owner will provide base lines for the location of the principle component parts of the Work with a suitable number of bench marks adjacent to the Work.

2.2 RIGHT OF ENTRY BY OWNER

2.2.1 The Owner and his authorized representative will have the right to enter the property or location on which the Work shall be constructed. The Owner further reserves the right to construct or have his authorized agents construct such work as the Owner will desire, so long as these operations do not interfere with or delay the work being constructed under this Contract.

2.3 OWNER'S RIGHT TO CARRY OUT THE WORK

2.3.1 If the Contractor defaults or neglects to perform the Work in accordance with the Contract Documents, including the requirements with respect to the schedule of completion, and fails after ten days written notice from the Owner to correct the deficiencies, the Owner may deduct the cost thereof from the payment then or thereafter due the Contractor.

ARTICLE 3 -- CONTRACTOR

3.1 GENERAL

3.1.1 The Contractor shall perform the Work in accordance with the Contract Documents.

3.1.2 The Contractor shall furnish labor, materials, equipment, and transportation necessary for the proper execution of the work unless specifically noted otherwise. The Contractor shall do all the work shown on Drawings and described in Specifications and all incidental work considered necessary to complete the project in a substantial and acceptable manner, and to fully complete the work or improvement, ready for use, occupancy and operation by the Owner. Drawings and Specifications shall be interpreted by the [Architect] [Engineer] [Landscape Architect] [Design Consultant].

3.1.3 The Contractor shall cooperate with the Owner, [Architect] [Engineer] [Landscape Architect] [Design Consultant], inspectors, and with other contractors on the Project. Contractor shall allow inspectors acting in an official capacity, to have access to the project site.

3.1.4 The Contractor shall determine that the final and completed work on the project is in accordance with the Contract Documents. The failure of the [Architect] [Engineer] [Landscape Architect] [Design Consultant] to find or correct errors or omissions in the use of materials or work methods during the progress of the work shall not relieve the Contractor from his responsibility to correct all the defects in the project.

3.1.5 The Contractor shall assist in making final inspections and shall furnish such labor and equipment as may be required for the final tests of equipment, piping, and structures.

3.2 REVIEW OF FIELD CONDITIONS

- 3.2.1 Before ordering material or doing Work, the Contractor shall verify all measurements involved and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of difference between actual dimensions and the measurements indicated on Drawings; differences which may be found, shall be submitted to [Architect] [Engineer] [Landscape Architect] [Design Consultant] for consideration before proceeding with the Work.
- 3.2.2 Drawings may show the location or existence of certain exposed and buried utilities as well as existing surface and subsurface structures. The Owner assumes no responsibility for failure to show any or all such utilities and structures on the Drawings or to show such in the exact location. It is mutually agreed such failure will not be considered sufficient basis for claims for extra work or for increasing the pay quantities in any manner unless the obstruction encountered necessitates substantial changes in the lines or grades or requires the building of a special structure.
- 3.3 REVIEW OF CONTRACT DOCUMENTS
- 3.3.1 The Contractor shall study and compare Drawings, Specifications, and other instructions and shall report to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] at once any error, inconsistency, or omission discovered.
- 3.3.2 In the event of conflict among the Contract Documents, interpretations will be based on the following order of precedence:
- a. The Agreement
 - b. Addenda, with those of later date having precedence
 - c. Supplementary Conditions
 - d. General Conditions
 - e. Drawings and Specifications
- 3.3.3 Since the Contract Documents are complementary, the Contractor shall take no advantage of any apparent error or omission in the Drawings and Specifications. The Owner or [Architect] [Engineer] [Landscape Architect] [Design Consultant] shall furnish interpretations as deemed necessary for the fulfillment of the intent of the Drawings and Specifications.
- 3.3.4 Discrepancies found between the Drawings and Specifications and actual site conditions or any errors or omissions in the Drawings or Specifications shall be immediately reported to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] who shall address such error or omission in writing. Work done by the Contractor after discovery of such discrepancies, errors, or omissions shall be at the Contractor's risk and expense.
- 3.4 REQUEST FOR SUPPLEMENTARY INFORMATION
- 3.4.1 The Contractor shall make timely requests of the Owner or [Architect] [Engineer] [Landscape Architect] [Design Consultant] for additional information required for the planning and production of the Work. Such requests shall be submitted as required, but shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.
- 3.4.2 Additional instructions may be issued by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] during the progress of the Work to clarify the Drawings and Specifications or as may be necessary to explain or illustrate changes in the Work.
- 3.5 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- 3.5.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

- 3.5.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.
- 3.5.3 Samples are physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.
- 3.5.4 The Contractor shall provide shop drawings and other submittals, settings, schedules, and other drawings as may be necessary for the prosecution of the Work in the shop and in the field as required by the Drawings, Specifications, or [Architect] [Engineer] [Landscape Architect] [Design Consultant] instructions.

3.6 LABOR AND MATERIALS

- 3.6.1 Except as otherwise specifically stated in the Contract, the Contractor shall provide, but not be limited to, all materials, labor, tools, equipment, water, light, heat, power, transportation, superintendence, temporary construction of every nature, taxes legally collectible because of the work, and all other services and facilities of every nature whatsoever necessary to complete the Work in accordance with the Contract Documents in an orderly and efficient manner. The sequence of construction operations shall follow the schedule of construction as approved by the [Architect] [Engineer] [Landscape Architect] [Design Consultant]. The Work shall not be discontinued by the Contractor without approval of the [Architect] [Engineer] [Landscape Architect] [Design Consultant]. Should prosecution of the Work be discontinued for any reason, the Contractor shall notify the [Architect] [Engineer] [Landscape Architect] [Design Consultant] at least twenty-four hours in advance of resuming the Work.
- 3.6.2 Materials and equipment furnished under this Contract will be subject to inspection by the Owner's authorized representative or by independent laboratories. Defective material, equipment, or workmanship may be rejected at any time before the acceptance of the Work even though the defective material, equipment, or workmanship may have been previously overlooked and estimated for payment. The Contractor shall replace defective equipment and material in accordance with the Contract Documents at no additional cost to the Owner.
- 3.6.3 The Contractor shall provide materials and supplies not subject to conditional sales agreements, bailment lease, or other agreement reserving unto the seller any right, title, or interest therein. All materials and supplies shall become the property of the Owner upon final acceptance of this Contract by the Owner.
- 3.6.4 If shop tests are to be conducted, the Contractor shall notify the Owner of such tests so a representative may witness tests, if desired.
- 3.6.5 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the [Architect] [Engineer] [Landscape Architect] [Design Consultant], and in accordance with a Change Order.

3.7 UNAUTHORIZED WORK

- 3.7.1 Work done without lines and grades having been given or work done beyond the lines or not in conformity with the grades shown on the Drawings or as provided by the Owner, except as provided herein, and work completed without proper inspection and supervision or any extra or unclassified work completed without written authority and prior agreement shall be at the Contractor's risk. Such unauthorized work, at the option of the [Architect] [Engineer] [Landscape Architect] [Design Consultant], may not be measured and paid for and may be ordered removed at the Contractor's expense.

3.8 SUPERINTENDENCE

- 3.8.1 The Contractor shall supervise and direct the Work. The Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures and for coordinating portions of the Work under the Contract. The Contractor shall maintain the workplace as a drug free work area. From time to time Owner may require drug test report.
- 3.8.2 The Contractor shall employ a qualified and experienced (in similar project type and magnitude) superintendent during the duration of the Project who is acceptable to the Owner and [Architect] [Engineer] [Landscape Architect] [Design Consultant]. The superintendent shall be maintained on the Project and give efficient supervision to the Work until completion. The superintendent shall be capable of reading and understanding the Drawings and Specifications and shall have full authority to act in behalf of the Contractor. All directions and instructions given to the Superintendent shall be considered as given to the Contractor and shall be as binding as if given to the Contractor.
- 3.8.3 Workmanship shall be performed by workmen experienced in their trade and skilled and experienced for the class of work to which assigned. Any person, including supervisory personnel, who does not show and exhibit skill and proficiency in said work shall be removed by the Contractor and replaced by a competent and experienced workman.
- 3.8.4 The Contractor shall, at all times, be responsible for the conduct and discipline of his employees and all Subcontractors and their employees. Disorderly, incompetent or intemperate persons, or persons who commit any crimes or trespass on public or private property in the vicinity of the Work must not be employed, retained, or allowed upon the project. Any foreman or workman employed by the Contractor or a Subcontractor who refuses or neglects to comply with the instructions of the Owner, [Architect] [Engineer] [Landscape Architect] [Design Consultant], or inspector shall, at the written request of the Owner or [Architect] [Engineer] [Landscape Architect] [Design Consultant], be discharged immediately and shall not be employed again in any portion of the Work without the approval of the Owner.
- 3.8.5 The Contractor shall coordinate Work by the various trades to provide uniform and symmetrical layout and spacing of the exposed components which will affect the finished design and appearance. Where spacing and related locations are not specifically shown on Drawings or where in doubt, the Contractor shall consult the [Architect] [Engineer] [Landscape Architect] [Design Consultant] prior to installation of that part of the Work.

3.9 PERMITS, FEES, AND NOTICES

- 3.9.1 The Contractor shall purchase and secure all drawings and specifications, permits and licenses and give all notices necessary and incidental to the prosecution of the Work.
- 3.9.2 When new construction under the Contract crosses highways, railroads, streets or utilities under the jurisdiction of the state, county, city, or other public agency, public utility, or private entity, the Contractor shall secure written permission from the proper authority before executing such new construction. A copy of this written permission shall be filed with the Owner before any work is completed. The Contractor shall furnish a release from the proper authority before final acceptance of the Work. Any bonds required for this Work shall be secured and paid for by the Contractor.

3.10 SAMPLES AND TESTS

- 3.10.1 The Contractor shall provide samples, materials, and equipment necessary or required for testing as outlined in the various sections of the Specifications or as directed by the Owner. The Contractor shall pay costs for testing. Should materials, methods, or systems fail to meet

specified standards, the Contractor shall pay all costs for additional testing as required by the Owner.

3.10.2 All tests shall be made by a laboratory approved by the Owner.

3.11 LOCATION, GRADIENT, AND ALIGNMENT

3.11.1 Based upon the site information provided by the Owner, the Contractor shall develop and make detailed surveys necessary for construction including slope stakes, batter boards, and other working points, lines and elevations.

3.11.2 The Contractor shall report any errors, inconsistencies, or omissions to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] as a request for information.

3.11.3 The Contractor shall preserve bench marks, reference points and stakes, and in the case of destruction thereof by the Contractor, shall be responsible for damage or mistakes resulting from unnecessary loss or disturbance.

3.12 LAND

3.12.1 Additional land and access thereto not shown on Drawings that may be required for temporary construction facilities or for storage of materials shall be provided by the Contractor at his expense with no liability to the Owner. The Contractor shall confine his equipment and storage of materials and the operation of his workmen to those areas shown on the Drawings and described in the Specifications, and such additional areas which he may provide or secure as approved by the Owner.

3.12.2 The Contractor shall not enter upon private property for any purpose without first obtaining permission.

3.12.3 The Contractor shall be responsible for the preservation of and prevent damage or injury to all trees, monuments, and other public property along and adjacent to the street and right-of-way. The Contractor shall prevent damage to pipes, conduits and other underground structures, and shall protect from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location, and shall not remove monuments or property marks until directed.

3.13 LIMITS OF WORK

3.13.1 The Contractor shall conduct Work and operations so as to cause a minimum of inconvenience to the public. At any time when, in the opinion of the Owner or [Architect] [Engineer] [Landscape Architect] [Design Consultant], the Contractor is obstructing a larger portion of a road, street, or other public right-of-way than is necessary for the proper execution of the Work, the [Architect] [Engineer] [Landscape Architect] [Design Consultant] may require the Contractor to finish the sections on which work is in progress before work is commenced on any new sections.

3.14 WARRANTY

3.14.1 The Contractor shall warrant that all Work, materials, and equipment furnished will be free from defects in design, materials, and workmanship and will give successful service under the conditions required. The warranty period for Work, materials, and equipment furnished by the Contractor shall be one year from the date of the written acceptance of the Work or the date that the Owner signs the final payment request.

3.15 PATENTS AND ROYALTIES

- 3.15.1 If the Contractor is required or desires to use any design, device, material or process covered by letters, patent, or copyright, he shall provide for such use by suitable legal agreement with the patents or Owner. It is mutually understood and agreed that without exception the Contract Sum shall include all royalties or costs arising from patents, trademarks, and copyrights in any way involved in the Work. The Contractor and the surety shall defend, indemnify, and save harmless the Owner and all its officers, agents and employees from all suits, actions, or claims of any

character, name and description brought for or on account of infringement or alleged infringement by reason of the use of any such patented design, device, material or process of any trademark or copyright used in connection with the Work agreed to be performed under this Contract, and shall indemnify the Owner for any cost, expense, or damage which it may be obliged to pay by reason of any action or actions, suit or suits which may be commenced against the Owner for any such infringement or alleged infringement at any time during the prosecution or after the completion of the Work contracted for herein. It is mutually agreed that the Owner may give written notice of any such suit to the Contractor, and thereafter, the Contractor shall attend to the defense of the same and save and keep harmless the Owner from all expense, counsel fees, cost liabilities, disbursements, recoveries, judgements, and executions in any manner growing out of, pertaining to, or connected therewith.

3.16 CLEANING UP

- 3.16.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractors tools, construction equipment, machinery, and surplus materials.
- 3.16.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

ARTICLE 4 -- ADMINISTRATION OF CONTRACT

4.1 [Architect] [Engineer] [Landscape Architect] [Design Consultant] AUTHORITY

- 4.1.1 The [Architect] [Engineer] [Landscape Architect] [Design Consultant] will interpret the requirements of the Contract Documents and decide matters concerning performance thereunder on request of the Owner or Contractor.
- 4.1.2 Work shall be performed under the general administration of the [Architect] [Engineer] [Landscape Architect] [Design Consultant]. The [Architect] [Engineer] [Landscape Architect] [Design Consultant] will decide any and all questions as to the acceptability of materials or equipment furnished, work performed, interpretation of the Drawings and Specifications, rate of progress of the Work, acceptability of the quality of workmanship provided, and other questions as to the fulfillment of the Contract by the Contractor.
- 4.1.3 The [Architect] [Engineer] [Landscape Architect] [Design Consultant] will prepare change orders and may authorize minor changes in the Work.
- 4.1.4 The [Architect] [Engineer] [Landscape Architect] [Design Consultant] and his authorized representatives will have the right to enter the property or location on which the Work shall be constructed.

4.2 CLAIMS

- 4.2.1 Definition: A claim is a demand or assertion by one of the parties seeking adjustment, or interpretation of Contract terms, payment of money, extension of time, or other relief with respect to the terms of the Contract. The term includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims will be initiated by written notice. The responsibility to substantiate claims shall rest with the party making the claim.
- 4.2.2 Claims of the Contractor or the Owner: Claims regarding the Work of the Contract shall be referred initially to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] for a decision. The [Architect] [Engineer] [Landscape Architect] [Design Consultant] will review claims, and 1) reject in whole or in part; 2) approve the claim; 3) suggest a compromise; 4) advise the parties that the [Architect] [Engineer] [Landscape Architect] [Design Consultant] is unable to resolve the claim.
- 4.2.3 Claims for Concealed or Unknown Conditions: If new and unforeseen items of work are discovered, which cannot be covered by any item or combination of items for which there is a Contract Sum, then the Contractor shall notify the [Architect] [Engineer] [Landscape Architect] [Design Consultant] before conditions are disturbed. The Contractor shall complete such work and furnish such materials as may be required for the proper completion or construction of the work contemplated upon written Change Order from the [Architect] [Engineer] [Landscape Architect] [Design Consultant] as approved by the Owner. Work shall be performed in accordance with the Contract Documents.
- 4.2.4 Claims for Extensions of Time: The Contractor shall provide written notice to [Architect] [Engineer] [Landscape Architect] [Design Consultant] within ten days stating the cause of the delay and request an extension of Contract Time. The [Architect] [Engineer] [Landscape Architect] [Design Consultant] will act on the request in writing. The extension of time shall be for a period equivalent to the time lost by reasons indicated.
- 4.2.5 Claims for Changes in the Work: The Contractor shall provide written notice to [Architect] [Engineer] [Landscape Architect] [Design Consultant] within ten days after the receipt of instructions from the Owner, as approved by the [Architect] [Engineer] [Landscape Architect] [Design Consultant], to proceed with changes in the Work and before such Work is commenced. Changes in the Work shall not be commenced before the claim for payment has been approved, except in emergencies endangering life or property. The Contractor's itemized estimate sheets showing labor, material, equipment, overhead, profit, insurance and any other cost shall be submitted to the [Architect] [Engineer] [Landscape Architect] [Design Consultant]. The Owner's order for changes in the Work shall specify any extension of the Contract Time and one of the following methods of payment:
- a. Unit prices or combinations of unit prices which formed the basis of the original Contract.
 - b. A lump sum fee based on the Contractor's estimate, approved by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] and accepted by the Owner..
 - c. The actual cost of the Work plus an allowance of 12 percent and 5 percent for the General Contractor/Subcontractor respectively.
- 4.2.6 Claims for Additional Costs: In case of an emergency which threatens loss or injury of property or safety of life, the Contractor shall be allowed to act, without previous instructions from the [Architect] [Engineer] [Landscape Architect] [Design Consultant], in a diligent manner. The Contractor shall notify the [Architect] [Engineer] [Landscape Architect] [Design Consultant] immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] for consideration. The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided under these General Conditions.

ARTICLE 5 -- SUBCONTRACTORS

5.1 ASSIGNMENT OF CONTRACT

5.1.1 Neither the Owner nor the Contractor shall have the right to sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof without written consent of the other party. No assignment, transfer, or subletting, even with the proper consent, shall relieve the Contractor of his liabilities under this Contract. Should any Assignee or Subcontractor fail to perform the work undertaken by him in a satisfactory manner, the Owner has the right to annul and terminate the Assignee's or Subcontractor's contract on the project.

5.2 SUBCONTRACTS

- 5.2.1 The subcontracting of the whole or any part of the Work to be done under this Contract will not relieve the Contractor of his responsibility and obligations. All transactions of the Owner or [Architect] [Engineer] [Landscape Architect] [Design Consultant] shall be with the Contractor. Subcontractors will be considered only in the capacity of employees or workmen and shall be subject to the same requirements as to character and competency.
- 5.2.2 The Contractor shall discharge or otherwise remove from the project any Subcontractor that the Owner or the [Architect] [Engineer] [Landscape Architect] [Design Consultant] may object to as incompetent or unfit.
- 5.2.3 The Contractor may not change Subcontractors without the written approval of the Owner. The Contractor shall not be relieved of any liabilities under this Contract, but shall be fully responsible for any Subcontractor or work by said Subcontractor where Subcontractor is employed by the Contractor to perform work under this Contract. Nothing contained in the Contract Documents shall create contractual relations between any Subcontractor and the Owner.
- 5.2.4 No officer, agent, or employee of the Owner, including the [Architect] [Engineer] [Landscape Architect] [Design Consultant], shall have any power or authority to bind the Owner or incur any obligation in his behalf to any Subcontractor, material supplier or other person in any manner whatsoever.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OTHER CONTRACTS

6.1.1 The Owner reserves the right to award other contracts in connection with the Project. The Contractor shall cooperate with the other contractors with regard to the storage of materials and equipment, access to the site, and execution of their work. It shall be the Contractor's responsibility to inspect the work of other contractors which will affect the work of this Contract and to report to the Owner irregularities which will not permit him to complete his work in a satisfactory manner or in the time allotted. Failure to so report shall constitute an acceptance of the work of other contractors.

6.2 DEPENDENCE ON OTHERS

6.2.1 If any part of the Contractor's work depends for proper execution or results upon the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the work, promptly report to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] any apparent discrepancies or defects in such other work that render it suitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acceptance of the work.

ARTICLE 7 -- CHANGES IN THE WORK

7.1 GENERAL

- 7.1.1 The Owner may, as the need arises, without invalidating the Contract, order changes in the work in the form of additions, deletions, or modifications. Compensation to the Contractor for additional work or to the Owner for deductions in the work and adjustments for the time of completion shall be adjusted at the time of ordering such change.
- 7.1.2 Additional work shall be done as ordered in writing by the Owner. The order shall state the location, character, and amount of extra work. All such work shall be executed under the conditions of the Contract, subject to the same inspections and tests.
- 7.1.3 The [Architect] [Engineer] [Landscape Architect] [Design Consultant] and the Owner reserve and shall have the right to make changes in the Contract Documents and the character or quantity of the work as may be considered necessary or desirable to complete fully and acceptably the proposed construction in a satisfactory manner.

7.2 CHANGE ORDERS

- 7.2.1 A Change Order is a written instrument, prepared by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] and approved by the Owner stating their agreement upon:
 - a. Description and details of the work.
 - b. Estimated amount of the adjustment in the Contract Sum.
 - c. Estimated extent of the adjustment in the Contract Time.

7.3 PAYMENT FOR CHANGES IN THE WORK

- 7.3.1 All changes in the Work will be paid for in the manner indicated in Article 4, Paragraph 4.2, and the compensation thus provided shall be accepted by the Contractor as payment in full for the use of small tools, superintendent's services, premium on bond, and all other overhead expenses incurred in the prosecution of such work.

ARTICLE 8 -- TIME

8.1 DEFINITIONS

- 8.1.1 Contract Time is the period of time, including authorized adjustments, identified in the Contract Documents for Substantial Completion of the Work.
- 8.1.2 Date for commencement of the Work is the fifth day following the date of mailing, by regular mail, of the Notice to Proceed, unless otherwise stated in the Contract.
- 8.1.3 Date of Substantial Completion is the date certified by the [Architect] [Engineer] [Landscape Architect] [Design Consultant].

8.2 PROGRESS

- 8.2.1 Time limits identified in the Contract Documents are of the essence of the Contract. The Contractor confirms that the Contract Time is a reasonable period of time for performing the Work.

8.3 HOLIDAYS

- 8.3.1 New Year's Day, Robert E. Lee/Dr. Martin Luther King's Birthday, George Washington's Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day and the day after Thanksgiving Day, Christmas Eve and Christmas Day will be considered as being holidays; no

other days will be considered. No engineering supervision will be furnished on legal holidays, Saturdays and Sundays, and no work shall be performed on these days except in an emergency or with written approval in advance.

8.4 DELAYS

- 8.4.1 Delays beyond the Contractor's control occasioned by an act or omission on the part of the Owner, strikes, fires, additions to the work, delays by any separate contractor employed by the Owner, extremely abnormal weather conditions, or other delays beyond the Contractors control may entitle the Contractor to an extension of time in which to complete the work. While such delays may be just cause for an extension of the Contract Time, the Contractor shall not have a claim for damages or any such cause or delay.

ARTICLE 9 -- PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

- 9.1.1 The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, equipment, labor, tools, and incidentals necessary to complete the Work and for performing all Work contemplated and embraced under the Contract; also for loss or damage arising from the nature of the Work, from the action of the elements or from any unforeseen difficulties which may be encountered during the prosecution of the Work until the final acceptance by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] and Owner and for all risks of every description connected with the prosecution of the Work, for all expenses incurred in consequence of the suspension or discontinuance of the Work as specified, for any infringement of patent, trademark, or copyright, and for completing the Work according to the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.
- 9.1.2 No moneys payable under Contract or any part thereof, except the estimate for the first month or period, shall become due and payable if the Owner so elects until the Contractor shall satisfy the said Owner that he has fully settled or paid for all materials and equipment used in or on the Work and labor done in connection therewith, and the Owner, if he so elects, may pay any or all such bills wholly or in part and deduct the amount or amounts so paid from any monthly or final estimate excepting the first estimate.
- 9.1.3 In the event the surety on any contract or payment bond given by the Contractor becomes insolvent, or is placed in the hands of a receiver, or has the right to do business in a state revoked as provided by law, the Owner may at its election withhold payment of any estimate filed or approved by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] until the Contractor shall give a good and sufficient bond in lieu of the bond so executed by such surety.

9.2 SCHEDULE OF VALUES

- 9.2.1 The Contractor shall submit to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] a schedule of values for each part of the Work. The schedule shall be a complete breakdown of labor and materials for the various parts of the Work including an allowance for profit and overhead. The total of these amounts shall equal the Contract Sum. The approved schedule of values shall be used as a basis for the monthly payments to the Contractor. In applying for the monthly payment, the Contractor shall show a detailed account of work accomplished in conformity with the schedule.

9.3 MEASUREMENT OF QUANTITIES

9.3.1 The Contractor shall be paid for all Work performed under the Contract based on [Architect] [Engineer] [Landscape Architect] [Design Consultant] computations of as-built quantities and the Contractor's Contract Sum. This payment shall be full compensation for furnishing all supplies, materials, tools, equipment, transportation, and labor required to do the Work; for all loss or damage, because of the nature of the Work, from the action of the elements or from any unforeseen obstruction or difficulty which may be encountered in the prosecution of the Work and for which payment is not specifically provided for all or any part of the Work; and for well and faithfully completing the Work in accordance with the Contract Documents. The method of computation and payment for each item shall be as set forth in the Specifications or the Supplementary Conditions.

9.4 REQUESTS FOR PAYMENT

9.4.1 The Contractor may submit periodically, but not more often than once each month, a Request for Payment for work completed. When unit prices are specified in the Contract Documents, the Request for Payment shall be based on the quantities completed.

9.4.2 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site, and if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest including applicable insurance and transportation to the site for those materials and equipment stored off the site.

9.4.3 The Contractor shall furnish the [Architect] [Engineer] [Landscape Architect] [Design Consultant] all reasonable facilities and job tickets required for obtaining the necessary information relative to the progress and execution of the Work and the measurement of quantities. Each Request for Payment shall be computed from the work completed on all items listed in the approved schedule of values less 10 percent of the first 50 percent of the adjusted Contract Sum and less previous payments to the Contractor on the Contract.

9.5 PERIODIC ESTIMATES FOR PAYMENT

9.5.1 Unless otherwise stated in the Supplementary Conditions, the Contractor shall prepare an Estimate for Payment to the Owner each month. This Estimate for Payment, except for final estimates, shall not be made if the amount due the Contractor is less than \$1,000. The Contractor will make the estimate for the materials complete in place and the amount of work performed in accordance with the Contract between the twenty-fifth day of the month and the fifth day of the succeeding month.

9.5.2 From the total of the amount estimated to be paid, an amount equal to 10 percent of the total completed shall be retained until the Contract is 50 percent complete after which no further retainage will be withheld from the monthly estimates. All sums withheld by the Owner will be paid to the Contractor within 30 days after the Contract has been substantially completed. No retainage will be withheld on that amount of the progress payment pertaining to the cost of materials stored at the site.

9.6 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

9.6.1 When alterations in the quantities of work not requiring Contract modifications are ordered and performed, the Contractor shall accept payment in full at the Contract Sum, for the actual quantities of work accomplished. No allowance will be made for anticipated profits. Increased or decreased work involving Contract modifications shall be paid for as stipulated in such Contract modifications.

9.7 [Architect] [Engineer] [Landscape Architect] [Design Consultant]'S ACTION ON A REQUEST FOR PAYMENT

9.7.1 The [Architect] [Engineer] [Landscape Architect] [Design Consultant] will, within ten working days plus time required for transmittal from one party to another, act on a Request for Payment by the Contractor in one of the following:

- a. Approve the Request for Payment as submitted by the Contractor.
- b. Approve an adjusted amount as the [Architect] [Engineer] [Landscape Architect] [Design Consultant] will decide is due the Contractor informing the Contractor in writing of the reason for the adjusted amount.
- c. Withhold the Request for Payment submitted by the Contractor informing the Contractor in writing of the reason for withholding the request.

9.8 OWNER'S ACTION ON A REQUEST FOR PAYMENT

9.8.1 The Owner will, within five working days, act on a Request for Payment after approval by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] by one of the following:

- a. Pay the Request for Payment as approved by the [Architect] [Engineer] [Landscape Architect] [Design Consultant].
- b. Pay an adjusted amount as the Owner will decide is due the Contractor informing the Contractor and the [Architect] [Engineer] [Landscape Architect] [Design Consultant] in writing of the reason for the adjusted amount of payment.
- c. Withhold the Request for Payment informing the Contractor and the [Architect] [Engineer] [Landscape Architect] [Design Consultant] in writing of the reason for withholding the payment.

9.9 BLANK- RESERVED

9.10 WITHHOLDING PAYMENT

9.10.1 The Owner may withhold payment, and the [Architect] [Engineer] [Landscape Architect] [Design Consultant] may withhold a Request for Payment in whole or in part to the extent necessary for the protection of the Owner from loss on account of any of the following causes discovered either before or subsequent to [Architect] [Engineer] [Landscape Architect] [Design Consultant] approval of a Request for Payment:

- a. Defective work on the project.
- b. Evidence indicating the probable filing of claims by other parties against the Contractor.
- c. Damage caused to another contractor.
- d. Reasonable evidence that Work cannot be completed for the unpaid balance of the Contract Sum or within the Contract Time.
- e. Failure of the Contractor to make payments on materials, equipment, or labor or to subcontractors.

9.11 PAYMENT FOR UNCORRECTED WORK

9.11.1 Should the [Architect] [Engineer] [Landscape Architect] [Design Consultant] direct the Contractor not to correct work that has been damaged or that was not performed in accordance with the

Contract Documents, an equitable deduction from the Contract Sum shall be made to compensate the Owner for the uncorrected work. The [Architect] [Engineer] [Landscape Architect] [Design Consultant] shall determine the amount of the equitable deduction.

9.12 PAYMENT FOR REJECTED MATERIALS AND WORK

9.12.1 The removal of rejected Work and materials and the re-execution of acceptable work by the Contractor shall be at the expense of the Contractor. The Contractor shall pay the cost of replacing the work of other contractors destroyed or damaged by the removal of the rejected work or materials and the subsequent replacement with acceptable work.

9.13 DATE OF SUBSTANTIAL COMPLETION

9.13.1 A Certificate of Substantial Completion, which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to work, and insurance and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion.

9.14 FINAL COMPLETION AND PAYMENT BY OWNER

9.14.1 The Contractor shall furnish a letter from the [Architect] [Engineer] [Landscape Architect] [Design Consultant] attached to the Contractor's final estimate which certifies that the [Architect] [Engineer] [Landscape Architect] [Design Consultant] has received and approved all guarantees, bonds, maintenance and operation manuals, air balance data, shop drawings, catalog data, and record documents specified in the Contract Documents.

9.14.2 Before final payment, the Contractor shall furnish to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] executed copies of the Release of Liens. Items mentioned shall be submitted with and at the same time as the final estimate to the [Architect] [Engineer] [Landscape Architect] [Design Consultant] and shall be promptly delivered by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] to the Owner; no final payment can be made without complete compliance.

9.15 PARTIAL OCCUPANCY OR USE

9.15.1 The Owner may occupy or use any completed or partially completed portion of the Work provided such use or occupancy is consented to by the insurer and authorized. The Contractor will prepare a list of items to be completed or corrected before partial acceptance. Upon receipt of the Contractors list, the [Architect] [Engineer] [Landscape Architect] [Design Consultant] will make an inspection to determine whether the Work or portion thereof is substantially complete.

9.15.2 The [Architect] [Engineer] [Landscape Architect] [Design Consultant] will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to Work and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion.

9.16 FINAL INSPECTION

9.16.1 Tests, inspections, and approvals of portions of the Work required by the Contract Documents, laws, ordinances, or any public authority having jurisdiction shall be made at the appropriate time. The Contractor shall give the [Architect] [Engineer] [Landscape Architect] [Design Consultant] timely notice of when and where tests and inspections shall be made so that the [Architect] [Engineer] [Landscape Architect] [Design Consultant] may be present. The Contractor shall make arrangements for the testing and inspection with an independent testing laboratory.

9.16.2 The Contractor shall ensure that the final completed work is in accordance with the Contract Documents. Required certificates of testing and inspection shall be secured by the Contractor and delivered to the [Architect] [Engineer] [Landscape Architect] [Design Consultant], unless otherwise required by the Contract Documents.

9.17 ASSIGNMENT OF WARRANTIES

9.17.1 All warranties of materials and workmanship running in favor of the Contractor shall be transferred and assigned to the Owner on completion of the Work and at such time as the Contractor receives final payment.

9.17.2 In case of warranties covering work performed by subcontractors, such warranties shall be addressed to and in favor of the Owner. The Contractor shall be responsible for delivery of such warranties to the Owner prior to final acceptance of the work.

9.17.3 Delivery of guarantees or warranties shall not relieve the Contractor from any obligation assumed under any provision of the Contract. All warranties shall be for one year from the date of Substantial Completion of the Project.

9.18 ACCEPTANCE AND FINAL PAYMENT

9.18.1 Upon receipt of written notice that the Work is ready for final inspection, the [Architect] [Engineer] [Landscape Architect] [Design Consultant] will conduct such inspection and when the [Architect] [Engineer] [Landscape Architect] [Design Consultant] finds the Work acceptable, the [Architect] [Engineer] [Landscape Architect] [Design Consultant] shall certify his acceptance to the Owner of the Contractor's final Request for Payment. This payment shall be the Contract Sum plus approved additions less approved deductions and less previous payments made. The Contractor shall furnish evidence that he has fully paid all debts for labor, materials, and equipment incurred in connection with the Work. The Owner will accept the Work and release the Contractor, except as to the conditions of the Performance and Maintenance Bond, any legal rights of the Owner, required guarantees and correction of faulty work after Final Payment, and shall authorize payment of the Contractor's final Request for Payment. The Contractor must allow sufficient time between the time of completion of the work and approval of the final Request for Payment for the [Architect] [Engineer] [Landscape Architect] [Design Consultant] to assemble and check the necessary data.

9.18.2 Acceptance of final payment by the Contractor shall constitute waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Request for Payment.

ARTICLE 10 -- PROTECTION OF PERSONS AND PROPERTY

10.1 GENERAL

10.1.1 The Contractor shall at all times exercise precaution for the safety of employees on the Project and of the public, and shall comply with all applicable provisions of federal, state and municipal

safety laws and applicable building and construction codes. The Contractor shall provide and maintain passageways, guard fences, lights, and other facilities for protection required by all applicable laws. All machinery, equipment, and other physical hazards shall be guarded in accordance with all federal, state or municipal laws or regulations.

- 10.1.2 The Work, from commencement to completion, and until written acceptance by the [Architect] [Engineer] [Landscape Architect] [Design Consultant], or to such earlier date or dates when the Owner may take possession and control, shall be under the charge and control of the Contractor and during such period of control by the Contractor, all risks in connection therewith shall be borne by the Contractor. The Contractor shall make good and fully repair all injuries and damages to the Project caused by any other casualty or cause whether or not the same shall have occurred by reason of the Contractor's negligence. The Contractor shall adequately protect adjacent Property as provided by law and the Contract Documents. The Contractor shall hold the Owner harmless from any and all claims for injuries to persons or for damage to property during the control by the Contractor of the project or any part thereof.
- 10.1.3 The Contractor shall at all times so conduct the Work as to ensure the least possible obstruction to traffic, to the general public, and the residents in the vicinity of the Work, and to ensure the protection of persons and property. No road, street, or highway shall be closed to the public except with the permission of the Owner and proper governmental authority. Fire hydrants on or adjacent to the Work shall be kept accessible to fire fighting equipment at all times. The local fire department shall be notified of the temporary closing of any street.

ARTICLE 11 -- INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

- 11.1.1 The Contractor shall secure and maintain in force during this Contract such insurance from an insurance company authorized to write the prescribed insurance in the jurisdiction where the Project is located as will protect the Contractor, his subcontractors, and the Owner from claims for bodily injury, death, or property damage which may arise from operations under this Contract. The Contractor shall not commence work under this Contract until he has obtained all the insurance required, has filed the Certificate of Insurance with the Owner, and the certificate has been approved by the Owner. Each insurance policy shall contain a clause providing that it shall not be canceled by the insurance company without written notice to the Owner of intention to cancel.
- 11.1.2 Workman's Compensation and Employer's Liability Insurance in statutory limits shall be secured and maintained as required by the laws of the State of Arkansas. This insurance shall cover all employees who have performed any of the obligations assumed by the Contractor under these Contract Documents including Employer's Liability Insurance. This insurance shall protect the Contractor against any and all claims resulting from injuries, sickness, disease, or death to employees engaged in work under this Contract.
- 11.1.3 Comprehensive General Liability Insurance, including automobile and truck liability. Prior to blasting, the Contractor shall furnish Certificate of Insurance which shall certify that damage caused by blasting is within the coverage of his Comprehensive General Liability Insurance to the full limits thereof. Hired and nonowned automobile insurance for automobiles and trucks shall include hired and nonowned automobile coverage.
- 11.1.4 Contractor's Protective Liability Insurance: The Contractor shall indemnify and save harmless the Owner from and against all losses and all suits, claims, demands, judgements, actions, and payments of every description and nature brought or recovered against him by reason of any omission or act of the Contractor, his agents, or employees in the execution of the Work or in the

guarding of it. The Contractor shall secure and maintain protective liability insurance in the name of the Owner and the Contractor covering them from contingent liability under this Contract.

- 11.1.5 Builder's Risk and Fire Insurance: The Contractor shall procure and maintain during the life of this Contract Builder's Risk Insurance fire, lightning, extended coverage, vandalism, and property theft on the insurable portion of the Project on a 100 percent completed value basis against damage to the equipment, structures, or material. The Owner and the Contractor, as their interests may appear, shall be named as the Insured.
- 11.1.6 Proof of Insurance: The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled or materially altered except after 15 days prior written notice has been received by the Owner."

11.2 BONDS

- 11.2.1 Performance Bond: The Contractor shall, at the time of execution of the Contract, furnish bonds covering faithful performance of the Contract and the payment of obligations. Performance and Payment bonds shall be filed with the circuit clerk office in the County Courthouse of the county where the work shall be performed.

ARTICLE 12 -- UNCOVERING AND CORRECTION OF WORK

12.1 EXAMINATION OF COMPLETED WORK

- 12.1.1 If any portion of the work should be covered contrary to the request of the Owner, [Architect] [Engineer] [Landscape Architect] [Design Consultant], or Inspector or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Owner, [Architect] [Engineer] [Landscape Architect] [Design Consultant], or Inspector, be uncovered for his observation and replaced at the Contractor's expense.

12.2 DEFECTIVE WORK

- 12.2.1 Defective work, whether through the use of defective materials, the result of poor workmanship, or any other cause, shall be removed within ten days after notice is given by the Owner or [Architect] [Engineer] [Landscape Architect] [Design Consultant]. The Work and affected materials and equipment shall be removed and replaced as necessary to comply with the Contract Documents without additional cost to the Owner. The fact that the defective work may have been previously overlooked by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] shall not constitute acceptance.

12.3 REJECTED MATERIALS

- 12.3.1 Materials which do not conform to the requirements of the Contract Documents, are not equal to samples approved by the [Architect] [Engineer] [Landscape Architect] [Design Consultant], or are in any way unsuited or unsatisfactory for the purpose for which intended, shall be rejected. Defective materials shall be removed within ten days after notice by the [Architect] [Engineer] [Landscape Architect] [Design Consultant]. The materials shall be replaced with new materials as necessary to comply with the Contract Documents at no additional cost to the Owner. The fact that the defective material may have been previously overlooked by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] shall not constitute acceptance.

12.3.2 Should the Contractor fail to remove and replace rejected material within the specified ten days after written notice to do so, the Owner may remove and replace the material and deduct the cost from the Contract Sum.

12.4 CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT

12.4.1 The approval of the final Request for Payment by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] and the making of the final payment by the Owner to the Contractor shall not relieve the Contractor of responsibility to correct faulty materials or workmanship promptly after receipt of written notice from the Owner. The Owner shall give such notice of faulty materials or workmanship promptly, after discovery of the condition. If the Contractor fails to correct the defects, promptly, after receipt of written notice from Owner, the Owner may have the work corrected at the Contractors expense.

ARTICLE 13 -- MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the law of the place where the Project is located.

13.1.2 The Contractor shall give all notices and comply with all federal, state, and local laws, ordinances, and regulations in any manner affecting the conduct of the Work. The Contractor shall indemnify and save harmless the Owner against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree whether by himself or his employees.

13.1.3 The Contractor shall comply with the laws of the local, state, and federal government regarding wages and hours of labor.

13.2 WRITTEN NOTICE

13.2.1 Consider as served when delivered in person or sent by certified or registered mail to the individual, firm, or corporation or to the last business address of such known to him who serves the notice.

13.2.2 The written Notice to Proceed with the Work shall be issued by the [Architect] [Engineer] [Landscape Architect] [Design Consultant] after the execution of the Contract by the Owner. The Contractor shall begin and prosecute the Work and uninterruptedly in a manner that will complete the Work within the time limits stated in the Contract.

13.3 TESTS AND INSPECTIONS

13.3.1 All materials and each and every part of the Work shall be subject at all times to inspection by the Owner, [Architect] [Engineer] [Landscape Architect] [Design Consultant], or the Inspector. The Contractor shall be held to the intent of the Contract Documents in regard to quality of materials, equipment, and workmanship, and the diligent execution of the Contract. The inspection may extend to and include plant, shop, or factory inspection of material furnished.

13.3.2 The Owner, [Architect] [Engineer] [Landscape Architect] [Design Consultant], and the Inspector shall be allowed access to all parts of the Work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection for ascertaining if the Work as performed is in accordance with the requirements and the Contract Documents.

13.3.3 Inspectors shall have authority to suspend any work which is being improperly done, subject to the final decision of the Owner or [Architect] [Engineer] [Landscape Architect] [Design Consultant].

Inspectors shall have no authority to permit deviations, or to relax provisions of the Contract Documents without the written permission or instruction of the Owner or [Architect] [Engineer] [Landscape Architect] [Design Consultant], or delay the Contractor by failing to work with reasonable promptness.

13.4 VERBAL AGREEMENTS

13.4.1 No verbal objection, order, claim, or notice by any of the parties involved to the other parties shall affect or modify any of the terms or obligations contained in the Contract Documents. None of the terms or provisions of the Contract Documents shall be considered waived or modified unless the waiver or modification thereof is in writing, and no evidence shall be introduced in any proceeding of any other waiver or modification.

ARTICLE 14 -- TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 SUSPENSION OF WORK

14.1.1 The work or any portion thereof may be suspended at any time by the Owner provided that the Owner gives the Contractor written notice of the suspension. The notice shall set forth the date on which the work is to be suspended and the date on which the work is to be resumed. The Contractor shall resume the work upon written notice from the Owner within ten days after the date set forth in the notice of suspension.

14.1.2 The Owner will have the authority to suspend the work, wholly or in part, for such period of time as deemed necessary. The suspension may be due to unsuitable weather, or such other conditions as are considered unfavorable for the proper prosecution of the work, or the failure on the part of the Contractor to fulfill the provisions of the Contract. Failure to supply material, equipment, or workmanship meeting the requirements of the Contract Documents shall be just cause for suspension of the Work. The Contractor shall not have the right to suspend operations without the [Architect] [Engineer] [Landscape Architect] [Design Consultant] or Owner's permission.

14.2 TERMINATION BY OWNER FOR CAUSE

14.2.1 The Owner will have the right to terminate the Contract upon giving ten days written notice of the termination to the Contractor and the Contractor's surety, in the event of any default by the Contractor and upon written notice from the [Architect] [Engineer] [Landscape Architect] [Design Consultant] to the Owner that sufficient cause exists to justify such action. In the event of termination of the Contract, the Owner may take possession of the Work and of all materials, tools, and equipment and construction equipment and machinery thereon and may finish the work by whatever method he may select.

14.2.2 It shall be considered a default by the Contractor whenever he shall:

- a. Become insolvent, declare bankruptcy, or assign assets for the benefit of his creditors.
- b. Fail to provide qualified superintendence, proper materials, competent subcontractors, competent workmen, or fail to make prompt payments for labor, materials, or equipment.
- c. Disregard or violate provisions of the Contract Documents or the [Architect] [Engineer] [Landscape Architect] [Design Consultant] instructions, or fail to execute the Work according to the approved schedule of completion, including extensions thereof.
- d. Start the work on the date established in the Notice to Proceed.

END OF SECTION

SECTION 00800 - SUPPLEMENTARY GENERAL CONDITIONS

GENERAL:

The following supplements are to be utilized when modifying the "General Conditions of the Contract for Construction", AIA Document A201, Fifteenth Edition, 1997. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect. The AIA General Conditions and the Supplementary Conditions are complementary and apply to all Work in every division of these specifications.

ARTICLE 1 **GENERAL PROVISIONS**

1.1 **BASIC DEFINITIONS**

1.1, Delete subparagraph 1.1.7 and substitute the following:

1.1.7 The Project Manual

The Project Manual is the volume(s) which include the Bidding Documents, the Conditions of the Contract, the Specifications including Division 1 General Requirements and technical sections of Division 2 through 16, and the Addenda (when issued).

ARTICLE 3 **CONTRACTOR**

3.4 **LABOR AND MATERIALS:**

3.4.2 Add the following to the existing paragraph:

"The Contractor shall provide products of specified manufacturers, or products of manufacturers approved during bidding period. After award of Contract, no substitution of products will be considered except under conditions and in the manner specified."

3.4 Add the following new subparagraphs:

3.4.4 "Contractors and Subcontractors employed for the Work shall conform to the labor laws of the State of Arkansas and the various acts amendatory and supplementary to such labor laws, and to such other applicable laws, ordinances and legal requirements."

3.4.5 "Labor shall be performed in the best and most professional manner by mechanics skilled in their respective trades. Standard results shall be first class only."

3.4.6 "Mechanics whose Work is unsatisfactory to the Architect or Owner, or who are considered to be unskilled or otherwise objectionable, shall be instantly dismissed from the Work upon notice from the Architect, Project Manager, or Owner".

3.5 WARRANTY:

3.5.1 Line 4, after "Documents", insert the following:

"and that said equipment is not a discontinued item but is still being manufactured, that replacement parts for same shall be obtainable for the anticipated or stated life of the equipment and, that equipment is not in essence actually, or considered to be, obsolete at the time of installation,".....

3.5 Add the following new subparagraph:

3.5.2 "The Contractor shall absolutely guarantee and warrant Contractor's and Subcontractor's work and materials and materials and work of suppliers of the Contractor and Subcontractors, for a period of one year from date of acceptance of project by Owner. Warranty shall be for a longer period on certain items when so designated in specifications. The foregoing one-year absolute guarantee and warranty shall not in any way limit, restrict, or affect the liability of Contractor or Subcontractors for indemnity as provided for in this Contract, nor shall it in any way shorten the period of limitation fixed by law for filing of any legal action against Contractor for enforcement or for breach of any provision of contract documents. Should Contractor elect to use any of the equipment in the building during construction period, Contractor shall make arrangements with Subcontractor or Supplier of that equipment for any extension of warranty of that equipment made necessary by such use. Warranty period of such equipment to Owner shall not be reduced by use of equipment by Contractor".

3.15 CLEANING UP:

3.15.1 Line 4, after "materials", add:

"Additionally, after the completion of Work, the Contractor shall clear debris from roofs and gutters, clear all drains, replace any broken glass, clean glass, hardware, accessories, and fixtures, vacuum floors, wash tile and special finish floors, dust counters and appliance tops, and, in general, leave the building ready for occupancy."

ARTICLE 5 SUBCONTRACTORS:

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK:

5.2.1 At the end of paragraph, add:

"Within 15 days after award of Contract, submit complete list of Subcontractors proposed for each portion of the Work, including those principal subcontractors identified on the Bid Form, as specified in Instruction to Bidders. Subcontractors shall have and maintain current license from the Arkansas Contractor's License Board".

5.2.3 Add to end of subparagraph:

"No increase in the Contract Sum shall be allowed should a substitution be required as a result of the Owner's or Architect's reasonable objection based on qualifications and requirements included in the Contract Documents."

5.2.5 Add new subparagraph as follows:

"Where provisions of paragraph 5.2 conflict with Act 477 of 1961 of the State of Arkansas, as amended, the provision of Act 477 shall govern."

5.3 SUBCONTRACTURAL RELATIONS:

5.3.1 Add to end of subparagraph:

"Use AIA Document A401, Contractor-Subcontractor Agreement or other appropriate written agreement that is specifically coordinated with the requirements, obligations, and responsibilities of Contract. If requested by Owner, submit copies of such executed agreements".

ARTICLE 7 CHANGES IN THE WORK

7.3 CONSTRUCTION CHANGE DIRECTIVES:

7.3.3 Delete in its entirety and substitute the following:

7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be determined based on one of the methods shown below.

- A. All quotations for changes, be they additions or deductions, shall be submitted in a complete itemized breakdown acceptable to State Building Services using Contract Unit Prices when set forth therein. The value of any and all such additions or deductions shall be determined as set forth in "C", as follows:
- B. The itemized breakdown shall show unit quantities and costs of all labor and materials. Submit all verifying data as necessary or required by State Building Services to support claims, such as copies of original invoices, payrolls, etc.

The burden of proof cost rests upon the Contractor. Contractor agrees that the State Building Services or Agency's Representative shall have the right, at reasonable times, to inspect and audit the books and records of Contractor to verify the propriety and allowability of such costs.

- C. Compute requests for changes be they additions or deductions as follows:
 - 1. For work performed by the Contractor: Net costs of Materials-----a
State Sales Tax-----b
Net Placing Cost-----c

W.C. Insurance Premium & FICA Tax-----d

Overhead and Profit -15% x (a+b+c+d)-----e

Allowable Bond Premium-----f

TOTAL COST a+b+c+d+e+f

2. Credit for work omitted shall be computed as outlined in (1) "a thru e" except the Contractor's share of overhead and profit percentage is 7%.
3. For work performed by sub-contractors

Sub-contractors shall compute their work as outlined in (1), "a" through "e".

To the cost of that portion of the work (change) that is performed by the subcontractor, the General Contractor shall add an Overhead and Profit Charge of Five Percent (5%) plus the Allowable Bond Premium.

ARTICLE 8 TIME

8.3 DELAYS AND EXTENSIONS OF TIME:

8.3.1 Add at end of subparagraph the statement shown below and then add the following subparagraphs 8.3.1.1 through 8.3.1.8:

"Claims for extension of time for causes enumerated above will be considered valid only under the following conditions:"

8.3.1.1 Only those enumerated conditions over which the Contractor has no control will be considered. The burden of proof to substantiate the claim for an extension shall rest with the Contractor, including evidence that the cause was beyond Contractor's control. It shall be deemed the Contractor has control over the supply of labor, materials, equipment, methods, techniques and over Subcontractors, Sub-subcontractors, and Suppliers.

8.3.1.2 In the event of changes in the Work, any consideration for a time extension will be made only at the time of authorizing the changes, and no later than when the Change Order is prepared, and then only if the change significantly affects the time and progress of the entire Work. For changes which do not affect the entire Work, time extensions may be granted only for the area, phase, unit or element affected by the change, and if due to a valid reason for a time extension.

8.3.1.3 Any unusual delay in transportation will not be considered unless it is due solely to transportation. An extension of time will not be granted for delays in deliveries where said delivery was not properly scheduled or when orders were not properly placed.

- 8.3.1.4 With respect to a claim for an extension of time as a result of climatic conditions, the Contractor shall recognize the location of the site and the existence, as normal, of variations from "average" conditions. Foul weather in itself will not be a valid reason for a time extension. Requests for time extension because of delay resulting from weather extremes will not be considered unless a substantial variation from usual weather conditions occurs for a significant period of time, during phases of Work when they would otherwise have been in progress. In considering the time extension, the weather conditions both before and after the period in which the delay is claimed will be evaluated with credit given for unseasonably favorable weather.
- 8.3.1.5 Delays resulting from a labor dispute will not result in a time extension.
- 8.3.1.6 A delay in the overall project progress actually occurred and clearly disrupted the total project progress as a result of one of the valid causes for time extension. An extension of time for parts, phases or stages may be granted where a valid delay indicates such partial time extension is justified.
- 8.3.1.7 No time extension will be granted as a result of improper scheduling or for failure to have shop drawings or samples submitted in ample time for review under a reasonable and agreed upon schedule.
- 8.3.1.8 Delays by Subcontractors, Sub-Subcontractors, or Suppliers will not be considered justification for a time extension, except for the same valid reasons and conditions enumerated under subparagraph 8.3.1.
- 8.3.3 Delete entirely and substitute the following subparagraph:
- "This paragraph 8.3 does not exclude the Owner's recovery of damages for delay under other provisions of the Contract Documents. The Contractor's sole and exclusive remedy for delay is a right to a time extension for completion of the Contract and not damages".

ARTICLE 9 PAYMENTS AND COMPLETION:

9.2 SCHEDULE OF VALUES:

9.2.1 At the end of subparagraph, add: "Submit in accordance with Section 01300".

9.3 APPLICATIONS FOR PAYMENT:

9.3.1 At the end of subparagraph, add: "Submit in accordance with Section 01300".

Add the following paragraphs:

9.3.1.3 "Until Substantial Completion of the Work, 10% of each progress payment will be retained. Refer to Article 9.8.2 for adjustment in retainage upon Substantial Completion of Work".

9.3.1.3.1 "If, in the judgment of Owner, satisfactory progress is being made and maintained in

the Work, and if Contractor furnishes Consent Surety to Reduction In or Partial Release of Retainage (AIA Document G707A), retainage may be reduced as follows: 10% of each progress payment will be retained through 50% completion of Work, with additional retainage thereafter reduced to below 10%"

9.3.1.3.2 "The full Contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Architect, or if the Surety withholds its consent, or for other good and sufficient reasons."

9.4.1 Amend as follows:

"Act 813 of 1977, as amended, allows a maximum processing time for contractor payment request. The Owner (or Architect if so empowered) is allowed five (5) working days; the state agency board, commission, or institution five (5) working days; Arkansas State Building Services two (2) working days; Department of Finance And Administration five (5) working days. Transmittal times are not included in processing. Failure of any of the above to complete processing within the time allowed can result in a penalty being assessed against the responsible agency. Failure to include this information in the bid documents or specifications shall deem the bid proposal null and void."

The Contractor shall complete and submit SBS ACL-1 with final payment request. Failure to do so will result in a DELAY of payment.

9.8 SUBSTANTIAL COMPLETION:

9.8.5 At the end of the paragraph, add:

"The payment shall be sufficient to increase the total payments to 95 percent of the Contract Sum, less such amounts as the Owner shall determine for all incomplete Work and unsettled claims."

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.2 At the end of the paragraph, add:

"Submit an affidavit of payment of debts and claims and an affidavit of release of liens on AIA Forms G706 and G706A, respectively."

ARTICLE 11 INSURANCE AND BONDS

11.1.1 Add the following sentence:

The amount of such insurance shall be not less than the following or any limits by law.

11.1.1 "General: The Contractor shall not commence Work under this Contract or allow any subcontractor or anyone directly or indirectly employed by any one of them to

commence Work until Contractor has obtained all insurance required under this section and duly executed certificates of such insurance have been filed with the Architect and approved by the Owner and Owner's agent. All insurance policies, certificates and endorsements shall be submitted to the Architect in duplicate, one copy of which will be retained by the Architect and the other forwarded to the Owner or Owner's agent".

11.1.2 Workmen's Compensation Insurance: The Contractor shall procure and maintain at Contractor's expense during the term of the Contract, Workmen's Compensation Insurance and Employer's Liability Insurance for all of Contractor's employees engaged at the site of the Work, in accordance with the statutes of the State of Arkansas. In case any hazardous occupations are required above stated insurance, a special Employer's Liability policy shall be procured and maintained by the Contractor during the term of the Contract to cover workmen engaged in such hazardous occupations".

11.1.3

a. State	Statutory
b. Applicable Federal	Statutory
c. Employer's Liability	Per Accident: <u>\$ 500,000.00</u>
	Disease, Policy Limit: <u>\$ 500,000.00</u>
	Disease, Each Employee: <u>\$ 500,000.00</u>

11.1.3.2 Add the following clause:

11.1.3.2 Commercial General Liability

General Aggregate: \$ 2,000,000.00

Completed Operations: Aggregate: \$1,000,000.00
(to be maintained for one year after final payment)

Personal Injury: Each Occurrence: \$1,000,000.00

Each Occurrence Limit: Each Occurrence: \$1,000,000.00

Automobile Liability: Combined Single Limit: \$1,000,000.00
(including owned, non-owned, and hired vehicles)

Umbrella Excess Liability: \$1,000,000.00

Subparagraph 11.1.4, add the following clause:

Owner's and Contractor's
Protective Liability: Combined Single Limit: \$1,000,000.00

Subparagraph 11.1.5:

Builder's Risk or Installation Floater Policy: \$ = Contract Amount

Contractor shall deliver to the Owner a copy of each Insurance policy for his review and approval prior to the issuance of the Notice to Proceed and any work being performed.

Please note: Policy Certificates shall state "The insurance covered by this certificate will not be cancelled, or materially altered except after 15 days prior written notice has been received by the Owner."

- 11.7 "The required insurance must be written by a company licensed to do business in the State of Arkansas at the time the policy is issued. In addition, the companies must be acceptable to the Owner and Owner's agent".
- 11.8 "The Contractor shall not cause any insurance to be canceled nor permit any insurance to lapse. All insurance policies shall contain a clause to the effect that the policy shall not be canceled, or reduced, restricted, or limited, until 15 days after the Owner and Owner's agent have received written notice as evidenced by return receipt of registered or certified letter. Certificates of insurance shall contain transcripts from the proper office of the insurer, evidencing in particular those insured, the extent of the insurance, the location, and the operations to which the insurance applies, the expiration date, and the above mentioned notice of cancellation clause".
- 11.9 The following extension clause shall be incorporated in the Builder's Risk Policy:
"Insured elects to extend the insurance provided by this policy for a period of 30 days beyond the date of completion of the Work or date of occupancy, but not beyond expiration date of this policy".
- 11.5 PERFORMANCE BOND AND PAYMENT BOND:
- 11.5.1 Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder in compliance with Arkansas Act 351 of the Acts of 1953. Bonds must be issued by a Surety licensed to do work in the state in which the project is located. Cost shall be included in the Contract Sum. The amount of each bond shall be equal to 100% of the Contract Sum.
- 11.5.1.1 The Contractor shall deliver the required bonds to the Owner no later than 10 days following the date of Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.
- 11.5.1.2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.
- 11.5.1.3 File a copy of the bonds with the Circuit Clerk in the County in which the project is located.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.6 Interest: Delete in its entirety.

Add the following paragraphs:

13.8 Equal Opportunity:

13.8.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, or age. The Contractor shall take affirmative action to insure that applicants are employed, and the employees are treated during employment without regard to their race, religion, color, sex, national origin, or age. Such action shall include, but not be limited to the following: employment, upgrading, demotion or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

13.8.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, include a statement that all applicants will receive consideration for employment without regard to race, religion, color, sex, national origin, or age.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

Add the following paragraphs:

14.4 Termination by the Owner for Convenience:

14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

1. Cease operations as directed by the Owner in the notice;
2. Take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
3. Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing Subcontracts and purchase orders and enter into no further Subcontracts or purchase orders.

END OF SECTION 00800

SECTION 01000

GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

Furnish all required labor, equipment, and materials to complete all work in accordance with the drawings and specifications.

1.2 DEFINITIONS

Whenever the specifications require approval or selection of any item, it shall be construed to mean approval or selection by the Engineer. Whenever the specifications require submittal of reports or certifications, it shall be construed to mean submitted to the Engineer.

Approvals made by the Owner prior to final project inspection and acceptance do not relieve the Contractor from his obligation to perform the work in accordance with the specifications and drawings. These approvals do not prohibit the Owner from subsequently asserting any other contract rights under this contract.

A. Locations of Work

The work to be performed is at the following location: Cabot, Arkansas.

B. Principal Features

The work to be performed includes site clearing, grading, paving, drainage, etc.

1.4 SUBMITTALS

A. Product Data

Submittals shall be furnished to ETC Engineers & Architects, Inc. 1510 South Broadway, Little Rock, Arkansas. 72202 RE: Paragould Fire Station No. 1, no later than 15 days after contract award, prior to the installation of the submitted materials and equipment. Submittals shall be approved by the Engineer, in writing, prior to the installation of the submitted materials and equipment. A seven day review period may be anticipated upon receipt of Contractor furnished submittals to the Engineer.

Submittals shall include shop drawings, certifications, manufacturer's literature, samples, etc., sufficient in detail to show full compliance with this contract document.

Contractor shall mark all submittals to show specific equipment or materials to be furnished under this contract.

If shop drawings show variations from the contract requirements, the Contractor

shall, in writing, describe such variations and the reasons therefore, separate from the drawings, at the time of submittal.

In lieu of the label or listing of a specified agency (UL, FM, etc.) a written certificate from an approved, nationally recognized testing organization may be submitted. The testing organization shall be equipped to perform such services and shall certify that the items have been tested and conform to the requirements and testing methods of the specified agency.

- B. Product Format
Submittals shall consist of two separately bound copies, placed in a hard cover binder, with each technical section separated by tabbed dividers. The dividers shall be keyed to an index inserted in the front of the binder.

Three copies of the submittal will be returned to the Contractor after the Engineer has reviewed it.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Access to Sites
Access to the sites will be from 6:30 A.M. to 5:30 P.M., Monday through Friday, unless other arrangement agreed upon with the site manager.
- B. Excavation
Prior to start of the work, the contractor must contact utility companies. Any work without authorization to excavate will be shut down.
- C. Protection
The Contractor shall provide signs, barriers, and barricades to provide a safe work area.

1.6 PRE-FINAL DEFICIENCY LIST

- A. All work shall be coordinated with ETC Engineers & Architects, Inc. at (501) 375-1786
- B. Prior to the completion of the work, the Owner/Engineer will furnish to the Contractor a list of all known project deficiencies. All deficiencies shall be corrected by the Contractor prior to final payment.
- C. Owner, Engineer, or his authorized representative, will conduct the final inspection and certify completion of the project to the Owner.

PART 2 PRODUCTS (Not applicable)

PART 3 EXECUTION (Not applicable)

END OF SECTION 01000

SECTION 01010 - SUMMARY OF WORK AND PROCEDURES

1.01 **DEFINITIONS**

- A. Contractor: The Party of the first part of the contract
- B. Owner: City of Paragould
301 West Court Street
Paragould, Arkansas 72450
- C. Architect: ETC Engineers & Architects, Inc.
1510 South Broadway
Little Rock, Arkansas 72202

1.02 **FORM OF AGREEMENT**

The "Agreement" Section 00007 shall be the Form of Agreement between Contractor and Owner. The Agreement takes place over all other Contract Documents.

1.03 **NOTICE TO PROCEED**

Do not begin work prior to receipt of written Notice to Proceed authorizing performance of the Contract for the Project.

1.04 **PAYMENTS TO CONTRACTOR**

- A. Partial payments to include the value of materials delivered to site and labor executed shall be paid by Owner to Contractor in monthly installments upon Architect's certificate as work progresses in proportion to amount of work executed during monthly period, and in accordance with Article 9, Supplementary Conditions.
- B. Deliver monthly application for payment to Architect. Include the updated Progress Schedule with Payment Request.
- C. After payment, submit receipted invoices from all Subcontractors and Material Suppliers, certifying that payment has been made in full, less 10%.

1.05 **PROGRESS SCHEDULE**

Submit copies of Progress Schedule in accordance with Section 01300, Submittals.

1.06 **CONSTRUCTION DOCUMENTS**

The Contractor is to supply all contract drawings and specifications to his subcontractors or material suppliers. Additional sets or portions of contract drawings and specifications requested by the Contractor will be furnished for actual cost of

printing at the Contractor's expense.

1.07 ORDERS FOR MATERIALS

- A. Place material orders within ten (10) days after execution of Contract. Furnish evidence of orders to Architect upon request.
- B. Place orders contingent upon selection of colors and finishes, approval of shop drawings and samples by Architect.
- C. Include with monthly request for payment and progress schedule a report of materials purchased and date materials are scheduled for delivery.

1.08 SUBSTITUTIONS OF MATERIAL, EQUIPMENT OR METHODS

Proposals for substitutions of material, equipment or methods shall be submitted no later than thirty (30) days from date of written Notice to Proceed authorizing performance of the Contract.

1.09 SUBCONTRACTOR LIST

Submit list of proposed Sub-contractors to Architect in accordance with Article 5, Supplementary Conditions. Do not award any Sub-contract without Architect's prior approval. This list does not refer only to subcontractors named in the Bid Form. It should include all of the subcontractors.

1.10 GUARANTEES

- A. Guarantee all work to be free from defects in materials and workmanship for a period of one (1) year from date of authorization of final settlement except where a different time period is specifically prescribed.
- B. When, at any time during the guaranty period, work is considered defective by either Owner or Architect, immediately:
 - 1. Place such defective work into satisfactory condition, free from faults and defects and in conformance with Contract requirements.
 - 2. Make good all damage to work, including contents thereof and grounds, developing within guaranty period when such damage is due to use of materials and labor not conforming to Contract requirements.
 - 3. Make good all work disturbed in fulfillment of Contract obligations during guaranty period. If work of other contractors is disturbed in the process of fulfilling Contract, restore such work to it original condition and guarantee such restored work.
- C. Upon failure by Contractor to proceed promptly to comply with terms of any

guaranty under the Contract, Owner shall have such work performed as necessary to fulfill guarantees, and Contractor shall pay Owner such sums as expended to fulfill such guaranty.

- D. Work required for fulfillment of guarantees embraced under the Contract shall be performed at no additional expense to Owner.

1.11 CONTRACT TIME

Perform all work necessary to bring entire Contract, Base Bid work, and its individual Projects, to state of final completion in not more than the time listed in the Bid Form.

1.12 WORK PERFORMED BY OWNER

A. Owner Furnished, Contractor Installed Items:

1. The Owner will purchase and deliver item to site. The Contractor shall unload, uncrate, assemble, and provide utilities and hook-up, as required for complete and operational installation.
2. Refer to plans for items that are Owner Furnished, Contractor Installed:

1.13 COORDINATION

- A. Provide administrative and supervisory requirements necessary for coordination of work, including meetings, administrative and supervisory personnel, survey, records, reports, limitations for use of site, installation provisions, cutting and patching, cleaning, protection, conservation, and salvage. Coordinate work with work performed by Owner, including storage of materials and equipment, and connections and execution of work.

END OF SECTION 01010

SECTION 01020 - SPECIAL CONDITIONS

- 1.01 GENERAL: The GENERAL CONDITIONS form a part of this Section.
- 1.02 EXAMINATION OF SITE:
- A. Each bidder shall visit the site of the Work, compare the Drawings and Specifications with any work in place, and inform himself of all conditions. Failure to visit the site will in no way relieve the successful bidder from necessity of furnishing materials or performing any work that may be required to complete Work in accordance with Drawings and Specifications, without additional cost to the Owner.
 - B. Take special care to verify all existing conditions, elevations, lines and dimensions. Prior to submitting bids or commencing work, report any dimensional variations, discrepancies, obvious omissions, or other conditions materially affecting performance of the work in accordance with requirements indicated in Drawings and Specifications.
- 1.03 PROJECT LIMITS: The Contractor shall confine his operation, other than work required in the installation of utilities, drainage, etc., to the area indicated on the plans.
- 1.04 CODES: All Work shall be performed to meet the requirement of applicable local, state and national codes and other agencies having jurisdiction.
- 1.05 PROTECTION: Protect Work from injury due to weather, frost, dampness, accident and other like causes.
- 1.06 TEMPORARY JOB OFFICES:
- A. The Contractor shall furnish and maintain:
 - 1. A job office to accommodate Contractor and Architect. Substantially constructed with floors above grade. Provide heat, light, and ventilation. A suitable travel trailer may be substituted in lieu of job constructed office space. Locate as directed by the Owner.
 - B. Maintain on file in job office: Copies of Drawings, and Specifications, supplemental drawings or data, shop drawings, approved samples, and records pertinent to the Project.
 - C. Do not store tools, materials, supplies and equipment in job office.
 - D. Telephone and Facsimile: Provide telephone and fax in the field office. Pay costs for temporary service.

- 1.07 STORAGE SHEDS: Provide temporary, substantially constructed, dampproof storage sheds for materials and tools. Locate as directed.
- 1.08 SANITARY FACILITIES: Contractor shall provide temporary toilets, as required.
- 1.09 UTILITIES:
- A. Make necessary arrangements for all temporary and permanent electric services for lighting and power as required. The Contractor shall coordinate with all local utility companies for utilities to be relocated during construction.
 - B. Provide temporary and permanent water, gas, and sewer connections as required.
 - C. Refer to Mechanical and Electrical plans and specifications for additional information concerning construction utilities.
 - D. The Contractor shall pay all fees associated with temporary and permanent utility connections.
- 1.10 LAYING OUT WORK:
- A. Employ a Civil Engineer to lay out the work. Verify grades, levels and dimensions indicated on Drawings. Report any errors or inconsistencies to Architect in writing before commencing work.
 - B. Provide and maintain well built batterboards at all corners of new construction, establish bench marks at not less than two widely separated locations, locate all general reference points and take such action necessary to prevent their destruction.
 - C. Employ a professional Civil Engineer or Land Surveyor registered in the state of Arkansas, and approved by the Architect, to confirm or define site boundaries and/or building lines. Erect substantial bench marks and preserve them throughout the work.
- 1.11 BARRICADES AND SIGNS:
- A. Provide and maintain lights, public barriers, and barricades, as required for protection of persons and property in accordance with local codes and good safety practices. The Contractor is solely responsible for the safety on the Project.
 - B. Provide and maintain such signs required by safety regulations and necessary to safeguard life and property.

1.12 RESPONSIBILITIES OF CONTRACTOR:

- A. Except as otherwise specifically stated in the Contract, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, heat, power, transportation, superintendence, permits, fees, temporary construction of every nature, taxes legally collectible because of the work and all other services and facilities of every nature whatsoever necessary to execute the Work to be done under the Contract and deliver it complete in every respect within the specified time.
- B. If work is required in a manner to make it impossible to produce first class work, or should discrepancy appear among Contract Documents, request interpretation before proceeding with work. If Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out work in a satisfactory manner.
- C. Should conflict occur in or between Drawings and Specifications, the Contractor is deemed to have estimated on more expensive way of doing work unless he shall have asked for and obtained a written decision before submission of Proposal as to which method of materials will be required.

1.13 FILE DRAWINGS: At the completion of this project, the General Contractor shall furnish to the Architect, and to the Owner, a complete file of the final copies of all shop drawings used in the construction of this project.

1.14 COORDINATION: In the interest of expediting the Work, it shall be the responsibility of the Contractor to coordinate the work of all trades. The Contractor shall increase his forces, work overtime, or take other measures necessary in order to protect the Work or complete certain portions of the Work within the established time for the Project at no additional cost to the Owner under the Base Contract.

- A. Provide administrative and supervisory requirements necessary for coordination of work, including meetings, administrative and supervisory personnel, survey, records, reports, limitations for use of site, installation provisions, cutting and patching, cleaning, protection, conservation, and salvage.
- B. Coordinate construction activities included under various sections of these specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different sections of the specifications that are dependent upon each other for proper installation, connection, and operation.
 - 1. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain its best results.
 - 2. Where availability of space is limited, coordinate installation of different

components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

Prepare similar memoranda for the Owner and separate contractors where coordination for their work is required.

- D. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of schedules.
 2. Installation and removal of temporary facilities.
 3. Delivery and processing of submittals.
 4. Progress meetings.
 5. Project close-out activities.
- E. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water and materials.
- F. Coordinate work with work performed by Owner and separate contractors, including storage of materials and equipment, and connections and execution of work.

1.15 ASSIGNMENT OF WORK: The terms "this Contractor" and "this Sub-Contractor" have not been used in this Specification. Whenever the term "Contractor" is mentioned within this Specification, it shall not be interpreted to imply that work required of various sub-contractors is assigned to other sub-contractors of the General Contractor.

1.16 ELECTRICAL LICENSE REQUIREMENT:

- A. No person shall perform electrical work on the contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one-to-one ratio.

- B. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.
- 1.17 INSPECTION: The Contractor awarded this Project agrees to allow any Federal or State Inspector, acting in their official capacity, to have access to the job site.
- 1.18 CERTIFICATIONS: Provide all required certifications for all systems as required in the Contract Price, including but not limited to mechanical, electrical, plumbing.
- 1.19 SUPERINTENDENT: Prior to start of work, the Contractor shall submit in writing to the Architect/Owner, the qualifications of the Superintendent for approval. If the Architect/Owner finds the Superintendent is unacceptable for any reason, the Contractor shall provide one which is acceptable.
- 1.20 INDUSTRY STANDARDS:
- A. Applicability of Standards: Except where more explicit or stringent requirements are written into the Contract Documents, applicable construction industry standards have the same force and effect as if bound into or copied directly into the Contract Documents. Such industry standards are made a part of the contract documents by reference. Individual specification sections indicate which codes and standards the Contractor must keep available at project site for reference.
 - B. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.
 - C. Conflicting Requirements: Where compliance with two or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the contract documents specifically indicate otherwise. Refer to requirements that are different, but apparently equal and uncertainties as to which quality level is more stringent to the Architect for decision before proceeding.
 - D. Copies of Standards: The Contract Documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with industry standards applicable to that part of the work. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.
 - E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in the specifications or other contract documents they are defined to mean

the recognized name of the trade association, standards generating organization, governing authority, or other entity applicable to the context of the text provisions.

- 1.21 CONSTRUCTION AIDS: Provide and maintain for the duration of construction temporary equipment and apparatus including scaffolds, elevators and hoists, canopies, tarpaulins, barricades, warning signs, steps, ladders, platforms, ramps, chutes, and other temporary construction aids and miscellaneous facilities as necessary for proper completion of the work; comply with pertinent safety regulations.
- 1.22 TEMPORARY HEAT: Provide temporary heat where indicated and where needed for the proper performance of work, for curing or drying of work recently installed, and protection of work in place from, adverse effects of low temperature.
- 1.23 DEWATERING AND SNOW AND ICE REMOVAL: Maintain site, excavations, and construction free of water, snow and ice, as necessary for protection and execution of the work. Comply with dewatering requirements specified in Division 2 Specification Sections; where feasible, utilize same facilities.
- 1.24 TEMPORARY FIRE PROTECTION: During construction period and until fire protection needs are fulfilled by permanent facilities, provide and maintain types and forms of temporary fire protection needed to protect facilities against fire losses. Store combustible materials in recognized fire-safe locations and containers.
- 1.25 SECURITY: Provide sufficient control to prevent illegal entry or damage during nights, holidays, or other periods when work is not being executed, and such other controls as required during working hours.
- 1.26 RODENT CONTROL: Institute an effective program of rodent control. Provide marked metal containers for edible rubbish and enforce their use by employees. Empty containers and remove contents from site as often as required to maintain an adequate rodent control program. If this program of rodent control is not effective, additionally provide for regular services of an experience exterminator who shall visit the site at least once a month for entire construction period.
- 1.27 REMOVAL: Maintain construction facilities and temporary controls as long as needed for safe and proper completion of Work. Remove temporary facilities and controls as rapidly as progress of Work will permit or as directed by Architect.

END OF SECTION 01020

SECTION 01030

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- B. Type of allowance included in this project:
 - 1. Lump-sum allowance: \$47,000.00, for installation of an Alarm/Security and Communication system.
 - 2. Lump-sum allowance: \$12,500.00, for exterior and interior signage.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At the Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by the Architect from the designated supplier.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly upon delivery for damage or defects.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

1. Allowance No.1: Include in the Base Bid the sum of Forty Seven Thousand Dollars (\$47,000.00) is to be for the design and installation of an Alarm & Security, and Communication System.
2. Allowance No. 2: Include the sum of Twelve Thousand Five Hundred Dollars (\$12,500.00) for the design, shop drawings, purchase, taxes, freight, delivery, and installation of all interior and exterior signage for this project. (Handicapped parking signs, parking stripes and painted directional arrows are included in the Civil Drawings). This allowance shall be for a turn-key process from design through installation.

END OF SECTION 01030

SECTION 01200 - PROJECT MEETINGS

1.01 PRE-CONSTRUCTION MEETING:

- A. Architect will schedule and administer a pre- construction meeting within 15 days after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties.
- C. Attendance:
 - 1. Owner's Representative.
 - 2. Architect and his professional consultants.
 - 3. Contractor's Superintendent.
 - 4. Major Subcontractors.
 - 5. Others as appropriate.

1.02 PROGRESS MEETINGS:

- A. Contractor shall schedule regular periodic meetings, as required by progress of the Work.
- B. Location of the meetings: The Project field office of the Contractor.
- C. Attendance:
 - 1. Architect and his professional consultants as needed.
 - 2. Subcontractors and suppliers as appropriate to the agenda.
- D. Representative of the Contractor, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.
- E. Architect may attend meetings to ascertain that Work is expedited consistent with Contract Documents and the construction schedules.

END OF SECTION 01200

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

- 1.01 SCOPE: Provide all submittals, including shop drawings, product data, samples, schedules, reports, and requests for substitutions, as required by the Bidding and Contract Documents and in strict accordance with the provisions of this section.
- 1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:
- A. Contractual Requirements for Submittals:
 - Section 00700: General Conditions
 - Section 00800: Supplementary General Conditions
 - B. Individual Submittals Required: Pertinent sections of these specifications.
 - C. Contract Closeout: Section 01700

PART 2 - PRODUCTS

- 2.01 SHOP DRAWINGS:
- A. Submit required shop drawings drawn to a scale sufficiently large enough to show all pertinent features of the item and its method of connection to the Work. Submit related shop drawings together; partial submittals will not be accepted. Provide manufacturer's name and model number of prefabricated items and indicate methods of attachment and clearances required relative to other trades affecting all elements of the Work. Identify deviations from the Contract Documents (if any), check dimensions, check that trades have been coordinated and that no conflict will develop in this installation. Notify the Architect in writing of any errors or deviations at the time of submittal. Any dimensional or coordination problems which surface during construction due to lack of coordination by the General Contractor will be corrected at the Contractor's expense. After reviewing the shop drawings, indicate Contractor's approval by signing and dating on Contractor's stamp. The use of stamps which pass on responsibility to subcontractors will not be allowed. The General Contractor is responsible for review and coordination of all aspects of the work, and shall indicate that submittals have been reviewed for dimensions and coordination of all subcontractor work. Failure to follow these procedures will result in rejection of the submission and no additional contract time will be allowed for delay of this cause.
 - B. Submit one transparency and one print of Contractor's stamped and approved shop drawings for Architect's review. The Architect will review the transparency, and stamp it with indication of action as appropriate. The

Architect will retain the print for his record, and will return the transparency to the Contractor. For transparencies marked "Revise and Resubmit, Rejected", correct the original drawings, make a new transparency reproduction and print, and resubmit. For transparencies returned "Reviewed, Furnish as Corrected", provide such number of prints of the transparency as may be needed for field distribution.

- 2.02 PRODUCT DATA AND SAMPLES: Submit three (3) copies of product data for Architect's review for items specified in the various specification sections (five copies required for mechanical and electrical data). Submit samples, where specified, along with product data. Mark data clearly to indicate exact items submitted, and note deviations from Contract Documents (if any). After reviewing the submittals, indicate approval by signing and dating on Contractor's stamp, and submit to the Architect for review.
- 2.03 PROGRESS SCHEDULE:
- A. Prior to signing the Contract, submit to the Architect a bar chart progress schedule indicating a time for each trade for operation of work to be performed at the site. Chart shall demonstrate planned work, properly sequenced and intermeshed and all critical dates to complete work, for expeditious completion of Work. Indicate all critical dates for Owner furnished items, either Owner installed or General Contractor installed. Identify phases if required. Contractor's schedule shall become a part of the Contract.
 - B. Submit with application for payments monthly updates of the schedule accurately depicting actual progress to the first day of the month. Indicate percentage of completion on the time bars at 10% increments.
- 2.04 SCHEDULE OF VALUES: Submit a schedule of values on AIA Document G703 (Continuation Sheet for G702). Itemize separate line cost for each major item of work and each subcontracted item of work (use Sections under Division 2 through 16 in Table of Contents as a basis for listing).
- 2.05 APPLICATION AND CERTIFICATE FOR PAYMENT: Submit Application and Certificate for Payment on AIA Document G702 and G703. Refer to Section 01370, Schedule of Values, Part 2, Paragraph A.
- 2.06 MANUAL: Upon completion of the Work and prior to final payment, submit to the Architect a loose-leaf hard cover binder with the project name printed on it, containing five indexed sections as follows:
- A. Subcontractors: A listing of all subcontractors for the project, including portions of the Work done, address and telephone number of the firm, and contact at the firm familiar with the Project.
 - B. Guaranties and Warranties: One fully executed copy of each guaranty and

warranty specified.

- C. Certificates: One fully executed copy of each certificate specified.
- D. Instructions: One operating, service, and maintenance manual or instruction sheet for each item specified.
- E. List of As-Built Drawings, Record Drawings, Shop Drawings, Product Data, and Samples.

2.07 DRAWINGS AND SUBMITTALS PACKAGE: Upon completion of the Work and prior to final payment, submit to the Architect a package labeled with the project name and containing one copy of all final record drawings, specifications, shop drawings, product data, and samples (see AIA A201 paragraph 3.11.1). This package and the manual will be presented by the Architect to the Owner upon completion of the Project.

PART 3 - EXECUTION

- 3.01 IDENTIFICATION OF SUBMITTALS: Completely identify each submittal and re-submittal by showing at least the following information. Submittals not properly identified are subject to return without review.
- A. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
 - B. Name of project as it appears in these specifications.
 - C. Drawing number and specifications section number to which the submittal applies.
 - D. Number each submittal consecutively.

END OF SECTION 01300

SECTION 01310 - SUBSTITUTION REQUEST FORM

Mail to: ETC Engineers & Architects, Inc.
1510 South Broadway
Little Rock, Arkansas 72202
Phone: 501-375-1786 Fax: 501-375-1277

SECTION PARAGRAPH SPECIFIED ITEM:
____ PROPOSED SUBSTITUTE:

Attach complete description, designation, catalog or model number, Spec/Data Sheet, and other technical data, including laboratory tests, if applicable.

Fill In Blanks Below:

1. Will substitution affect dimensions indicated on Drawings?
2. Will substitution affect wiring, piping, ductwork, etc., indicated on Drawings?
3. What affect will substitution have on other trades?
4. Differences between proposed substitutions and specified items?
5. If necessary, will the undersigned pay for Architect's cost, required to revise working drawings, caused by substitution?
6. Manufacturer's warranties of specified items and proposed items are: Same Different (explain)
7. Does substitution come in same colors, patterns, etc., as specified item, if applicable?

Submitted By:

Firm:

Address:

Telephone:

Fax:

Signature:

Date:

REVIEW COMMENTS:
(Architect's Use Only)

Accepted

Accepted As Noted
(see attached copy)

Not Accepted

Received Too Late

By:

Date:

Remarks:

SECTION 01370 - SCHEDULE OF VALUES

PART 1 - GENERAL

- A. Prior to the first Application for Payment, the Contractor shall submit to the Architect, an expanded Schedule of Values which will define labor and material separately for each significant portion of the work to be performed.
- B. Upon request of the Architect, Contractor shall support the values with date, which will substantiate their correctness.
- C. The Schedule of Values, unless objected to by the Architect, shall be used only as the basis for the Contractor's Applications for Payment.

PART 2 - FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Submit schedule of AIA Document G703, Contractor's standard forms and automated printout will be considered for approval by Architect upon Contractor's request.
- B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Follow the table of contents of this Project Manual as the format for listing component items. Identify each line item with the number and title of the respective major section of the specifications.
- D. For each major line item list sub-values of major products or operations under the item.
- E. For items on which progress payments will be requested for stored materials, break down the value into:
 - 1. The cost of the materials, delivered and unloaded, with taxes paid.
 - 2. The total installed value.
- F. The sum of all values listed in the schedule shall equal the total Contract Sum.

END OF SECTION 01370

SECTION 01400 – QUALITY CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The Contractor shall employ and pay for the services of an independent testing laboratory to perform specified testing, except where designated otherwise in the respective Specification sections.
- B. Testing laboratory services are required for, but are not necessarily limited to, the following:
 - 1. Soil testing and compaction control.
 - 2. Cast-in-place concrete: Curing and testing of molded cylinders.
 - 3. Concrete paving: Density of compacted base for paving.

1.02 RELATED WORK:

- A. Related requirements in other parts of the Project Manual:

Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: General Conditions of the Contract.
- B. Related requirements specified in other sections:
 - 1. Certification of products: The respective sections of Specifications.
 - 2. Test, adjust and balance of equipment: The respective sections of Specifications.
 - 3. Laboratory tests required, and standards for testing: Each specification section listed.

1.03 QUALITY ASSURANCE:

- A. The testing laboratory employed by the Owner will meet "Recommended Requirements for Independent Laboratory Qualification" published by the American Council of Independent laboratories.
- B. In its work on this project, the testing laboratory will be required to meet the basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

1.04 SUBMITTALS:

Submit written report of each test and inspection to the following:

- A. Architect/Engineer.
- B. Contractor.
- C. Project Record file at job site.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DUTIES OF TESTING LABORATORY:

- A. Cooperate with Architect and Contractor; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling and testing of materials and method of construction:
 - 1. Comply with specified standards.
 - 2. Ascertain compliance of materials with requirements of Contract Documents.
- C. Promptly notify Architect and Contractor of observed irregularities or deficiencies of work or products.
- D. Promptly submit copies of the written report of each test and inspection as required in Article 1.04 above.

3.02 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY:

- A. The testing laboratory is not authorized to:
 - 1. Release, revoke, alter or enlarge on the requirements of the Contract Documents.
 - 2. Approve or accept any portion of the Work.
 - 3. Perform any duties of the Contractor.

3.03 CONTRACTOR'S RESPONSIBILITIES:

- A. Cooperate with laboratory personnel and provide access to the Work and to Manufacturer's Operations.

- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the laboratory the proposed design mix to be used for concrete and other material mixes which require control by the testing laboratory.
- D. Furnish copies of Products test reports as required.
- E. Furnish incidental labor and facilities:
 - 1. To provide access to the Work to be tested.
 - 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test specimens.
- F. Notify the laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
- G. Provide all required time within the construction schedule for the testing laboratory to perform its tests and to issue each of its findings.
- H. Provide at the site three extra standard test cylinder molds for emergency use.

END OF SECTION 01400

SECTION 01410 - ENVIRONMENT PROTECTION

1.1 GENERAL REQUIREMENTS

The Contractor shall perform the Work minimizing environmental pollution and damage as the result of construction operations. Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of land, water, and air, and includes management of visual aesthetics, noise, solid waste, as well as other pollutants. The environmental resources within the Project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this Contract.

A. Subcontractors

The Contractor shall ensure compliance with this section by subcontractors.

B. Environmental Protection Plan

The Contractor shall submit an environmental protection plan within 15 days after receipt of the Notice to Proceed. Approval of the Contractor's plan will not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures. The environmental protection plan shall include, but shall not be limited to, the following:

1. Location of the solid waste disposal area.

C. Stormwater Pollution Prevention Plan

The Contractor shall provide and comply with stormwater pollution plan developed by Engineer. (Not included in this contract.)

D. Permits

The Contractor shall obtain all needed permits or licenses. The Contractor shall be responsible for implementing the terms and requirements of the appropriate permits as needed and for payment of all fees.

E. Notification

The Architect/Engineer will notify the Contractor in writing of any observed noncompliance with the previously mentioned Federal, State or local laws or

regulations, permits, and other elements of the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Architect/Engineer of proposed corrective action and take such action when approved. If the Contractor fails to comply promptly, the Architect/Engineer may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to the Contractor for any such suspensions.

F. Litigation

If work is suspended, delayed, or interrupted due to a court order of competent jurisdiction, the Architect/Engineer will determine whether the order is due in any part to the acts or omissions of the Contractor, or subcontractors at any tier, not required by the terms of the contract. If it is determined that the order is not due to Contractor's failing, such suspension, delay, or interruption shall be considered as ordered by the Architect/Engineer in the administration of the contract under the contract clause SUSPENSION OF WORK.

G. Payment

No separate payment will be made for work covered under this section; all costs associated with this section shall be included in the Contract unit and/or lump sum prices in the Bidding Schedule.

1.2 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the Drawings and Specifications. Prior to the beginning of any construction, the Contractor shall identify the land resources to be preserved within the work area. Except in areas indicated on the Drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without permission. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, earth, or other material displaced into uncleared areas shall be removed.

A. Work Area Limits

Prior to any construction, the Contractor shall mark the areas that need not be disturbed under this Contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where

construction operations are to be conducted during darkness, the markers shall be visible. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

B. Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

C. Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils.

D. Disturbed Areas

The Contractor shall effectively prevent erosion and control sedimentation through approved methods including, but not limited to, the following:

1. Retardation and control of runoff. Runoff from the construction site or from storms shall be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches, berms, and by any measures required by area wide plans under the Clean Water Act.

E. Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the Drawings or as directed by the Architect/Engineer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

1.3 WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation when such application may cause contamination of the fresh water reserve.

1.4 AIR RESOURCES

Equipment operation and activities or processes performed by the Contractor in accomplishing the specified construction shall be in accordance with the state's rules and all federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained. Monitoring of air quality shall be the Contractor's responsibility.

A. Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

B. Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

C. Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise.

1.5 WASTE DISPOSAL

Disposal of wastes shall be as specified in Section 02220 and as specified below.

A. Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off City property and dispose of it in compliance with federal, state, and local requirements for solid waste disposal.

B. Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. Chemical waste shall be collected in corrosion resistant, compatible containers. Wastes shall be disposed of in accordance with Federal and local laws and regulations.

C. Hazardous Wastes

The Contractor shall take sufficient measures to prevent spillage of hazardous

and toxic materials during dispensing and shall collect waste in suitable containers observing compatibility. The Contractor shall transport hazardous waste off City property and dispose of it in compliance with Federal and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Architect/Engineer. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility.

D. Burning

Burning will not be allowed on construction site.

1.6 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

If during excavation or other construction activities any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rocks or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Architect/Engineer.

1.7 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction.

1.8 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work areas.

1.9 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

1.10 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental pollution control.

END OF SECTION 01410

SECTION 14533
STRUCTURAL TESTS AND SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Arkansas Special Inspections Guidelines (SEAoAR SI GL 01-5/21/2010) in accordance with 2007 Arkansas Fire Prevention Code (based on 2006 International Building Code).

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements necessary for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.
- B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
 - 3. Requirements for contractor to provide quality-assurance and -control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.
- C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.
- D. Related Sections include but are not limited to the following:
 - 1. Section 033000 Cast-In-Place Concrete
 - 2. Section 051200 Structural Steel
 - 3. Section 053100 Metal Decking
 - 4. Section 054000 Cold-Formed Metal Framing
 - 5. Section 05500 Metal Fabrications and Miscellaneous Metal Work

1.3 DEFINITIONS

- A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.

- B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.
- C. Shop Drawings/Submittal Data: Written, graphic and pictorial documents prepared and/or assembled by the contractor based on the Construction Documents.
- D. Structural Observation: Visual observation of the structural system by a representative of the registered design professional's office for general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace inspections and testing by the testing agency or special inspector.
- E. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer, or engineering intern or a qualified representative from the testing agency who is under supervision of a licensed professional engineer.
- F. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
- G. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- H. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and/or Inspection of Materials Used in Construction.
 - a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.

2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.5 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design professional in responsible charge for a decision before proceeding.
- C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.
- D. Where a conflict exists between the construction documents and approved shop drawings/submittal data, the construction documents shall govern unless the shop drawings/submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

1.6 SUBMITTALS BY SPECIAL INSPECTOR AND/OR TESTING AGENCY

- A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.
 1. Special inspection reports and test results shall include, but not be limited to, the following:
 - a. Date of inspection.
 - b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
 - c. Statement noting that the work, material, and/or product conforms or does not conform to the construction document requirement

- 1) Name and signature of contractor’s representative who was notified of work, material, and/or products that do not meet the construction document requirements.
- d. Name and signature of special inspector and/or testing agency representative performing the work.
- B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection/test report and subsequent dates of re-inspection/retesting.
- C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.
- D. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTOR’S RESPONSIBILITY

- A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.
- B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.
- C. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the quality assurance plan shall submit a written contractor’s statement of responsibility to the building official and to the owner prior to the commencement of work on the system or component. The contractor’s statement of responsibility shall contain the following:
 1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
 2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
 3. Procedures for exercising control within the contractor’s organization, the method and frequency of reporting and the distribution of the reports.
 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- D. Each contractor responsible for the construction of a main wind force-resisting system or a wind-resisting component listed in the quality assurance plan shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor’s statement of responsibility shall contain the following:

1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
 2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
 3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- E. The contractor shall repair and/or replace work that does not meet the requirements of the construction documents.
1. Contractor shall engage an engineer/architect to prepare repair and/or replacement procedures.
 2. Engineer/architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
 3. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.
- F. The contractor shall be responsible for costs of:
1. Re-testing and re-inspection of materials, work, and/or products that do not meet the requirements of the construction documents and shop drawings/submittal data.
 2. Review of proposed repair and/or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
 3. Repair or replacement of work that does not meet the requirements of the construction documents.

3.2 STRUCTURAL OBSERVATIONS

- A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

3.3 TESTING AND INSPECTION

- A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.
- B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

PART 4 - SCHEDULES AND FORMS (ATTACHED)

4.1 STATEMENT OF SPECIAL INSPECTIONS.

4.2 SCHEDULE OF SPECIAL INSPECTIONS.

4.3 FINAL REPORT OF SPECIAL INSPECTIONS.

STATEMENT OF SPECIAL INSPECTIONS

(Completed by the Registered Design Professional in Responsible Charge)

PROJECT: _____

LOCATION: _____

PERMIT APPLICAN: _____

APPLICANT'S ADDRESS: _____

ARCHITECT OF RECORD: _____

STRUCTURAL ENGINEER OF RECORD: _____

MECHANICAL ENGINEER OF RECORD: _____

ELECTRICAL ENGINEER OF RECORD: _____

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: _____

This Statement of Special Inspections is submitted in accordance with Section 1704 of the 2007 Arkansas Fire Prevention Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Wind Resistance*.

Are Requirements for Seismic Resistance included in the Statement of Special Inspections?

Yes No

Are Requirements for Tornado Resistance included in the Statement of Special Inspections?

Yes No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

____ Weekly ____ Bi-Weekly ____ Monthly Other; specify: _____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

Preparer's Seal

Signature

_____ Date

Building Official's Acceptance:

Signature

Date

Permit Number:

Frequency of interim report submittals to the Building Official:

_ Monthly _ Bi- Monthly _ Upon Completion Other; specify: _____

Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a main wind or seismic force-resisting system, designated seismic system or wind or seismic-resisting component listed in the Statement of Special Inspections, Requirements for Seismic or Tornado Resistance, must submit a Statement of Responsibility, in accordance with the Building Code, Section 1706.

Project: _____

Name Contractor's: _____

Address: _____

License No: _____

Description of building systems and components included in Statement of Responsibility:

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to obtain conformance with the approved construction documents.

Name and Title (type or print)

Signature

Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: _____

Fabricator's _____ Name:

Address: _____

Certification _____ or _____ Approval _____ Agency:

Certification _____ Number:

Date of Last Audit or Approval: _____

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

Name and Title (type or print)

Signature

Date

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

SPECIAL INSPECTION INTERIM REPORT

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:										
BEGINNING & END DATES INCLUDED IN THIS REPORT:										
INSPECTION TYPE(S) COVERAGE										
<input type="checkbox"/> CONTINUOUS					<input type="checkbox"/> PERIODIC					
TIME BEGINNING INSECTION:					TIME ENDING INSPECTION:					
DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:										
LIST TESTS MADE:										
TOTAL INSPECTION TIME EACH DAY				DATE						
				HOURS						
LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:										
COMMENTS:										
TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.										
PRINTED FULL NAME										
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY										
SIGNED:							DATE:			
CERTIFICATION:							NUMBER:			

One copy of this report to remain at job site with the contractor for review upon request.

FINAL REPORT OF SPECIAL INSPECTIONS

(Completed by each Special Inspector)

PROJECT: _____

LOCATION: _____

PERMIT _____ APPLICANT: _____

APPLICANT'S ADDRESS: _____

ARCHITECT		OF	RECORD:
STRUCTURAL	ENGINEER	OF	RECORD:
MECHANICAL	ENGINEER	OF	RECORD:
ELECTRICAL	ENGINEER	OF	RECORD:

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: _____

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above-referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents.

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor. Interim reports submitted prior to this final report and numbered ___ to ___ form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____ have been corrected:

(Attach 8 1/2"x11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

Special Inspection Agent/Firm

Type or print name of Special Inspector

Signature

Date

DISCREPANCY NOTICE No. _____

SPECIAL INSPECTION DISCREPANCY NOTICE

(Complete by Special Inspector)

PROJECT NAME / ADDRESS:		
INSPECTION TYPE(S) COVERAGE <input type="checkbox"/> CONTINUOUS <input type="checkbox"/> PERIODIC		
AREA INSPECTED	TYPE OF INSPECTION	
NOTICE DELIVERED TO: <input type="radio"/> CONTRACTOR <input type="radio"/> ENGINEER/ARCHITECT <input type="radio"/> OWNER	DATE:	TIME:
MAKE THE FOLLOWING CORRECTIONS AND SECURE INSPECTION APPROVAL PRIOR TO PROCEEDING WITH THIS PHASE OF THE WORK:		
PRINTED FULL NAME		
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY		
SIGNED:	DATE:	
CERTIFICATION:	NUMBER:	

One copy of this report to remain at job site with the contractor for review upon request.

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT		(Completed by the Registered Design Professional in Responsible Charge)			
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.2 Inspection of Fabricators					
Verify fabrication/quality control procedures.	In-plant review	N	Periodic		
1704.3 Steel Construction					
Material verification of high-strength bolts, nuts, and washers.	Review material markings and certificates of compliance	Y	Periodic	1	
Inspection of high-strength bolting:	Field inspection				
a. Bearing-type connections		Y	Periodic	1	
b. Pre-tensioned or slip-critical					
1) Turn-of-nut with matching markings		Y	Periodic	1	
2) Direct tension indicator		N	Periodic		
3) Twist-off bolt		Y	Periodic	1	
4) Turn-of-nut without matching markings		N	Continuous		
5) Calibrated wrench		N	Continuous		
Material verification of structural steel:					
a. Identification markings	Field inspection	Y	Periodic	1	
b. Certified mill test reports	Review submittals	Y	Each submittal	1	
Weld filler materials.	Review certificate of compliance and field verification	Y	Periodic and each submittal	1	
Structural steel welding:	Shop and field inspection				
a. Complete and partial penetration groove welds		Y	Continuous	1	
b. Multi-pass fillet welds		Y	Continuous	1	
c. Single-pass fillet welds > 5/16"		N	Continuous		

d. Single-pass fillet welds $\leq 5/16"$		Y	Periodic	1	
e. Floor and deck welds		Y	Periodic	1	
Reinforcing steel welding:	Shop and field inspection				
a. Verification of weldability of steel other than ASTM A 706		Y	Periodic	1	
b. Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special concrete shear walls, and shear reinforcement		N	Continuous		
c. Shear reinforcement		N	Continuous		
d. Other reinforcing steel		N	Periodic		
Inspection of steel frame joint details for compliance with approved construction documents.	Field inspection				
a. Details such as bracing & stiffening		Y	Periodic	1	
b. Member locations		Y	Periodic	1	
c. Application of joint details at each connection		Y	Periodic	1	
1704.4 Concrete Construction					
Inspection of reinforcing steel installation.	Field inspection	Y	Periodic.	1	
Inspection of prestressing steel installation.	In-plant or field review	Y	Periodic	1	
Inspection of prestressed concrete:	In-plant or field review				
a. Application of prestressing force		Y	Continuous	1	
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system		N	Continuous		

Inspection of anchor bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased per Building Code section 1911.5 or where strength design is used	Field inspection	Y	Continuous	1	
Inspection of anchors installed in hardened concrete	Field inspection	Y	Periodic	1	
Verification of required design mix.	Review submittals	Y	Periodic	1	
Fresh concrete sampling.	Field testing	Y	Continuous	1	
Inspection of concrete and shotcrete placement for proper application techniques	Field review	Y	Continuous	1	
Concrete curing operations.	Field review	Y	Periodic	1	
Erection of precast concrete members.	Field review	Y	Periodic	1	
Evaluation of concrete strength.	Field testing and review of laboratory reports	Y	Periodic	1	
Verification of in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	Field testing and review of laboratory reports	Y	Periodic	1	
Inspection of formwork for shape, lines, location and dimensions	Field inspection	Y	Periodic	1	
1704.5.1 Masonry Construction (Level 1)					
Verify proportions of site prepared mortar.	Field and submittal review	Y	Periodic	1	
Verify construction of mortar joints.	Field inspection	N	Periodic		
Verify location of reinforcement, connectors, prestressing tendons and anchorages.	Field inspection	Y	Periodic	1	
Verify prestressing technique	Field inspection	N	Periodic		
Verify grade and size of prestressing tendons and anchorages.	Field inspection	N	Periodic		
Verify size and location of structural masonry elements.	Field and submittal review	Y	Periodic	1	

Verify type, size, and location of anchors, including details of anchorage of masonry to structural members, frames, or other construction.	Field inspection	Y	Periodic	1	
Verify size, grade, and type of reinforcement.	Field inspection	Y	Periodic	1	
Verify welding of reinforcing bars.	Field inspection	N	Continuous		
Verify protection of masonry during hot/cold weather.	Field inspection	N	Periodic		
Verify application and measurement of prestressing force	Field inspection	N	Periodic		
Verify grout space is clean prior to grouting.	Field inspection	Y	Periodic	1	
Verify placement of reinforcement, connectors, prestressing tendons and anchorages prior to grouting.	Field inspection	Y	Periodic	1	
Verify proportions of site prepared grout and prestressing grout for bonded tendons.	Field and submittal review	N	Periodic		
Verify grout placement complies with code and construction document provisions.	Field inspection	Y	Continuous	1	
Verify proper grouting of prestressing bonded tendons.	Field inspection	N	Continuous		
Observe preparation of any required grout specimens, mortar specimens, and/or prisms.	Field inspection	Y	Continuous	1	
Verify compliance with required inspection provisions of construction documents and the approved submittals.	Field inspection	Y	Periodic	1	
1704.5.3 Masonry Construction (Level 2)					
Verify proportions of site prepared mortar, grout and prestressing grout for bonded tendons.	Field and submittal review	N	Periodic		
Verify placement of masonry units and construction of mortar joints.	Field inspection	N	Periodic		
Verify placement of reinforcement, connectors, prestressing tendons and anchorages.	Field inspection	N	Periodic		
Verify grout space is clean prior to grouting.	Field inspection	N	Continuous		

Verify placement of grout.	Field inspection	N	Continuous		
Verify placement of prestressing grout.	Field inspection	N	Continuous		
Verify size and location of structural masonry elements.	Field and submittal review	N	Periodic		
Verify type, size, and location of anchors, including details of anchorage of masonry to structural members, frames, or other construction.	Field inspection	N	Continuous		
Verify size, grade, and type of reinforcement.	Field inspection	N	Periodic		
Verify welding of reinforcing bars.	Field inspection	N	Continuous		
Verify protection of masonry during hot/cold weather.	Field inspection	N	Periodic		
Verify application and measurement of prestressing force	Field inspection	N	Continuous		
Observe preparation of any required grout specimens, mortar specimens, and/or prisms.	Field inspection	N	Continuous		
Verify compliance with required inspection provisions of construction documents and the approved submittals.	Field inspection	N	Periodic		
1704.6 Wood Construction					
Inspection of the fabrication process of wood structural elements and assemblies in accordance with Section 1704.2	In-plant review	N	Periodic		
For high-load diaphragms, verification of grade and thickness of structural panel sheathing.	Field inspection	N	Periodic		
For high-load diaphragms, verify nominal size of framing members at adjoining panel edges, nail or staple diameter and length, number of fastener lines, and that spacing between fasteners in each line and at edge margins agrees with approved bldg plans.	Field inspection	N	Periodic		
1704.7 Soils					

Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic	1	
Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic	1	
Perform classification and testing of controlled fill materials.	Field inspection	Y	Periodic	1	
Verify site preparation complies with approved soils report.	Field inspection	Y	Continuous	1	
Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	Y	Continuous	1	
Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly	Field inspection	Y	Periodic	1	
Verify dry-density of compacted fill complies with approved soils report.	Review field testing	Y	Periodic	1	
1704.8 Pile Foundations					
Verify pile materials, sizes and lengths comply with requirements.	Field inspection and submittal review.	N	Continuous		
Verify capacities of test piles and results of additional load tests, as required.	Field inspection and submittal review.	N	Continuous		
Observe pile driving operations and maintain complete and accurate records for each pile	Field inspection and submittal review. Submittal to the bldg official of the results of pile load tests.	N	Continuous		
Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, verify required penetrations to achieve design capacity, record tip and butt elevations, and document any pile damage.	Field inspection and submittal review	N	Continuous		
For steel piles, perform additional inspections per Section 1704.3	See Section 1704.3	N	See Section 1704.3		
For concrete piles and concrete-filled piles, perform additional inspections per Section 1704.4.	See Section 1704.4	N	See Section 1704.4		

For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	Field inspection	N	Periodic or Continuous		
For augered uncased piles and caisson piles, perform inspections per Section 1704.9.	See Section 1704.9	N	See Section 1704.9		
1704.9 Pier Foundations					
Observe drilling operations and verify that complete and accurate records are maintained for each pier.	Field inspection and submittal review.	N	Continuous	1	
Verify placement locations and plumbness, confirm pier diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable), and adequate end bearing strata capacity.	Field inspection and submittal review.	N	Continuous	1	
For concrete piers, perform additional inspections per Section 1704.4.	See Section 1704.4	N	See Section 1704.4	1	
For masonry piers, perform additional inspections per Section 1704.5.	See Section 1704.5	N	See Section 1704.5		
1704.10 Sprayed Fire-resistant Materials					
Verify surface condition preparation of structural members.	Field inspection	Y	Periodic	1	
Verify application of sprayed fire-resistant materials.	Field inspection	Y	Periodic	1	
Verify average thickness of sprayed fire-resistant materials applied to structural members.	Field inspection	Y	Periodic	1	
Verify density of the sprayed fire-resistant material complies with approved fire-resistant design.	Field inspection and submittal review	Y	Periodic	1	
Verify the cohesive/adhesive bond strength of the cured sprayed fire-resistant material.	Field inspection and submittal review	Y	Per Building Code section 1704.10.5	1	
1704.11 Mastic and Intumescent Fire-Resistant Coatings					

Inspect mastic and intumescent fire-resistant coatings applied to structural elements and decks, in accordance with AWCI 12-B.	Field inspection	N	Periodic		
1704.12 Exterior Insulation and Finish Systems (EIFS)					
Inspect EIFS applications.	Field inspection	N	Periodic		
1704.13 Special Cases (work unusual in nature, including but not limited to alternative construction materials, unusual design applications, systems or materials with special manufacturer requirements. Attach 8 1/2x11 if needed).	Submittal review, shop inspection and/or field inspection.	N			
1704.14 Smoke Control Systems					
Leakage testing and recording of device locations prior to concealment.	Field testing	N	Periodic		
Prior to occupancy and after sufficient completion, pressure difference testing, flow measurements, and detection and control verification.	Field testing	N	Periodic		
1707.2 Structural Steel Special Inspections for Seismic Resistance					
Continuous inspection of structural welding in accordance with AISC 341, Seismic Provisions	Shop and field inspection	N	Continuous		
1707.3 Structural Wood Special Inspections for Seismic Resistance					
Inspection of field gluing operations of elements of the seismic-force resisting system.	Field inspection	N	Continuous		
Inspection of nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system.	Shop and field inspection	N	Periodic		
1707.4 Cold-formed Steel Framing Special Inspections for Seismic Resistance					

Inspection during welding operations of elements of the seismic-force-resisting system.	Shop and field inspection	N	Periodic		
Inspections for screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system.	Shop and field inspection	N	Periodic		
1707.5 Pier Foundations Special Inspections for Seismic Resistance					
Inspection during placement of reinforcing.	Field inspection	N	Periodic		
Inspection during placement of concrete.	Field inspection	N	Continuous		
1707.6 Storage Racks/ Access Floors Special Inspections for Seismic Resistance					
Inspection during the anchorage of access floors and storage racks 8 feet or greater in height.	Field inspection	N	Periodic		
1707.7 Architectural Components Special Inspections for Seismic Resistance					
Inspection during the erection and fastening of exterior cladding and interior and exterior veneer.	Field inspection	N	Periodic		
Inspection during the erection and fastening of interior and exterior non load bearing walls.	Field inspection	N	Periodic		
1707.8 Mechanical and Electrical Components Special Inspections for Seismic Resistance					
Inspection during the anchorage of electrical equipment for emergency or standby power systems.	Field inspection	N	Periodic		
Inspection during the anchorage of other electrical equipment.	Field inspection	N	Periodic		

Inspection during installation of piping systems intended to carry flammable, combustible, or highly toxic contents and their associated mechanical units.	Field inspection	N	Periodic		
Inspection during the installation of HVAC ductwork that will contain hazardous materials	Field inspection		Periodic		
Inspection during the installation of vibration isolation systems.	Field inspection		Periodic		
1707.9 Designated Seismic System Verification					
Inspect and verify that that the component label, anchorage or mounting conforms to the certificate of compliance in accordance with 1708.5.	Field inspection	N	Periodic		
1707.10 Seismic Isolation System					
Inspection during the fabrication and installation of isolator units and energy dissipation devices used as part of the seismic isolation system.	Shop and field inspection	N	Periodic		
1708.1 Masonry Testing and Verification for Seismic Resistance					
Certificates of compliance used in masonry construction	Review submittals	N	Each submittal		
Verification of f'_m and f'_{AAC} prior to construction	Review submittals	N	Each Submittal		
Verification of f'_m and f'_{AAC} every 5000 SF during construction (Level 2 Only)	Review submittals and field testing	N	Periodic		
Verification of proportions of materials in mortar and grout as delivered to the site (Level 2 Only)	Field review	N	Periodic		
1708.3 Reinforcing and Prestressing Steel Testing for Seismic Resistance					
Review certified mill test reports	Field review	N	Each submittal		

Verify reinforcing steel weldability	Review testing reports	N	Each submittal		
1708.4 Structural Steel Testing for Seismic Resistance					
Test In accordance with the quality assurance requirements of AISC 341, Seismic Provisions	Shop and field testing	N	Each occurrence		
Ultrasonically test for discontinuities behind and adjacent to welds with base metal thicker than 1.5 inches where subject to through-thickness weld shrinkage strains.	Shop and field testing	N	Each occurrence		
1708.5 Seismic Qualification of Mechanical and Electrical Equipment					
Review certificate of compliance for designated seismic system components	Certificate of compliance review	N	Each submittal		
1708.6 Seismically Isolated Structures					
Test seismic isolation system in accordance with ASCE 7-05 Section 17.8	Prototype testing	N	Per ASCE 7-05		

*** INSPECTION AGENTS FIRM ADDRESS TELEPHONE NO.**

1.	SPECIAL INSPECTION AGENCY
2.	
3.	
4.	
5.	
6.	
7.	
8.	

NOTES:

- The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies are subject to the approval of the Building Official and/or the Design Professional.*
- The list of Special Inspectors may be submitted as a separate document, if noted so above.*

Encircle "Yes" or "No" as appropriate and date this document below:

Are requirements for Seismic Resistance included in the Statement of Special Inspections? **NO**

Are requirements for Tornado Resistance included in the Statement of Special Inspections? **NO**

DATE: 8/15/2012

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS				
Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop In- spection	Field Test- ing /Inspection	Review Submittals	Review Testing, Certification, & Lab Reports
1704.2 Inspection of Fabricators				
Pre-cast concrete	A, C, E			
Structural steel construction	C, F, G			
Wood construction	A			
Cold formed metal construction	A			
1704.3 & 1707.2 Steel Construction				
Welding	C, F, G	C, F, G	A	A
High strength bolting, inspection of steel frame joint details		A, C	A	A
1704.4 & 1708.3 Concrete Construction				
Reinforcing placement, cast-in-place bolts, post installed anchors, concrete and shotcrete placement and curing operations		A, C, H		
Pre-stressing steel installation		A, C, D, E		
Erection of pre-cast concrete members		A, C, H		
Concrete field testing		A, C, H, I, J		
Review certified mill reports and design mixes			A	
Verify use of required design mix		A, C, H, I, J		
Pre-stressed (pre-tensioned) concrete force application	A, C, E			
Post-tensioned concrete force application		A, C, D		
Review of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs		A, C, D		
Reinforcing steel weldability, reinforcing welding, weld filler material		C, F, G		
1704.5 & 1708.1 Masonry				
Review f'_m prior to construction			A	
Mortar joint construction, grout protection and placement, materials proportion, type/size/location of reinforcement, structural elements, anchorage, and connectors		A, C, K		
Sampling/testing of grout/mortar specimens		A, C, K		
Observe preparation of masonry prisms for testing of compressive strength of masonry, f'_m		A, C, K		
Inspection of welding of reinforcing steel		C, F, G		
(Table continued on next page)				

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS				
Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop In- spection	Field Test- ing /Inspection	Review Submittals	Review Testing, Cer- tification, & Lab Reports
1704.2 Inspection of Fabricators				
Pre-cast concrete	A, C, E			
Structural steel construction	C, F, G			
Wood construction	A			
Cold formed metal construction	A			
1704.3 & 1707.2 Steel Construction				
Welding	C, F, G	C, F, G	A	A
High strength bolting, inspection of steel frame joint details		A, C	A	A
1704.4 & 1708.3 Concrete Construction				
Reinforcing placement, cast-in-place bolts, post installed anchors, concrete and shotcrete placement and curing operations		A, C, H		
Pre-stressing steel installation		A, C, D, E		
Erection of pre-cast concrete members		A, C, H		
Concrete field testing		A, C, H, I, J		
Review certified mill reports and design mixes			A	
Verify use of required design mix		A, C, H, I, J		
Pre-stressed (pre-tensioned) concrete force application	A, C, E			
Post-tensioned concrete force application		A, C, D		
Review of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs		A, C, D		
Reinforcing steel weldability, reinforcing welding, weld filler material		C, F, G		
1704.5 & 1708.1 Masonry				
Review f'_m prior to construction			A	
Mortar joint construction, grout protection and placement, materials proportion, type/size/location of reinforcement, structural elements, anchorage, and connectors		A, C, K		
Sampling/testing of grout/mortar specimens		A, C, K		
Observe preparation of masonry prisms for testing of compressive strength of masonry, f'_m		A, C, K		
Inspection of welding of reinforcing steel		C, F, G		
(Table continued on next page)				

KEY:

- A. Arkansas Professional Engineer (AR PE) competent in the specific task area or graduate of accredited engineering/engineering technology program under the direct supervision of a AR PE.
- B. Arkansas Registered Architect (AR RA) or graduate of accredited architecture/architecture technology program under the direction of a AR RA.
- C. International Code Council (ICC) Special Inspector Certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
- D. Post-tensioning Institute (PTI) Certification, Level 2.
- E. Pre-stressed Concrete Institute (PCI) Plant Quality Personnel Certification – Level III.
- F. American Welding Society (AWS) Certified Welding Inspector (CWI) or AWS Certified Associate Welding Inspector working under the direct on-site supervision of a CWI.
- G. American Society for Nondestructive Testing (ASNT) Level II certification, or a Level III certification if previously certified as a Level II in the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
- H. American Concrete Institute (ACI) Concrete Construction Special Inspector.
- I. National Institute for Certification in Engineering Technologies (NICET) Level II or higher certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
- J. ACI Concrete Field Testing Technician with Grade 1 certification.
- K. National Concrete Masonry Association (NCMA) Certified Concrete Masonry Testing Technician.
- L. NICET Certified Engineering Technologist (CT).
- M. Other Qualified Special Inspector as approved by the Building Official.

Notes:

1. *The Special Inspector shall meet one of the minimum qualifications listed for the applicable Category of Testing and Inspection.*
2. *Materials testing shall be done by an Approved Testing Agency meeting the requirements of the Building Code Section 1703 and ASTM E 329.*

COMMENTARY ON SCHEDULE OF SPECIAL INSPECTION SERVICES	
MATERIAL / ACTIVITY	COMMENTARY
General	Other items may be added to the Schedule of Special Inspection Services at the discretion of the Design Professional and/or the Owner.
Definition: Special Inspection, Periodic	The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work. May be allowed when compliance of the work or product can be determined after being incorporated into the structure.
Definition: Special Inspection, Continuous	The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
1704.2 Inspection of Fabricators	Required where structural load-bearing members are fabricated in a shop, except not required where fabricator is approved in accordance with section 1704.2.2. Where this exception is utilized, at the completion of fabrication, the fabricator shall submit a certificate of compliance stating that the work was performed in accordance with the approved construction documents.
1704.3 Steel Construction	
Inspection of high-strength bolting	Installation of high strength bolts shall be inspected in accordance with RCSC (June 23, 2000) specifications.
1704.4 Concrete Construction	Building Code Section 1704.4 states that Special Inspections are not required for certain isolated spread concrete footings, certain continuous concrete footings, certain nonstructural concrete slabs, and certain concrete foundation walls. See Section 1704.4 for these specific exceptions. Special inspections are not required for <u>any</u> concrete patios, driveways and sidewalks, on grade.
Inspection of cast-in-place and post-installed anchors	<p>It is recommended that construction documents specify what needs to be included in the special inspection of post-installed anchors. Guidance for inspection requirements can be obtained from anchor manufacturers and in ICC-ES reports (www.icc-es.org) for specific anchors. The structural engineer may want to require continuous special inspection of particularly critical installations. Most anchor manufacturers will also provide field representatives to projects to train installers and inspectors. Post-installed anchor special inspections should include verification of anchor type, anchor dimensions, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, concrete minimum thickness, anchor embedment and tightening torque. The Special Inspector should verify the initial installations of each type and size of adhesive anchor by construction personnel on site and periodically thereafter.</p> <p>Note that adhesive anchors meeting ICC-ES Criteria AC308 use different strength reduction factors depending on whether periodic or continuous inspection is performed. If the higher strength values are used in design, continuous inspection must be required in the Schedule of Special Inspections.</p>
1704.5 Masonry Construction	For Level 1, use table 1704.5.1. For Level 2 use table 1704.5.3. See Section 1704.5 for application.

1704.6 Wood Construction	
For high-load diaphragms, verification of grade and thickness of structural panel sheathing.	Applies to high-load diaphragms using values from Building Code Table 2306.3.2.
For high-load diaphragms, verify nominal size of framing members at adjoining panel edges, nail or staple diameter and length, number of fastener lines, and that spacing between fasteners in each line and at edge margins agrees with approved bldg plans.	
1704.7 Soils	
Perform classification and testing of controlled fill materials.	Special Inspections are not required during placement of controlled fill 12-inches deep or less; however, it is recommended.
Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill.	
Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.	
1704.8 Pile Foundations	The approved soils report, required by Section 1802.2, and the documents prepared by the registered design professional in responsible charge, shall be used to determine compliance.
1704.9 Pier Foundations	The approved soils report, required by Section 1802.2, and the documents prepared by the registered design professional in responsible charge, shall be used to determine compliance
1704.10 Sprayed Fire-resistant Materials	
Verify average thickness of sprayed fire-resistant materials applied to structural members.	Thickness testing required for minimum of 25% of structural members on each floor. See Section 1704.10.3.1 for testing requirements for floor, roof and wall assemblies.
1704.11 Mastic and Intumescent Fire-Resistant Coatings	
Inspect mastic and intumescent fire-resistant coatings applied to structural elements and decks, in accordance with AWCI 12-B.	Special inspections shall be in accordance with the Association of the Wall and Ceiling Industry Technical Manual AWCI 12-B. Special inspections shall be based on the fire-resistance design as designated in the approved construction documents.

1704.12 Exterior Insulation and Finish Systems (EIFS)	Mandatory except for applications installed over masonry or concrete walls, or where installed over a water-resistive barrier with means of draining moisture to the exterior.
1707.2 Structural Steel Special Inspections for Seismic Resistance	
Continuous inspection of structural welding in accordance with AISC Seismic Provisions	Mandatory for the seismic-force-resisting systems in Seismic Design Categories C, D, E & F. Exceptions: 1. Single-pass fillet welds not exceeding 5/16 inch in size. 2. Floor deck and roof deck welding. 3. Structures assigned to SDC C with structural steel systems not specifically detailed for seismic resistance in accordance with Table 1617.6.
1707.3 Structural Wood Special Inspections for Seismic Resistance	
Inspection of field gluing operations of elements of the seismic-force resisting system.	Mandatory for the seismic-force-resisting systems in Seismic Design Categories C, D, E & F.
Inspection of nailing, bolting, anchoring and other fastening of components with the seismic-force-resisting system.	Exception: Not required for fastening of wood sheathing used for wood shear walls, shear panels and diaphragms where the fastener spacing is more than four inches on center.
1707.4 Cold-formed Steel Framing Special Inspections for Seismic Resistance	
Inspection during welding operations of elements of the seismic-force-resisting system.	Mandatory for the seismic-force-resisting systems in Seismic Design Categories C, D, E & F.
Inspections for screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system.	
1707.5 Pier Foundations Special Inspections for Seismic Resistance	
Inspection during placement of reinforcing.	Mandatory for the seismic-force-resisting systems in Seismic Design Categories C, D, E & F.
Inspection during placement of concrete.	

<p>1707.6 Storage Racks and Access Floors Special Inspections for Seismic Resistance</p>	
<p>Inspection during the anchorage of access floors and storage racks 8 feet or greater in height.</p>	<p>Mandatory for buildings assigned to Seismic Design Category D, E or F.</p>
<p>1707.7 Architectural Components Special Inspections for Seismic Resistance</p>	
<p>Inspection during the erection and fastening of exterior cladding and interior and exterior veneer.</p>	<p>Mandatory for buildings assigned to Seismic Design Category D, E or F. Exceptions:</p>
<p>Inspection during the erection and fastening of interior and exterior non load bearing walls.</p>	<p>1. Not required for architectural components in structures 30 feet or less in height. 2. Not required for cladding and veneers weighing 5 psf or less. 3. Not required for interior non-bearing walls weighing less than 15 psf.</p>
<p>1707.8 Mechanical and Electrical Components Special Inspections for Seismic Resistance</p>	
<p>Inspection during the anchorage of electrical equipment for emergency or standby power systems, including emergency lighting fixtures.</p>	<p>Mandatory for buildings assigned to Seismic Design Category C, D, E or F.</p>
<p>Inspection during the anchorage of other electrical equipment</p>	<p>Mandatory for buildings assigned to Seismic Design Category E or F.</p>
<p>Inspection during installation of piping systems intended to carry flammable, combustible, or highly toxic contents and their associated mechanical units.</p>	<p>Mandatory for buildings assigned to Seismic Design Category C, D, E or F.</p>
<p>Inspection during the installation of HVAC ductwork that will contain hazardous materials</p>	
<p>Inspection during the installation of vibration isolation systems.</p>	<p>Mandatory for structures assigned to Seismic Design Category C, D, E or F, where the construction documents require a nominal clearance of 0.25 inches or less, between the equipment support frame and restraint.</p>
<p>1707.9 Designated Seismic System Verification</p>	<p>Per ASCE 7, Section 11.2, Designated Seismic Systems are defined as: "The seismic force resisting system and those architectural, electrical, and mechanical systems or their components that require design in accordance with (ASCE 7) Chapter 13 and for which the component importance factor, I_p, is greater than 1.0."</p>

Inspect and verify that the component label, and anchorage or mounting conforms to the certificate of compliance in accordance with 1708.5.	Required where the component has a Component Importance Factor of greater than 1.0 and the component is to be placed in a building assigned to Seismic Design Category C, D, E or F.
1707.10 Seismic Isolation System	
Inspection during the fabrication and installation of isolator units and energy dissipation devices used as part of the seismic isolation system.	See ASCE 7-05, Section 17 for additional inspection and quality control requirements.
1708.1 Masonry Testing and Verification for Seismic Resistance	
Certificates of compliance used in masonry construction	Mandatory for empirically designed masonry and glass unit masonry in Occupancy Category I, II, or III facilities.
Certificates of compliance used in masonry construction	Mandatory for empirically designed masonry and glass unit masonry in Occupancy Category IV facilities. Mandatory for engineered masonry in Occupancy Category I, II, or III facilities... ceptions: See section 1704.5.
Verification of f'_m and f_{AAC} prior to construction	
Certificates of compliance used in masonry construction	Mandatory for engineered masonry in Occupancy Category IV facilities.
Verification of f'_m and f_{AAC} every 5000 SF during construction	
Verification of proportions of materials in mortar and grout as delivered to the site	
1708.3 Reinforcing and Prestressing Steel Testing for Seismic Resistance	This section applies to reinforced concrete intermediate frames, special moment frames or boundary elements of special reinforced concrete or masonry shear walls in Seismic Design Categories D, E or F.
1708.4 Structural Steel Testing for Seismic Resistance	This section applies to structural steel systems designed to AISC 341 Seismic Provisions in Seismic Design Categories C, D, E or F. This is not required for steel structures utilizing the Seismic Force-Resisting System: "Steel Systems not Specifically Detailed for Seismic Resistance, Excluding Cantilever Column Systems" per ASCE 7-05, Table 12.2-1.
1708.5 Seismic Qualification of Mechanical and Electrical Equipment	Per ASCE 7-05, Section 11.2, Designated Seismic Systems are defined as: "The seismic force resisting system and those architectural, electrical, and mechanical systems or their components that require design in accordance with (ASCE 7) Chapter 13 and for which the component importance factor, I_p , is greater than 1.0."
Submit certificate of compliance for designated seismic system components	Required where the component has a Component Importance Factor of greater than 1.0 and the component is to be placed in a building assigned to Seismic Design Category C, D, E or F.

1708.6 Seismically Isolated Structures	
Test seismic isolation system in accordance with ASCE 7-05 Section 17.8	Specific testing and requirements meeting ASCE 7-05 Section 17.8 shall be included in the construction documents

END OF SECTION 14533

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 SCOPE

- A. Provide temporary utilities and miscellaneous facilities required during construction, complete, including maintenance and removal.

PART 2 - PRODUCTS

2.1 UTILITIES

- A. Temporary Utilities: Provide and pay for costs for gas, water, and electricity required for performance of this work. Make necessary arrangements with utility companies for temporary service.
 - 1. Gas and Water: Provide necessary temporary piping and fittings.
 - 2. Electricity: Provide necessary temporary electric wiring. Provide area distribution boxes so located that individual trades may use their own construction type extension cords to obtain adequate power and lighting for construction operations.
- B. Telephone: Provide telephone and facsimile machine in the field office. Pay costs for temporary service.

2.2 TEMPORARY SANITARY FACILITIES

- A. Provide on-site temporary toilet facilities for use of construction personnel; maintain in a sanitary condition. Comply with applicable codes and regulations of authorities having jurisdiction.

2.3 FIELD OFFICE AND SHEDS

- A. Provide field office and storage facilities adequate in size and accommodation for Contractor's offices, superintendent's office, and supply and tool's rooms. Make the field office available to Architect throughout entire construction period.

2.4 PROJECT IDENTIFICATION

- A. Provide project sign, to be located as directed by Architect. Exact text lettering, and paint color selection will be provided by Architect at a later date.
- B. Sign to be not less than 32 sq. ft., with painted graphic content to include title of project, name of Owner, name and title of authorities, name and title of Architect and Engineer, prime contractor, and major subcontractors.
- C. Sign Materials: New or used wood or metal structure and framing and exterior grade softwood plywood with medium density overlay for sign surface. Use standard large sizes to minimize joints.

- D. Paint exposed surfaces of supports, framing, and surface material with coat of primer and one coat of exterior paint as specified in Section 09900.
- E. Remove sign, framing, and supports at completion of project.

2.5 PERSONNEL IDENTIFICATION

- A. Provide identification badges for all employees. Badges shall be minimum 2-1/2 inches in diameter, with Contractor's name in not less than 12 point capital letters and employee's identification number in not less than 24 point size. Provide letters and background in light and dark colors respectively (or dark and light) to facilitate easy reading.

2.6 CONSTRUCTION AIDS

- A. Provide and maintain for the duration of construction temporary equipment and apparatus including scaffolds, elevators and hoists, canopies, tarpaulins, barricades, warning signs, steps, ladders, platforms, ramps, chutes, and other temporary construction aids and miscellaneous facilities as necessary for proper completion of the work; comply with pertinent safety regulations.

2.7 TEMPORARY HEAT

- A. Provide temporary heat where indicated and where needed for the proper performance of work, for curing or drying of work recently installed, and protection of work in place from, adverse effects of low temperatures.

2.8 DEWATERING AND SNOW AND ICE REMOVAL

- A. Maintain site, excavations, and construction free of water, snow and ice, as necessary for protection and execution of the work. Comply with dewatering requirements specified in Section 02220; where feasible, utilize same facilities.

2.9 TEMPORARY FENCING

- A. Provide and maintain a temporary fence around the entire construction area, with truck and pedestrian gates, as required by project conditions. The General Contractor may, at his discretion, provide whatever type of fencing he determines suitable to fence around whatever construction materials, equipment, vehicles, etc. in storage at the site for his benefit and security. Fencing may be economical as well as durable for the length of time it will exist.

2.10 TEMPORARY FIRE PROTECTION

- A. During construction period and until fire protection needs are fulfilled by permanent facilities, provide and maintain types and forms of temporary fire protection needed to protect facilities against fire losses. Store combustible materials in recognized fire-safe locations and containers.

2.11 SECURITY

- A. Provide sufficient control to prevent illegal entry or damage during nights, holidays, or other periods when work is not being executed, and such other controls as required during working hours.

PART 3 - EXECUTION

3.1 REMOVAL

- A. Maintain construction facilities and temporary controls as long as needed for safe and proper completion of work. Remove temporary facilities and controls as rapidly as progress of work will permit or as directed by Architect.

END OF SECTION 01500

SECTION 01526

TRENCH SAFETY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Publications referenced below define construction safety regarding trenching. The Code of Federal Regulations (CFR) publications:
 - 1. 29 CFR, Part 1910: Occupational Safety and Health Administration (OSHA) General Industry and Health Standards.
 - 2. 29 CFR, Part 1926: OSHA Construction Industry Standards.
- B. Acquisition of Publications: Referenced CFR publications may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Section 02220 – Excavation, Backfilling and Compacting and Section 02221 – Trenching and Backfilling.
- B. Occupational Safety and Health Administration (OSHA) Technical Manual Section V, Chapter 2.

1.3 SAFETY MEETING

- A. Prior to commencing construction, the Contractor, including the principal on-site project representative and one or more safety representatives, shall meet with designated representatives of the Owner, for the purpose of reviewing the Contract's safety and health requirements.
- B. The Contractor's safety and health program shall be reviewed, and implementation of safety and health provisions pertinent to the Work shall be discussed.

1.4 COMPLIANCE WITH REGULATIONS

- A. The Work involving trench excavation which exceeds five (5) feet in depth shall comply with the OSHA Technical Manual referenced above and with the applicable requirements of 29 CFR 1926, Subpart P.
- B. Work shall additionally comply with applicable state and local safety and health regulations.
- C. In case of a conflict between applicable regulations, the more stringent requirements shall apply.
- D. Contractor Responsibility: The Contractor shall assume full responsibility and liability for compliance with all applicable codes, standards and regulations pertaining to the health and safety of personnel during execution of the Work, and shall hold the Owner harmless for any action on the Contractor's part, or that of the Contractor's employees or subcontractors, that results in illness, injury or death.

- E. The Contractor shall have written safety and health programs in compliance with 29 CFR 1926.

1.5 SUBMITTALS

- A. Safety and Health Programs: The Contractor shall submit, for approval, copies of the project safety and health programs, as applicable to the work scope, or required as a result of the safety meeting, including but not necessarily limited to the following:
 - 1. Fall Protection.
 - 2. Personnel Protective Equipment.
 - 3. Respirator Protection.
 - 4. Confined spaces.
- B. Contractor's Safety Plan: In addition to specific safety and health programs applicable to the project, Contractor shall submit firm's general safety plan listing emergency procedures and contact persons with home addresses and telephone numbers.
- C. Accident Reporting: Submit a copy of each accident report that the Contractor or Subcontractors submits to their insurance carriers, within seven calendar days after the date of the accident.

PART 2 - PRODUCTS

2.1 PERSONNEL PROTECTIVE EQUIPMENT

- A. Special facilities, devices, equipment and similar items used by the Contractor in execution of the Work shall comply with 29 CFR 1926 and other applicable regulations.

PART 3 - EXECUTION

3.1 EMERGENCY SUSPENSION OF WORK

- A. When the Contractor is notified by the Owner or the Architect, or the Owner's authorized representative, of non-compliance with the safety or health provisions of the Contract, the Contractor shall immediately, correct the unsafe or unhealthy condition.
- B. If the Contractor fails to comply promptly, all or part of the Work will be stopped by written notice from the Architect or his authorized representative.
- C. When, in the opinion of and by written notice given by the Architect or his authorized representative, satisfactory corrective action has been taken by the Contractor, work shall resume.

- D. The Contractor shall not be allowed any extension of time or compensation for damages in connection with a work stoppage for an unsafe or unhealthy condition.

3.2 PROTECTION OF PERSONNEL

- A. The Contract shall take all necessary precautions to prevent injury to the public, occupants, or damage to property of others. The public and occupants includes all persons not employed by the Contractor or a subcontractor.
- B. Wherever practical, the work area shall be fenced, barricaded or otherwise blocked off from the public or occupants to prevent unauthorized entry into the work area.
- C. Provide traffic barricades and traffic control signage where construction activities occur in vehicular areas.
- D. Corridors, aisles, stairways, doors and exit ways shall not be obstructed or used in a manner to encroach upon routes of ingress or egress utilized by the public or occupants, or to present an unsafe or unhealthy condition to the public or occupants.
- E. Store, position and use equipment, tools, materials, scraps and trash in a manner that does not present a hazard to the public or occupants by accidental shifting, ignition or other hazardous activity.
- F. Store and transport refuse and debris in a manner to prevent unsafe and unhealthy conditions for the public and occupants. Cover refuse containers, and remove refuse on a frequent regular basis acceptable to the Architect and/or the Owner. Use tarpaulins or other means to prevent loose transported materials from dropping from trucks.

END OF SECTION 01526

SECTION 01630 - SUBSTITUTIONS

PART 1 - GENERAL

1.01 GENERAL: General Conditions of the Contract, Supplementary Conditions, pertinent portions of sections in Division 1 of the Project Specifications and the Drawings shall apply to the Work of this Section

1.02 SUBSTITUTIONS:

A. Product List: Within 30 days after Contract Date, submit to the Architect a complete list of major products proposed to be used, with name of manufacturer and installing contractor.

B. Contractor's Option:

1. For products or methods specified only by commercial standard, reference standard, Federal Specification, trade association standards or other similar standards; select any product or method meeting that standard. Where this specification requires a better quality than such standard, these project specifications shall govern.
2. For products specified by naming several products or manufacturers, select any one of products or manufacturers named, which complies with this project specification.
3. For products specified by naming one or more products, methods or manufacturers and "or equal", Contractor must submit a request as for substitutions for any product or method or manufacturer not specifically named.
4. For products specified by naming only one product, method or manufacturer, and "no substitutions"; provide specified product, methods or manufacturer.

NOTE: Where proprietary products or methods are specified for one use, the intention is to establish a standard of quality, performance and/or size and not to exclude any other products of equal merit unless stated otherwise.

1.03 SUBSTITUTIONS: For products specified as above, bids shall be based on products named in Project Manual, or on items which Architect has designated as an "approved equal". A product not named in Project Manual or that is not approved by Architect will only be acceptable when such product meets all other requirements of Project Specifications, including specifications of originally specified products' manufacturer as of date of contract documents.

1.04 REQUESTS FOR SUBSTITUTIONS: Requests for Architects approval of a product

as equal will not be considered unless sufficient data for evaluation is received by Architect.

- 1.05 SUBMITTALS: Submit a separate request for each product, supported with complete data, with drawings, cut sheets, and samples as appropriate, including:
- A. Comparison of qualities of proposed substitution with that of specified product.
 - B. Changes required in other elements of the Work because of substitution.
 - C. Effect on construction schedule.
 - D. Cost data comparing proposed substitution with product specified.
 - E. Availability of maintenance service, and source of replacement parts.
- 1.06 CONTRACTOR'S REPRESENTATION: Contractor's substitution of a product constitutes a representation that Contractor:
- A. Has investigated proposed product and determined that it is equal or superior in all respects to that specified.
 - B. Will provide same warranties or bonds for substitutions as for product specified.
 - C. Will coordinate installation of an accepted substitution into Work, and make such other changes as may be required to make Work complete in all respects.
 - D. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.
- 1.07 APPROVAL: Architect shall be judge of acceptability of proposed substitutions. Architect will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of decision to accept or reject requested substitution.
- 1.08 NOTICE: Architect's approval of an item for a previous project does not constitute approval for this Project.

PART 2 - PRODUCTS NOT APPLICABLE

PART 3 - EXECUTION NOT APPLICABLE

END OF SECTION 01630

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

- 1.01 SCOPE: Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedure in closing out the Work.
- 1.02 WORK SPECIFIED IN OTHER SECTION:
- A. Cleaning: Section 01710
 - B. Project Record Documents: Section 01720
 - C. Operating and Maintenance Data: Section 01730
 - D. Warranties and Bonds: Section 01740
- 1.03 SUBSTANTIAL COMPLETION:
- A. When Contractor considers the Work is substantially complete, he shall submit to Architect, written notice that the Work, or designated portion thereof, is substantially complete including list of items to be completed or corrected.
 - B. Within a reasonable time after receipt of such notice, Architect will make an inspection to determine the status of completion.
 - C. Should Architect determine that the Work is not substantially complete:
 - 1. Architect will promptly notify the Contractor in writing, giving the reasons therefore including list of items to be completed or corrected.
 - 2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Architect.
 - 3. Architect will re-inspect the Work.
 - D. When Architect concurs that the Work is substantially complete, he will:
 - 1. Prepare a Certificate of Substantial Completion on AIA Form G704, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
 - 2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.
- 1.04 FINAL INSPECTION:
- A. When Contractor considers the Work is complete, he shall submit written certification that:

1. Contract Documents have been reviewed.
 2. Work has been inspected for compliance with Contract Documents.
 3. Work has been completed in accordance with Contract Documents.
 4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
 5. Work is completed and ready for final inspection.
- B. Architect will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Architect consider that the Work is incomplete or defective:
1. Architect will promptly notify the Contractor in writing, listing the incomplete or defective work.
 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Architect that the Work is complete.
 3. Architect will re-inspect the Work.
- D. When the Architect finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.05 RE-INSPECTION FEES:

- A. Should Architect perform re-inspection due to failure of the Work to comply with the claims of status of completion made by the Contractor:
1. Owner will compensate Architect for such additional services.
 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.06 CONTRACTOR'S CLOSEOUT SUBMITTALS:

- A. Evidence of compliance with requirements of governing authorities:
1. Certificate of Occupancy.
 2. Certificates of Inspection:

- a. Mechanical
 - b. Electrical
 - B. Project Record Documents: To requirements of Section 01720.
 - C. Operating and Maintenance Data, Instructions to Owner's Personnel: To requirements of Section 01730.
 - D. Warranties and Bonds: To requirements of Section 01740.
 - E. Keys and Keying Schedule: To requirements of Section 08700 - Door Hardware.
 - F. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.
- 1.07 FINAL ADJUSTMENTS OF ACCOUNTS:
- A. Submit a final statement of accounting to Architect. Statement shall reflect all adjustments to the Contract Sum:
 - 1. The original Contract Sum.
 - 2. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Allowances.
 - c. Unit Prices
 - d. Deductions for uncorrected Work.
 - e. Deductions for reinspection payments.
 - f. Other adjustments.
 - 3. Total Contract Sum, as adjusted.
 - 4. Previous payments.
 - 5. Sum remaining due.
 - B. Architect will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.
- 1.08 FINAL APPLICATION FOR PAYMENT:
- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

END OF SECTION 01700

SECTION 01710 - CLEANING

PART 1 - GENERAL

- 1.01 DESCRIPTION: Execute cleaning, during progress of the Work, and at completion of the Work, as required by General Conditions.
- 1.02 DISPOSAL REQUIREMENTS: Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 - PRODUCTS

- 2.01 MATERIALS:
- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
 - B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
 - C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

- 3.01 DURING CONSTRUCTION:
- A. Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations or his subcontractor's operations. Oversee cleaning and ensure that building and grounds are maintained free from accumulations of waste materials and rubbish.
 - B. At reasonable intervals during progress of work, clean up site, building and access, and dispose of waste materials, rubbish and debris. Provide containers and locate on site for collection of waste materials, rubbish and debris. Do not allow waste materials, rubbish and debris to accumulate and become an unsightly or hazardous condition.
 - C. Transport waste materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces. Sprinkle dusty debris with water.
 - D. Burning or burying of rubbish and waste materials on the project site is not permitted. Disposal of volatile fluid wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems is not permitted. Remove waste materials, rubbish and debris from the site and legally dispose of at public or

private dumping areas off the Owner's property.

3.02 DUST CONTROL:

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.
- C. Broom clean interior building areas when ready to receive finish painting and continue cleaning on an as needed basis until building is ready for acceptance or occupancy.

3.03 FINAL CLEANING:

- A. At completion of construction and just prior to acceptance or occupancy conduct a final inspection of exposed interior and exterior surfaces. Perform final cleaning and maintain cleaning until building, or portion thereof, is accepted by Owner.
- B. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from interior and exterior surfaces. Repair, patch and touch-up marred surfaces to match adjacent finishes. Broom clean paved surfaces; rake clean other surfaces of grounds.
- C. Clean all glass and all other finish surfaces, replace all broken and scratched glass; remove stains, spots, marks and dirt from decorated work; clean all hardware; remove paint spots and smears from all surfaces, clean all fixtures and wash or vacuum all floors; leaving work in a clean and spotless condition.
- D. Replace air conditioning filters if units were operated during construction. Clean ducts, blowers and coils if air conditioning units were operated without filters during construction.
- E. Remove all waste materials and rubbish from and about the Project as well as all tools, construction equipment, machinery and surplus cleaning.
- F. Use experienced workmen or professional cleaners for final cleaning.
- G. Comply with cleaning instructions contained in the Specifications. In absence of specific cleaning instructions, follow accepted cleaning practices or the recommendations of the manufacturer of the material to be cleaned.

END OF SECTION 01710

SECTION 01720 - PROJECT RECORD DOCUMENTS

1.01 GENERAL:

- A. Maintain at the Site for the Owner one record copy of:
 - 1. Drawings and Specifications
 - 2. Addenda
 - 3. Change Orders and other Modifications to the Contract
 - 4. Architect/Engineer Field Orders or written instructions.
 - 5. Approved Shop Drawings, Product Data and Samples.
 - 6. Field Test records.
- B. The Contractor will provide one set of Construction Drawings at the time construction is commenced. These drawings shall be marked up by Contractor, throughout the construction period, indicating all changes, revisions and additions to the Work, including field relocations of work concealed from view.

1.02 RECORD DRAWINGS: In accordance with the requirements of the General Conditions, the Architect will provide the Contractor with a set of reproducible drawings of the original bidding documents, as required and at Contractor's expense as follows:

- A. If the Contractor elects to vary from the Contract Documents, and secures prior approval of the Architect, for any phase of the Work other than those listed below, he shall record in a neat readable manner all such variances on the reproducible drawings furnished.
- B. For plumbing, heating, ventilating and air conditioning, electrical, and fire protection work; Record Drawings shall be maintained by the Contractor as this work progresses and as follows:
 - 1. All deviations from sizes, locations and from all other features of all installations shown in the Contract Documents shall be recorded.
 - 2. In addition, it shall be possible, using these Drawings, to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as all other features of work which will be concealed underground and/or in the finished building.

- a. Locations of underground work shall be established by dimensions to column lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
 - b. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases, this may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actual installed. Architect's decisions shall be final.
- C. The following requirements apply to all Record Drawings:
1. They shall be maintained at the Contractor's expense.
 2. All such drawings shall be done carefully and neatly by a competent draftsman and in form approved by the Architect.
 3. Additional drawings shall be provided as necessary for clarification.
 4. They shall be kept up-to-date during the entire course of the Work and shall be available on request for examination by the Architect and, when necessary, to establish clearances for other parts of the work.
 5. The Record Drawings shall be returned to the Architect on completion of the Work and are subject to the approval of the Architect.

END OF SECTION 01720

SECTION 01730 - OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 GENERAL:

- A. Compile Manufacturer's Directions and Manuals, Product Data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.
 - 1. Furnish operating and maintenance data as specified in other pertinent sections of Specifications.
- B. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.02 FORM OF SUBMITTALS:

- A. Prepare data in the form of an instructional manual for use by Owner's personnel.
- B. Bind in Commercial quality three ring binders with durable and cleanable plastic cover, with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS".
- C. When multiple binders are used, correlate the data into related consistent groupings.

1.03 CONTENT OF MANUAL:

- A. Neatly typewritten table of contents for each volume, arranged in a systematic order.
 - 1. Contractor, name of responsible principal, address and telephone number.
 - 2. A list of each product required to be included, indexed to the content of the volume.
 - 3. List, with each product, the name, address and telephone number of:
 - a. Subcontractor or installer.
 - b. Maintenance contractor, as appropriate.
 - c. Identify the area of responsibility of each.
 - d. Source of supply for parts and replacement.

4. Identify each product-by-product name and other identifying symbols.
 - B. Product Data: Include only those sheets which are pertinent to the specific product. Clearly identify the specific product or part installed.
 - C. Drawings: Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems, and control and flow diagrams.
 1. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
 2. Do not use Project Record Documents as maintenance drawings.
 - D. Written text, as required to supplement product data for the particular installation:
 1. Organize in a consistent format under separate headings for different procedures.
 2. Instances which might affect the validity of warranties or bonds.
- 1.04 MANUAL FOR MATERIALS AND FINISHES:
- A. Submit two copies of complete manual in final form.
 - B. Content, for architectural products, applied materials and finishes:
 1. Manufacturer's data, giving full information on products.
 2. Instructions for care and maintenance.
- 1.05 MANUAL FOR EQUIPMENT AND SYSTEMS:
- A. Submit copies of complete manuals for mechanical and electrical equipment as required by Specifications.
- 1.06 SUBMITTAL SCHEDULE:
- A. Submit one copy of completed data in final form fifteen days prior to final inspection or acceptance.
 1. Copy will be returned after final inspection or acceptance, with comments.
 - B. Submit specified number of copies of approved data in final form 10 days after final inspection or acceptance.

1.07 INSTRUCTION OF OWNER'S PERSONNEL:

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction.
- C. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION 01730

SECTION 01740 - WARRANTIES AND BONDS

1.01 SUBMITTAL REQUIREMENTS:

- A. Assemble warranties, bonds and services and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Review submittals to verify compliance with Contract Documents. Submit to Architect for review and transmittal to Owner.

1.02 TIME OF SUBMITTALS:

- A. For equipment or component parts of equipment put into service during progress of construction submit within 10 days after inspection and acceptance.
- B. Otherwise make submittals within ten days after Date of Substantial Completion, prior to final request for payment.
- C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.

END OF SECTION 01740

SECTION 01750 - Release of Lien Form

Contractor name: _____
Address: _____
Contract name/number: _____
Project location: _____
Contract execution date: _____

I, the undersigned, confirm that I was contracted to construct, alter or repair improvements on the above-referenced project.

All improvements on the subject properties have been fully and satisfactorily completed in substantial conformity with the contract. All materials used in said improvement, all labor performed thereon and all fees, industrial insurance and permits, in connection with the said improvements which might give rise to liens on the within described properties have been paid in full.

Listed below are all subcontractors and major material suppliers included in this work. Attached are waivers of liens from all of them as substantiation of the above statement.

Name of Subcontractor(s) or Supplier(s) and Addresses

The affiant hereby waives any lien or right to lien which he may have against the described property and warrants to save harmless the Owner from any liens which are now in existence, or may hereafter arise by reason of said improvements, and cause the same to be released of record immediately. The foregoing waiver and these statements are an express warranty and representation to the Owner of the facts whereof is acknowledged.

_____ **Date** _____ **Contractor**

SUBSCRIBED and SWORN to before me on _____
Date

Notary Public

My commission expires: _____

SECTION 01780

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SUBMITTALS

Two sets of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location. Engineer/Architect approval is required for submittals with a "A/E" designation; submittals having an "FIO" designation are for information only.

As-Built Drawings; A/E.

Drawings showing final as-built conditions of the project. The manually prepared drawings shall consist of 1 set approved marked working as-built prints.

Warranty Management Plan; A/E.

Two sets of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

1.2 PROJECT RECORD DOCUMENTS

A. As-Built Drawings

This paragraph covers as-built drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

1. Working As-Built and Final As-Built Drawings

The Contractor shall revise 1 set of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a weekly basis and at least one set shall be available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. The working as-built marked prints will be jointly reviewed for accuracy and completeness by the Engineer/Architect and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working drawings as specified herein, the

Engineer/Architect will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement can be reached between the Engineer/Architect and the Contractor regarding the accuracy and completeness of updated drawings. The working as-built drawings shall show, but shall not be limited to, the following information:

- a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.
- b. The location and dimensions of any changes within the building structure.
- c. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.
- d. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
- e. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
- f. Changes or modifications which result from the final inspection.
 - 1) Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints.
 - 2) Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.
 - 3) Modifications (change order price shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with the following procedures.

- 4) Directions in the modification for posting descriptive changes shall be followed.
- 5) A Modification Circle shall be placed at the location of each deletion.
- 6) For new details or sections which are added to a drawing, a Modification Circle shall be placed by the detail or section title.
- 7) For minor changes, a Modification Circle shall be placed by the area changed on the drawing (each location).
- 8) For major changes to a drawing, a Modification Circle shall be placed by the title of the affected plan, section, or detail at each location.
- 9) For changes to schedules or drawings, a Modification Circle shall be placed either by the schedule heading or by the change in the schedule.

B. Drawing Preparation

These working as-built marked prints shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned to the Engineer/Architect after approval by the City. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the City of Cabot

C. Manually Prepared Drawings

When final revisions have been completed, each drawing shall be lettered or stamped with the words "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 3/16 inch high.

D. Payment

No separate payment will be made for as-built drawings required under this contract, and all costs accrued in connection with such drawings shall be considered a subsidiary obligation of the Contractor.

1.3 WARRANTY MANAGEMENT

The Contractor shall develop a warranty management plan which shall contain information relevant to the clause Warranty of Construction of the contract. The Contractor shall submit the warranty management plan for the City of Cabot's approval. The warranty management plan shall include all required actions and documents to assure that the City receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. Approved information shall be assembled in a binder and shall be turned over to the City upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. Information contained in the warranty.

- A. Warranty Management Plan
 - 1. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.
 - 2. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

1.4 OPERATION AND MAINTENANCE MANUALS

Operation manuals and maintenance manuals shall be submitted as specified. Operation manuals and maintenance manuals provided in a common volume shall be clearly differentiated and shall be separately indexed.

1.5 FINAL CLEANING

The premises shall be left broom clean. Stains, foreign substances, and temporary labels shall be removed from surfaces. Equipment and fixtures shall be cleaned to a sanitary condition. Filters of operating equipment shall be cleaned. Debris shall be removed from roofs, drainage systems, gutters, and downspouts. Paved areas shall be swept and landscaped areas shall be raked clean. The site shall have waste, surplus materials, and rubbish removed. The project area shall have temporary structures, barricades, project signs, and construction facilities removed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01780

SECTION 02010

SUBSURFACE CONDITIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. General
A soils investigation report has been prepared for the site of this work by Materials Testing of Arkansas, Inc., hereinafter referred to as the Soil Engineer.
- B. Availability
The soils investigation report is included in these specifications.
- C. Use of Data
 - 1. This report was obtained only for the Architect's/Engineer's use in design and is not a part of the Contract Documents. The report is available for bidder's information, but is not a warranty of subsurface conditions.
 - 2. Bidders should visit the site and acquaint themselves with all existing conditions. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but all such investigations shall be performed only under time schedules and arrangements approved in advance by the Engineer/Architect.
 - 3. Bidders shall acquaint themselves with the soils investigation pertaining to the types of soil conditions found at this site.

1.3 QUALITY ASSURANCE

- A. Adjustment of Work
Readjust all work performed that does not meet technical or design requirements, but make no deviations from the Contract Documents without specific and written approval from the Architect/Engineer.

END OF SECTION 02010



MTA Engineers: *a Division of Materials Testing of Arkansas, Inc.*

•Little Rock, AR •Springdale, AR •Jonesboro, AR
P.O. Box 23715 Little Rock, AR 72221
501-753-2526 or mtaengineers.com

REPORT OF GEOTECHNICAL EXPLORATION
PROPOSED FIRE STATION
in
PARAGOULD, AR

PREPARED FOR:

ETC ENGINEERS AND ARCHITECTS
1501 S BROADWAY ST
LITTLE ROCK, AR 72202

PREPARED BY:

KELTON PRICE, P.E.
MTA ENGINEERS

DATE:

March 6, 2019

• GEOTECHNICAL ENGINEERING

• CONSTRUCTION MATERIALS TESTING

TABLE OF CONTENTS

SECTION	PAGE NO.
EXECUTIVE SUMMARY.....	1
INTRODUCTION.....	2
FIELD EXPLORATION.....	2
GENERAL SITE AND SUBSURFACE CONDITIONS.....	2
LABORATORY TESTING.....	3
ANALYSIS AND RECOMMENDATIONS	3
• SITE PREPARATION	3
• STRUCTURAL FILL.....	4
• BUILDING FOUNDATIONS.....	4
• SHALLOW FOUNDATIONS.....	4
• SEISMIC CONSIDERATIONS.....	5
• PAVEMENT DESIGN	5
CONSTRUCTION PROCEDURES.....	6

APPENDICES

APPENDIX A: Plan of Borings	A
APPENDIX B: Boring Logs	B
APPENDIX C: Key to Terms and Symbols	C
APPENDIX D: Laboratory Test Results	D
APPENDIX E: Seismic Considerations	E

TABLES

Table 1. Soil Types Encountered	1
Table 2. General Strata Classification of Boring Logs.....	3
Table 3. Pavement Design Assumption Values	5
Table 4. Pavement Design Recommendations	6

EXECUTIVE SUMMARY:

The exploration was conducted for the proposed fire station along Highway 49 in Paragould, Arkansas. This investigation was performed in general accordance with an emailed proposal dated January 31, 2019.

The general topography of the site was relatively flat with light grass and loose gravel. Subsurface conditions are similar throughout the entirety of the proposed development. Major soil types encountered at the proposed fire station may be visually summarized as follows:

Table 1. Soil Types Encountered at the site

SOIL TYPE	DESCRIPTION
CL	Lean Clay
SC	Sandy Clay

See the individual boring logs found in Appendix B for a more detailed overview of the soils encountered on site. No water table was encountered during the investigation; however, see individual boring logs for perched water encountered within the borings.

Based on the nature of the existing soil encountered on the site during the time of our exploration, we recommend that any structures be supported on continuous and/or individual spread footings founded a minimum of 24 inches beneath the final exterior grade. Recommendations will be expressed in further detail in subsequent sections of this report.

Shallow foundations founded in the CL clay may be sized using a net allowable end bearing pressure of 2500 pounds per square foot for continuous and 3000 pounds per square foot for individual spread footings. This net allowable end bearing pressure is based on a factor of safety more than 3.0 with respect to the anticipated shear strength of the compacted select fill. Total and differential settlement is anticipated to be less than 0.5 inches.

INTRODUCTION:

MTA Engineers conducted a geotechnical investigation in general accordance with the proposal dated January 31, 2019. This exploration was requested in order to evaluate existing subsurface conditions for placement of foundation for the proposed fire station and related parking and drives. The results of this exploration are presented in this report.

Exploration was accomplished by:

- 1.) Boring seven (7) locations to a maximum depth of twenty (20) feet to explore subsurface soil, and groundwater conditions.
- 2.) Obtaining samples from each stratum at the seven (7) testing locations using the split spoon sampling method for the report.
- 3.) Performing laboratory tests on various samples to determine pertinent engineering properties of the subsurface strata.
- 4.) Analyzing field and laboratory test data to develop design recommendations.

The scope of this geotechnical exploration did not include an environmental assessment for determining the presence of wetlands and/or hazardous or toxic materials in the soil or groundwater on or near this site. If there is concern of wetlands or a hazardous/toxic material presence a qualified environmental assessment consultant should be contacted to perform a site investigation before construction begins.

FIELD EXPLORATION:

Subsurface conditions at the site were explored by boring to a maximum depth of twenty (20) feet at seven (7) locations within the area of proposed improvements. The approximate locations of the borings are shown on the Plan of Borings, Appendix A. Boring Log Reports presenting descriptions of the soil strata encountered and results of field and laboratory tests are included in Appendix B. A key to the terms and symbols used on the Boring Log Reports is presented in Appendix C. Laboratory testing results of the different soil types are located in Appendix D.

Samples were obtained at various intervals throughout the entirety of each location through the use of split spoon sampling method. Blow counts to drive the split spoon were recorded to determine the standard penetration number (N Value). All soil samples encountered were visually identified and removed from the field in moisture tight, sealed containers. At the lab all various soil types were analyzed for specific engineering properties.

Samples were collected using dry auger procedures to facilitate observation of shallow groundwater conditions. No water table was observed at the time of this exploration. Perched water was encountered at nine (9) to eighteen (18) feet.

GENERAL SITE AND SUBSURFACE CONDITIONS:

The site is located in Paragould, Arkansas on the west side of Highway 49 near the intersection with W. Morgan Street. The proposed borings were located within the area identified by drawings provided by ETC Engineers and Architects of the proposed fire station. The site was generally flat and contained light grass over portions of the area. The stratigraphy encountered in the boring

locations is shown in Table 2. For a more detailed description of soils encountered while testing refer to the boring log sheets found in Appendix B.

Table 2. General Strata Classification of Boring Logs

STRATA	DEPTH	SOIL CLASSIFICATION	SOIL DESCRIPTION	SIGNIFICANT PROPERTIES
STRATUM I	0 – 13'	CL	Brown to Gray Silty Clay	Stiff to Very Stiff Some softer soils in the upper 2'
STRATUM III	13' to Completion	SC	Gray Clayey Sand	Medium Dense

No significant groundwater was encountered during testing. Some perched water was encountered from nine (9) to eighteen (18) feet. The significant properties and characteristics of the subsurface strata pertinent to design and construction are:

- A. The planned location of the improvements.
- B. Silty clay of Stratum II.
- C. Clayey sand of Stratum III.

The relationship of these factors to design and construction of the proposed facility is considered in the subsequent sections of this report.

LABORATORY TESTING:

Descriptions of the soils encountered in the sample locations were prepared in general accordance with applicable ASTM standards. The soil stratification shown on the Boring Log Reports represent soil conditions at the specific sample locations. Possible variations occur between or beyond the sample location. The stratification lines on the Boring Log represent the approximate boundaries between soil types, but actual transitions between soil layers in the stratification of the proposed site may be gradual.

Laboratory testing was performed to verify/evaluate classification, determine water content, and determine hydraulic conductivity. The results of all testing performed are presented on the Boring Logs and attached as Appendix D.

ANALYSIS AND RECOMMENDATIONS:

SITE PREPARATION:

Remove existing light grass in areas of proposed improvements by grubbing to approximately eight (8) inches. Existing loose gravel located within the proposed improvements can be mixed into the CL clay of Stratum I. Existing soils are adequate for use in the subgrade at proper moisture and compaction, however, some areas of over-excavation may exist due to loss of shear strength caused by excess moisture within the clay soils. Prior to placement of fill, or excavation of footings, the site should be scarified to a minimum depth of twelve (12) inches and recompacted. Upon re-compaction the site should be "Proof Rolled" using a 62,000 lb loaded tandem axle dump truck, or equivalent, to determine the stability of these areas. All areas of instability should be undercut a

MTA Engineers: a Division of Materials Testing of Arkansas, Inc.

approximately of two (2') feet, and backfilled with select compacted fill as stated in subsequent sections of this report. Mass over-excavation is not expected. The amount of undercut will be dependent on the soil-moisture content and subgrade elevation at the time of construction. Fill should be placed according to the "Structural Fill" section of this report.

Excavation should be performed under dry conditions, using equipment adequate to perform the work. Positive drainage should be maintained throughout this process. The addition of excessive moisture could cause a significant loss of soil stability.

No free groundwater was encountered during the drilling process; however, potential exists for perched groundwater. Consideration should be given to the incorporation of pipe underdrains for the control of perched groundwater as necessary.

STRUCTURAL FILL:

Fill should consist of approved materials, which are free of organic matter and debris. For approval, samples of the proposed fill material should be submitted to Materials Testing of Arkansas for classification testing. Select fill, consisting of low plasticity (lean clay) soil or clayey gravel, classifying as SC, CL, or GC according to the Unified Soils Classification System are generally considered suitable. High plasticity clay soils (soils with a Liquid Limit above 50) should not be used. Rock fragments that are greater than four (4") inches for the building or six (6") inches for the parking and drive areas should not be included in engineered fill. Select fill should have a Plasticity Index between ten (10) and twenty-five (25) and a Liquid Limit no greater than fifty (50).

Placement of approved fill should be achieved in multiple thin lifts. Each lift should not exceed eight (8") inches in loose thickness. Compaction of these lifts should be performed with suitable equipment to achieve 95% of standard proctor (ASTM D-698) at 2% below to 3% above optimum moisture content. Care should be taken that all compaction recommendations are performed.

If clay is to be used, compaction should be performed using a kneading-type vibratory compactor such as a vibratory sheepsfoot. The material should be broken down sufficiently to provide a dense matrix of particles. Rock fragments should be no larger than four (4") inches under the building slab and six (6") inches under the parking and drive areas.

BUILDING FOUNDATIONS:

All foundations must satisfy two basic and independent design criteria. First, foundations must have an acceptable factor of safety against bearing failure under maximum design loads. Second, movement of the foundation due to consolidation, shrinkage, and/or swelling of the supporting strata, should not exceed tolerable limits for the structure. Construction factors such as installation of foundations units, excavation procedures, and surface and groundwater conditions should also be considered. The factors and the aforementioned subsurface conditions were influential in development of the following recommendation.

In view of the anticipated foundation loading and subsurface conditions encountered, we recommend that the proposed structures be supported on a foundation system designed in accordance with the following recommendations.

SHALLOW FOUNDATIONS:

MTA recommends that the proposed structures be supported on traditional continuous and/or individual spread footings founded a minimum of twenty-four (24") inches beneath the final exterior grade. In addition, to minimize the potential for localized shear failure within the soils, a minimum footing width of twenty-four (24") inches is recommended. For design, continuous

MTA Engineers: a Division of Materials Testing of Arkansas, Inc.

and/or individual spread footings may be sized using a net allowable end bearing pressure two thousand five hundred (2500 PSF) pounds per square foot and three thousand (3000 PSF) pounds per square foot respectively within compacted structural fill or the CL soils of Stratum I. This net allowable end bearing pressure will be based on a factor of safety in excess of 3.0. Total and differential settlement is anticipated to be less than 0.5 inches. It is anticipated that the footing will be founded within compacted select fill.

Slab-on-grade type construction is considered appropriate for the floor slab. We recommend that the slab be supported on four (4") inches of clean crushed stone or gravel (ASTM C-33 #57 or equivalent) on prepared subgrade. A Class A impervious moisture barrier with a minimum thickness of 10 millimeters, specified according to ASTM E-1745, should be provided between the slab and the granular fill due to the potential for perched water to develop during the wetter seasons.

Subgrade soils under the slab and within footings should be evaluated by the geotechnical engineers from MTA Engineers to verify proper bearing.

SEISMIC CONSIDERATIONS:

Based on IBC Table 1615.1.1, a site soil class D may be used for design purpose. Liquefaction potential of the silty sandy clay soils is negligible.

PAVEMENT DESIGN:

Paved parking lots will be constructed as part of the project. Design traffic volumes and loadings have not been determined at this time. However, we anticipate that the parking will be subject to light vehicles and weekly service trucks. Areas of heavy-duty loading will exist where heavier equipment is driven and stored will exist over portions of the site. We also anticipate that pavement construction will involve only minor cut and fill. The following design criteria were used to develop the recommended pavement sections in conjunction with the AASHTO Design Guide 1996:

Table 3. Pavement Design Assumption Values

PAVEMENT DESIGN ASSUMPTION VALUES	
CBR	5
R-VALUE	15
SOIL SUPPORT VALUE (S)	5

Based on information obtained during this study, subgrade soils in the paved areas should generally consist of Structural Fill or recompacted soils of Stratum I. Structural fill, where required, should be placed as recommended in the site grading section of the report. It is recommended that positive site drainage should be provided during construction and be incorporated during the final design.

Table 4. Pavement Design Recommendations

PAVEMENT DESIGN RECOMMENDATIONS	
Standard Duty Asphalt Paving	3" Asphalt Surface Course
	6" Class 7 Crushed Stone Base Course
	12" Compacted Subgrade (Min. CBR 5)
Standard Duty Concrete Paving	5" PC Concrete Pavement (min. 3,500 psi)
	6" Class 7 Crushed Stone Base Course
	12" Compacted Subgrade (Min. CBR 5)
Heavy Duty Asphalt Paving	2" Asphalt Surface Course
	2" Asphalt Base/Binder Course
	8" Class 7 Crushed Stone Base Course
	12" Compacted Subgrade (Min. CBR 5)
Heavy Duty Concrete Paving	6" Concrete Pavement (min. 3,500 psi)
	8" Class 7 Crushed Stone Base Course
	12" Compacted Subgrade (Min. CBR 5)
Dumpster Pad	6" Concrete Pavement (min. 3,500 psi)
	8" Class 7 Crushed Stone Base Course
	A min. of # 3 Lateral & Transverse Rebar Mat 12" O-C
	12" Compacted Subgrade (Min. CBR 5)

It should be recognized that some periodic maintenance of pavement will be required. As a minimum, this should include periodic sealing of all joints and cracks to prevent surface water infiltration.

CONSTRUCTION PROCEDURES:

The potential exists for increased groundwater to develop during wetter seasons. Therefore, foundation excavation and any other site grading should be performed during drier periods to reduce the possibility of changes in conditions.

Subsurface conditions significantly at variance with those encountered within the borings should be brought to the attention of the engineer, and work delayed pending evaluation and/or preparation of additional recommendations, if warranted.

MTA Engineers: a Division of Materials Testing of Arkansas, Inc.

* * * * *

The following illustrations are attached and complete this report:

- Appendix A Plan of Borings
- Appendix B Boring Logs
- Appendix C Key to Terms and Symbols
- Appendix D Laboratory Test Results
- Appendix E Seismic Information

* * * * *

The opportunity to be of service on this project is highly appreciated. If there are any questions regarding information provided in this report, or if additional assistance during final design or construction is required, please contact us.

Sincerely,

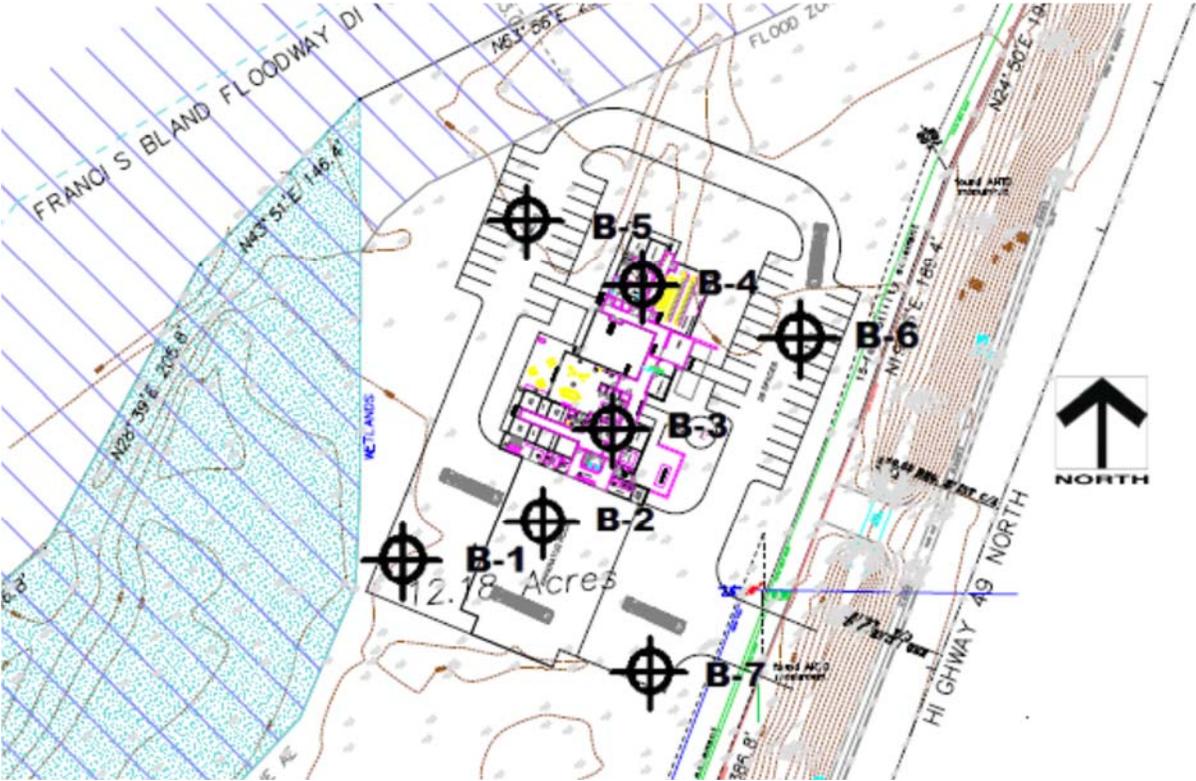
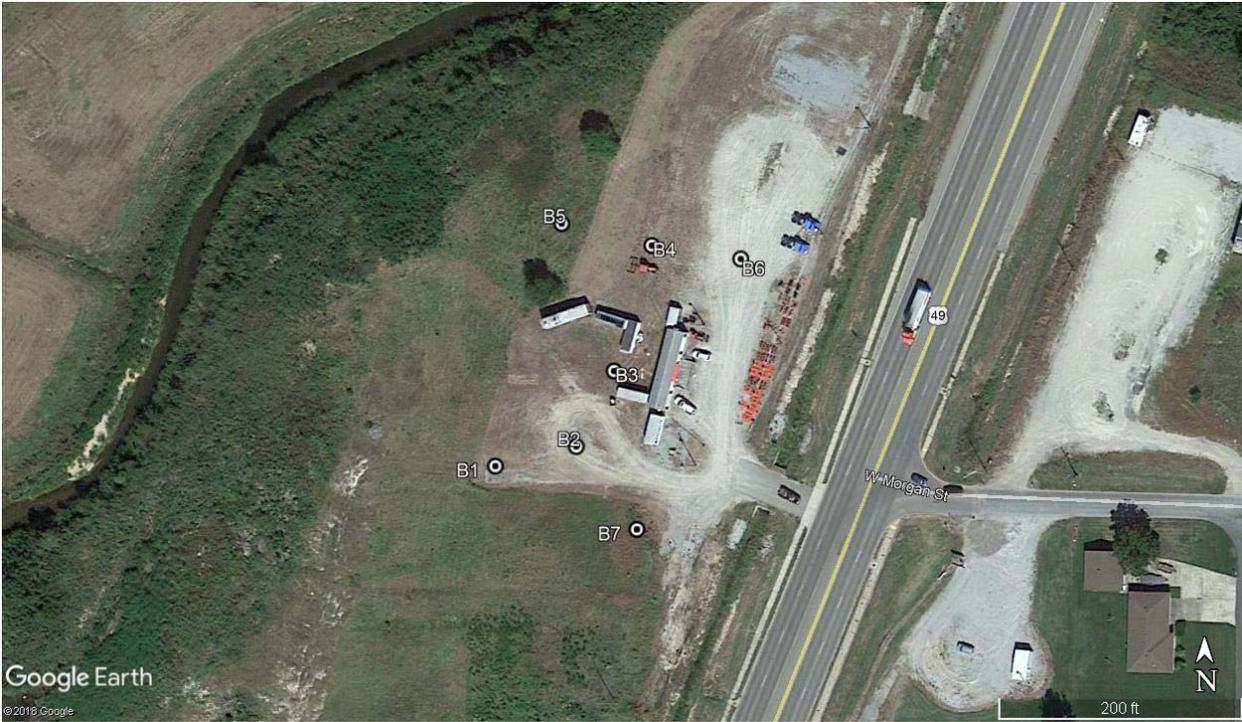
MTA Engineers


Kelton Price, P.E.



Appendix A

MTA Engineers: a Division of Materials Testing of Arkansas, Inc.



APPROXIMATE BORING LOCATIONS

Appendix B



JOB NO. _____
 JOB NAME: PARAGOULD FIRE STATION
 COORDINATES: NORTH: _____ EAST: _____
 STATION: _____
 LOCATION: PARAGOULD, AR

DATE: 02/13/2019
 TYPE OF DRILLING: DRY AUGER
 EQUIPMENT: GEOPROBE 7822DT
 LOGGED BY: K GOWING
 DRILLED BY: L JOHNSON

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTICITY INDEX	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			SURFACE ELEVATION:								
			VERY SOFT, GRAY WITH BROWN, SILTY CLAY, ORGANICS IN FIRST 3", MOIST							2 1-1	2
5			FIRM, LIGHT GRAY WITH ORANGE, SILTY CLAY WITH TRACE SAND	CL	17	24.2	41	24	90.0	3 4-6	10
										4 4-5	9
			STIFF, GRAY, SANDY CLAY, VERY FINE TO FINE SAND		17	20.7	27	10	70.0	6 11-9	20
10						19.0			63.3	5 7-8	15
			Boring Terminated								
15											
20											
25											
30											

COMPLETION DEPTH: 10 WATER DEPTH> INITIAL: AFTER 24 HOURS:

REMARKS:



JOB NO. _____
 JOB NAME: PARAGOULD FIRE STATION
 COORDINATES: NORTH: _____ EAST: _____
 STATION: _____
 LOCATION: PARAGOULD, AR

DATE: 02/13/2019
 TYPE OF DRILLING: DRY AUGER
 EQUIPMENT: GEOPROBE 7822DT
 LOGGED BY: K GOWING
 DRILLED BY: L JOHNSON

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTICITY INDEX	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			SURFACE ELEVATION:								
			VERY SOFT, GRAY WITH BROWN, SILTY CLAY, ORGANICS IN FIRST 3", MOIST							3 2-1	3
			FIRM, LIGHT GRAY WITH ORANGE, SILTY CLAY WITH TRACE SAND							3 3-6	9
5										4 4-5	9
				CL						6 7-8	15
10			FIRM TO STIFF, LIGHT GRAY, SANDY CLAY, FINE SAND, MOIST @ 9'							4 4-6	10
						19.7			63.4	8 8-9	17
15			MEDIUM DENSE, GRAY, CLAYEY SAND, FINE TO MEDIUM SAND, WET @ 18'	SC							
						16.5			20.9	6 6-8	14
20											
			Boring Terminated								
25											
30											

COMPLETION DEPTH: 20 WATER DEPTH> INITIAL: AFTER 24 HOURS:

REMARKS:



BORING NO. B-3

PAGE 1 OF 1

JOB NO. _____
 JOB NAME: PARAGOULD FIRE STATION
 COORDINATES: NORTH: _____ EAST: _____
 STATION: _____
 LOCATION: PARAGOULD, AR

DATE: 02/13/2019
 TYPE OF DRILLING: DRY AUGER
 EQUIPMENT: GEOPROBE 7822DT
 LOGGED BY: K GOWING
 DRILLED BY: L JOHNSON

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTICITY INDEX	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			SURFACE ELEVATION:								
			FIRM, GRAY WITH BROWN, SILTY CLAYM ORGANICS IN FIRST 3", MOIST							3 4-4	8
										3 3-5	8
5			FIRM, LIGHT GRAY WITH ORANGE, SILTY CLAY	CL						4 4-6	10
										5 4-5	9
10			FIRM, GRAY, SILTY CLAY WITH SAND, MOIST @ 8'							4 4-4	8
15			MEDIUM DENSE, LIGHT GRAY, CLAYEY SAND, VERY FINE TO FINE SAND	SC		23.2			73.5	6 5-7	12
20			MEDIUM DENSE, GRAY, SAND WITH CLAY			16.1			26.5	9 8-9	17
			Boring Terminated								
25											
30											

COMPLETION DEPTH: 20 WATER DEPTH> INITIAL: _____ AFTER 24 HOURS: _____

REMARKS:



JOB NO. _____
 JOB NAME: PARAGOULD FIRE STATION
 COORDINATES: NORTH: _____ EAST: _____
 STATION: _____
 LOCATION: PARAGOULD, AR

DATE: 02/13/2019
 TYPE OF DRILLING: DRY AUGER
 EQUIPMENT: GEOPROBE 7822DT
 LOGGED BY: K GOWING
 DRILLED BY: L JOHNSON

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTICITY INDEX	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			SURFACE ELEVATION:								
			SOFT, GRAY WITH BROWN, SILTY CLAY, ORGANICS IN FIRST 3", MOIST							3 2-3	5
			FIRM, GRAY WITH ORANGE, SILTY CLAY WITH SOME SAND		19	21.3	35	16	85.4	4 4-5	9
5				CL						3 3-6	9
			FIRM TO STIFF, LIGHT GRAY, SANDY CLAY, VERY FINE SAND							5 6-9	15
10										5 6-6	12
			LIGHT GRAY, CLAYEY SAND, FINE SAND, MOIST							9 6-7	13
15				SC							
			MEDIUM DENSE, LIGHT GRAY TO PALE ORANGEISH TAN, SAND WITH CLAY, WET							4 6-8	14
20											
			Boring Terminated								
25											
30											

COMPLETION DEPTH: 20 WATER DEPTH> INITIAL: AFTER 24 HOURS:

REMARKS:



JOB NO. _____
 JOB NAME: PARAGOULD FIRE STATION
 COORDINATES: NORTH: _____ EAST: _____
 STATION: _____
 LOCATION: PARAGOULD, AR

DATE: 02/13/2019
 TYPE OF DRILLING: DRY AUGER
 EQUIPMENT: GEOPROBE 7822DT
 LOGGED BY: K GOWING
 DRILLED BY: L JOHNSON

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTICITY INDEX	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			SURFACE ELEVATION:								
			SOFT, GRAY WITH BROWN, SILTY CLAY, MOIST							1 2-2	4
			FIRM TO STIFF, GRAY WITH ORANGE, SILTY CLAY	CL						4	8
5		4								10	
		4								17	
10			VERY STIFF, GRAY, SANDY CLAY, VERY FINE TO FINE SAND, MOIST	CL	19	21.5	28	9	85.6	8 9-13	22
			Boring Terminated								
15											
20											
25											
30											

COMPLETION DEPTH: 10 WATER DEPTH> INITIAL: AFTER 24 HOURS:

REMARKS:



BORING NO. B-6

PAGE 1 OF 1

JOB NO. _____
 JOB NAME: PARAGOULD FIRE STATION
 COORDINATES: NORTH: _____ EAST: _____
 STATION: _____
 LOCATION: PARAGOULD, AR

DATE: 02/13/2019
 TYPE OF DRILLING: DRY AUGER
 EQUIPMENT: GEOPROBE 7822DT
 LOGGED BY: K GOWING
 DRILLED BY: L JOHNSON

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTICITY INDEX	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			SURFACE ELEVATION:								
		▲	FIRM, GRAY WITH BROWN, SILTY CLAY, MOIST	CL						1 3-3	6
		▲	FIRM TO STIFF, LIGHT GRAY WITH ORANGE, SILTY CLAY	CL	19	23.4	34	15	95.5	4 4-7	11
5		▲								4 5-6	11
		▲	FIRM, GRAY, SANDY CLAY, VERY FINE TO FINE SAND	CL						10 8-15	23
10		▲							4 4-6	10	
			Boring Terminated								
15											
20											
25											
30											

COMPLETION DEPTH: 10 WATER DEPTH> INITIAL: AFTER 24 HOURS:

REMARKS:



Boring Log Report

BORING NO. B-7
 PAGE 1 OF 1

JOB NO. _____
 JOB NAME: PARAGOULD FIRE STATION
 COORDINATES: NORTH: _____ EAST: _____
 STATION: _____
 LOCATION: PARAGOULD, AR

DATE: 02/13/2019
 TYPE OF DRILLING: DRY AUGER
 EQUIPMENT: GEOPROBE 7822DT
 LOGGED BY: K GOWING
 DRILLED BY: L JOHNSON

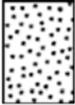
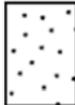
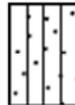
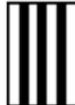
DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTICITY INDEX	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			SURFACE ELEVATION:								
			VERY SOFT, GRAY WITH BROWN, SILTY CLAY, WET @ SURFACE							WOH WOH-1	1
			FIRM, LIGHT GRAY WITH ORANGE, SILTY CLAY	CL						3	9
5										4	11
			STIFF, GRAY WITH ORANGE, SANDY CLAY, FINE SAND			20.5			82.8	4	13
										5	13
10										5	13
			Boring Terminated							6-7	
15											
20											
25											
30											

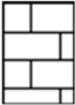
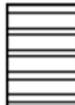
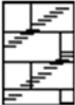
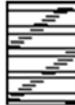
COMPLETION DEPTH: 10 WATER DEPTH> INITIAL: AFTER 24 HOURS:

REMARKS:

Appendix C

TERMS AND SYMBOLS USED ON BORING LOGS

SOIL TYPES			
	CLAY (CH)		SILTY CLAY (CL)
	CLAY (CL)		SANDY CLAY (CL)
	WELL-GRADED SAND (SW)		POORLY-GRADED SAND (SP)
	SILTY SAND (SM)		CLAYEY SAND (SC)
	WELL-GRADED GRAVEL (GW)		POORLY-GRADED GRAVEL (GP)
	SILTY GRAVEL (GM)		SANDY SILT (ML)
	CLAYEY GRAVEL (GC)		SILT (ML)
	SILT (MH)		FILL MATERIAL

ROCK TYPES			
	LIMESTONE		SHALE
	SANDSTONE		WEATHERED LIMESTONE
	WEATHERED SHALE		WEATHERED SANDSTONE

SAMPLER TYPE			
	SHELBY TUBE SAMPLE		SPLIT SPOON SAMPLE
	AUGER SAMPLE		NO RECOVERY

MTA Engineers: a Division of Materials Testing of Arkansas, Inc.

SOIL GRAIN SIZE

U.S. STANDARD SIEVE								
12"	3"	3/4"	4	10	40	200		
BOULDERS	COBBLES	GRAVEL		SAND			SILT	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		
304	76.2	19.1	4.75	2	0.42	0.074	0.002	
SOIL GRAIN SIZE IN MILLIMETERS								

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on No 200 sieve): Includes (1) clean gravels and sands, and (2) silty clayey gravels and sands condition is rated according to relative density, as determined by laboratory tests.

DESCRIPTIVE TERMS	N VALUE	RELATIVE DENSITY
VERY LOOSE	0-4	0 – 15 %
LOOSE	4-10	15 – 35 %
MEDIUM DENSE	10-30	35 – 65 %
DENSE	30-50	65 – 85 %
VERY DENSE	50 and above	85 – 100 %

FINE GRAINED SOILS (major portion passing No 200 sieve): include (1) inorganic and organic silt and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer reading or by unconfined compression tests.

DESCRIPTIVE TERMS	UNCONFINED COMPRESSIVE STRENGTH TON / SQ. FT.
VERY SOFT	less than 0.25
SOFT	0.25 - 0.50
FIRM	0.50 - 1.00
STIFF	1.00 - 2.00
VERY STIFF	2.00- 4.00
HARD	4.00 and higher

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above because of planes of weakness or cracks in the soil. The consistency rating of such soils are based on penetrometer readings

TERMS CHARACTERIZING MOISTURE CONTENT

DRY: No water evident in sample; fines less than plastic limit.
 MOIST: Sample feels damp; fines near the plastic limit.
 VERY MOIST: Water visible on sample; fines greater than plastic limit and less than liquid limit.
 WET: Sample bears free water; fines greater than liquid limit.

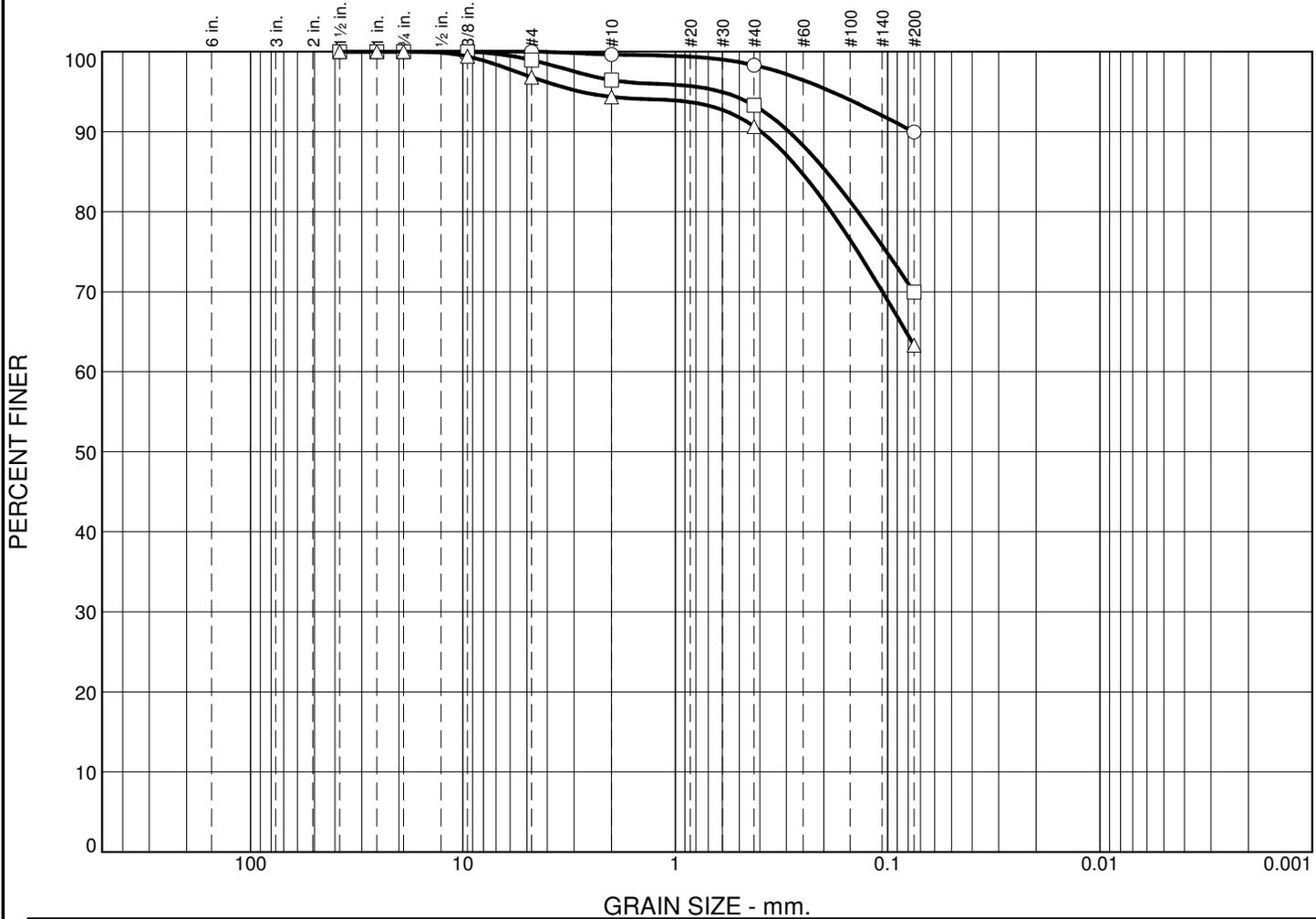
TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED: Having inclined planes of weakness that are slick and glassy in appearance.
 FISSURED: Containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
 LAMINATED: Composed of thin layer of varying color and texture.
 INTERBEDDED: Composed of alternate layers of different soil types
 CALCAREOUS: Containing appreciable quantities of calcium carbonate.
 WELL GRADED: Having wide range in grain sizes and substantial amounts of all intermediate particle size.
 POORLY GRADED: Predominantly of one grain size, or having a range of sizes with some intermediate size missing

Terms used in this report for describing soils according to their texture or grain size distribution are in accordance with UNIFIED SOIL CLASSIFICATION SYSTEM as described in technical Memorandum No 3-357, Waterways Experiment Station, March 1953

Appendix D

Particle Size Distribution Report



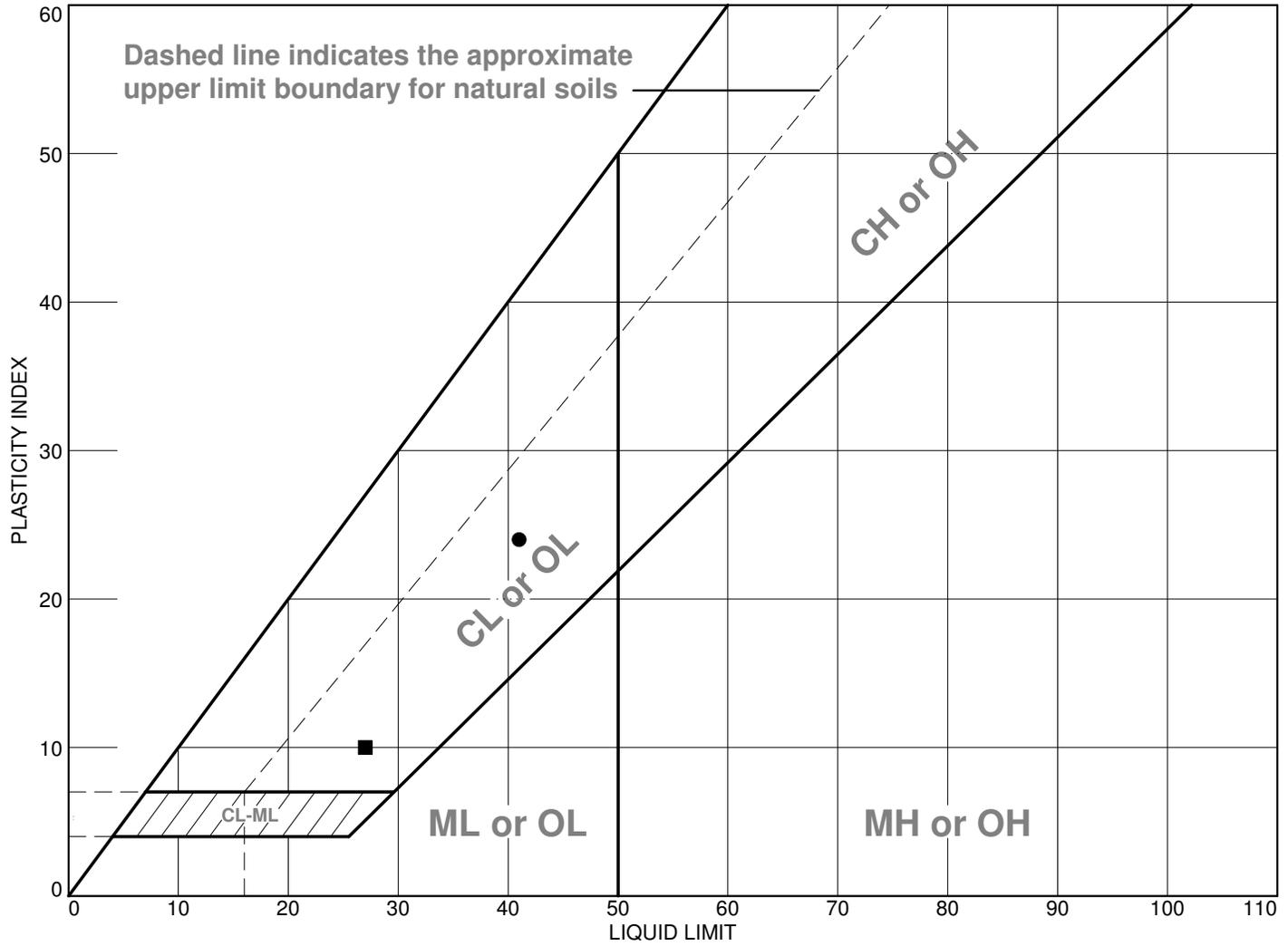
	% +3"		% Gravel		% Sand			% Fines		
			Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	
○	0.0		0.0	0.0	0.4	1.3	8.3	90.0		
□	0.0		0.0	1.0	2.6	3.1	23.3	70.0		
△	0.0		0.0	3.2	2.5	3.7	27.3	63.3		
×	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
○	41	17								
□	27	17	0.1942							
△			0.2561							

Material Description							USCS	AASHTO
○							CL	A-7-6(22)
□							CL	A-4(5)
△								

Project No.	Client:	Remarks:
Project: PARAGOULD FIRE STATION		
○ Source of Sample: B-1	Depth: 2	
□ Source of Sample: B-1	Depth: 6	
△ Source of Sample: B-1	Depth: 8	
Materials Testing of Arkansas		
Little Rock, AR		

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		41	17	24	98.3	90.0	CL
■		27	17	10	93.3	70.0	CL

Project No. _____ **Client:** _____

Project: PARAGOULD FIRE STATION

● **Source of Sample:** B-1 **Depth:** 2

■ **Source of Sample:** B-1 **Depth:** 6

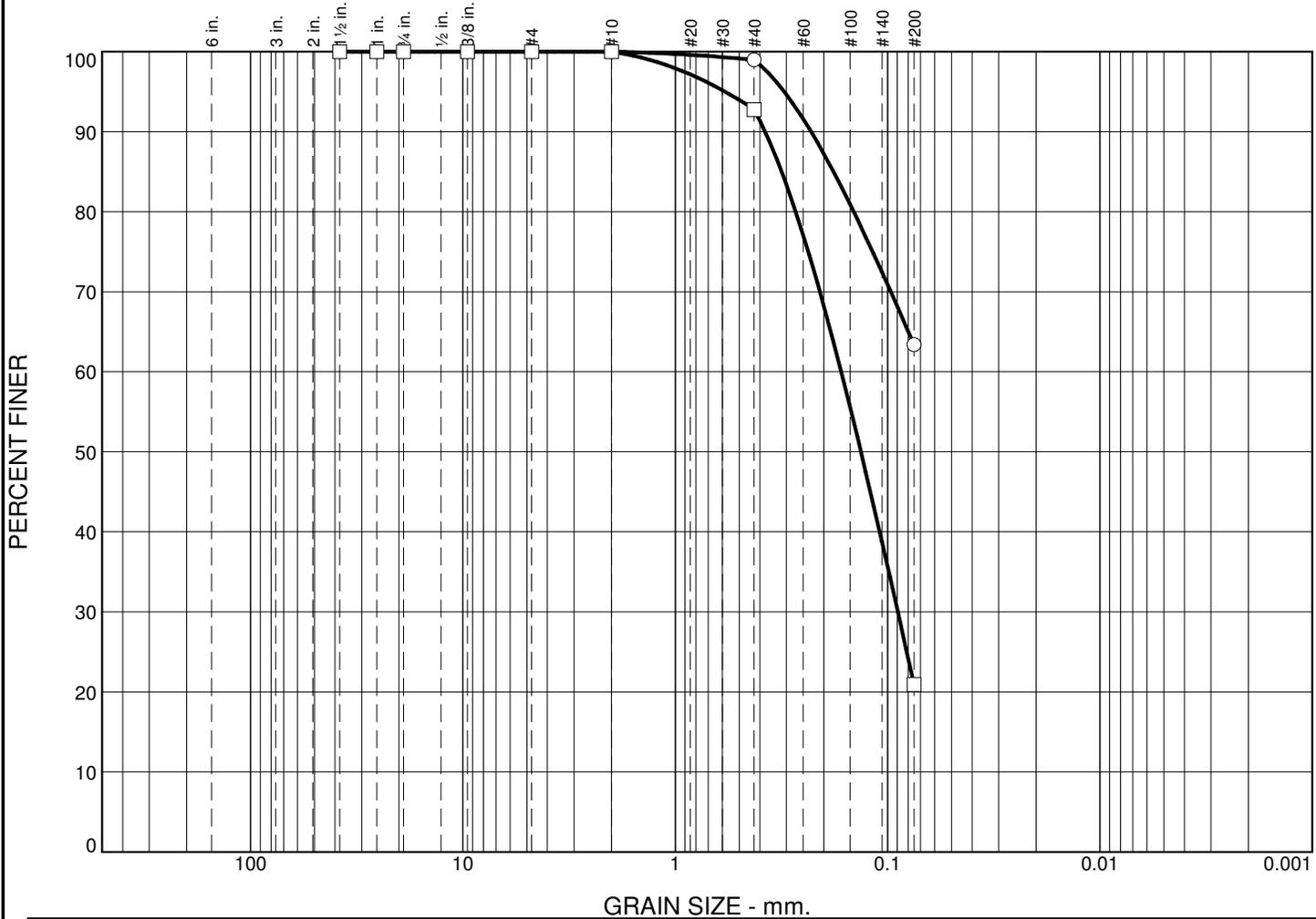
Materials Testing of Arkansas

Little Rock, AR

Remarks:

Figure

Particle Size Distribution Report



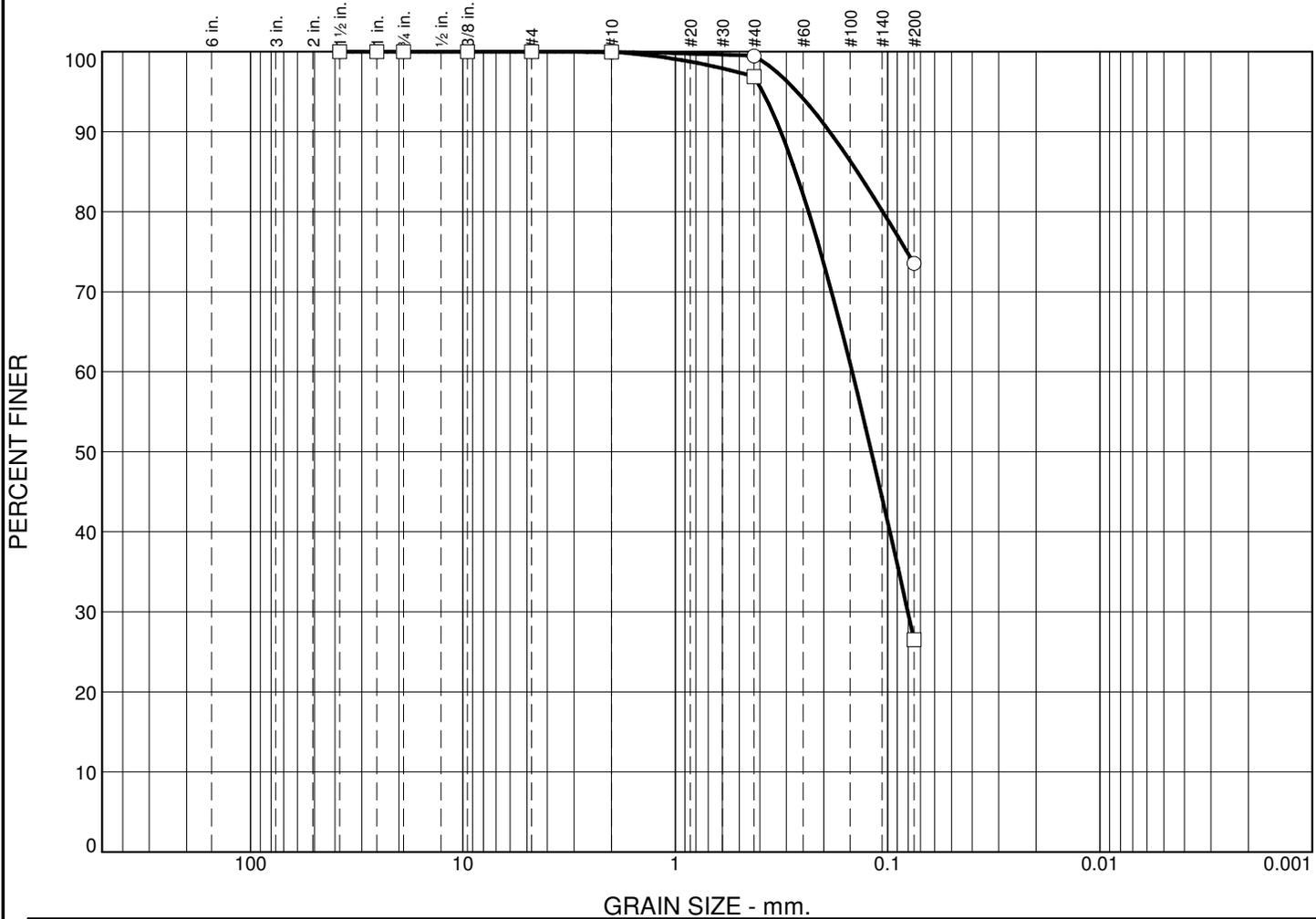
GRAIN SIZE - mm.

	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	0.0	0.0	1.0	35.6	63.4			
□	0.0	0.0	0.0	0.0	7.2	71.9	20.9			
×	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
○			0.1798							
□			0.3158	0.1654	0.1336	0.0895				

Material Description	USCS	AASHTO
○		
□		

Project No.	Client:	Remarks:
Project: PARAGOULD FIRE STATION		
○ Source of Sample: B-2 Depth: 13.5	□ Source of Sample: B-2 Depth: 18.5	
Materials Testing of Arkansas		
Little Rock, AR		

Particle Size Distribution Report



GRAIN SIZE - mm.

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.5	26.0	73.5	
□	0.0	0.0	0.0	0.0	3.1	70.4	26.5	

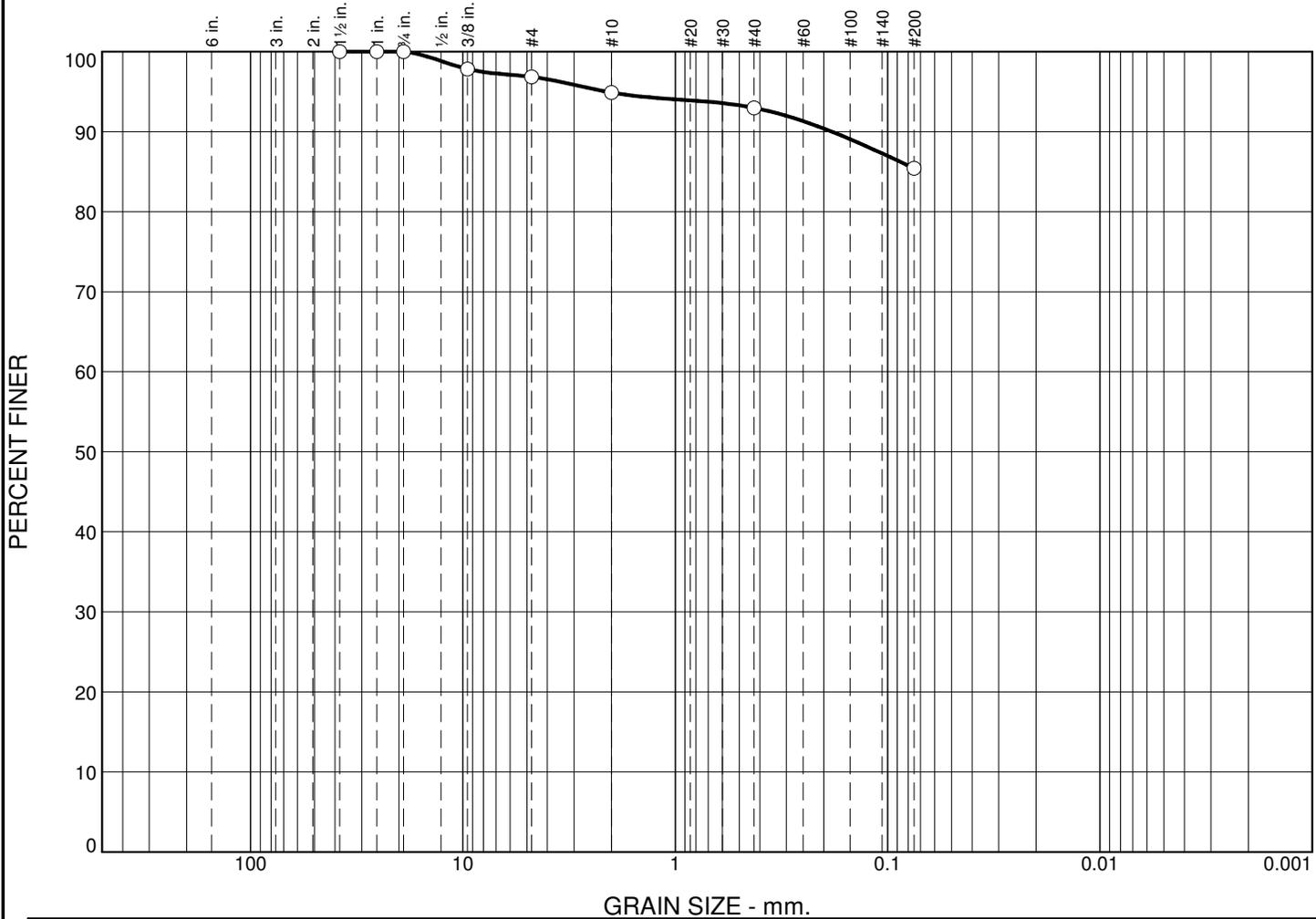
	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
○			0.1390							
□			0.2716	0.1469	0.1192	0.0802				

Material Description							USCS	AASHTO	
○									
□									

Project No. Project: PARAGOULD FIRE STATION	Client: Source of Sample: B-3 Depth: 13.5 Source of Sample: B-3 Depth: 18.5	Remarks:
Materials Testing of Arkansas Little Rock, AR		

Figure

Particle Size Distribution Report



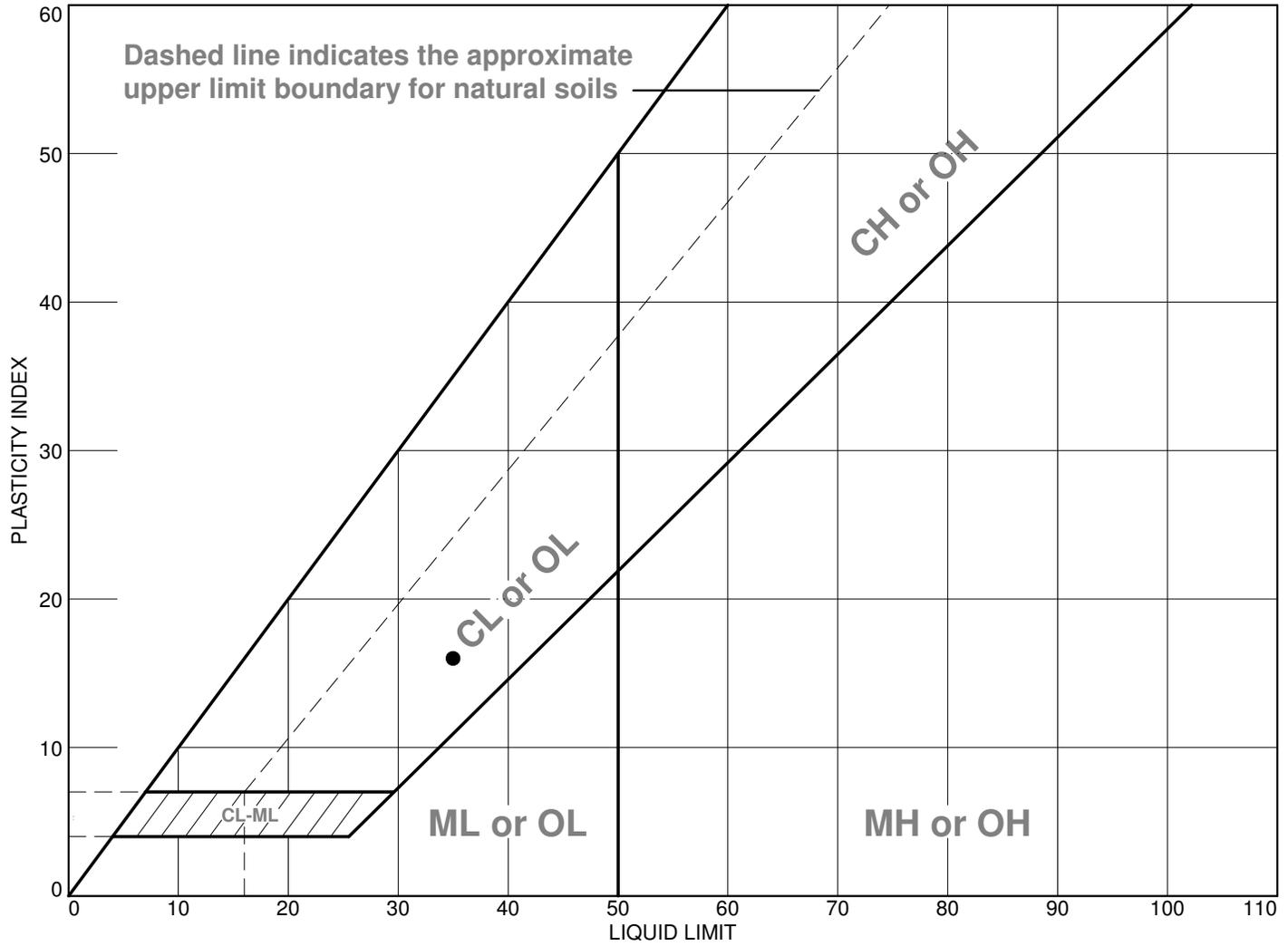
GRAIN SIZE - mm.

%	+3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	3.2	1.9	1.9	7.6	85.4			
⊗	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
○	35	19								

Material Description	USCS	AASHTO
○	CL	A-6(13)

<p>Project No. _____ Client: _____</p> <p>Project: PARAGOULD FIRE STATION</p> <p>○ Source of Sample: B-4 Depth: 4</p>	<p>Remarks:</p>
<p>Materials Testing of Arkansas</p> <p>Little Rock, AR</p>	

LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	35	19	16	93.0	85.4	CL

Project No. _____ **Client:** _____

Project: PARAGOULD FIRE STATION

● **Source of Sample:** B-4 **Depth:** 4

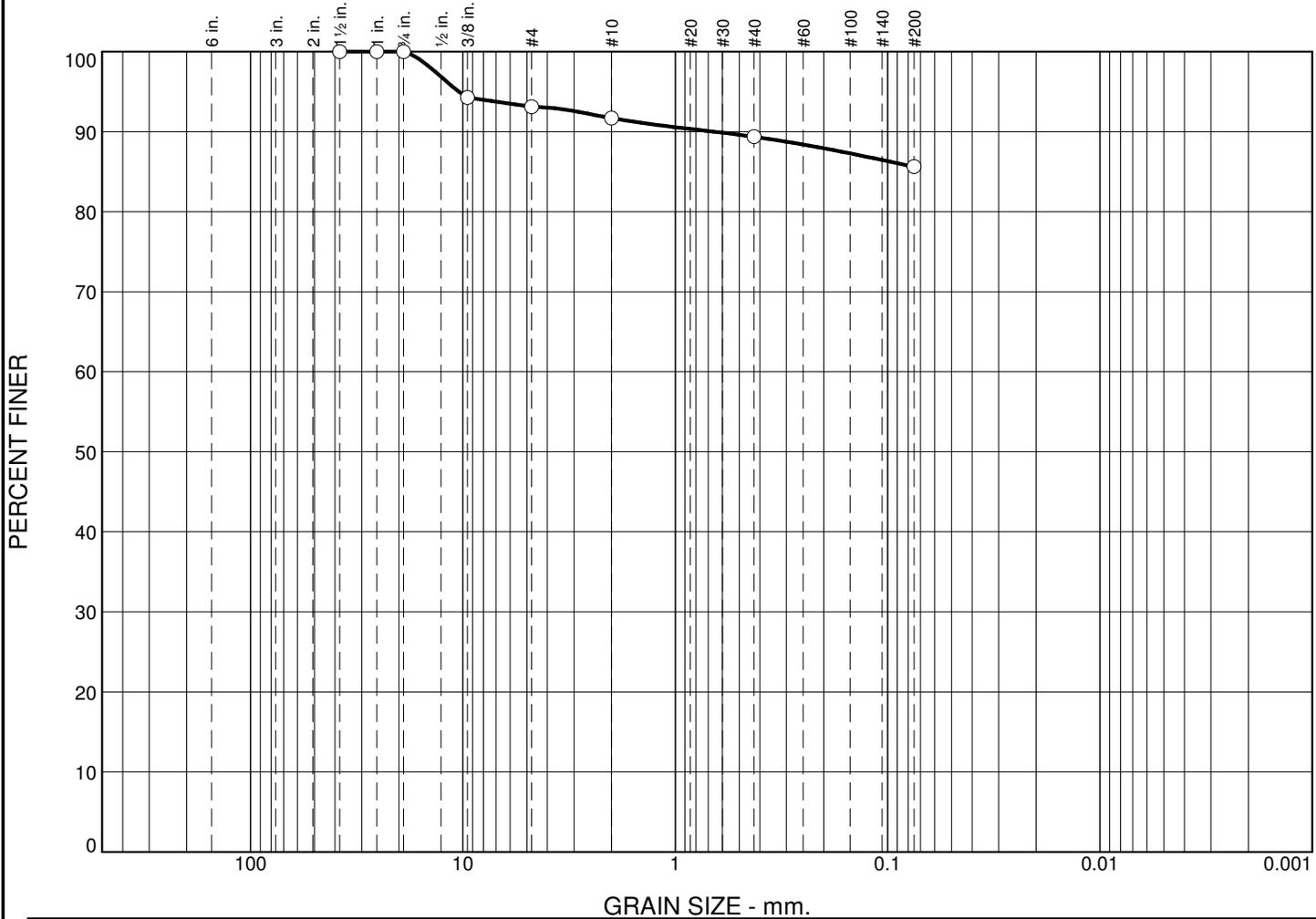
Materials Testing of Arkansas

Little Rock, AR

Remarks:

Figure

Particle Size Distribution Report



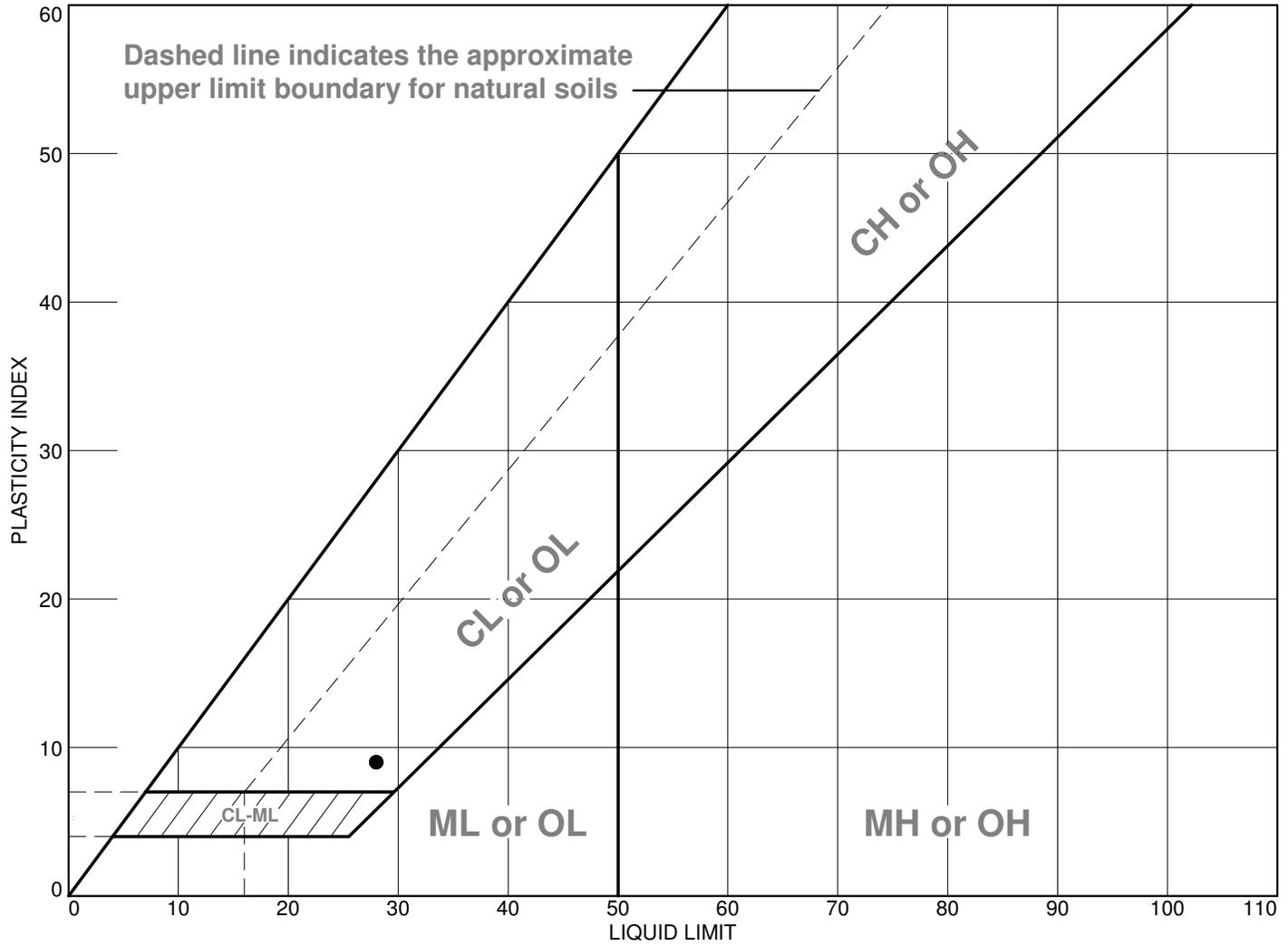
GRAIN SIZE - mm.

%	+3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	6.9	1.4	2.3	3.8	85.6			
⊗	LL	PL	D85	D60	D50	D30	D15	D10	C _c	C _u
○	28	19								

Material Description	USCS	AASHTO
○	CL	A-4(6)

<p>Project No. _____ Client: _____</p> <p>Project: PARAGOULD FIRE STATION</p> <p>○ Source of Sample: B-5 Depth: 8</p>	<p>Remarks:</p>
<p>Materials Testing of Arkansas</p> <p>Little Rock, AR</p>	

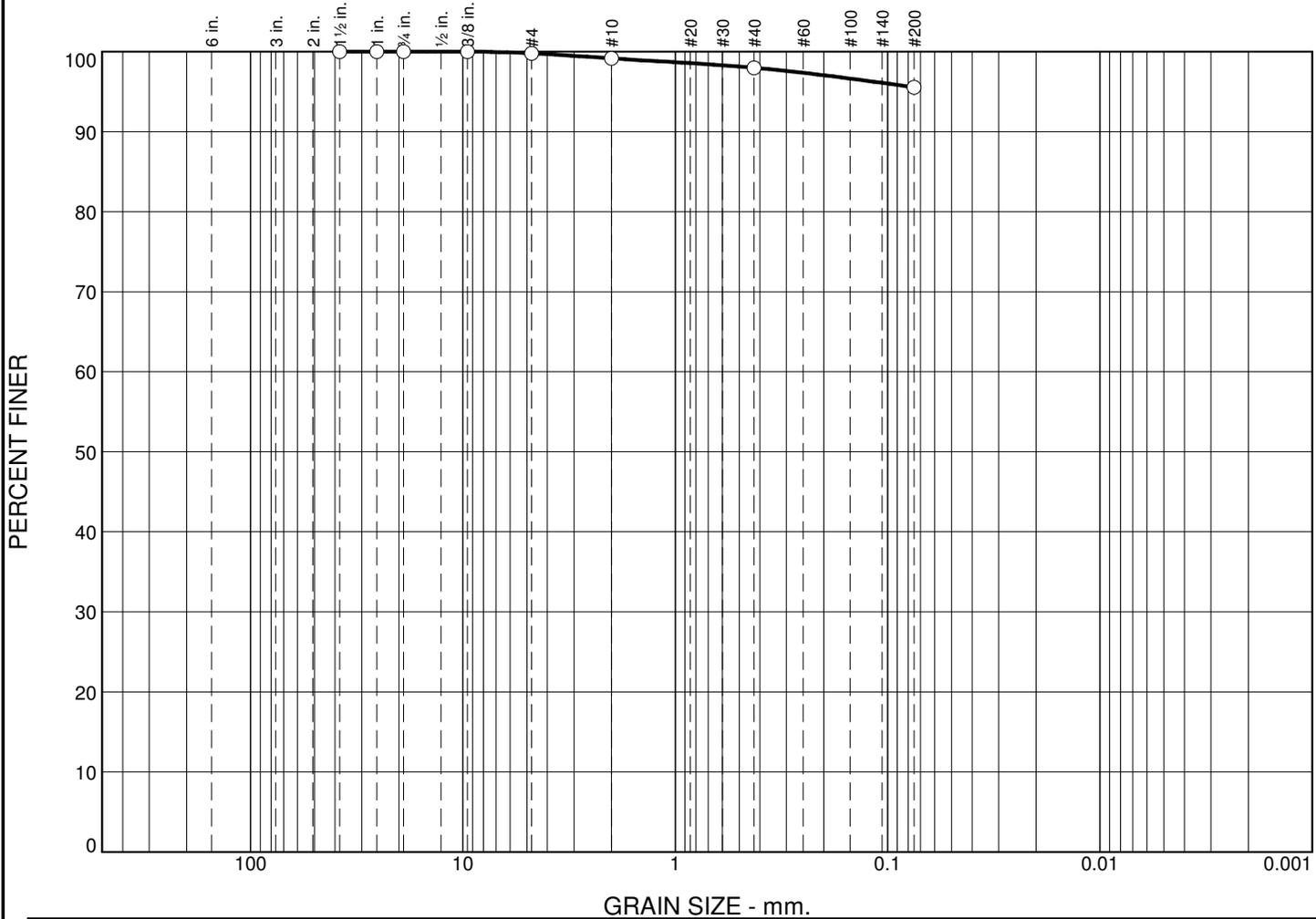
LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	28	19	9	89.4	85.6	CL

<p>Project No. _____ Client: _____</p> <p>Project: PARAGOULD FIRE STATION</p> <p>● Source of Sample: B-5 Depth: 8</p>	<p>Remarks:</p>
<p>Materials Testing of Arkansas</p> <p>Little Rock, AR</p>	

Particle Size Distribution Report



GRAIN SIZE - mm.

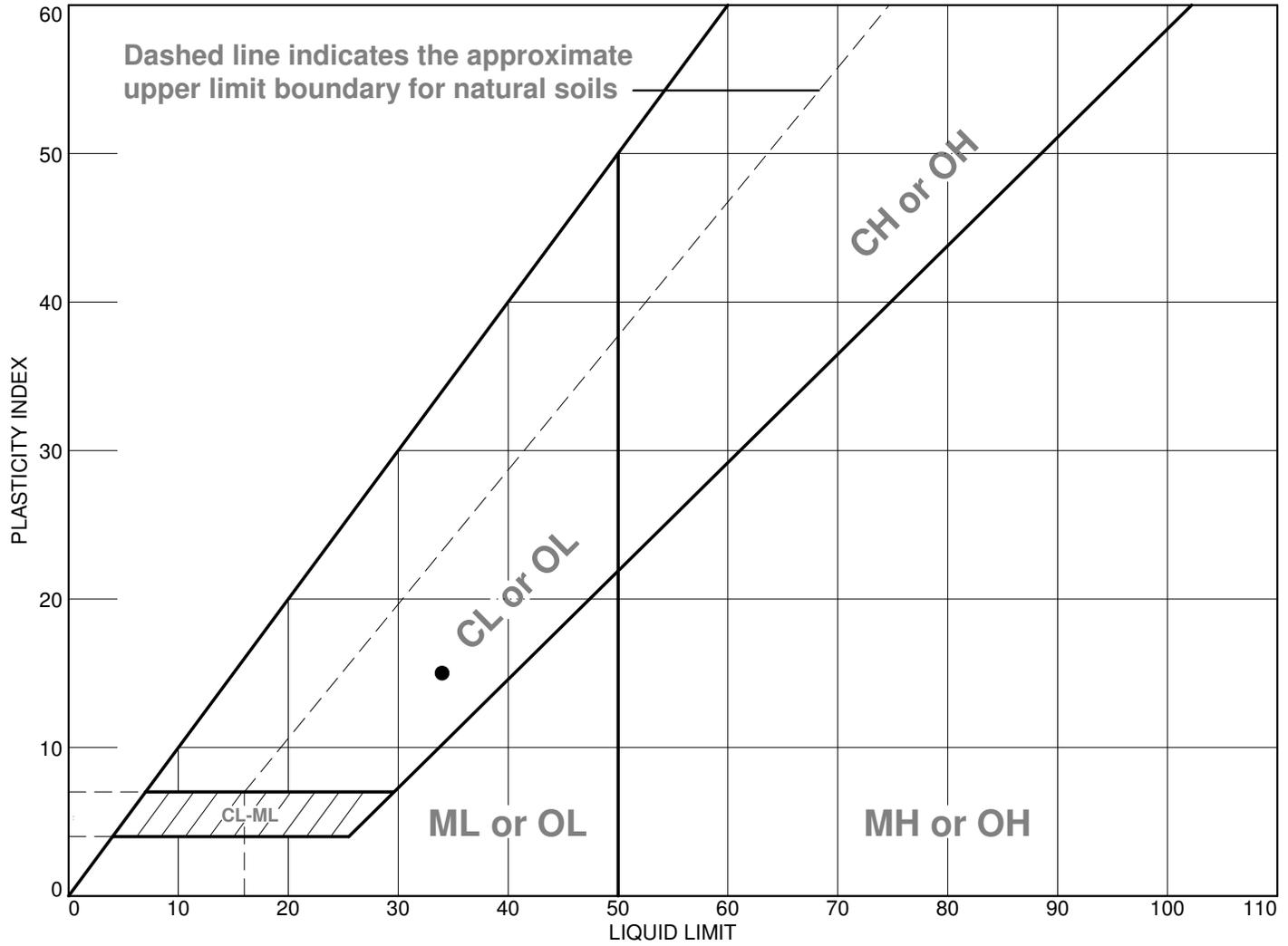
%	+3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	0.2	0.6	1.2	2.5	95.5			
X	LL	PL	D85	D60	D50	D30	D15	D10	C _c	C _u
○	34	19								

Material Description	USCS	AASHTO
○	CL	A-6(14)

Project No. _____ Client: _____ Project: PARAGOULD FIRE STATION ○ Source of Sample: B-6 Depth: 4	Remarks:
Materials Testing of Arkansas Little Rock, AR	

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	34	19	15	98.0	95.5	CL

Project No. _____ **Client:** _____

Project: PARAGOULD FIRE STATION

● **Source of Sample:** B-6 **Depth:** 4

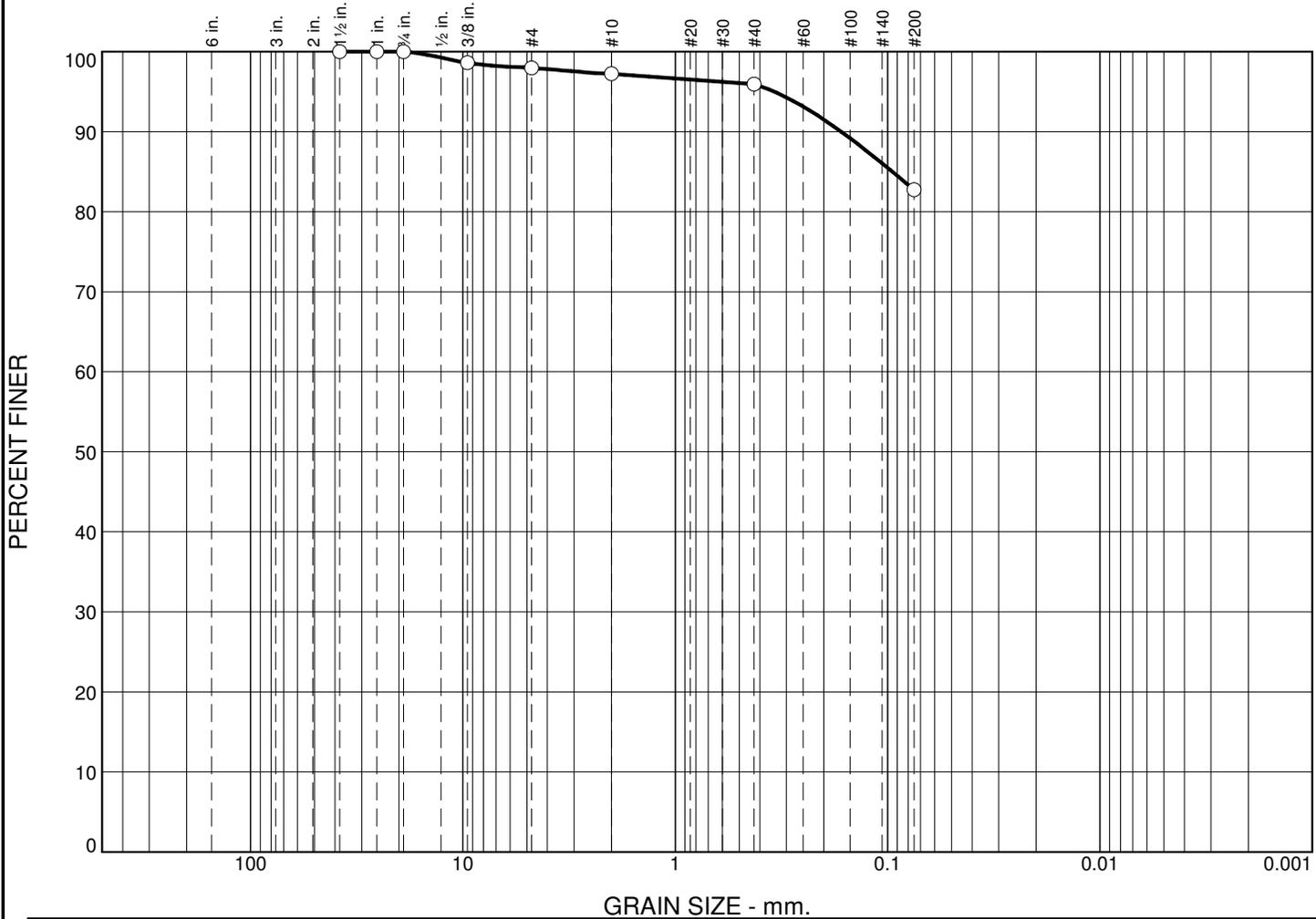
Materials Testing of Arkansas

Little Rock, AR

Remarks:

Figure

Particle Size Distribution Report



GRAIN SIZE - mm.

%	+3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	2.0	0.8	1.3	13.1	82.8			
⊗	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○			0.0950							

Material Description	USCS	AASHTO
○		

Project No.	Client:	Remarks:
Project: PARAGOULD FIRE STATION		
○ Source of Sample: B-7	Depth: 8	
Materials Testing of Arkansas		
Little Rock, AR		

Appendix E



Proposed Fire Station

Latitude, Longitude: 36.06342603, -90.50326516

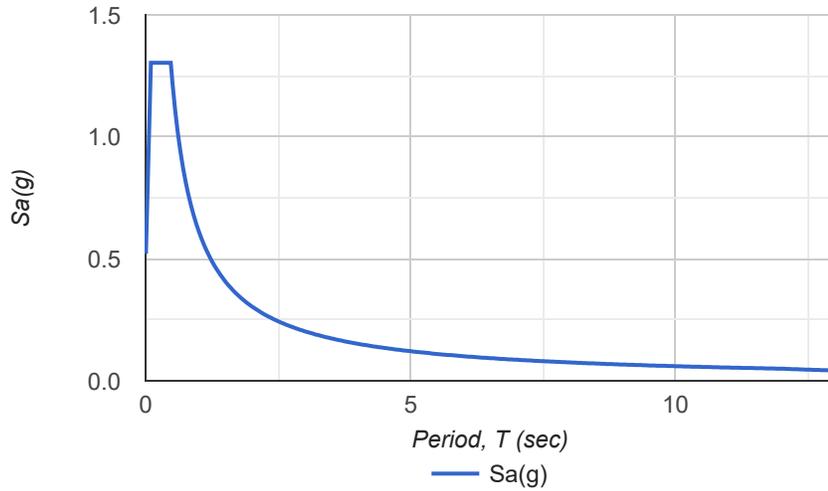


Date	3/6/2019, 8:46:24 AM
Design Code Reference Document	IBC-2015
Risk Category	IV
Site Class	C - Very Dense Soil and Soft Rock

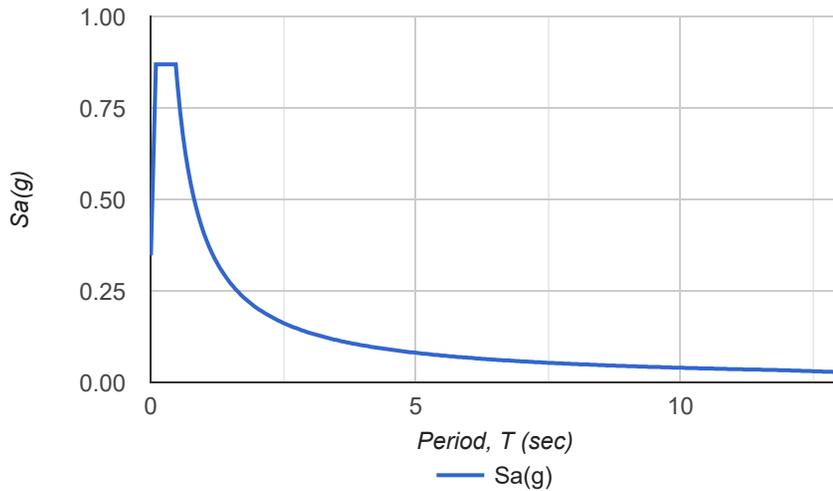
Type	Value	Description
S_S	1.305	MCE_R ground motion. (for 0.2 second period)
S_1	0.456	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.305	Site-modified spectral acceleration value
S_{M1}	0.613	Site-modified spectral acceleration value
S_{DS}	0.87	Numeric seismic design value at 0.2 second SA
S_{D1}	0.408	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.344	Site amplification factor at 1.0 second
PGA	0.68	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.68	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
$SsRT$	1.305	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	1.64	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.456	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	0.568	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	0.6	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.68	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.796	Mapped value of the risk coefficient at short periods
C_{R1}	0.803	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum



Design Response Spectrum



DISCLAIMER

While the information presented on this website is believed to be correct, SEAO / OSHPD and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in this web application should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. SEAO / OSHPD do not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the seismic data provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the search results of this website.

SECTION 02110 - SITE PREPARATION

PART 1 GENERAL

1.1 PROVISIONS

- A. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

- A. Work covered by this section includes furnishing of and paying for all materials, labor, services, equipment, licenses, taxes, other items, and appliances necessary for the execution, installation and completion of all work specified herein and/or shown on the drawings.
- B. The Work described in this section of the specifications includes, but is not limited to, the following:
1. Site clearing in preparation for grading and excavation.
 2. All debris and surplus soil undercut shall be disposed of off site in strict accordance with governing regulatory agencies. Any dumping in public waters such as lakes, streams, floodways is strictly prohibited. The contractor may be required to present a consent letter from the property owner for permitted dumping.
 3. Compliance with applicable air pollution control regulations.
 4. Procuring permits for transportation of debris and surplus soil to disposal site, and dust permits.

1.3 SUBMITTALS

- A. Permit, Notices, Etc.: Submit for the record copies of permits and notices, and certificates of severance of utility services. No copies will be returned.

1.4 ENVIRONMENTAL CONDITIONS

- A. Protect plant growth and features remaining as final landscaping, and bench marks and existing construction from damage or displacement.
- B. Maintain designated site access for vehicle and pedestrian traffic.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove following except those designated to remain:
 - 1. Existing surface vegetation and other organic materials.
 - 2. Underground facilities including septic tanks and cesspools.
 - 3. Abandoned utility lines.
 - 4. Construction rubble and debris, existing fill or backfill, and unstable soils.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Perform demolition in accordance with applicable authorities having jurisdiction.
- E. Assume possession of materials being demolished, unless indicated otherwise.
- F. Carefully remove and deliver materials and equipment to be retained by Owner, such as cornerstones, their contents, commemorative plaques and tablets, to Owner when and where directed.
- G. Sprinkle area with water to prevent dust. Provide and maintain hoses and connections to watermain or hydrant.
- H. Do not burn materials on site.
- I. Pump out buried tanks located outside building proper. Remove tanks and service piping from site.
- J. Immediately upon discovery, remove and dispose of contaminated, vermin infested, or dangerous materials by safe means so as not to endanger health of workers and public.
- K. Remove trees and shrubs within marked areas, clear undergrowth and dead plant material.
- L. Backfill open pits and holes caused by demolition in accordance with Section 02210.
- M. Remove demolished materials, tools and equipment upon completion of work. Leave site in acceptable condition.

END OF SECTION 02110

SECTION 02200 - EARTH WORK

PART 1 GENERAL

1.1 DESCRIPTION

A. Work Included

Excavating, filling, and grading for this work includes, but is not necessarily limited to:

1. Undercutting beneath foundation and slab;
2. Excavating for grade beams;
3. Filling to attain indicated grades;
4. Rough and finish grading of the site;
5. Excavation for drainage system;
6. Excavation at sidewalks.

B. Related Work Described Elsewhere

- | | |
|---------------------|---------------|
| 1. Quality Control | Section 01400 |
| 2. Site Preparation | Section 02110 |

C. Definitions

The words “finished grade”, as used herein mean the required final grade elevations indicated on the drawings. Where not otherwise indicated, project site areas outside of building shall be given uniform slopes between points for which finished grades are shown, or between such points and existing grade, except that vertical curves or roundings shall be provided at abrupt changes in slope.

1.2 JOB CONDITIONS

A. Dust Control

1. Use all means necessary to control dust on and near the work.
2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site.

PART 2 PRODUCTS

2.1 FILL MATERIAL, GENERAL

Fill material shall be as specified in Part 3 - Execution.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Remove all existing organic topsoil within the root zone, this may be stockpiled and used as a partial requirement for topsoil. It shall be the responsibility of the Contractor to provide the required amount of topsoil. Do not strip topsoil in a muddy condition and avoid admixture of topsoil. Stock the stripped topsoil within the site at locations approved by the Architect and where it will not hinder construction operations. Topsoil stockpiled against loss and the admixture of debris. Topsoil shall be suitable for plant growth and approved by Architect prior to use at job site.

3.2 ENVIRONMENTAL CONDITIONS

A. Drainage

Special attention shall be given to immediately draining all areas holding surface water and establishing surface drainage before commencing with filling or excavation. Surface drainage shall be maintained throughout the project to prevent surface ponding and subsequent saturation of the subgrade soil.

B. Temporary Drainage

1. Where natural drainage is interfered with, provide temporary drainage system until such time as permanent system is installed and functioning.
2. Temporary drainage system shall be so installed as not to create a nuisance in adjacent property.
3. Keep excavations free of water during entire progress of work, with methods or systems being maintained and properly supervised at all times.
4. Springs encountered shall be brought to the attention of the Architect. Presence of ground water in the soil shall not constitute a condition for which any increase may be made in the contract price.

3.3 EXCAVATING, FILLING AND GRADING

A. Excavating

1. Grades, Dimensions

For buildings, excavate to elevations and dimensions indicated, plus ample space for construction operations and inspection of foundation. Remove any soft soil pockets or other unsuitable materials encountered at bearing depth. The sirtube should be proof-rolled with a minimum 20,000 lb. pneumatic-tired roller, loaded tandem-wheeled dump truck, or similar equipment to identify by the proof rolling process should be undercut and be processed and recompacted or replaced with approved select fill.

2. Obstruction

Remove entirely all obstructions from the locations of new foundations; elsewhere within the lines of new buildings, remove such obstruction a depth of 2' 0" below required grade as shown on the drawings. Clean out any existing dug wells, cisterns, abandoned manholes, catch basins, and other similar structures, and fill with granular material firmly compacted.

3. Classified Excavation

All excavation under this Section shall be unclassified and no allowance shall be made for classification regardless of the materials encountered. Remove all materials required to perform excavation, including rock, etc.

4. Shore, sheet and/or brace excavations as required by OSHA to maintain them secure, remove shoring as the backfilling progresses, but only when banks are safe against caving. Such shoring shall not constitute a condition for which any increases may be made in the Contract Price.

5. Drainage

Keep excavations free from water. Do not discharge water from excavations onto privately owned property not where harmful erosion will result.

6. Frost Protection

Make no excavations to the full depth indicated when freezing temperature may be expected, unless the footings or slabs can be poured immediately after the excavation has been completed. Protect the bottom of excavation from frost if placing of concrete is delayed.

7. Disposal

Remove from the site, and dispose of, all debris and all excavated materials not suitable or needed for fill.

8. Bearing Surfaces

Bearing surfaces shall be level, free of all loose material; recompact to overcome disturbances.

9. After excavations have been dug for indicated footings, notify the Architect prior to placing concrete for his observation.

B. Filling and Grading

1. Grades

Do all cutting, filling, backfilling and grading required to bring the entire project area to subgrades as follows:

- a. For surfaces area: including walks, to the underside of the respective surfacing and/or surfacing base course as fixed by the finished grades therefore.
- b. For lawn and planted area: to 4" below finished grade. Unless otherwise shown on the drawings, slope the subgrade evenly to provide drainage away from building walls in all directions at a grade of 1/4" per foot minimum for at least 10 feet from the building walls.

2. Fill Material

Fill required for backfill or to raise existing grade shall consist of clayey sand (SC), sandy clay (CL), or clayey gravel (GC) having a liquid limit less than 40, or an approved alternative. Fill soils in the building and paving areas and within 5 feet of the building or paving areas shall be compacted to a minimum of 95 percent of maximum Modified Proctor dry density (ASTM D-1557), with a moisture content range of minus 2 to plus 3 percent of optimum.

3. Site Fill

In landscaped areas, compaction criteria may be reduced to a minimum of 90 percent of maximum Modified Proctor dry density (ASTM D-1557) at a moisture content near optimum. Fill should be placed in maximum 8-inch loose lifts. Each lift of fill should be properly compacted, tested, and approved prior to placing subsequent lifts.

4. Place fill in uniform layers. Fill shall be placed in loose lifts no greater than 8" in thickness and properly compacted as specified under building and pavements. The in-place density and moisture content shall be established for each lift prior to placement and subsequent lifts. Compact

“cut” or “virgin” material on which fill material is to be place shall be proof-rolled to verify stability prior to placing fill material. If a thick initial lift is used for “bridging” over soft pockets the top 8" of the initial lift shall be compacted to the density required for the fill above. Place fill in 12 inch lifts at site, fill areas.

5. Sand

Washed river sand free of all foreign matter.

6. Gravel Drainage Fill

Washed river gravel, graded from 1/4" to 1/2"; (1" to 2" for use around trees). Gravel shall be thoroughly consolidated with vibrating equipment.

7. Top soil 4" deep at non-paved areas.

3.4 DISPOSITION OF UTILITIES

Rules and regulations governing the respective utilities shall be observed in executing all work under this heading. Active utilities shown on the drawings shall be adequately protected from damage, and removed or relocated only as indicated or specified. Active utilities not shown on the drawings shall be protected or relocated in accordance with written instructions of the Architect Unactive and abandoned utilities encountered in excavating and grading operation shall be removed, plugged or capped. In absence of specified requirements, plug or cap such utility lines at least 3 feet outside of new building walls or as required by the local regulations.

3.5 FINISH GRADING

Remove all debris and re-grade as necessary to bring rough grade to a uniform surface. Spread topsoil to a minimum depth of 4" over all areas that were graded (cut of filled) which are not to be paved. All areas 10' from new construction, shall require 4" of topsoil. Grade to a smooth uniform surface conforming to finish grades or cross sections indicated on the drawings. Clean finished surface of all stones, roots, or other undesirable foreign matter and remove from project site.

3.6 GENERAL

Complete the grading operations after buildings have been finished, utilities installed, site improvement constructed, and all materials, rubbish and debris removed from the site. Leave subgrade for lawns and planted areas clean and at required grades.

END OF SECTION 02200

SECTION 02210 - GRADING

PART 1 GENERAL

1.1 PROVISIONS

Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer/Architect for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

- A. Work covered by this section includes furnishing all materials, labor, services, equipment, licenses, taxes, other items, and appliances necessary for the execution, installation and completion of all work specified herein and/or shown on the drawings.
- B. The Work described in this section of the specifications includes, but is not limited to the following:
 - 1. Excavation, stockpiling and disposal of topsoil and subsoil, rough/fine grading and contouring of site in preparation for site.

1.3 RELATED WORK

- A. The following items of related work are specified and included in other sections of these specifications:
 - 1. Section 02110 - Site Preparation.

1.4 REFERENCE STANDARDS

- A. ASTM D698-Latest - Tests for Moisture-Density Relations of Soils and Soil Aggregate Mixtures using 5.5 lb. hammer and 12 inch drop.
- B. ASTM D1557-Latest - Tests for Moisture-Density Relations of Soils and Soil Aggregate Mixtures using 10 lb. hammer and 18 inch drop.

1.5 SUBMITTALS

- A. Project Record Documents:

1. Submit documents in accordance with Section 01000 - General Requirements.
2. Maintain existing utilities and accurately record location of newly encountered utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Clean soils free of vegetation, debris and organic contaminants with:
 1. On site silty to sandy clay (CL) should be suitable for use as fill material (see soils report).
 2. Use fat clay (CH) only in non-structural fill areas such as ball field areas.
 3. Use fat clay (CH) as liner material for the pond (6" to 12" thick).
 4. Consult soils report to determine usability of soil as fill material.
 5. Use site excavated material for site fill material.
 6. Maximum plasticity index of 15 as determined in accordance with ASTM D4318.
 7. Comply with Paragraph 3.5 A. Section 02210.
- B. Select clayey sand (SC) or clayey gravel (GC) or sandy clay (CL) with liquid limit less than 40.

PART 3 EXECUTION

3.1 PREPARATION

- A. Perform construction staking and site layout using horizontal and vertical control points provided on the drawings
- B. Identify and maintain required lines, levels, contours, and baseline points.
- C. Identify, maintain and protect existing utilities which pass through construction area.

- D. Notify utility company to remove and relocate utilities when required for construction.
- E. Upon discovery of unknown utility or concealed conditions, discontinue affected construction and notify Engineer/Architect.

3.2 EXCAVATION

- A. Strip topsoil (approximately 8 inches) and stockpile for later use.
- B. Excavate to elevations and grades indicated.
- C. Widen depressions to accommodate compaction equipment and provide a level base for placing fill.
- D. Stockpile excavated material to be reused on site where directed, not higher than 6 feet and with maximum 25 percent slope. Cover stockpiles to prevent erosion.
- E. Grass, grass roots and incidental topsoil shall not be left beneath a fill area nor shall this material be used as fill material. It may be stockpiled for later use in the top 6 inches of fills outside building pads and roadways.
- F. Remove unusable and surplus material to designated site. (Future community center see drawing for location).
- G. The detention ponds bottoms should be scarified and compacted. Top 6 inches of the bottom should have CL material. The in-situ clay (CL) soils should be used as the liner material scarified and re-compacted. Minimum permeability should be 1×10^{-5} cm/sec. Where cohesionless soils are encountered in the pond bottom or slopes, a clay liner will be required. The in-situ CL material should be used.

3.3 SCARIFICATION

- A. Scarify, adjust moisture, and compact exposed natural surface soils to minimum 12 inch depth in all fill areas. Bring the upper 12 inches to optimum moisture content or above as determined in ASTM D1557.
- B. Scarify undisturbed surfaces which receive fill to depth of 6 inches.

3.4 FILL

Fill required for low areas shall be placed in 8 inch loose lifts, within two percentage points of optimum, and compacted to 95% Modified Procter (ASTM D 1557).

- A. Place and compact fill material in continuous layers not exceeding twelve (12)

inches loose depth. Maintain optimum moisture content in fill materials to obtain required compaction density.

- B. Deeper lifts may be authorized when proposed equipment is proven to compact deeper lifts.
- C. Controlled fill shall not be constructed when the atmospheric temperature is below 35°F. When the temperature falls below 35°F, it shall be the responsibility of the contractor to protect all areas of completed surface against any detrimental effects of ground freezing by methods approved by the geotechnical engineer. Any areas that are damaged by freezing shall be reconditioned, reshaped, and compacted by the contractor in conformance with the requirements of this specification without additional cost to the Owner.

3.5 COMPACTION

- A. Use mechanical compaction equipment which will not disturb adjacent structures. Do not use water settling and jetting methods.
- B. Compact fill materials in accordance with ASTM D1557.
- C. Rework, moisten or dry as required, and compact exposed surface and subgrade soils to minimum depth of 8 inches. Reworking may be accomplished by scarification, dicing, removal and replacement or other method which will result in uniform moisture contents and densities.
- D. Compact soils within following ranges of moisture content:
 - 1. On-Site Subgrade Soils: 2 percent below optimum or higher.
 - 2. Imported Soils: Minimum weight of 125.0 of pcf placed at +1 to +3 of optimum moisture.
 - 3. Subgrade Soil and Fill Below Asphaltic Pavement: 2 percent below optimum or higher.
- E. Compact fill materials to following minimum percent compaction:
 - 1. Native Soils and Subbase Fill:
 - a. Below footings 95 percent
 - b. Below concrete slabs-on-grade 95 percent
 - 2. Subbase Fill:

- a. Below footings 95 percent
- b. Below concrete slabs-on-grade 95 percent
- 3. Miscellaneous Backfill outside of building pad (Not Intended for Lateral Support of Pipelines): 95 percent

3.6 SUBGRADE PREPARATION

Maintain subgrade of areas to be covered with structural fill or aggregate base course in moist condition until covered.

3.7 GRADING TOLERANCES

- A. Subgrade: Within 0.5 feet from grades and cross section indicated.
- B. Ball Fields: Within 0.2 feet from grades
- C. Variations Within Tolerances: Compensating so that average grade and cross-section are met.

3.8 OBSERVATION AND TESTING OF WORK

- A. Observation and testing shall be performed by an independent geotechnical testing laboratory in accordance with Section 01000, General Requirements.
- B. Testing shall be performed so as to least encumber construction.
- C. When tests indicate that compacted materials do not meet specified requirements, correct defective construction, and have construction retested.
- D. Ensure compacted fills are tested before proceeding with placement of surface materials.
- E. Tests of fill materials and embankments will be made at the following minimum rates:
 - 1. One field density test for each 5,000 square yards of original ground surface prior to placing fill or constructing floor slabs.
 - 2. One field density test for each 250 cubic yards of fill placed or each layer of fill for each work area, whichever is the greater number of tests.

3. One moisture-density curve for each type of material used, as indicated by sieve analysis and plasticity index.
4. The contractor shall bear the cost all required testing.

3.9 PROTECTION

- A. Protect trees, shrubs, and other features remaining as portion of final landscaping.
- B. Protect bench marks, property monuments, walls, fences, roads, sidewalks paving and curbs.
- C. Protect above or below grade utilities which are to remain.
- D. Protect newly graded areas from traffic and erosion, keep areas free of trash and debris. Repair and reestablish grades in settled, rutted, or eroded areas.
- E. Repair damage.

END OF SECTION 02210

SECTION 02220
EXCAVATING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 PROVISIONS

Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

- A. Work covered by this Section includes furnishing all labor, materials, services, appliances, licenses, taxes, and equipment necessary for the execution, installation and completion of all work specified herein and/or shown on the drawings.
- B. The Work described in this section of the specifications includes, but is not limited to, the following:
 - 1. Excavating, backfilling and compacting for structures, utilities, driveways, curbs, gutters, sidewalks and other hardscape.

1.3 RELATED WORK

- A. The following items of related work are specified and included in other sections of these specifications:
 - 1. Section 02110 - SITE PREPARATION.
 - 2. Section 02210 - GRADING.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Fill: In accordance with Section 02210.
- B. Bedding Material: Granular material containing no pieces larger than 3/4 inches and free of broken concrete pavement, wood or other deleterious materials. Do not use open graded rock unless approved; sum of plasticity index and percent of material passing No. 200 sieve not to exceed 23.

- C. Base Course: Gravel aggregate base course.
 - 1. Gravel: Fully or partially rounded and water-worn particles with uniformly distributed crushed rock exceeding ASTM D422 maximum gradation sizes as follows:
 - a. 100% passing 1 inch sieve by weight.
 - b. 85% to 100% passing 3/4 inch sieve by weight.
 - c. 45% to 95% passing No. 4 sieve by weight.
 - d. 10% to 40% passing No. 30 sieve by weight.
 - e. 0% to 8% passing No. 200 sieve by weight.
 - 2. Maximum plasticity index of 3 when tested in accordance with ASTM D4318.
 - 3. Maximum percent of wear of 50 when subjected to Los Angeles abrasion test (ASTM C131).

PART 3 EXECUTIONS

3.1 PREPARATION AND LAYOUT

- A. Maintain baseline points and other reference points throughout the project. Any control point destroyed during the construction shall be re-established by the contractor.
- B. Stake limits of excavation horizontally and vertically by using furnished baseline points.

3.2 PROTECTION

- A. Protect areas to receive planting, and other features specified to remain.
- B. Protect baseline points existing structures, roads, sidewalks, paving, and curbs from damage by equipment and vehicular or foot traffic.
- C. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods, as required to prevent cave-ins or loose dirt from falling into excavations.

- D. Underpin adjacent structures which may be damaged by excavation work, including service lines and pipe chases.
- E. Notify Engineer of unexpected subsurface conditions and discontinue work in area until Engineer provides notification to resume work.
- F. Protect bottom of excavations and soil around and beneath foundations from frost.
- G. Grade around excavations to prevent surface water run-off from flowing into excavated areas.

3.3 UTILITIES

- A. Before starting excavation, contact A One Call@ at 1-800-482-8998, establish location and extent of underground utilities occurring in work area.
- B. Maintain existing utility lines designated to remain within the work area.
- C. Include costs for maintaining utilities in bid.
- D. Protect utility services uncovered by excavation.
- E. Remove abandoned utility service lines from areas of excavation; cap, plug or seal such lines and identify at grade.
- F. Accurately locate (tie to control points) and record abandoned and active utility lines rerouted or extended, on Project Record Documents.

3.4 TRENCHING FOR UTILITIES

- A. Do not disturb soil within branch spread of existing trees or shrubs designated to remain. When necessary to excavate through roots, excavate by hand, tunnel through roots where possible and cut roots with sharp ax where tunneling is not possible.
- B. Where trenches lie within concrete or asphaltic concrete pavement sections, sawcut to neat, vertical, true lines without damage to adjoining surfaces.
- C. Accurately grade trench bottom to specified lines and grades and provide uniform bearing and support for each section of pipe at every point along its entire length. Trim and shape trench bottoms and leave free of irregularities, lumps and projections.
- D. Brace, sheath or shore as necessary to perform and protect excavation and personnel.

- E. Minimize length of open trench whenever possible.
- F. Cut trenches sufficiently wide to enable proper installation of services and to allow for inspection, but not in excess of following maximum widths at top of pipe greater than O.D. of barrel and minimum widths at spring line each side of pipe:
 - 1. For Pipe Less than 18 inches (I.D.): 16 inches at top and 6 inches at spring line.
 - 2. For Pipe from 18 through 24 inches (I.D.): 19 inches at top and 7-1/2 inches at spring line.
 - 3. For Pipe from 27 through 39 inches (I.D.): 22 inches at top and 9 inches at spring line.
 - 4. For Pipe from 42 through 60 inches (I.D.): Half O.D. at top and 12 inches at spring line.
 - 5. For Pipe over 60 inches (I.D.): 36 inches at top and 12 inches at spring line.
- G. Dig bell or coupling holes after grading trench only as necessary to permit accurate work in making joints.
- H. Refill unauthorized excavation below specified grade with aggregate base material and compact to uniform density of 95%.
- I. When excavations are complete, request and receive inspection. Correct unauthorized excavation.
- J. For pipe 12 inches or greater in diameter, provide initial granular bedding at least 4 inches thick or 1/12 outside diameter of pipe whichever is greater. Place bedding material at uniform density with minimum compaction. Granular bedding for pipes less than 12 inches in diameter shall be 3" thick.
- K. Excavate for manholes, valves, inlets, catch basins and other accessories. Structures may be placed directly against excavated earth when excavated faces are firm and unyielding, and outside structure line. Over excavate unacceptable native material, backfill with aggregate base material and compact. Request and receive inspection of excavation prior to pouring concrete.
- L. Stockpile excavated soil for reuse where directed. Remove excess or unsuitable excavated soil from site.

3.5 DEWATERING

- A. Keep trenches dry. Provide necessary equipment including pumps, piping and temporary drains.
- B. Do not discharge drainage water lines into municipal sewers without municipal approval. Ensure water discharge does not contain silt held in suspension.
- C. Control grading in and adjacent to excavations to prevent water from running into excavated areas or onto adjacent properties or public thoroughfares.
- D. Furnish and operate suitable pumps on 24 hour basis to keep excavations free of water until after installing utility service and backfilling.

3.6 BACKFILLING UTILITY TRENCHES

- A. Do not start backfilling until services have been inspected and approved.
- B. Keep building debris and water out of trenches.
- C. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.
- D. Place fill materials in accordance with governing utility company requirements. Use method which will not disturb or damage services.
- E. Maintain optimum moisture content of fill materials so as to attain required compaction density.
- F. From bottom of trench to 12 inches above top of pipe compact to minimum of 95% maximum dry density.
- G. From 12 inches above top of pipe to 24 inches below surface compact fill to minimum of 95% maximum dry density.
- H. Compact upper 24 inches to 100% maximum density for granular soils, 95% maximum density for nongranular soils except in areas where solid sodding or seeding is required. In those areas the top 6 inches shall be topsoil compacted to the density of adjacent soil.
- I. Remove surplus fill materials from site.
- J. Compact fill at trenches where footings occur to 95% maximum density.

3.7 EXCAVATION FOR PAVEMENT DRIVEWAYS, CURBS AND GUTTERS, SIDEWALKS, AND OTHER HARDSCAPE

- A. Remove debris and loose material.
- B. Excavate:
 - 1. Unstable material outside planned improvement or ditch slopes which constitutes potential slides.
 - 2. Material which has deposited on improvement site or in ditch.
 - 3. Material which has slipped out of embankments.
- C. Excavate material to grades indicated.
- D. No point on the completed slope shall vary from the designated plane by more than one inch as measured at right angles to the slope, except where otherwise indicated.
- E. Do not encroach on road bed or parking area.
- F. Round tops, toes and ends of excavation slopes.

3.8 COMPACTION, TOLERANCES

- A. Compact soils under improvements in accordance with Section 02210 - GRADING.
- B. Grading tolerances under improvements shall be in accordance with Section 02210 - GRADING.

3.9 SURPLUS AND UNSUITABLE MATERIALS

- A. Dispose of materials in accordance with regulatory requirements specified in Section 02110 - SITE PREPARATION.
- B. Quantities when shown or specified are approximate.

3.10 OBSERVATION AND TESTING OF WORK

- A. Conform to requirements specified in Section 02210 - GRADING
- B. One field density test for each 100 lineal ft. of trench backfill per lift shall be performed, unless directed otherwise.

END OF SECTION 02220

SECTION 02221

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 WORK INCLUDED IN THIS SECTION

This section shall consist of excavation of trench, bedding of pipe and backfilling of trench.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Not applicable.

1.3 QUALITY ASSURANCE

- A. Materials which have been rejected shall be removed from the job site.
- B. Bedding or backfill that do not conform to the specifications shall be removed or reworked until the specifications are met.

1.4 PROTECTION

- A. Existing Property - The contractor shall exercise reasonable care in excavating trenches for water lines or sewer force mains in order not to interfere with or damage existing improvements on public or private property. Any property damaged shall be replaced by the contractor at his own expense.
- B. Existing Utilities
 - 1. The contractor shall be responsible for determining the exact location of existing utilities within the work area.
 - 2. Any utility line that is cut must be reported to the Owner and repaired immediately in order to maintain service to the customers. These repairs are considered part of the pipe laying cost and will not be paid for separately.
 - 3. The contractor shall coordinate with the utility company and the Owner in the event that utilities must be shut off.

1.5 SITE CONDITIONS

- A. Excavations
 - 1. Trenches and other excavations more than five feet deep (or less when

hazardous ground movement is expected) shall be shored, laid back to a stable slope or some other means of protection provided (such as trench boxes) where employees may be exposed to moving ground or cave-ins.

2. Additional precaution (shoring or bracing) shall be installed when trenches are exposed to vibrations (railroad, highway or machinery) or adjacent to backfill. Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically and be secured.
 3. Trenches over five feet deep shall have ladders or stairs every 50 feet.
 4. In all events all excavations and trenches shall be in compliance with all codes and ordinances especially the OSHA "Construction Standards for Excavations" 29CFR Part 1926.650 through 1926.652 Subpart P.
- B. Dewatering - If dewatering is required, the contractor shall exercise care not to allow water to damage existing property or damage bedding.

PART 2 PRODUCTS

2.1 BEDDING

Pipe Bedding - Shall consist of pea gravel.

2.2 BACKFILL

- A. PIPE - Initial backfill material shall consist of pea gravel.
- B. Remaining backfill (called general backfill) shall be select material free of stones (maximum particle size of 6 inches). Stones or rock larger than 6 inches shall be removed from the work site.

PART 3 EXECUTION

3.1 TRENCH EXCAVATION

- A. Trenches shall be excavated to the depth specified. In the event rock is encountered in the excavation, the trench must be excavated to a depth not less than six (6) inches below grade and then filled back to grade with bedding material. There shall be no additional payment for the excavation of rock or the placing of the bedding in the bottom of the trench.
- B. Rock or other unsuitable material excavated which is not suitable for backfill shall be removed from the job site.
- C. Trench Width - (1)Water mains shall be of sufficient width for the proper

installation of the pipe. Maximum widths are as follows:

PIPE SIZE	TRENCH WIDTH (Maximum)
1" - 3"	18"

3.2 DEPTH OF TRENCH

Except when otherwise shown on the drawings, or herein specified, all pipe trenches shall be constructed to a minimum depth of 36 inches. Pipe shall be laid deeper whenever necessary in order to avoid obstructing other lines.

3.4 METHOD OF PAYMENT AND MEASUREMENT

- A. Trenching for pipes shall be subsidiary to the other items. Trenching will not be measured or paid for separately.
- B. Rock excavation shall be subsidiary to the trenching and shall be included in the lump sum price and will not be paid for separately.
- C. All items of work in this section shown on the plans or called for in the specifications which are not given in the list of variable quantities shall be included in the various unit contract prices of work.

END OF SECTION 02221

SECTION 02232
SUBGRADE

PART 1 GENERAL

1.1 PROVISIONS

- A. Requirements of the General Provisions apply to all work under this section.
- B. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

This item shall consist of shaping, compacting and otherwise preparing the completed roadbed for the placing of base and surface courses and pavements in accordance with these specifications and in substantial conformity with the lines, grades, and cross sections shown on the Plans.

PART 2 PRODUCT (Not Applicable)

PART 3 EXECUTION

- 3.1** The subgrade shall be prepared in such manner as to insure that the base, surface course, or pavement will be placed on a firm foundation that is stable and reasonably free from dust pockets, wheel ruts and other defects.

The subgrade area shall be scarified as may be necessary for shaping, and shaped and compacted to the required grade and section. The top eight (8) inches of the subgrade shall be compacted to a density, as determined by AASHO T 191, of not less than 95% of the maximum density obtained by AASHO T 99. This compaction shall be accomplished by any satisfactory method or methods that will obtain the required density. The Contractor shall bring the moisture content of the material to be compacted to substantially that of optimum moisture by the addition of water or by manipulation and aeration as it may be necessary to increase or decrease the moisture content under the conditions encountered.

The density requirements specified above will not apply to subgrade for unbound granular type surface courses.

Compaction operations may be dispensed with when an old stone or gravel roadbed is used as a foundation or subgrade for a base course or pavement where scarifying for shaping is unnecessary and its stability is approved by the Engineer.

All soft and yielding material and other portions of the subgrade which will not compact readily when rolled or tamped shall be removed. Holes or depressions made by the removal of unsuitable material as directed above shall be filled with an approved material and the whole subgrade brought to the lines, grade and cross section shown on the plans and compacted to the required density.

If the succeeding course is not placed immediately after the subgrade has been prepared and the subgrade becomes cut up, rough, or unstable, it shall again be shaped and recompactd in accordance with the above requirements.

END OF SECTION 02232

SECTION 02233
AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 PROVISIONS

- A. Requirements of the General Provisions apply to all work under this Section.
- B. Throughout the specifications, types of materials may be specified by manufacturers name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

This item shall consist of a foundation course for surface courses pavements. It shall be constructed on the prepared subgrade or other completed base course in accordance with these specifications, and in substantial conformity with the lines, grades, compacted thickness and typical cross section shown on the Plans.

PART 2 PRODUCTS

2.1 MATERIALS

This material shall consist of crusher run stone or a mixture of crushed stone and natural fines uniformly mixed and so proportioned as to meet all the requirements hereinafter specified, with further provisions that a mixture of crushed stone and natural fines shall contain not less than 90 per cent crusher produced material. The stone shall be hard and durable with a percent of wear by the Los Angeles Test (AASHO T 96) not greater than 45. For the purpose of this specification, shale and slate are not considered to be stone. The material furnished shall not contain more than 5% by weight of shale, slate, and other objectionable, deleterious, or injurious matter.

The class or classes of crushed stone base course material that may be used on any particular job will be those called for on the proposal schedule.

GRADING REQUIREMENTS

Size of Sieve	Percent by Weight	
Total Retained	Class SB-2	Class SB-3
1-1/2"	0	0
1"	0	0
3/4"	10-50	0-35
#4	45-75	45-75

Total Passing		
#40	10-30	10-30
#200	3-10	3-10

The fraction passing the No. 200 sieve shall not be greater than two-thirds the fraction passing the No. 40 sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6.

When it is necessary to blend two or more materials, each material shall be proportioned separately through mechanical feeders to insure uniform production. Premising or blending in the pit to avoid separate feeding will not be permitted.

The blending of materials on the roadway in order to obtain a mixture that will comply with the above requirements will not be permitted.

PART 3 EXECUTION

3.1 GENERAL

- 1.1 The base course material shall be placed on a completed and approved subgrade or existing base that has been bladed to substantially conform to the grade and cross section shown on the plans.
- 1.2 The subgrade shall be prepared as specified in Section 02232, and shall be free from an excess or deficiency of moisture at the time of placing the base course. The subgrade shall also comply, where applicable, with the requirements of other items that may be contained in the contract that provide for the construction or shaping of the subgrade or the reconstruction of the existing base course.
- 1.3 Base course material shall not be placed on a frozen subgrade or subbase.
- 1.4 The crushed stone shall be placed on the subgrade or other base course material and spread uniformly to such depth and lines that when compacted it will have the thickness, width and cross section shown on the plans.
- 1.5 If the required compacted depth of the base course exceeds 6 inches, the base shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches. When vibrating or other approved types of special compacting equipment are used, the compacted depth of a single layer of the base course may be increased to 8 inches upon approval.
- 1.6 The spreading shall be done the same day that the material is hauled, and it shall be performed in such manner that no segregation of coarse and fine particles nor nests or hard areas caused by dumping the crushed stone on the subgrade will exist. To insure proper mixing, the crushed stone shall be bladed across the

roadbed before being spread. Care must be taken to prevent mixing of subgrade or shoulder material with the base course material in the blading and spreading operation.

- 1.7 Each course shall be compacted by any satisfactory method that will obtain the density herein specified. The crushed stone shall be substantially maintained at optimum moisture during the mixing, spreading, and compacting operations, water being added or the material aerated as may be necessary. The specified grade and section shall be maintained by blading throughout the compaction operation. The density of the compacted material in each course, as determined by AASHTO T 191, shall not be less than 100% of the density obtained in the laboratory. The crushed stone shall be compacted across the full width of application.
- 1.8 The laboratory density shall be obtained as follows: the sample is prepared by removing the aggregate passing the $\frac{3}{4}$ " inch sieve and retained on a #4 sieve in an amount equal to that removed. The sample so prepared is compacted at various water contents in five equal layers in a mould 6 inches in diameter and 7 inches high. Each layer is compacted by 55 blows of a 10 pound hammer 2 inches in diameter dropped at a height of 18 inches. The density used is the dry weight obtained at the optimum water content.
- 1.9 The compacted base course shall be tested for depth and any deficiencies corrected by scarifying, placing additional material, mixing, reshaping, and recompacting to the specified density, as directed.
- 1.10 Where neither prime coat, surfacing, nor pavement are provided in the same contract with the base course, the density requirement for the base course will be waived and no compaction will be required beyond that obtained by systematic maintenance under traffic.
- 1.11 The Contractor shall maintain the base course in a satisfactory condition until accepted.

END OF SECTION 02233

SECTION 02511

CONCRETE SIDEWALKS AND CURBS AND GUTTERS

PART 1 SCOPE

1.1 PROVISIONS

- A. Requirements of the General Provisions apply to all work under this section.
- B. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

This item shall consist of construction of all sidewalks, curbs and gutters as shown on the drawings.

1.3 RELATED WORK

The following items of related work are specified and included in other sections of these specifications:

- A. Section 02210 – GRADING
- B. Section 02220 - EXCAVATING, BACKFILLING, AND COMPACTION
- C. Section 02513 - PORTLAND CEMENT CONCRETE PAVING
- D. Section 033000 - CAST-IN PLACE CONCRETE

PART 2 PRODUCTS

2.1 CONCRETE

- A. Strength - Concrete shall have a minimum compressive strength of 3500 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inches.
- B. Air Content - Mixtures may have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

2.2 CONCRETE PROTECTION MATERIALS

Concrete protection materials shall be a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

2.3 JOINT FILLER STRIPS

- A. Contraction/Expansion Joint Filler.
- B. Joint filler shall be Omniseal as manufactured by Sonneborn or approved equal
- C. Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, ½ inch thick, unless otherwise indicated.

2.4 FORM WORK

Form work shall be designed and constructed to insure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4-inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of three welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

A. Sidewalk Forms

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

B. Curb and Gutter Forms

Curb and gutter outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together.

2.5 REINFORCEMENT STEEL

Reinforcement steel shall be as specified in Section 02513 - PORTLAND CEMENT CONCRETE PAVING.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The subgrade shall be constructed to the specified grade and cross section prior to concrete placement.

A. Sidewalk Subgrade

The subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

B. Curb and Gutter Subgrade

The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

C. Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected so as to produce a subgrade free from frost when the concrete is deposited.

3.2 FORM SETTING AND REMOVAL

Forms shall be held rigidly in place by a minimum of three stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed.

A. Sidewalks

Forms for sidewalks shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10-foot long section. After forms are set, grade and alignment shall be checked with a 10-foot straightedge. Forms shall have a transverse slope of 2% (maximum) with the low side adjacent to the roadway, unless otherwise shown on the drawings. Side forms shall not be removed for 24 hours after finishing has been completed.

B. Curbs and Gutters

The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished as specified for concrete finishing. Gutter forms shall not be removed while the concrete is plastic enough to slump in any direction.

3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

A. Reinforcement Steel Placement

Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties before the concrete is placed.

B. Formed Sidewalks

Concrete shall be placed in the forms in one layer of such thickness that when

consolidated and finished the sidewalks will be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a wood float, bull float, or darby, edged and broom finished.

C. Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic.

D. Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished carefully with an edger having a radius of 1/8 inch. Transverse joints including those used for handicapped ramps shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

A. Formed Curb and Gutter

Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators.

B. Concrete Finishing

Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes.

The edges of the gutter and the base edge of the top of the curb shall be rounded with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float.

C. Joint Finishing

Curb edges at formed joints shall be finished as indicated.

3.5 SIDEWALK JOINTS

Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or

5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and in line with expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated.

A. Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8-inch blade to the depth indicated. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

B. Expansion Joints

Expansion joints shall be formed with 3/8-inch joint filler strips. Joint filler shall be placed with top edge 1/4 inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be carefully cleaned and filled with joint sealer. Concrete at the joint shall be surface dry and the atmospheric and pavement temperatures shall be above 50 degrees F at the time of application of joint-sealing materials. Joints shall be filled with sealer flush with the concrete surface in such manner as to avoid spilling or smearing onto the walk surface.

3.6 CURB AND GUTTER JOINTS

Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

A. Contraction Joints

Contraction joints shall be constructed in line with contraction joints in abutting Portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length. Contraction joints shall be constructed by means of 1/8-inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

B. Expansion Joints

Expansion joints shall be formed by means of preformed expansion joint filler

material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter in line with expansion joints of abutting Portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement. Where curb and gutter do not abut Portland cement concrete pavement, expansion joints at least 3/8 inch in width shall be provided at intervals not exceeding 30 feet. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated.

END OF SECTION 02511

SECTION 02513
PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.1 PROVISIONS

Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

Work covered by this Section includes furnishing of and paying for all materials, labor, services, equipment, licenses, taxes, other items and appliances necessary for the execution, installation and completion of all work specified herein and/or shown on the drawings. The covered work includes excavating and compacting of subgrade, and forming, placing and curing of concrete driveways, curbs, gutters and sidewalks.

1.3 RELATED WORK

The following items of related work are specified and included in other sections of these specifications:

- A. Section 02220 - Excavating, Backfilling and Compacting
- B. Section 033000 - Cast-In-Place Concrete

1.4 SUBMITTALS

Concrete Design: Contractor shall be responsible for design of concrete mixes. An independent testing laboratory shall determine design mixes of each type concrete based on specified strengths and materials in accordance with ACI 318-89. Submit 4 copies of design mix for approval.

1.5 MOCK-UP

Construct sidewalk width by 5-foot-long mock-up, which may be incorporated into the work. Construct mock-up in time to allow evaluation of color and texture after setting.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C-150-78a, Type I or III.
- B. Fine Aggregate: Natural Sand, ASTM C-33-78.
- C. Coarse Aggregate: Hard, durable natural gravel or crushed rock meeting requirements of ASTM C-33-78. Maximum size and gradation in accordance with Size No. 67 or 467 in Table II of ASTM C-33.
- D. Grading: ASTM C-136.

- E. Water: Potable.
- F. Admixture: Cement-dispersing, water reducing compound such as Pozzolith 100 series, as made by Master Builders. Air entraining agent meeting requirements of ASTM C260.
- G. Reinforcing Steel: ASTM A615, grade 60.
- H. Wire Mesh, ASTM A185.
- I. Forms: Nominal 2" thickness dimension fir wood, 3/4" fir plywood, or steel paving forms.
- J. Premolded Expansion Joint Filler: ASTM D-1782, non-asphaltic.
- K. Dowels and Sleeves: 3/4" plain round bars, with plastic sleeve at one end, 24 inches long, allowing one inch of movement. Refer to drawings.

PART 3 EXECUTION

3.1 PREPARATION

- A. Sawcut existing pavements and concrete to be joined by new construction to neat, vertical, true lines in such manner that adjoining surfaces will not be damaged. Clean cut asphalt pavement with approved equipment. Do not rip or root outside limits of cuts. Haul surfacing materials removed from the Project site to an approved offsite disposal area immediately. Do not use removed surfacing materials for backfill.
- B. Excavate, backfill and compact subbase in accordance with related work.
- C. Do not place excavated or displaced material on the base course or surface of the roadway. Do not deposit excavated materials where the material will interfere with access to property or traffic flow in street.
- D. Sawcut and remove concrete driveways as required to provide the slopes indicated by the standard details.
- E. Sawcut and remove concrete sidewalks as required to provide slopes within the specified limits.

3.2 FORMWORK AND REINFORCING

- A. Construct concrete curbs, gutter and sidewalks with conventional forms, or with appropriate machines specifically designed for construction of concrete curbs, gutters and sidewalks when approved.
- B. When machines designed specifically for such work and approved are used and results are not satisfactory, discontinue use of machine and make repairs. Apply applicable requirements of construction with use of forms to use of machines.
- C. Carefully set forms conforming to dimensions of curb, gutter, sidewalk and

driveway to line and grade, and securely stake forms in position. Oil forms and luster subgrade immediately prior to placing concrete.

- D. Install ½ inch thick expansion joint filler strips with top edge 1/4 inch below projected concrete surface. Hold joint filler strips in place with steel pins or other devices to prevent warping or deflecting of filler during placing and finishing. Install expansion joints as noted in paragraph 3.3. Install the joints in straight lines and vertical planes perpendicular to longitudinal lines of sidewalks or curbs and gutters, or when in curved alignments, along radial lines. Install joints to full depth and width of concrete and matching joints in adjacent sidewalks or curb gutters. Install joints at P.C.'s and P.T.'s of curves, at intersection between driveways, sidewalks, and at eyes of adjoining structures.
- E. Install reinforcement as required in the drawings.
- F. Thoroughly clean forms after each use and coat forms with light oil, or other releasing agent which will not discolor concrete.

3.3 CONCRETE PLACEMENT AND FINISHING

- A. Place concrete in accordance with related work.
- B. Place concrete in one lift so when compacted and finished pavement will be of thickness indicated.
- C. After placing concrete, strike-off surface with strike-off tool guided by side forms. Thoroughly spade concrete away from forms so that there is no rock pockets next to forms, or compact concrete with approved mechanical vibrators. Continue tamping or vibrating until mortar flushes to surface, and coarse aggregate is below surface.
- D. Finish surface with wood float.
- E. Divide surface into rectangular areas as indicated or at approximately 5 feet o.c. with scored ½ inch deep control joints. Score control joints with deep cutting scoring tool.
- F. Control Joints: Strike control joints in straight lines and vertical planes perpendicular to longitudinal lines of sidewalks or curbs and gutters, or when in curved alignments, along radial lines of curbs.
- G. Construction Joints: Stoppage of concrete placing shall occur at expansion joint or other detailed contraction joints. Construct bulkheads to permit continuation of reinforcing steel.
- H. Expansion Joints: Place expansion joint fillers where detailed on drawings; where paving abuts existing paving, structure or walls; every 30 feet each way in paving. Provide removable tacked-on strips to provide a recess for joint sealing compound. Provide expansion joints every 30 feet in curbs at walks. 3/4"
- I. Dowels, 24" long shall be placed at 24" O.C. through expansion joints, sleeved one side, at all expansion joints except where joint abuts building, unless noted otherwise.

- J. Saw-Cut Contraction Joints: Saw-cut joints when concrete is hard enough not to be torn, raveled, or damaged by saw cutting equipment and no later than 10 hours after concrete placement. Trial cuts shall be made prior to execution. Use a power drive concrete saw. Saw blades shall make a clean, smooth cut, producing a groove 1/8" to 1/4" wide to depth required (1/4 slab depth). Locate contraction joints nominally at 15'-0" O.C., unless specified otherwise on Drawings. All joints shall receive sealant.
- K. Immediately after finishing, round edges of perimeter of forms and joint edges with edging tool having radius of 1/8 inch, and remove concrete from over joint fillers.
- L. Completed surface shall be uniform in color and should be free of surface blemishes and tool marks.
- M. Do not remove front face forms until concrete has initially set and has sufficient strength to carry its own weight. Do not remove gutter forms and rear forms until concrete has hardened sufficiently to prevent damage to edges. Exercise care to prevent damage. Repair or replace concrete damaged while stripping forms. Test faces, tops backs, and flow lines of curbs and gutters with ten foot straightedge or curve template, longitudinally along surfaces. Correct deviation in excess of 1/4 inch.
- N. Finish concrete as follows:
 - 1. Sidewalks: Light brown perpendicular to walk centerline.
 - 2. Driveway: Medium broom perpendicular to driveway centerline.
 - 3. Curb and Gutter: Fine hair brush parallel with curb.
- O. Stamp name and year on work on each end of curb, gutter, or sidewalk in letters not less than 3/4 inch high.

Backfill behind curbs or sidewalks with soil native to area to lines and grades indicated.

3.4 INSTALLATION OF CONCRETE STRUCTURES

- A. Place concrete on firm subgrade, free from water. Keep ground water several inches below subgrade until concrete has set. Moisten subgrade in dry earth with water from spray nozzles immediately before concrete is placed.
- B. Place reinforcing steel and concrete immediately after placing filter or drain material. Keep filter or drain material dewatered to prevent concrete materials from being carried away before concrete has set.
- C. Construct concrete formwork, reinforcement, concrete accessories and cast-in-place concrete in accordance with related work.

3.5 CURING

Cure concrete in accordance with related work.

3.6 TESTING OF SURFACES

- A. Test surfaces of concrete sidewalks with 5 foot straightedge. Correct deviations in excess of 1/8 inch.
- B. Water test gutters slopes of 0.8 foot per hundred feet or less, or where unusual or special conditions cast doubt on capability of gutters to drain. Establish flow in length of gutter to be tested by supplying water from hydrants, tank trucks or other source. One hour after water supply is shut off, inspect gutter for evidence of ponding or improper shape. Correct defects when water is found ponded in gutters or on adjacent asphalt pavement to 1/4 inch or greater, No ponding of any depth is allowed at the bottom of the handicapped ramps.

3.7 PROTECTION AND REPAIR

- A. Protect concrete work from damage and vandalism. Repair damaged or vandalized concrete and clean discolored concrete.
- B. When concrete cannot be repaired and must be removed, remove damaged concrete and replace concrete between expansion joints.

3.8 OPENING TO TRAFFIC

- A. Obtain approval prior to opening pavement to traffic.
- B. Close pavement to traffic for at least 7 full days or until minimum compressive strength of concrete is at least 75% of design strength.
- C. Restrict traffic to passenger cars and light trucks for at least 14 days after concrete is placed.

3.9 TESTING

- A. Inspection and testing will be performed accordance with Division 1, General Requirements.
- B. Provide free access to work and cooperate with appointed firm.
- C. Tests of cement and aggregates may be performed to ensure conformance with Contract Documents.
- D. Three concrete test cylinders will be taken for every 75 or less cu. yds. of each class of concrete placed. Make and cure concrete compressive strength test specimens in accordance with ASTM C31.
- E. One additional test cylinder will be taken during cold weather and shall be cured on the Project site under same conditions as concrete it represents. Construct storage box of sufficient size and design to provide protection for cylinders stored on site.
- F. One slump test will be taken in accordance with ASTM C143 for each set of compressive strength test cylinders taken.
- G. Where concrete is placed by pumping, tests shall be taken at truck before

concrete is placed in pump.

- H. Testing laboratory will perform compressive strength tests in accordance with ASTM C39.

END OF SECTION 02513

**SECTION 02669
WATER MAIN**

PART 1 GENERAL

1.1 PROVISIONS

- I. Throughout the specifications, manufacturer's name and catalogue number may specify types of materials in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

- A. Work covered by this Section includes furnishing of and paying for all materials, labor, services, equipment, licenses, taxes, other items, and appliances necessary for the execution, installation and completion of all work specified herein and/or shown on the drawing.
- B. The Work described in this section of the specifications includes, but is not limited to the following:
 1. Water line construction with necessary water main materials, fittings, connections and accessories.

1.3 RELATED WORK

The following items of related work are specified and included in other sections of these specifications:

1. Section 02220 - Excavating, Backfilling and Compacting.

1.4 CONSTRUCTION SCHEDULING AND COORDINATION

Service to water customers shall not be disrupted during installation of the water line improvements except for the time required to change individual services as specified herein.

The Contractor shall notify the City of Lake Village Utility Department at least 48 hours prior to scheduled connections of mains. Scheduling shall be subject to the approval of the Utility Department and the Engineer.

The work of this Section shall be coordinated with the work of other Sections. The Contractor shall make field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all construction items.

The sequence of construction and change over shall be as follows:

- A. Install new mains as shown on the plans, including fire hydrants in accordance with the specification shown in the plan.

- B. Test, disinfect and sample mains as specified. After samples are approved, place mains in service.
- C. Install new services, including saddles, and transfer customer's services to the new main.
- D. On lines to be abandoned, close existing valves and cut and plug line; remove existing valve box and fire hydrants.

PART 2 PRODUCTS

2.1 PVC PIPE

- A. All Polyvinyl chloride (PVC) pressure pipe shall conform to AWWA C 900 made from class 12454 - A or 12454-B material as defined by ASTM D1784 with classification specified in the drawing. PVC pipe shall have a minimum pressure class rating of 150 psi.

2.2 GATE VALVES AND BOXES

- A. Gate valves 3" and smaller shall be iron body, bronze mounted, resilient seat or double disc, parallel seat "O" ring. Gate valves may be either mechanical or slip joint rubber gasket joint. Gate valves shall be Mueller or American Flow Control AWWA Standard or equal. All valves must operate to close in the same direction as described in "C" below.
- B. Gate valves 4" and larger shall be resilient seat type iron body with modified wedge disc. Valve interior shall have an iron body with modified wedge disc. Valve interior shall have an epoxy coating. Gate valve may be either mechanical or slip joint rubber gasket joint. Gate valves shall be Mueller resilient seat gate valve or equal.
- 1. C. All gate valves shall be non-rising stem type with 2" square operating nuts. Gate valves shall open to the left (counterclockwise) and shall be 200 psi design. One operating wrench shall be provided to the Owner. All gate valves by one manufacturer.
- 2. D. Valve boxes shall consist of cast iron base and top section with cover which shall be marked "Water." The top section shall be adjustable for elevations and shall be set to allow equal movement above and below finished grade. The base shall be centered over the valve and below finished grade. The base shall be centered over the valve and shall rest on compacted backfill. The top of the base section shall be approximately on line with nut at top of valve stem, and the entire assembly shall be plumb. The boxes shall be two-piece screw type, Tyler #142-Q on 2" and 3" valves, #562-S on 4" and 6" valves, and #461-S on 8" through 12" valves, or approved equal. Valve boxes shall be made by an American manufacturer.

2.3 CORPORATION COCKS

Shall be suitable for use with plastic or copper water service and shall be similar or equal to Type F1000 as manufactured by Ford Meter Box Company, or H-15008 as manufactured by Mueller Corporation. All 'brass' service line fittings shall be of red brass containing 85% copper and 5% each of tin, lead, and zinc in accordance with ASTM B-62. Upon request by the Owner, the supplier shall certify in writing to the Engineer that the fittings supplied meet

the above specifications and those of AWWA C-800. All corporation cocks shall be designed to withstand working pressures of up to 250 psi.

2.4 MASTER METER VAULT

A. Concrete Vault - To be constructed by the contractor as per Drawings.

2.5 MASTER WATER METERS

A. To be provided and installed by the Utility Company.

2.6 FIRE HYDRANTS

Three-way hydrants shall be 5-1/4" safety break flange design equal to Mueller Centurion Catalog No. A-423. Leads shall be of the same material as the mains. One safety flange repair kit (Mueller A-301) shall be furnished to the Owner.

2.7 TAPPING SLEEVES AND VALVES

The tapping sleeve shall be either of the following types acceptable to Utility Company:

Cast Iron - Tapping sleeves shall be of cast iron material with mechanical joint type seals and shall be of split gland type designed for 150 psi working main pressure. The sleeves shall have a Class 125 outlet flange and be similar and equal to Mueller H-615.

B. Stainless Steel - Tapping sleeves shall be of stainless steel material of the split gland type designed for 150 psi working main pressure. The sleeve shall be similar and equal to Ford "SST."

C. Carbon Steel - Tapping sleeves shall be of ASTM 285 Grade C carbon steel with corrosion resistant bolts. The body of the fitting shall be coated with a fusion applied epoxy coating. The sleeve shall be similar and equal to JCM 412.

The tapping valve shall have a Class 125 inlet flange, be rated for 150 psi working pressure, and have a mechanical joint outlet. The valve shall be a gate valve meeting latest revision of AWWA Standard C500.

2.8 TRACER WIRE / LOCATOR TAPE FOR NON-METALIC PIPE

Install Tracer Wire or Locator Tape as indicated in the plan as per following specifications:

TRACER WIRE: 12 gauge, insulated copper wire

Or,

LOCATOR TAPE: 3" wide MAGNA - TEC or approved equal

PART 3 EXECUTION

3.1 LAYING OF WATER PIPE AND FITTINGS

A. Pipe and accessories shall be handled in such a manner as to insure delivery on the work in sound, undamaged condition. Particular care shall be taken not to injure the

pipe coating. Cutting the pipe for closure pieces or for other reasons shall be done by means of mechanical cutters of an approved type. Wheeled cutters shall be used where practicable.

- B. Before lowering into trench, and while suspended, the pipe shall be inspected for defects and cracks. Any defective, damaged, or unsound pipe shall be rejected. Deflections from a straight line or grade, made necessary by vertical or horizontal curves or offsets, shall not exceed the maximum recommended by the pipe manufacturer. Where these maximum deficiencies would otherwise be exceeded, the contractor shall provide special bends as approved by the Engineer, or a sufficient number of shorter lengths of pipe to provide angular deflections within the limits set out above. Except where otherwise necessary, pipe shall be laid with the bells facing in the direction of laying.
- C. All fittings at bends in the pipe shall be firmly wedged against the vertical face of the trench, or have suitable thrust backing as required by the Engineer. Reaction of thrust bearing shall be of concrete, placed between solid ground and the fitting.

3.2 TESTING

- A. General - After the water mains have been laid as specified, the entire system shall be given a hydrostatic pressure test and a leakage test. This may be done by sections between valves as selected by the Engineer for convenience. These tests shall be performed by the contractor in the presence of the Engineer. The contractor shall furnish all necessary pressure gauges, meters, and pumps, and make all taps and connections.
- B. Hydrostatic Test - The section to be tested shall be slowly filled with water and all air expelled. Pressure shall be applied by means of a pressure pump and maintained for at least two hours or until the whole section can be examined. The test shall be at 50% above normal operating pressure for the area, not to exceed the class rated pressure of the pipe; however, in no case shall the testing pressure be lower than 100 psi on any portion of the line being tested. All leaks and defects found during the test shall be satisfactorily repaired and corrected by the contractor. The contractor shall provide the water for testing.
- C. Leakage Test - The contractor will make a leakage test, and the test shall be at the same pressure conditions as specified for the hydrostatic test. Testing allowance shall comply with the latest version of AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings, Section 10.3. Each leakage test shall be of two hours duration or longer, if necessary, to satisfy the Engineer that leakage in the line meets the specifications.

Allowable leakage (in GPH) is given by the formula:

$$Q = LD(P)^{0.5} / 148,000$$

Where,

*Q = quantity of makeup water in
gallons per hour*

L = length of pipe section being tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the hydraulic test in PSI (gauge pressure)

If the leakage in the test section does not meet the specifications, the contractor shall locate and repair the leaks and retest the line. The cost of this work shall be included in the unit price for laying pipe and will not be paid for separately.

3.3 STERILIZATION

Sterilization of new water mains shall comply with the latest version of AWWA 651 , “Disinfecting Water Mains”, section 4.

All mains shall be thoroughly flushed until all foreign material and colored water is expelled before sterilization.

Before the mains are placed in service, they shall be sterilized with chlorine. Either liquid chlorine or hypochlorite may be used in such amount as to provide a dosage of chlorine not less than 50 ppm. The sterilizing agent may be introduced in any manner, approved by the Engineer, that will insure a uniform distribution. Following a contact period of not less than 24 hours, the chlorine shall have a residual of not less than 25 ppm. The chlorinated water shall then be flushed from the line or structures and samples taken and analyzed for bacterial purity. Sets of samples shall be collected every $\pm \frac{1}{2}$ mile of the new water main. This process shall be continued until samples indicate that the water is safe for human consumption as determined by the Arkansas Health Department. All valves in water lines being sterilized shall be opened and closed several times during the test period. Two consecutive daily samples are presently required by the Health Department for approval.

The contractor shall provide samples as directed by the Engineer for bacterial analysis and approval by the Arkansas Health Department. The cost of this work shall be included in the unit price for laying pipe and will not be paid for separately.

3.4 SETTING VALVES

Valves shall be placed in the line at points designated on the drawings. Valves shall be placed with the stem vertical. Valve boxes shall be placed with the top of the finished grade of the street.

3.5 INSTALLATION OF SERVICE CONNECTION

Service connection shall be made in accordance with details shown on the plans. The service line shall be laid perpendicular to the main line where possible. The contractor is responsible to connect the building shown on the drawings to the main water main. This task shall only take place after, testing and sterilizing of the main and service lines.

3.6 SETTING FIRE HYDRANTS

All fire hydrants shall have a minimum bury of 3 feet, and shall be installed as shown on the plans.

END OF SECTION

SECTION 02720

STORM DRAINAGE SYSTEM

PART 1 GENERAL

1. PROVISIONS

Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

DESCRIPTIONS

- A. Work covered by this Section includes furnishing of and paying for all materials, labor, services, equipment licenses, taxes, other items, and appliances necessary for the execution, installation and completion of all work specified herein and/or shown on the drawing.
- B. The work described in this section of the specifications includes, but is not limited to, the following:
 - 1. Trench excavation, backfilling and compaction.
 - 2. Construction of storm drainage system.

1.3 RELATED WORK

- A. The following items of related work are specified and included in other sections of these specifications:
 - 1. Section 02210 - GRADING
 - 2. Section 02220 - EXCAVATING, BACKFILLING AND COMPACTING.
 - 3. Section 02722 - PVC CORRUGATED PIPE
 - 4. Section 033000 - CAST-IN-PLACE CONCRETE.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes & types indicated and shall conform to the requirements specified in the Plans & Specifications.

PART 3 EXECUTION

3.1 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches and for appurtenances and backfilling for culverts and storm drains shall be in accordance with the applicable portions of Section 02220 EXCAVATING, BACKFILLING AND COMPACTING.

- A. Trenching

The width of trenches at any point below the top of the pipe shall not be greater than the outside diameter of the pipe plus the widths listed in Section 02220 - EXCAVATING, BACKFILLING, AND COMPACTING to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing where required shall be placed within the trench width as specified. Care shall be taken not to over excavate.

B. Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the owner.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of the pipe or pipe arch. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type of joint.

3.3 PLACING PIPE

PVC Pipe- See Section 02722 - PVC CORRUGATED PIPE

Concrete Pipe

Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow. All pipe in place shall be inspected before backfilling, and those pipes damaged during placement shall be removed and replaced.

3.4 JOINTS

A. PVC Pipe: See Section 02722- PVC CORRUGATED PIPE

B. Concrete Pipe - Cement-mortar Bell-and-spigot Joint

The first pipe shall be bedded to the established gradeline, with the bell end placed upstream. The interior surface of the bell shall be carefully cleaned with a wet brush and the lower portion of the bell filled with mortar to such depth as to

bring inner surfaces of abutting pipes flush and even. The spigot end of each subsequent pipe shall be cleaned with a wet brush and uniformly matched into a bell so that sections are closely fitted. After each section is laid, the remainder of the joint shall be filled with mortar, and a bead shall be formed around the outside of the joint with sufficient additional mortar. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint shall be wrapped with cheesecloth to hold mortar in place.

3.5 DRAINAGE STRUCTURES

A. Manholes, junction boxes and Inlets

Construction shall be of cast-in-place reinforced concrete, or precast reinforced concrete, complete with frames and covers or gratings and with fixed galvanized steel ladders where indicated.

B. Yard Drains shall be of the sizes & types indicated and shall conform to the requirements specified in the Plans & Specifications.

C. Walls and Headwalls

Construction shall be of reinforced concrete as indicated in drawings.

3.6 BACKFILLING

A. Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of back joint of pipe. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding six (6) inches. Tests for density will be made as necessary to insure conformance to the compaction requirements specified elsewhere in this paragraph.

B. Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified above. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding six (6) inches.

C. Compaction

1. General

Cohesionless materials include gravels, gravel-sand mixtures, sands, gravelly sands, and very fine sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays and silts. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

2. Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density (densities) which will be determined as specified in this paragraph.

- a. Under paved roads, streets, parking areas, curb and gutter, driveways, and sidewalks, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.
- b. Under unpaved or turfed areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material to within 6" of the surface. The top 6 inches shall be topsoil compacted to the density of the surrounding material. Disturbed areas shall be solid sodded after placement of topsoil.

END OF SECTION 02720

SECTION 02722

PVC CORRUGATED PIPE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

This Item shall govern for the furnishing and installing of all Smooth Interior Corrugated PVC Pipe and/or materials for constructing corrugated pipe culverts or corrugated sewer mains, laterals, stubs and inlet leads. The pipes shall be of the sizes, types, design and dimensions shown on the plans and shall include all connections and joints to new or existing pipes, sewer, manholes, inlets, headwalls and other appurtenances as may be required to complete the work.

PART 2 PRODUCTS

2.1 MATERIALS

Unless otherwise specified on the plans or herein, all smooth interior corrugated PVC pipe shall be A-2000 as manufactured by CONTECH Construction Products Inc., or approved equal.

- A. PVC Compound: Pipe and fittings shall be made of PVC compound having a minimum cell classification of 12454 in accordance with ASTM D1784.
- B. Elastomeric Gaskets: Gaskets shall meet the requirements ASTM F477 and be suitable for the service intended.
- C. Pipe: Pipe shall be manufactured as a single extrusion of the smooth inner and the corrugated outer walls. The corrugated exterior profile shall be annular and seamless.
- D. Joints: All pipe joints are of the bell/spigot type and will be field connected. The joint shall utilize elastomeric sealing gasket with a double sealing surface design. The watertight joint shall meet the requirements of ASTM D3212.
- E. Fittings: Couplings, elbows reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They may be molded or fabricated.
- F. Diameters: The inside and outside diameters of the pipe barrel 4"-36" nominal diameters shall be in accordance with ASTM F949 when measured in accordance with ASTM D2122.
- G. Lengths: Pipe shall be supplied in standard lengths of 12.5, 13 or 20 feet.
- H. Wall Thickness: The minimum wall thickness shall be as stated in Table 1 of ASTM F949 when measured in accordance with ASTM D2122.
- I. Sockets: All socket (bell) dimensions on pipe and fittings shall meet the requirements given in Table 2 of ASTM F949 when measured in accordance with ASTM D2122.

2.2 TESTING

- A. Pipes: Pipes shall be manufactured and tested in accordance with ASTM F949.
- B. Joints: Joints shall remain watertight when tested in accordance with ASTM D3212.
- C. Stiffness: The minimum pipe stiffness shall be 46 psi when tested in accordance with

ASTM D2412.

2.3 INSPECTION

All delivered pipe shall be inspected. Damaged pipe will not be accepted.

2.4 INSTALLATION

Installation shall be in accordance with ASTM D2321 except that the minimum cover shall be 12" or as directed by the Engineer/Architect. Backfill shall be as shown in the construction plans, or as directed by the Engineer/Architect. Minimum trench width shall as shown in the construction plans or as designated by the Engineer/Architect. Backfill shall be placed in 8" loose lifts and compacted to a minimum of 95% standard proctor density or as designated by the Engineer/Architect.

2.5 METHODS

The location of private driveway and side road pipe shall be constructed at locations shown on the plans or as directed by the Engineer/Architect.

Smooth Interior Corrugated PVC Pipe shall be installed in accordance with the plans and requirements herein.

A. Excavation.

All excavation shall be in accordance with the requirements of Item 400, "Excavation and Backfill for Structures", except where tunneling or jacking methods are shown on the plans or permitted by the Engineer/Architect.

B. Shaping and Bedding.

All shaping and bedding shall be in accordance with Section 131, "Select Fill/Sand," and Item 400, "Excavation and Backfill for Structures".

C. Laying Pipe.

Unless otherwise authorized by the Engineer/Architect, the laying of pipes on the bedding shall be started at the outlet end, the separate sections firmly joined together, outside laps of annular joints pointing upstream and longitudinal laps on the sides. Proper facilities shall be provided for hoisting and lowering the sections of pipe into the trench without damaging the pipe or disturbing the bedding and the sides of the trench. Any pipe which is not in alignment or which shows any undue settlement after laying shall be taken up and re-laid without extra compensation.

D. Culvert Connections.

Where new structures are constructed as extensions to structures in place or are joined to existing structures, the construction shall include all work necessary to provide a proper connection between the new structure and the existing structure as indicated on the plans.

E. Reuse of Existing Appurtenances.

When existing appurtenances are specified on the plans for reuse, the portion to be reused shall be severed from the existing culvert and moved to the new position previously prepared, by approved methods.

Connections shall conform to the requirements for joining sections of pipes as indicated herein or as shown on the plans. Any headwalls and any aprons or pipe attached to the headwall that are damaged during moving operations shall be restored to their original condition at the CONTRACTOR's expense. The CONTRACTOR, if he so desires, may remove and dispose of the existing headwalls and aprons and construct new headwalls at

his own expense, in accordance with the pertinent specifications and design indicated on the plans or as furnished by the Engineer/Architect.

- F. Sewer Connections and Stub Ends.
Connections of pipe sewer to existing sewers or sewer appurtenances shall be as shown on the plans or as directed by the Engineer/Architect. The bottom of the existing structure shall be mortared or concreted if necessary, to eliminate any drainage pockets created by the new connection. Where the sewer is connected into existing structures which are to remain in service, any damage to the existing structure resulting from making the connection shall be restored by the CONTRACTOR to the satisfaction of the Engineer/Architect. Stub ends, for connections to future work not shown on the plans, shall be sealed by installing watertight plugs into the free end of the pipe.
- G. Backfilling.
Backfilling for the sewer pipe structure is a critical phase of the construction and shall be in accordance with Item 400, "Excavation and Backfill for Structures". Special emphasis is placed upon the need for obtaining uniform backfill material and uniform compacted density throughout the length of the structure so that equal pressure will be provided. Care is to be taken to insure proper backfill under the structure.
- H. Protection of Pipe.
Unless otherwise shown on the plans or permitted in writing by the Engineer/Architect, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of four (4) feet of compacted fill (permanent or temporary) has been placed over the top of the structure.
Prior to adding each new layer of loose backfill material, until a minimum of twelve (12) inches of cover is obtained, an inspection will be made of the inside periphery of the structure for local or unequal deformation caused by improper construction methods. Evidence of such will be reason for such corrective measures as may be directed by the Engineer/Architect.
Pipe damaged by the CONTRACTOR shall be removed and replaced by the CONTRACTOR at no additional cost to the City.

END OF SECTION 02722

SECTION 02730

SANITARY SEWAGE SYSTEM

PART 1 GENERAL

1.1 PROVISIONS

- A. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION

- A. Work covered by this Section includes furnishing of and paying for all materials, labor, services, equipment, licenses, taxes, other items, and appliances necessary for the execution, installation and completion of all work specified herein and/or shown on the drawing.
- B. The Work described in this section of the specifications includes, but is not limited to, the following:
1. Relocate sewer service to backwash pit.

1.3 RELATED WORK

- A. The following items of related work are specified and included in other sections of these specifications:
1. Section 02220 - Excavating, Backfilling and Compacting.

PART 2 PRODUCTS

2.1 SANITARY SEWER MAIN

The pipe for the gravity sewer shall be PVC SDR 35 sewer pipe, ASTM Specification D3034(PSM), made from plastic having cell classification of 12454-B as defined in ASTM D1784. All wyes, tees, and bends shall be manufactured of the same material as the sewer pipe used and all wyes or ends of service shall be equipped with a watertight plug. All sewer pipe shall be installed using either Class I embedment materials.

2.2 SANITARY SEWER SERVICE

4" PVC SDR 35 sewer pipe as specified above shall be used for service gravity sewer. Maintain minimum slope of 1% for all service lines.

PART 3 EXECUTION

3.1 GENERAL

All equipment necessary and required for the proper construction of the sanitary sewers shall be on the project in first class working condition. The contractor shall provide the necessary hand tampers and pneumatic tampers to obtain the compaction of the pipe bed and backfill as specified. In order to comply with the requirements of the Arkansas State Health Department, the contractor shall maintain a minimum of ten (10) feet of horizontal separation between water and sewer lines when they are installed parallel and a vertical separation of 18" (minimum) when these lines cross.

Backfilling operations shall not lag more than 500 feet behind laying operations unless written authorization to do otherwise is given by the Engineer. The contractor shall mark all trenches left open at the end of the working day with appropriate barriers, lights, and signs as required by the various safety codes.

3.2 EXCAVATION

- A. The Contractor shall do all excavation to the depth shown on the plans. Common excavation shall include all excavation including such rock as may be encountered in the trench. If the soil at the bottom of the trench is mucky, or in such condition that it cannot be properly shaped and graded, or if this material is too soft to properly support the bedding material, the contractor shall excavate below the normal subgrade elevation as directed by the Engineer. Whenever excavation is carried below the subgrade, at the direction of the Engineer, the contractor shall provide and install a foundation material of gravel or crushed stone thoroughly tamped into place up to an elevation sufficient to prepare the bedding as specified. A minimum of 6 inches of such foundation material will be required.

- B. Where rock excavation is encountered in trench, the contractor shall excavate to the depth shown on the plans plus at least six inches (6"). A bedding material of at least six (6") inches shall be placed between the rock and the bottom of the pipe. This bedding shall consist of ballast, concrete aggregate or other acceptable graded or crushed stone material as shown on the plans. The depth of cut shown on the plans is from the surface of the ground to the invert of the pipe. The width of the trench at the top of the pipe shall be the outside diameter of the pipe bells plus twelve inches, minimum, and plus sixteen inches maximum. The bed for the pipe shall be so shaped that at least the lower quarter of the pipe shall be in continuous contact with the top of the bedding. The contractor shall do all bracing, sheathing, and shoring necessary to perform and protect all excavations required to prepare trenches for laying and installing pipe, and other structures incidental to the construction of this sewer system.

3.3 LAYING AND INSTALLING PIPE

The contractor shall provide a laser beam type grade light to insure the pipe is laid to the lines and grade shown on the plans. The Engineer shall inspect all pipe before it is laid and reject any pipe damaged or defective. Laying of pipe shall be started at the lowest point and be laid up grade. The pipe shall be protected from water during placing and until joints are made.

3.4 BACKFILLING

All trenches and excavations shall be backfilled in a reasonable time after the pipe is installed and bedded. Backfill material shall be shown on the standard detail drawings. Select backfill material containing stones or rock exceeding three inches (3") in diameter shall not be used adjacent to the pipe or until the fill over the pipe exceeds one foot (1') in common excavation and two feet (2') in rock excavation. No haunching or initial backfill material may be dropped from a height exceeding two feet (2') over the top of the pipe. Compaction of the bedding, haunching, and initial backfill material shall be obtained by hand tamping method until cover exists over the pipe as shown on the standard trench detail drawings. General backfill material containing large clods or stones larger than six inches (6") in diameter shall not be placed in trenches. In trenches located in paved streets, the general backfill shall be made in layers not to exceed six inches (6") and shall be compacted to a density of 95% Modified Proctor by pneumatic tampers or other equipment approved by the Engineer in such manner that minimal settling of the trench will occur. The contractor will top the backfill by placing the stone or gravel base material level with the existing surface. The crossing shall then be opened to traffic for a period of at least three weeks before the finished surface is placed. Where sufficient backfill material is not available for any of the above operations, it shall be hauled to the work site by the contractor.

3.7 TESTING OF GRAVITY SEWERS AND MANHOLES

Mandrel deflection testing is required for gravity sewer lines. Deflection shall not exceed 5 percent. Tests for water tightness shall be made on each section of sewer line by the contractor in the presence of the Engineer or his authorized representative by one of the following methods:

A. Exterior Saturated Ground Water Pressure - Infiltration due to exterior ground water pressure shall not exceed 50 gallons per mile per inch diameter per day. The contractor shall furnish all equipment necessary for the completion of this test. If dependable results cannot be achieved due to a low ground water table, the low pressure air loss method shall be used. This method (the E.S.G.W.P.) shall be used only when the ground water table is over the top of the sewer pipe.

B. Low Pressure Air Loss - for testing the water tightness of sewer lines. The contractor shall furnish all equipment necessary for this test. The test shall be conducted following procedures outlined. Air pressure in the lines shall not exceed 5.0 psig. An internal pressure of 3.5 psig minimum shall be maintained for at least 5 minutes. After the stabilization period, the time required for a pressure loss of 0.5 psig (3.5 psig to 3.0 psig) will be recorded. If the time for this pressure loss is greater than that shown in the table below, the section undergoing the test shall have passed.

END OF SECTION

SECTION 02760
FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in this text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 789	(1998) Determination of Relative Viscosity and Moisture Content of Polyamide (PA)
ASTM D 3405	(1997) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements

1.2 SUBMITTALS

Engineer's approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials List; G

List of all materials required and the manufacturer's data for each material listed 30 days prior to use on the project.

Manufacturer's Recommendations; G

Where installation procedures, or any part thereof, are required to be in accordance with the manufacturer's recommendations, printed copies of these recommendations, 30 days prior to use on the project. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

Construction Equipment List; G

List of proposed equipment to be used in performance of construction work including descriptive data, 45 days prior to use on the project.

SD-04 Samples

Materials; G

Samples of the materials (sealant, primer if required, and backup material), in sufficient quantity for testing and approval 30 days prior to the beginning of work. No material will be allowed to be used until it has been approved.

1.3 TEST REQUIREMENTS

The joint sealant and backup or separating material shall be tested for conformance with the referenced applicable material specification. Testing of the materials shall be performed in an approved independent laboratory and certified copies of the test reports shall be submitted and approved 30 days prior to the use of the materials at the job site. Samples will be retained by the Government for possible future testing should the materials appear defective during or after application. Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials.

1.4 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and shall be maintained in satisfactory condition at all times.

1.4.1 Joint Cleaning Equipment

1.4.1.1 Tractor-Mounted Routing Tool

The routing tool used for removing old sealant from the joints shall be of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

1.4.1.2 Concrete Saw

A self-propelled power saw with water-cooled diamond or abrasive saw blades will be provided for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

1.4.1.3 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The maximum nozzle opening should not exceed 6.4 mm. The air compressor shall be portable and shall be capable of furnishing not less than 71 liters per second and maintaining a line pressure of not less than 621 kPa at the nozzle while in use. Compressor capability under job conditions must be demonstrated before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjusted as necessary to secure satisfactory results.

1.4.1.4 Waterblasting Equipment

Waterblasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle~ and auxiliary water resupply equipment. The water tank and auxiliary resupply equipment shall be of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjustable as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in pounds per square inch at which the equipment is operating.

1.4.1.5 Hand Tools

Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

1.4.2 Sealing Equipment

1.4.2.1 Hot-Poured Sealing Equipment

The unit applicators used for heating and installing ASTM D 3405 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

1.5 TRIAL JOINT SEALANT INSTALLATION

Prior to the cleaning and sealing of the joints for the entire project, a test section of at least 60 m long shall be prepared using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the test section and before any other joint is sealed, the test section shall be inspected to determine that the materials and installation meet the requirements specified. If it is determined that the materials or installation do not meet the requirements, the materials shall be removed, and the joints shall be recleaned and resealed at no cost to the Government. When the test section meets the requirements, it may be incorporated into the permanent work and paid for at the contract unit price per linear foot for sealing items scheduled. All other joints shall be prepared and sealed in the manner approved for sealing the test section.

1.6 DELIVERY AND STORAGE

Materials delivered to the job site shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be provided by the Contractor at the job site for maintaining materials at the temperatures and conditions recommended by the manufacturer.

1.7 ENVIRONMENTAL CONDITIONS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 10 degrees C and rising at the time of application of the materials. Sealant shall not be applied if moisture is observed in the joint.

PART 2 PRODUCTS

2.1 SEALANTS

Materials for sealing cracks in the paved areas indicated on the drawings shall be as follows: ASTM D 3405 AND COE CRD-C 525

2.2 PRIMERS

Primers, when their use is recommended by the manufacturer of the sealant, shall be as recommended by the manufacturer of the sealant.

2.3 BACKUP MATERIALS

The backup material shall be a compressible, nonshrinking, nonstaining, nonabsorbing material and shall

be nonreactive with the joint sealant. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C 509. The backup material shall be 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

2.4 BOND BREAKING TAPES

The bond breaking tape or separating material shall be a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive—backed tape. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The bond breaker tape shall be approximately 3 mm wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 EXECUTION

3.1 PREPARATION OF JOINTS

Immediately before the installation of the sealant, the joints shall be thoroughly cleaned to remove all laitance, curing compound, filler, protrusions of hardened concrete, and old sealant from the sides and upper edges of the joint space to be sealed.

3.1.1 Existing Sealant Removal

The in-place sealant shall be cut loose from both joint faces and to the depth shown on the drawings, using the concrete saw as specified in paragraph EQUIPMENT. Depth shall be sufficient to accommodate any separating or backup material that is required to maintain the depth of new sealant to be installed. Prior to further cleaning operations, all loose old sealant remaining in the joint opening shall be removed by blowing with compressed air. Hand tools may be required to remove sealant from random cracks. Chipping, spalling, or otherwise damaging the concrete will not be allowed.

3.1.2 Facing of Joints

Facing of joints shall be accomplished using a concrete saw as specified in paragraph EQUIPMENT. The blade shall be stiffened with a sufficient number of suitable dummy (used) blades or washers. Immediately following the sawing operation, the joint opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.3 Refacing of Random Cracks

Sawing of the cracks shall be accomplished using a power-driven concrete saw as specified in paragraph EQUIPMENT. The saw blade shall be 152 mm or less in diameter to enable the saw to follow the trace of the crack. The blade shall be stiffened as necessary with suitable dummy (or used) blades or washers. Immediately following the sawing operation, the crack opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.4 Sandblasting

The newly exposed concrete joint faces and the pavement surfaces extending a minimum of 13 mm from the joint edges shall be sandblasted clean. A multiple-pass technique shall be used until the surfaces are free of dust, dirt, curing compound, filler, old sealant residue, or any foreign debris that might prevent the bonding of the sealant to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water.

3.1.5 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, the lower portion of the joint opening shall be plugged or sealed off using a back-up material to prevent the entrance of the sealant below the specified depth. Care shall be taken to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

3.1.8 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, a bond breaker separating tape will be inserted to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. The tape shall be securely bonded to the bottom of the joint opening so it will not float up into the new sealant.

3.1.7 Rate of Progress of Joint Preparation

The stages of joint preparation, which include sand blasting, air pressure cleaning and placing of the back-up material shall be limited to only that lineal footage that can be sealed during the same day.

3.2 PREPARATION OF SEALANT

3.2.1 Hot-Poured Sealants

Sealants conforming to ASTM D 3405 shall not be heated in excess of the safe heating temperature recommended by the manufacturer as shown on the sealant containers. Sealant that has been overheated or subjected to application temperatures for over 4 hours or that has remained in the applicator at the end of the day's operation shall be withdrawn and wasted.

3.3 INSTALLATION OF SEALANT

3.3.1 Time of Application

Joints shall be sealed immediately following final cleaning of the joint walls and following the placement of the separating or backup material. Open joints that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

3.3.2 Sealing Joints

Immediately proceeding, but not more than 15 m ahead of the joint sealing operations, a final cleaning with compressed air shall be performed. The joints shall be filled from the bottom up to 3 mm plus or minus 1.5 mm below the pavement surface. Excess or spilled sealant shall be removed from the pavement by approved methods and shall be discarded. The sealant shall be installed in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. Then a primer is recommended by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's instructions. Joints shall be checked frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.4 INSPECTION

3.4.1 Joint Cleaning

Joints shall be inspected during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints shall be approved prior to installation of the separating or back-up material and joint sealant.

3.4.2 Joint Sealant Application Equipment

The application equipment shall be inspected to ensure conformance to temperature requirement5~ proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set shall be cause to suspend operations until causes of the deficiencies are determined and corrected.

3.4.3 Joint Sealant

The joint sealant shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Government.

3.5 CLEAN-UP

Upon completion of the project, all unused materials shall be removed from the site and the pavement shall be left in a clean condition.

END OF SECTION 02760

SECTION 02763
PAVEMENT MARKINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 247 (2005) Glass Beads Used in Traffic Paints

ASTM INTERNATIONAL (ASTM)

ASTM D 4280 (2004) Extended Life Type, Nonplowable, Raised, Retroreflective Pavement Markers

ASTM D 4505 (2005) Preformed Retroreflective Pavement Marking Tape for Extended Service Life

ASTM D 792 (2000) Density and Specific Gravity (Relative Density) of Plastics by Displacement

ASTM E 28 (2004) Softening Point of Resins Derived from Naval Stores by Ring and Ball Apparatus

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-B-1325(Rev C) Beads (Glass Spheres) Retro-Reflective (Metric)

FS TT-P-1952(Rev D) Paint, Traffic and Airfield Markings, Waterborne

1.2 UNIT PRICES

1.2.1 Measurement

1.2.1.1 Surface Preparation

The unit of measurement for surface preparation will be the number of square meters feet of pavement surface prepared for marking and accepted by the Contracting Officer.

1.2.1.2 Pavement Striping and Markings

The unit of measurement for pavement striping and markings will be the number of square meters feet of reflective and nonreflective striping or marking actually completed and accepted by the Contracting Officer.

1.2.1.3 Raised Pavement Markers

The unit of measurement for raised pavement markers will be the number of square meters feet of each specific color required. Payment will be for the total number actually placed and approved by the Contracting Officer.

1.2.1.4 Removal of Pavement Markings

The unit of measurement for removal of pavement markings shall be the number of square meters feet of pavement markings actually removed and accepted by the Contracting Officer.

1.2.2 Payment

The quantities of surface preparation, pavement striping or markings, raised pavement markers, and removal of pavement markings determined as specified in paragraph Measurement, will be paid for at the contract unit price. The payment will constitute full compensation for furnishing all labor, materials, tools, equipment, appliances, and doing all work involved in marking pavements. Any striping or markings which are placed without reflective media, when reflective media is required, shall be removed and replaced at no cost to the Government. Striping or markings which do not conform to the alignment and/or location required shall be removed and replaced at no cost to the Government.

1.3 SUBMITTALS

Engineer's approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment; [G]

Lists of proposed equipment, including descriptive data, and notifications of proposed Contractor actions as specified in this section. List of removal equipment shall include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation.

Composition Requirements

Manufacturer's current printed product description and Material Safety Data Sheets (MSDS) for each type paint/color proposed for use.

Qualifications

Documentation on personnel qualifications, as specified.

SD-06 Test Reports

Sampling and Testing

Certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

SD-07 Certificates

Volatile Organic Compound (VOC)

Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

1.4 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

1.5 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Equipment operating on roads and runways shall display low speed traffic markings and traffic warning lights.

1.5.1 Paint Application Equipment

1.5.1.1 Self-Propelled or Mobile-Drawn Pneumatic Spraying Machines

The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall have a speed during application not less than 8 km/hour 5 mph, and shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION, and of even uniform thickness with clear-cut edges. [Equipment used for marking streets and highways shall be capable of placing the prescribed number of lines at a single pass as solid lines, intermittent lines or a combination of solid and intermittent lines using a maximum of two different colors of paint as specified.] [The equipment used to apply the paint binder to airfield pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with an arrangement of atomizing nozzles capable of applying a line width at any one time in multiples of 150 mm 6 inches, from 150 mm 6 inches to 900 mm 36 inches]. The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

1.5.1.2 Hand-Operated, Push-Type Machines

All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small streets and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

1.5.2 Thermoplastic Application Equipment

1.5.2.1 Thermoplastic Material

Thermoplastic material shall be applied to the primed pavement surface by spray techniques or by the extrusion method, wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of, suitable equipment for heating and controlling the flow of

material. By either method, the markings shall be applied with equipment that is capable of providing continuous uniformity in the dimensions of the stripe.

1.5.2.2 Application Equipment

- a. Application equipment shall provide continuous mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the extrusion shoe or spray gun shall prevent accumulation and clogging. All parts of the equipment which come into contact with the material shall be easily accessible and exposable for cleaning and maintenance. All mixing and conveying parts up to and including the extrusion shoes and spray guns shall maintain the material at the required temperature with heat-transfer oil or electrical-element-controlled heat.
- b. The application equipment shall be constructed to ensure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off stripe ends squarely and shall provide a method of applying "skiplines". The equipment shall be capable of applying varying widths of traffic markings.
- c. The applicator shall be equipped with a drop-on type bead dispenser capable of uniformly dispensing reflective glass spheres at controlled rates of flow. The bead dispenser shall be automatically operated and shall begin flow prior to the flow of composition to assure that the strip is fully reflectorized.

1.5.2.3 Mobile and Maneuverable

Application equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. The equipment used for the placement of thermoplastic pavement markings shall be of two general types: mobile applicator and portable applicator.

- a. Mobile Application Equipment: The mobile applicator shall be defined as a truck-mounted, self-contained pavement marking machine that is capable of hot applying thermoplastic by either the extrusion or spray method. The unit shall be equipped to apply the thermoplastic marking material at temperatures exceeding 190 degrees C 375 degrees F, at widths varying from 75 to 300 mm 3 to 12 inches and in thicknesses varying from 1.0 to 5.0 mm 0.020 to 0.190 inch and shall have an automatic drop-on bead system. The mobile unit shall be capable of operating continuously and of installing a minimum of 6 km 20,000 lineal feet of longitudinal markings in an 8-hour day.

(1) The mobile unit shall be equipped with a melting kettle which holds a minimum of 2.7 metric tons 6000 pounds of molten thermoplastic material. The kettle shall be capable of heating the thermoplastic composition to temperatures of 195 to 220 degrees C 375 to 425 degrees F. A thermostatically controlled heat transfer liquid shall be used. Heating of the composition by direct flame will not be allowed. Oil and material temperature gauges shall be visible at both ends of the kettle. [The mobile unit shall be equipped with a minimum of two extrusion shoes located one on each side of the truck, and shall be capable of marking simultaneous edgeline and centerline stripes. Each extrusion shoe shall be a closed, oil-jacketed unit; shall hold the molten thermoplastic at a temperature of 195 to 220 degrees C 375 to 425 degrees F; and shall be capable of extruding a line of 75 to 200 mm 3 to 8 inches in width; and at a thickness of not less than 3 mm 0.125 inch nor more than 5.0 mm 0.190 inch, and of generally uniform cross section.] [The mobile unit shall be equipped with a spray gun system. The spray system shall consist of a minimum of four spray guns, located two on each side of the truck, and shall be capable of marking simultaneous edgeline and centerline stripes. The spray system shall be surrounded (jacketed) with heating oil to maintain the molten thermoplastic at a temperature of 195 to 220 degrees C 375 to 425 degrees F; and shall be capable of spraying a stripe of 75 to 300 mm 3 to

12 inches in width, and in thicknesses varying from 1.5 mm 0.055 inch to 2.5 mm 0.095 inch, and of generally uniform cross section.]

(2) The mobile unit shall be equipped with an electronic programmable line pattern control system. The control system shall be capable of applying skip or solid lines in any sequence, through any and all of the extrusion shoes, or the spray guns, and in programmable cycle lengths. In addition, the mobile unit shall be equipped with an automatic counting mechanism capable of recording the number of lineal meters feet of thermoplastic markings applied to the pavement surface with an accuracy of 0.5 percent.

b. Portable Application Equipment: The portable applicator shall be defined as hand-operated equipment, specifically designed for placing special markings such as crosswalks, stopbars, legends, arrows, and short lengths of lane, edge and centerlines. The portable applicator shall be capable of applying thermoplastic pavement markings by the extrusion method. The portable applicator shall be loaded with hot thermoplastic composition from the melting kettles on the mobile applicator. The portable applicator shall be equipped with all the necessary components, including a materials storage reservoir, bead dispenser, extrusion shoe, and heating accessories, so as to be capable of holding the molten thermoplastic at a temperature of 195 to 220 degrees C 375 to 425 degrees F, of extruding a line of 75 to 300 mm 3 to 12 inches in width, and in thicknesses of not less than 3.0 mm 0.125 inch nor more than 5.0 mm 0.190 inch and of generally uniform cross section.

1.5.3 Reflective Media Dispenser

The dispenser for applying the reflective media shall be attached to the paint dispenser and shall operate automatically and simultaneously with the applicator through the same control mechanism. The dispenser shall be capable of adjustment and designed to provide uniform flow of reflective media over the full length and width of the stripe at the rate of coverage specified in paragraph APPLICATION, at all operating speeds of the applicator to which it is attached.

1.5.4 Preformed Tape Application Equipment

Mechanical application equipment shall be used for the placement of preformed marking tape. Mechanical application equipment shall be defined as a mobile pavement marking machine specifically designed for use in applying precoated, pressure-sensitive pavement marking tape of varying widths, up to 300 mm 12 inches. The applicator shall be equipped with rollers, or other suitable compactive device, to provide initial adhesion of the preformed, pressure-sensitive marking tape with the pavement surface. Additional hand-operated rollers shall be used as required to properly seat the thermoplastic tape.

1.5.5 Surface Preparation Equipment

1.5.5.1 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 70.8 L/sec 150 cfm of air at a pressure of not less than 620 kPa 90 psi at each nozzle used, and shall be equipped with traps that will maintain the compressed air free of oil and water.

1.5.5.2 Waterblast Equipment

The water pressure shall be specified at 17.9 MPa 2600 psi at 60 degrees C 140 degrees F in order to adequately clean the surfaces to be marked.

1.5.6 Marking Removal Equipment

Equipment shall be mounted on rubber tires and shall be capable of removing markings from the pavement without damaging the pavement surface or joint sealant. Waterblasting equipment shall be capable of producing an adjustable, pressurized stream of water. Sandblasting equipment shall include an air compressor, hoses, and nozzles. The compressor shall be equipped with traps to maintain the air free of oil and water.

1.5.6.1 Shotblasting Equipment

Shotblasting equipment shall be capable of producing an adjustable depth of removal of marking and pavement. Each unit shall be self-cleaning and self-contained, shall be able to confine dust and debris from the operation, and shall be capable of recycling the abrasive for reuse.

1.5.6.2 Chemical Equipment

Chemical equipment shall be capable of application and removal of chemicals from the pavement surface, and shall leave only non-toxic biodegradeable residue.

1.5.7 Traffic Controls

Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

1.6 MAINTENANCE OF TRAFFIC

1.6.1 Airfield

The performance of work in the controlled zones of airfields shall be coordinated with the Contracting Officer and with the Flight Operations Officer. Verbal communications shall be maintained with the control tower before and during work in the controlled zones of the airfield. The control tower shall be advised when the work is completed. A radio for this purpose [will be provided by the Government] [shall be provided by the Contractor and approved by the Contracting Officer].

1.6.2 Roads, Streets, and Parking Areas

When traffic must be rerouted or controlled to accomplish the work, the necessary warning signs, flagpersons, and related equipment for the safe passage of vehicles shall be provided.

1.7 WEATHER LIMITATIONS FOR REMOVAL

Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 5 degrees C 40 degrees F and rising at the beginning of operations, except those involving shot or sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal.

1.8 QUALIFICATIONS

The Contractor shall submit documentation certifying that pertinent personnel are qualified for equipment operation and handling of chemicals.

PART 2 PRODUCTS

2.1 PAINT

The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paints for airfields, roads, parking areas, and streets shall conform to FS TT-P-1952, color as [indicated] [selected]. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

2.2 THERMOPLASTIC COMPOUNDS

The thermoplastic reflectorized pavement marking compound shall be extruded or sprayed in a molten state onto a primed pavement surface. Following a surface application of glass beads and upon cooling to normal pavement temperatures, the marking shall be an adherent reflectorized strip of the specified thickness and width that is capable of resisting deformation by traffic.

2.2.1 Composition Requirements

The binder component shall be formulated as a hydrocarbon resin. The pigment, beads and filler shall be uniformly dispersed in the binder resin. The thermoplastic composition shall be free from all skins, dirt, and foreign objects and shall comply with the following requirements:

Component	Percent by Weight	
	White	Yellow
Binder	17 min.	17 min.
Titanium dioxide	10 min.	-
Glass beads,	20 min.	20 min.
Calcium carbonate & inert fillers	49 max.	*
Yellow pigments	-	*

*Amount and type of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, providing the other composition requirements of this specification are met.

2.2.2 Physical Properties

2.2.2.1 Color

The color shall be as indicated.

2.2.2.2 Drying Time

When installed at 20 degrees C 70 degrees F and in thicknesses between 3 and 5 mm 1/8 and 3/16 inch, after curing 15 minutes.

2.2.2.3 Softening Point

The composition shall have a softening point of not less than 90 degrees C 194 degrees F when tested in accordance with ASTM E 28.

2.2.2.4 Specific Gravity

The specific gravity of the composition shall be between 1.9 and 2.2 as determined in accordance with ASTM D 792.

2.2.3 Asphalt Concrete Primer

The primer for asphalt concrete pavements shall be a thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved and/or dispersed in a volatile organic compound (VOC). Solids content shall not be less than 10 percent by weight at 20 degrees C 70 degrees F and 60 percent relative humidity. A wet film thickness of 0.10 mm 0.005 inch plus or minus 0.025 mm 0.001 inch, shall dry to a tack-free condition in less than 5 minutes.

2.2.4 Portland Cement Concrete Primer

The primer for Portland cement concrete pavements shall be an epoxy resin primer. The primer shall be of the type recommended by the manufacturer of the thermoplastic composition. Epoxy primers recommended by the manufacturer shall be approved by the Contracting Officer prior to use. Requests for approval shall be accompanied with technical data, instructions for use, and a 1 liter 1 quart sample of the primer material.

2.3 PREFORMED TAPE

The preformed tape shall be an adherent reflectorized strip in accordance with ASTM D 4505 Type I or IV, Class optional.

2.4 SAMPLING AND TESTING

Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Upon notification by the Contractor that the material is at the site or source of supply, a sample shall be taken by random selection from sealed containers by the Contractor in the presence of a representative of the Contracting Officer. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. [Materials will be sampled and tested by the Government. No material shall be used at the project prior to receipt by the Contractor of written notice that the materials meet the laboratory requirements. The cost of initial testing of samples from each lot of materials will be borne by the Government. If the sample fails to meet specification requirements, the material represented by the sample shall be replaced and the new material will be tested. Cost of sampling and testing the new material will be borne by the Contractor.] [Testing shall be performed in an approved independent laboratory. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application.]

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

3.1.1 Pretreatment for Early Painting

Where early painting is required on rigid pavements, a pretreatment with an aqueous solution containing 3 percent phosphoric acid and 2 percent zinc chloride shall be applied to prepared pavement areas prior to painting.

3.1.2 Cleaning Existing Pavement Markings

In general, markings shall not be placed over existing pavement marking patterns. Existing pavement markings, which are in good condition but interfere or conflict with the newly applied marking patterns, shall be removed. Deteriorated or obscured markings that are not misleading or confusing or interfere with the adhesion of the new marking material do not require removal. New preformed and thermoplastic pavement markings shall not be applied over existing preformed or thermoplastic markings. Whenever grinding, scraping, sandblasting or other operations are performed the work must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. When these operations are completed the pavement surface shall be blown off with compressed air to remove residue and debris resulting from the cleaning work.

3.1.3 Cleaning Concrete Curing Compounds

On new Portland cement concrete pavements, cleaning operations shall not begin until a minimum of 30 days after the placement of concrete. All new concrete pavements shall be cleaned by either sandblasting or water blasting. When water blasting is performed, thermoplastic and preformed markings shall be applied no sooner than 24 hours after the blasting has been completed. The extent of the blasting work shall be to clean and prepare the concrete surface as follows:

- a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.
- b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.
- c. All remaining curing compound is intact; all loose and flaking material is removed.

- d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.
- e. The surface to be marked is dry.

3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 5 degrees C 40 degrees F and less than 35 degrees C 95 degrees F. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint. Paint shall be applied pneumatically with approved equipment at rate of coverage specified. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

3.2.1.1 Rate of Application

- a. Reflective Markings: Pigmented binder shall be applied evenly to the pavement area to be coated at a rate of 2.9 plus or minus 0.5 square meter/L 105 plus or minus 5 square feet/gallon. Glass spheres shall be applied uniformly to the wet paint [on airfield pavement at a rate of 1.0 8] [on road and street pavement at a rate of 0.7 6] plus or minus 0.06 kg 0.5 pounds of glass spheres per L gallon of paint.
- b. Nonreflective Markings: Paint shall be applied evenly to the pavement surface to be coated at a rate of 2.9 plus or minus 0.5 square meter/L 105 plus or minus 5 square feet/gallon.

3.2.1.2 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

3.2.2 Thermoplastic Compounds

Thermoplastic pavement markings shall be placed upon dry pavement; surface dry only will not be considered an acceptable condition. At the time of installation, the pavement surface temperature shall be a minimum of 5 degrees C 40 degrees F and rising. Thermoplastics, as placed, shall be free from dirt or tint.

3.2.2.1 Longitudinal Markings

All centerline, skipline, edgeline, and other longitudinal type markings shall be applied with a mobile applicator. All special markings, crosswalks, stop bars, legends, arrows, and similar patterns shall be placed with a portable applicator, using the extrusion method.

3.2.2.2 Primer

After surface preparation has been completed the asphalt and/or concrete pavement surface shall be primed. The primer shall be applied with spray equipment. Primer materials shall be

allowed to "set-up" prior to applying the thermoplastic composition. The asphalt concrete primer shall be allowed to dry to a tack-free condition, usually occurring in less than 10 minutes. The Portland cement concrete primer shall be allowed to dry in accordance with the thermoplastic manufacturer's recommendations. To shorten the curing time of the epoxy resins an infrared heating device may be used on the concrete primer.

- a. Asphalt Concrete Primer: Primer shall be applied to all asphalt concrete pavements at a wet film thickness of 0.10 mm 0.005 inch, plus or minus 0.025 mm 0.001 inch (25-40 square meters/L 265-400 square feet/gallon).
- b. Portland Cement Concrete Primer: Primer shall be applied to all concrete pavements (including concrete bridge decks) at a wet film thickness of between 1.0 to 1.3 mm 0.04 to 0.05 inch (30-40 square meters/L 320-400 square feet/gallon).

3.2.2.3 Markings

After the primer has "set-up", the thermoplastic shall be applied at temperatures no lower than 190 degrees C 375 degrees F nor higher than 220 degrees C 425 degrees F at the point of deposition. Immediately after installation of the marking, drop-on glass spheres shall be mechanically applied so that the spheres are held by and imbedded in the surface of the molten material.

- a. Extruded Markings: All extruded thermoplastic markings shall be applied at the specified width and at a thickness of not less than 3.0 mm 0.125 inch nor more than 5.0 mm 0.190 inch.
- b. Sprayed Markings: All sprayed thermoplastic markings shall be applied at the specified width and the thicknesses designated in the contract plans. If the plans do not specify a thickness, centerline markings shall be applied at a wet thickness of 2.0 mm 0.090 inch, plus or minus 0.10 mm 0.005 inch, and edgeline markings at a wet thickness of 1.5 mm 0.060 inch plus or minus 0.10 mm 0.005 inch.
- c. Reflective Glass Spheres: Immediately following application, reflective glass spheres shall be dropped onto the molten thermoplastic marking at the rate of 1 kg/2 square meters 1 pound/20 square feet of compound.

3.2.3 Preformed Tape

The pavement surface temperature shall be a minimum of 15 degrees C 60 degrees F and the ambient temperature shall be a minimum of 15 degrees C 60 degrees F and rising. The preformed markings shall be placed in accordance with the manufacturer's written instructions.

3.3 MARKING REMOVAL

Pavement marking, including plastic tape, shall be removed in the areas shown on the drawings. Removal of marking shall be as complete as possible without damage to the surface. Aggregate shall not be exposed by the removal process. After the markings are removed, the cleaned pavement surfaces shall exhibit adequate texture for remarking as specified in paragraph SURFACE PREPARATION. Contractor shall demonstrate removal of pavement marking in an area designated by the Contracting Officer. The demonstration area will become the standard for the remainder of the work.

3.3.1 Equipment Operation

Equipment shall be controlled and operated to remove markings from the pavement surface, prevent dilution or removal of binder from underlying pavement, and prevent emission of blue smoke from asphalt or tar surfaces.

3.3.2 Cleanup and Waste Disposal

The worksite shall be kept clean of debris and waste from the removal operations. Cleanup shall immediately follow removal operations in areas subject to air traffic. Debris shall be disposed of at approved sites.

END OF SECTION 02763

SECTION 02810 IRRIGATION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Complete irrigation system including pipe and fittings, sleeves, mains, laterals, controllers, wiring, connectors, valves, heads and related work.
 - 1. Pipe, tubing and fittings for non-potable water pressure.
 - 2. Sprinkler heads.
 - 3. Control Units and associated special valves.
 - 4. Backflow prevention devices.
 - 5. Trenching, installation and connection of system to water source, testing and backfilling.
- B. Related Sections:
 - 1. Section 02110-Site Preparation.
 - 2. Section 02920-Lawns and Grasses.

1.2 REFERENCES

- A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) 11 West 42nd St
New York, NY 10036 Ph: 212-642-4900 Fax: 212-398-0023 Internet: www.ansi.org
 - 1. ANSI A300 Tree Care Operations - Trees, Shrubs and Other Woody Plant Maintenance
 - 2. ANSI B1.2 Gages and Gaging for Unified Inch Screw Threads
 - 3. ANSI B16.3 Malleable Iron Threaded Fittings
 - 4. ANSI B16.15 Cast Bronze Threaded Fittings
 - 5. ANSI B40.1 Gauges - Pressure Indicating Dial Type - Elastic Element
- B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) , 1916 Race
Street, Philadelphia, PA 19103-1187
 - 1. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 3. ASTM D224 1 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - 4. ASTM D2464 Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 5. ASTM D2466 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - 6. ASTM D2467 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 7. ASTM D2564 Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

8. ASTM D2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
 9. ASTM D2855 Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
 10. ASTM F441/F441 Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- C. American Water Works Association (AWWA) 6666 West Quincy, Denver, CO 80235, Ph: 800-926-7337, Fax: 303-795-1989, <http://www.awwa.org>
1. AWWA C500 Metal-Seated Gate Valves for Water Supply Service
 2. AWWA C506 Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types
 3. ANSI/AWWA C605 Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings
 4. AWWA C651 Disinfecting Water Mains
 5. AWWA M14 Manual: Backflow Prevention and Cross-Connection Control
 6. AWWA M23 Manual: PVC Pipe - Design and Installation
- D. ARKANSAS HEALTH DEPARTMENT, 4815 West Markham, Little Rock, Arkansas 72205.
1. Arkansas State Plumbing Code (ASPC)
- E. CODE OF FEDERAL REGULATIONS (CFR) Government Printing Office, Washington, DC 20402.
1. 28 CFR 36 Nondiscrimination on the Basis of Disability by Public Accommodations and Commercial Facilities {Americans with Disabilities Act (ADA)}
- F. FEDERAL SPECIFICATIONS (FS) GENERAL SERVICES ADMINISTRATION, Federal Supply Service Bureau, 470 L'Enfant Plaza, S.W. Washington, DC 20407
1. FS WW-H-001220 Head, Sprinkler, (Underground Connected)
 2. FS WW-S-610(Rev. B) (Amd. 1) Sprinkler, Lawn, (Surface Connected)
- G. FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR) USC KAP-200, University Park MC-2531, Los Angeles, CA 90089-2531.
1. FCCCHR-01 Manual of Cross-Connection Control
 2. FCCCHR List of Approved Back-Flow Prevention Assemblies
- H. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS), 127 Park Street, NE, Vienna, VA 22180-4602.
1. MSS SP-80 Bronze Gate, Globe, Angle and Check Valves
 2. MSS SP-85 Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.
- I. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA), 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209, (703) 841-3200.
1. ICS 6-1993 Industrial Control and Systems: Enclosures
 2. ICS 2-1993 Industrial Control and Systems: Controllers, Contactors and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC
- NATIONAL SANITATION FOUNDATION INTERNATIONAL (NSF)
ATTN: Publications, P.O. Box 130140, Ann Arbor, MI 48113-0140.

- J. NSF ANSI/NSF 14 (1998) Plastics Piping Components and Related Materials.
- K. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), Francis Perkins Department of Labor Building, 200 Constitution Ave., N.W., Washington, DC 20210.
 - 1. OSHA 29 CFR 0001 et seq. - Occupational Safety and Health Regulations
- L. SOUTHERN BUILDING CODE CONGRESS INTERNATIONAL (SBCCI) PUBLIC SAFETY TESTING AND EVALUATION SERVICES, INC., 900 Montclair Road, Suite A, Birmingham, AL 35213-1206
 - 1. Arkansas Fire Prevention Code (AFPC)

1.3 SYSTEM DESCRIPTION

This system is designed with a minimum water pressure of 40 psi at the last head in each zone.

- A. Design Requirements, Performance Requirements:
 - 1. Uniform turf irrigation;

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each component and the control system with wiring diagrams. Transmit a copy of each instruction to the installer.
 - 1. Piping, tubing, and fittings
 - 2. Valves
 - 3. Sprinkler heads
 - 4. Backflow preventers
 - 5. Automatic controllers
 - 6. Solvent cement
 - 7. Control wires
 - 8. Submit data for reduced pressure type backflow preventers
- B. Project Record Documents
 - 1. Record Drawings
 - a. Keep and accurate daily record of all changes and corrections to contract documents.
 - b. Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, controller, plant and landscaping features, site structures and fittings used. Locate mainline piping, remote control valves, valves, intermediate electrical connections and other significant features from permanent site features.
 - c. Locate all dimensions accurately from a minimum of two permanent reference points (buildings, monuments, sidewalks, curbs or pavements).
 - d. Change irrigation legend to indicate equipment installed.
 - e. Provide one set [mylar] [paper sepia] reproducible record drawings.
 - f. Paper reproducibles may be obtained from Engineer/Architect.

- g. Mark drawings "Record Drawings"
 - h. Date and sign record drawings and submit to Engineer/Architect prior to final acceptance.
 - 2. Controller charts. Provide one chart for each controller supplied. Indicate in chart area controlled by automatic controller. The chart is a reduced drawing of actual as-built system that will fit the maximum dimensions inside controller housing. Use black line print for chart and a different pastel or transparent color to indicate each station area of coverage. After chart is completed and approved for final acceptance, seal chart between two 20-mil pieces of clear plastic.
 - C. Samples
 - 1. Provide one head or irrigation outlet of each type, with housing. Accepted samples may be used in Work.
 - 2. Provide one foot length of each piping type with complete permanent markings.
 - D. Quality Control/Assurance Submittals
 - 1. Test Reports
 - a. Sprinkler head tests
 - b. Valve tests
 - c. Automatic controller tests
 - d. Reduced pressure type backflow preventer tests
 - 2. Field Test Reports
 - a. Pressure test
 - b. Operation test
 - c. Submit record of pressure tests conducted on recording gauge
 - 3. Certificates of Compliance
 - a. Backflow preventers: Submit a certificate of Full Approval or a current Certificate of Approval from FCCCHR for size, and make of backflow preventer being provided for this project. A Certificate of Provisional Approval will not be acceptable
 - 4. Manufacturers Instructions
 - a. Automatic controllers
 - b. Sprinkler heads
 - c. Backflow preventers
 - 5. Operating and Maintenance Data: Provide three copies of operating instructions, warranty and equipment brochures manual.
 - a. Include written instructions covering full operation, care and maintenance of system and controls.
 - 1) Neatly bound in a three ring binder
 - 2) Include names and addresses of two suppliers of all project equipment
 - 3) Include all installer, suppliers, and/or manufacturers warranties

- 4) Include troubleshooting procedures with respect to valve and controller problems.
- 5) Include schedule showing length of time each valve is opened to provide designed amount of water.

1.5 QUALITY ASSURANCE

- A. Qualifications
 1. Applicator: Company specializing in installing landscape irrigation systems with minimum three years documented experience with installations of similar scope, materials and design approved by the manufacturer and Engineer/Architect.
- B. Regulatory Requirements
 1. Comply with Arkansas Department of Health regulations (Arkansas State Plumbing Code).
- C. Pipe Markings: Identify all pipe with the following indelible markings.
 1. Manufacturer
 2. Nominal Pipe Size
 3. Schedule or Class
 4. Pressure Ratings p.s.i.
 5. NSF seal of approval
 6. Date of extrusion
- D. Inspections, Permits, and Fees
 1. Contractor
 - a. Obtain and pay for all required permits, and inspections in connection with this work under the Contract.
 - b. Deliver to the Owner a copy of each certificate of approval from each inspection agency.
 - c. Pay for required testing.
 - d. Pay any and all fees in connection to all utilities and pay all utilities bills during construction.
 - e. Bear all costs of correcting deficiencies of any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, and utility company regulations.
 2. Testing Facilities
 - a. An approved commercial testing laboratory; or
 - b. Facilities furnished by the Contractor.
 - c. DO NOT perform any work requiring testing until the facilities have been inspected and approved by the Engineer/Architect.
 - d. The first inspection of the testing facility is at the expense of the Owner.
 - e. Required subsequent inspection because of first inspection failure is the expense Contractor at no additional cost to the Owner.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling, Storage, Protection and Unloading
 1. Deliver, store, protect, and handle products to site under with extreme care.
 2. **DO NOT** drop or dump materials from vehicles.
 3. Handle in a manner to prevent damage, bending, breakage, and/or contamination.
 4. Place and stack skids and units to distribute weight evenly and to prevent breakage or cracking.
 5. Deliver packaged materials in original rolls, packages, cartons, and containers with the name of manufacturer, brand, and model with seals unbroken and labels, including grade seal, intact until time of use, in accordance with manufacturer's instructions.
- B. Acceptance at Site
 1. Inspect materials delivered to the site for damage and specification requirements. Remove damaged and unsatisfactory materials from the site immediately.
- C. Storage and Protection
 1. Store equipment and materials in original rolls, packages, cartons, and containers with the name of manufacturer, brand, and model with seals unbroken and labels, including grade sea, intact until time of use, in accordance with manufacturer's instructions, suitably sheltered from the elements, but readily accessible for inspection by Engineer/Architect until installed.
 2. Store all items subject to moisture damage in dry, heated places.
 3. Tightly cover equipment and protect against dirt, water, and chemical or mechanical injury and theft.
 4. **DO NOT** store materials directly on the ground.
 5. Keep the inside of pipes and fittings free of dirt and debris.
 6. Protect plastic materials from exposure to the direct sunlight over extended periods.
 7. At completion of the work, fixtures, equipment, and materials shall be free of defects and damage. Clean fixtures, equipment, and materials and turn over to the Owner in first class condition.
 8. Contractor repair or make good damage or defects developing before acceptance of the work shall be made good at the Contractor's expense.
 9. Place and stack skids and units to distribute weight evenly and to prevent breakage or cracking.
 10. Place and stack skids and units to distribute weight evenly and to prevent breakage or cracking.
- D. Waste Management and Disposal
 1. Remove rejected materials from site immediately.

1.7 PROJECT/SITE CONDITIONS

- A. Subsurface soil exploration are included in this package.

1. This data is the best subsurface information available; variations may exist in the subsurface between exploration locations.
- B. Existing Conditions: The Contractor is not liable for additional excavation expenses resulting from undisclosed, subsurface conditions, i.e. rock, water, clay pan, contaminated soils or other undiscovered conditions that are not apparent at time of estimating.

1.8 SCHEDULING

Coordinate irrigation installation with vehicular and pedestrian paving, lawns and grasses and exterior plants to ensure construction operations do not negatively impact on completed or future work.

1.9 WARRANTY

- A. Fully warranty materials and workmanship for one year after final acceptance.
- B. Include repair or replacement of defective materials or workmanship, repair or replacement of damage caused by defect or delay in repair and the repair of backfill settlement.
- C. Provide Owner with manufacturers certificate of equipment and materials warranties and guarantees.

1.10 COMMISSIONING

- A. Dynamically test and adjust system to provided designed precipitation rates, at correct times and duration.
- B. Instruct Owners designated maintenance personnel in proper operation and maintenance or system.

1.11 MAINTENANCE

- A. Extra Materials: Provide the following extra components
 1. Two keys for each controller.
 2. Two sprinkler heads of each type and size.
 3. Two valve box keys.
 4. Two quick coupler keys with match swivel hose ells.
 5. Two wrenches for each type head core and for removing and installing each type head.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Rain Bird Corporation, 970 West Sierra Madre Ave., Azusa, CA 91702
(626) 812-3400
- B. The Toro Company, Irrigation Division, P.O. Box 489, Riverside, California 92502,
<http://www.toro.com>.
- C. Ametek/Plymouth Products Division, 502 Indiana Ave, PO Box 1047, Sheboygan,

Wisconsin 53082-1047, (800) 222-7558, <http://www.ametek-westchesterplas.com>
Products Valve Boxes.

- D. NDS, Incorporated, 851 North Harvard Avenue, Lindsey, California 93247, (800) 726-1994, Product Valve Boxes.
- E. Substitutions: Are not allowed without a written request and approval by Engineer/Architect.

2.2 MATERIALS

A. Topsoil: Reusable excavated or imported friable loam; free of subsoil, roots, grass, excessive amount of weeds, large stones, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter.

B. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ANSI/ASTM C136 within the following limits:.

Sieve Size	Percent Passing
No. 4	100
No. 14	10

C. Drainage Fill: 1/2 to 3/4 in (13 to 19 mm) washed pea gravel.

2.3 COMPONENTS

A. Piping Materials

- 1. Polyvinyl Chloride (PVC) Pipe, Fittings and Solvent Cement
 - a. Pipe: or ASTM D2241, PVC 1120 SDR 21, Class 200
- 2. Fittings:
 - a. Solvent Welded Socket Type: ASTM D2466, Schedule 40.
 - b. Threaded Type: ASTM D2464, Schedule 80.
 - c. Solvent Cement: ASTM D2564.
- 3. Water Meter, Backflow Preventer, and Isolation Valve Piping: ASTM A53, Schedule 40, galvanized Steel Pipe.
- 4. Outlets: Brass or bronze construction.

B. Sleeves

- 1. Provide sleeves under all paved surfaces, curbs, walls, ramps, steps, etc.
- 2. Provide sleeve a minimum of two pipe sizes larger than the pipe.
- 3. Less than 6 in (150 mm) diameter: ASTM D2241, PVC 1120 SDR 21 Class 200 or Schedule 40, ASTM D1785.
- 4. 6 in (150 mm) and over: ASTM D2241, PVC 1120 SDR 26 Class 160 or Schedule 40 ASTM D1785.

C. Fittings: Type and style of connection to match pipe according to applicable reference.

2.4 MANUFACTURED UNITS

A. Valves: Manufacturer's standard, of size and type indicated on the plan.

1. Gate Valves: MSS SP-80 AWWA C500, bronze construction, non-rising stem, inside screw with threaded ends.] [designed for working pressure of 150 psi at 115 degrees. Valves open by turning counter- clockwise, with cast arrow indicated direction of operation.
 - a. Less than 3 In (75 mm): MSS SP80, Type 1, Class 150, threaded ends.
 - b. 3 In (75 mm) and Larger: AWWA C500, bottom wedging double discs, parallel seats, non-rising stems, open by counterclockwise turning. Provide flanged end connections. Provide bronze interior construction of valves including stem containing a maximum 2 percent aluminum and maximum 16 percent zinc.
 2. Globe Valves: Bronze construction, non-rising stem, inside screw with threaded ends.
 3. Remote Control Valves: normally closed 24 v DC electric type with plastic body. Equip valve with capability of manual operation at the valve location.
 4. Isolation Valves
 - a. 2 in (50 mm) diameter and smaller: MSS SP-110, bronze or stainless steel body, stainless steel ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends.
 - b. 2 in (50 mm) diameter and larger: Resilient seat gate valve.
 5. Drain Valve
 - a. Manual
 - 1) 2-1/2 in (64 mm) or less: MSS SP80, Type 3, Class 150, angle type brass/bronze with stainless steel stem and cross handle with rising seat, threaded ends.
 - 2) 2 1/2 in (64 mm) and larger: MSS SP85, Type II, Class 250, [angle type brass/bronze with stainless steel stem and cross handle with rising seat, threaded ends.
 6. Quick Coupler: Brass, 1 1/2 in with NPT male threads, low pressure loss type with lockable, hinged, purple vinyl covers lids with springs for positive closure on key removal. Designed to permit operation with a special connection device (key) designed for this purpose.
- B. Reduced Pressure Type Backflow Preventers: AWWA C506. Provide backflow preventers complete with 150-pound flanged bronze mounted gate valve and strainer, 304 stainless steel or bronze, internal parts. Total pressure drop through complete assembly shall be a maximum of 10 psi at rated flow. Listing of particular make, model/design, and size in FCCCHR will be acceptable as required proof for testing and certification.
1. Piping Assembly: Galvanized steel pipe and fittings.
 2. Strainers: Bronze or brass construction with gasket caps. Equip units with 200-mesh stainless steel screen elements.
 3. Outlets: Brass or bronze construction.
- C. Heads
1. Manufacturer=s standard unit designed to Manufacturer's standard unit

designed to provide uniform coverage over entire area of spray shown on plan, and of commercial grade.

2. **DO NOT** exceed the maximum or minimum spacing indicated by manufacturer.
3. Match precipitation rates of all heads within a zone operated by the same valve.
4. Make coverage overlap 100% for all heads.

2.5 ACCESSORIES

- A. Valve Box and Cover: Hard plastic with green plastic cover extending below valve, with self-draining base, in the size and quantity needed to place all valves in boxes. Permanently mark covers with zone number, or equipment name.
- B. Concrete Pads: Precast or cast-in-place reinforced concrete construction for reduced pressure type backflow preventers.
- C. Pressure Gauges: ANSI B40.1, single style pressure gauge for water with 4 1/2 in (11 cm) dial, brass or aluminum case, bronze tube, gauge cock, pressure snubber, and siphon. Provide scale range suitable for irrigation sprinkler systems.
- D. Service Clamps: Bronze flat, double strap, with neoprene gasket or "O"-ring seal.
- E. Closure Caps: Provide in accordance with manufacturer's recommendations.
- F. Solenoid Valve Wire: NFPA 70, copper conductor, Type UF.
 1. Size: 16 AWG (minimum) in accordance with controller manufacturer's specifications.
- G. Color coding: Red and White.
- H. Plastic Marking Tape
 1. Acid and alkali-resistant plastic film; manufactured for marking and locating underground utilities;
 2. manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 ft (1 m) deep; metallic core or wires encased in a protective jacket or provided with other means to protect from corrosion;
 3. minimum 3 in (75 mm) wide;
 4. minimum thickness of 0.004 in (0.102 mm);
 5. minimum strength of 1750 psi (12.1 MPa) lengthwise and 1500 psi (10.3 MPa) crosswise;
 6. bearing a continuous printed inscription describing the specific utility;
 7. color blue.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site verification of Conditions
 1. Verify field conditions and location of existing utilities are acceptable.
 2. Arkansas State Law requires that the excavator is to locate all existing utilities in accordance with the Arkansas Underground Facilities Damage

Prevention Act. This law requires that the excavator make a telephone call to the Arkansas One-call System at 1-800-482-8998 at least two working days prior to excavating to ensure that any existing utilities can be located.

3. Verify adequate pressure is available to properly operate system and system components.
4. Immediately notify Engineer/Architect, if pressures are not adequate.
5. Examine all work and/or surfaces to which work will be applied under this section.
6. Immediately notify Engineer/Architect, if work or surfaces are not adequate.
7. Verify sleeves are in place for all areas where it is necessary to cross under pavement.

3.2 PREPARATION

- A. Submit shop drawings, data, manufacturer=s information, and samples to Engineer/Architect.
- B. Protection
 1. Piping layout indicated is diagrammatic only.
 2. Route piping to avoid plants and structures and to reach sleeves or good crossing areas.
 3. When rock is encountered, excavate 4 in (10 cm) deeper and backfill with silty sand (SM) or well-graded sand (SW) to pipe grade. Keep trenches free of obstructions and debris that would damage pipe. Do not mix subsoil with topsoil.
 4. Route lines as far from existing large trees as possible. Hand trench around roots to pipe grade when roots of 2 inches diameter or greater are encountered. Make width of trench 4 in (10 cm) minimum or diameter of pipe, whichever is wider. Backfill and hand tamp over excavation.
 5. Slight variations in location may require the contractor to make minor field adjustments.
 6. If adjustments significantly alter the arrangement or operation of the system, contact the Engineer/Architect before proceeding.
 7. Identify and flag known utility locations.
 8. Maintain and protect existing utilities to remain.
 9. Verify foundation or basement walls are braced to support surcharge forces imposed by backfilling or excavation operations.
 10. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
 11. Grade excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties.
 12. Stake locations of all heads for approval of Engineer/Architect before proceeding.
 13. Do not exceed manufacturer's recommended spacing.
- C. Surface Preparation
 1. Identify required lines, levels, contours, and datum.

2. Notify Engineer/Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

3.3 INSTALLATION

A Trenches

1. Trench in accordance with Section 02221.
2. Fill, contour, and compact entire site prior to trenching for irrigation.
3. Excavate for irrigation piping to municipal utilities.
4. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.
5. Hand trim excavation and leave free of loose matter.
6. Support pipe and conduit during placement and compaction of bedding fill.
7. Clearances:
8. Minimum horizontal clearances between lines: 4 in (10 cm) for 2 in (5 cm) pipe and less; 12 in (30 cm) for 2 in (5 cm) pipe and more.
9. Minimum vertical clearances between lines: 1 in (25 mm).
10. Minimum Pitch: Down 6 in (15 cm) per 100 ft (30 m) in direction of drain valves.

B. Backfilling

After backfilling, fill all trenches with water to prevent aftersettling. Perform flooding from the top to the bottom of the trench and work the mud to liquid consistency. Fill to finish grade with topsoil. Hand rake all trenches and adjoining areas to leave grade in as good as if not better than before trenching.

C. Minimum Cover

1. Main Line Trenches: Provide and maintain a minimum backfill cover of 18 inches.
2. Lateral Line Trenches: Provide and maintain a minimum backfill cover of 12 inches (30 cm) in lawn areas and 15 in (380 mm) in beds.
3. 36 inches for pipes under traffic loads, farm operations, and freezing temperatures.
4. 8 in (20 cm) for low-voltage wires.
5. Backfill areas to contours and elevations. Use unfrozen and unsaturated materials.
6. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
7. Place and compact fill materials in continuous layers not exceeding 6 in (15 cm) loose depth.
8. Employ a placement method so not to disturb or damage foundations, foundation perimeter drainage, foundation dampproofing, foundation waterproofing and protective cover, or utilities in trenches.
9. Maintain optimum moisture content of backfill materials to attain required compaction density.
10. Backfill against supported foundation walls.

11. Slope grade away from building minimum 2 in in 10 ft (15 cm in 3 m), unless noted otherwise.
12. Make grade changes gradual. Blend slope into level areas.
13. Compact each layer of the fill or embankment and subgrade to at least the percent of laboratory maximum density specified below:

	Cohesive material	Cohesionless material
Under pavements and shoulders	90	95
Under non-paved areas	85	90
Subgrade		
Under pavements and shoulders, to a depth of at least 6 in (15 cm) below the surface.	90	95
Expansive clayey materials	Compacted to not less than 90 percent nor more than 100 percent. Moisture content shall not be less than 1 percent below optimum and not more than 4 percent above optimum.	

- D. Special Requirements
 1. Plastic Marking Tape:
 2. Install directly above the pipe or utility 18 in (45 cm) below finished grade.
- E. Placing Topsoil
 1. Fill top 3 in (75 mm) of trenches with topsoil and compact with same density as surrounding soil.
 2. Place topsoil in areas where seeding and planting is scheduled to depth with amendments called for on Drawings and Landscape specifications.
 3. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.

4. Remove large stone, roots, grass, weeds, debris, and foreign material while spreading.
 5. Lightly compact or roll placed topsoil.
 6. Leave stockpile area and site clean and raked, ready to receive landscaping.
- F. Piping: Install pipe, valves, controls, and irrigation heads in accordance with manufacturer's instructions. Provide for thermal movement of system.
1. Polyvinyl Chloride (PVC) Pipe: ASTM D2774 or ASTM D2855, and pipe manufacturer's instructions. Install pipe in a serpentine (snaked) manner to allow for expansion and contraction in trench before backfilling. Install pipes at temperatures over 40 deg F (4.4 deg C).
 - a. Solvent-Cemented Joints: ASTM D2855.
 - b. Threaded Joints: PPI TN8/8; full cut with a maximum of three threads remain exposed on pipe and nipples. Make threaded joints tight without recourse to wicks or fillers, other than polytetrafluoroethylene thread tape.
 2. Threaded Brass or Galvanized Steel Pipe: Prior to installation ream pipe. Cut threads as specified in ANSI B1.2. Make joints with pipe joint compound applied to male end only.
 3. Dielectric Protection: Where pipes of dissimilar metal are joined, make connection with dielectric fitting.
 4. Thrust Blocks: Place concrete so that sides subject to thrust or load are against undisturbed earth, and valves and fittings are serviceable after concrete has set.
- G. Valves and Accessories
1. Manual Valves: Install in a valve box extending from grade to below valve body, with a minimum of 4 in (10 cm) cover measured from finish grade to top of valve stem.
 2. Automatic Valves: Plumb valve in a valve box extending from grade to below valve body, with minimum of 4 in (10 cm) cover measured from grade to top of valve. Install automatic valves beside sprinkler heads with a valve box.
 3. Drain Valves: Provide entire system with manual drain valves. Equip low point of each underground line with drain valve draining into an excavation containing gravel. Cover gravel with building paper. Backfill with excavated material and 6 inches of topsoil.
- H. Valve Boxes: Set box covers at finish grade elevations. Set bottom of valve boxes or extensions to a minimum of 1 in (25 mm) below the bottom of valve.
- I. Sprinkler Heads and Quick Coupling Valves: Install plumb and level with terrain at finish grade elevations. Install valves in a level position at a depth to provide a minimum 12 in (30 cm) cover. Use threaded Schedule 80 nipples for risers to each head to facilitate easy replacement.
- J. Backflow Preventers: Install backflow preventer in new connection to existing water distribution system, between connection and control valves. Install with concrete pads.

1. Reduced Pressure Type: Install as follows:
 - a. Flush pipe lines prior to installing device.
 - b. Protect device by a strainer located upstream.
 - c. **DO NOT INSTALL** in pits or where any part of device could become submerged in standing water.
- K. Control Wiring
 1. Install control wiring. Bury wires beside pipe in same trench. Provide conduit where wires run under paving. Number tag wires at key locations along main to facilitate service. Provide one control circuit for each zone and a circuit to control sprinkler system.
 2. Install control wiring to provide 12 in (30 cm) minimum coil at each valve connection and every 100 ft (30 m). Bury wire in trenches for piping, tucked under irrigation piping. Bundle multiple tubes or wires and tape together at 20 ft (6 m) intervals with 12 in (30 cm) loop for expansion and contraction.
 3. Minimize wire splices. Solder the wire splice, coat with a general Bakelite cement, wrap with electric tape, and coat with an outer coat of general Bakelite cement to make the splice waterproof.
- L. Flushing
 1. After piping is installed, before irrigation heads are installed and backfill commences, open valves and flush out system lines completely with a full head of water. Maintain flushing for 3 minutes.

3.4 CONSTRUCTION

- A. Site Tolerances
 1. Top Surface of Exposed Subgrade: Plus or minus one in (25 mm).
 2. Top of Topsoil: Plus or minus 1/2 in (13 mm).

3.5 REPAIR/RESTORATION

Replace all plantings or structures damaged by irrigation installation. Restore lawns according to Section 02920.

3.6 FIELD QUALITY CONTROL

- A. Site Tests, Inspection
 1. Notify Engineer/Architect in writing a minimum of five days prior to:
 - a. Hydrostatic test of piping;
 - b. Operation Test;
 - c. Substantial completion inspection.
 2. Hydrostatic tests
 - a. Hydrostatically test system for leakage before piping is covered to 100 psi (690 kPa) at farthest point of system, for one hour, with no leakage or pressure drop of 5 psi before backfilling system.
 - b. At conclusion of pressure test, install sprinkler heads or emitter heads, quick coupling assemblies, and hose valves, and test entire system for operation under normal operating pressure.

3. Operation Test
 - a. Test entire system for operation under normal operating pressure.
 - b. Acceptance: Operation test is acceptable if system operates through at least one complete cycle for areas to be sprinkled.

3.7 ADJUSTING

- A. Adjust control system to achieve time cycles required.
- B. Make final adjustments to irrigation system, after installation is complete.
- C. Adjust irrigation heads for proper operation and directional alignment.
- D. Adjust rotary and pop-up sprays for proper arc of operation. Adjust for prevailing winds.
- E. After grading, seeding, and rolling of planted areas, adjust sprinkler heads flush with finished grade. Make adjustments by providing new nipples of proper length or by use of heads having an approved device, integral with head, which will permit adjustment in height of head without changing piping.

3.8 STERILIZATION

Sterilize sprinkler system fed from a potable water system upstream of backflow preventer in accordance with AWWA C651. Sterilize new waterlines for a minimum of 24-hours, to meet ASPC, health test requirements before placing in service. Minimum retention period shall be 3 hours.

3.9 CLEANING

- A. Keep site clean of materials and debris.
- B. Keep pavements broom clean and work area in orderly condition, daily.
- C. Restore all ground surfaces to original condition upon completion of Work.
- D. Remove all excess irrigation material and equipment, waste and debris from the site.
- E. Leave stockpile area and site clean and raked, ready to receive landscaping.
- F. Leave pavements broom clean and work area in orderly condition.

3.10 DEMONSTRATION

Demonstrate operation and adjustment of system to Owner and Engineer/Architect.

3.11 PROTECTION

- A. Protect installed irrigation equipment and accessories from damage until Final Acceptance.
- B. Protect trees, shrubs, groundcovers, lawns, structures and features installed or remaining as part of the Work from damage.
- C. Replace or provide replacement cost of property damaged during system installation. Repair and replacement includes plant materials at no additional charge to Owner.

END OF SECTION 02810

**SECTION 02920
LAWNS AND GRASSES**

PART 1 GENERAL

1.1 SUMMARY

Fine grade all areas not covered by buildings or structure, paving or planting areas or otherwise designated. Furnish and install seeding, sprigging, soil supplements, and accessories as specified. Accomplish maintenance and turf establishment as specified. In the event construction prevents planting of the Bermuda grass turf areas during the specified seeding season, apply an approved temporary erosion control method to stabilize soil until Bermuda grass is established in specified seeding season.

Section Includes:

Preparation of topsoil.
Placing topsoil, soil amendments, mulch, and fertilizer.
Sprig, Turfgrass SOD, Hydroseeding and Hydromulching.
Maintenance.

Related Sections:

Section 02200 – Earth Work
Section 02810 – Irrigation System

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AGRICULTURAL MARKETING SERVICE (AMS)

AMS-01 Federal Seed Act Regulations Part 201

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602 Agricultural Liming Materials
ASTM D2944 Standard Test Method of Sampling Processed Peat Materials
ASTM D2973 Standard Test Method for Total Nitrogen in Peat Materials
ASTM D2974 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
ASTM D2976 Standard Test Method for pH of Peat Materials
ASTM D2977 Standard Test Method for Particle Size Range of Peat Materials for Horticultural Purposes
ASTM D2978 Standard Test Method for Volume of Processed Peat Materials
ASTM D2980 Standard Test Method for Volume Weights, Water-Holding Capacity, and Air Capacity of Water-Saturated Peat Materials
ASTM D4427 Standard Classification of Peat Samples by Laboratory Testing
ASTM D 4972 Standard Test Method for pH of Soils

ASTM D 5268 Standard Specification for Topsoil Used for Landscaping Purposes

ASTM D5883 Standard Guide for Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

FEDERAL SPECIFICATIONS (FS) GENERAL SERVICES ADMINISTRATION, Federal Supply Service Bureau, 470 L'Enfant Plaza, S.W. Washington, DC 20407

FS O-F-241 Fertilizers, Mixed, Commercial.

FS JJJ-S-181 Seeds, Agricultural

STAFF OF THE L.H. BAILEY HORTORIUM, CORNELL UNIVERSITY

HORTUS THIRD A Concise Dictionary of Plants Cultivated in the United States and Canada - Reference of botanical plant names.

1.3 DEFINITIONS

Noxious Weeds: Bentgrass (*Agrostis spp.*), Bindweed (*Convolvulus spp.*), Bromegrass (*Bromus spp.*), Dodder (*Cuscuta sp.*), Ground Ivy (*Glechoma hederacea*), Johnson Grass (*Sorghum halepense*), Leafy spurge (*Euphorbia esula*), Nimblewill (*Muhlenbergia shreberi*), Nutgrass or nutsedge (*Cyperus spp.*), Perennial Sorrel (*Oxalis spp.*), Perrenial Sowthistle (*Sonchus arvensis*), Poison Ivy (*Toxicodendren Radicans*), Russian Knapweed (*Centaurea picris*), Quackgrass (*Agropyron repens*), Thistle (*Cirsium spp.*), Whitetop (*Lepidium draba*, *Lepidium repens*, *Hymenos-physa pubescens*), and Wild Garlic (*Allium vineale*).

Weeds: Annual Bluegrass (*Poa annua*), Tall fescue (*Festuca eliator*), Barnyardgrass (*Echinochloa crus-galli*), Blackberry (*Rubus spp.*), Burclover (*Medicago hispida*), Crabgrass (*Digitaria spp.*), Chickweed (*Stellaria media*), Chess (*Bromus spp.*), Dallisgrass (*Paspalum dilatatum*), Dandelion (*Taraxacum officinale*), Dock (*Rumex spp.*), English Daisy, (*Bellis perrene*), Foxtail (*Alopecus spp.*), Henbit (*Lamium amplexicaule*), Horsetail (*Equisetum arvense*), Jimsonweed (*Datura stramonium*), Knotweed (*Polygonum aviculare*), Lambsquarter (*Chenopodium album*), Mallow or Cheesweed (*Malva spp.*), Morning Glory (*Cusutata spp.*), Mustard (*Sisymbrium spp.*), Plantain (*Plantago spp.*), Poison Oak (*Toxicodendren toxicarium*), Purslane (*Portulaca oleracacea*), Ragwort (*Senecio spp.*), Rush grass (*Juncus spp.*), Spotted spurge (*Euphorbia maculata*), Veronica or Speedwell (*Veronica filiformis*), and Wild Onion (*Allium canadense*).

1.4 SUBMITTALS

A. Product Data: Manufacturer's literature, including physical characteristics, application and installation instructions.

1. Equipment: Hydroseeder and Hydromulcher.
2. Fertilizer.

- B. Shop Drawings: Tagged plant locations.
- C. Samples
 - 1. Edging: 1 ft (300 mm) sample of edging including stake and staking bracket
 - 2. Topsoil: Samples taken from several locations at the source.
 - 3. Submit minimum 10oz (280 g) sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
 - 4. Testing is not required if recent tests are available for imported topsoil.
 - a. Submit these test results to the Landscape Architect for approval.
 - 5. Soil Amendments: 5 lbs (2.26 kg) sample of each type.
 - 6. Temporary Seeding: 5 lbs (2.26 kg) sample of annual seed species and application rate
 - 7. One pound sample of mulch;
 - 8. 5 lbs (2.26 kg) sample of fertilizer.
- D. Quality Control/Assurance Submittals:
 - 1. Test Reports
 - a. Results of soil analysis for existing and imported topsoils with recommended soil amendments. Provide analysis of topsoil fill under provisions of Section 01400.
 - 1) Analyze to ascertain textural class, particle size, percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.
 - b. Seed. Classification, botanical name, common name, percent pure seed, minimum percent germination and hard seed, maximum percent weed seed content, and date tested.
 - c. Package standard products with manufacturer's certified analysis.

- d. Fertilizer: For chemical analysis, composition percent.
 - e. For other material provide analysis by a recognized laboratory, made in accordance with methods established by the association of official Agricultural Chemists..
2. Certificates: Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements.
- a. Submit shipping tags to Landscape Architect upon delivery of materials.
 - b. Department of Agriculture certificates from the state or point of origin (or purchase) declaring that the material is alive, in good health and free from insects and disease.
 - c. Arkansas Code §2-16-210 Plant Board Inspection and Certificate for Plant Materials and Products. Inspection certificates complying with all local, and federal regulations.
3. Sprigs: Cultivar name, genetic purity and field location.
4. Topsoil: article size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.
5. pH Adjuster. Calcium carbonate equivalent and sieve analysis.
6. Fertilizer: Chemical analysis and composition percent.
7. Agricultural Limestone: For calcium carbonate equivalent and sieve analysis.
8. Peat: For compliance with ASTM D2980 AND D4427.
- E. Qualification Statements
1. Turfgrass Grower supplier:
Submit evidence of experience.
 2. Landscape Contractor:
Submit evidence of experience.
- F. Delivery Schedule
- Delivery schedule, at least 14 days prior to the intended date of the first delivery.

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. Sprig Producer: Company specializing in turfgrass sprig propagation with five years documented experience.
 - 2. Seed Producer: Company specializing in turfgrass seed propagation with five years documented experience.
 - 3. Installer: Company specializing in turfgrass and plant installation with five years documented experience.
- B. Provide seed mixture in containers showing percentage of seed mix, origin of seed, year of production, percent germination, net weight, testing date, date of packaging, and location of packaging.
- C. Regulatory Requirements

Comply with regulatory agencies for fertilizer and herbicide composition.
- D. State Regulatory Requirements - Comply with Arkansas Code Annotated (ACA)
 - 1. §2-16-210 Plant Board Inspection and Certification
 - 2. §2-16-401 Pesticide and Pesticide Disposal
 - 3. §2-21-101 Nursery Fraud and License
 - 4. §17-25-101 Contractor Licensing
 - 5. §20-20-201 Pesticide Application License
- E. Inspections, Permits, And Fees
 - 1. Contractor
 - a. Obtain and pay for all required permits, and inspections in connection with this work under the Contract.
 - b. Deliver to the Owner a copy of each certificate of approval from each inspection agency.
 - c. Pay for required testing.

- d. Pay any and all fees in connection to all utilities and pay all utilities bills during construction.
 - e. Bear all costs of correcting deficiencies of any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, and utility company regulations.
2. Testing Facilities
- a. An approved commercial testing laboratory; or
 - b. Facilities furnished by the Contractor.
 - c. DO NOT perform any work requiring testing until the facilities have been inspected and approved by the Landscape Architect.
 - d. The first inspection of the testing facility is at the expense of the Owner.
 - e. Required subsequent inspection because of first inspection failure is the expense Contractor at no additional cost to the Owner.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling, and Unloading:
- 1. Deliver, store, protect, and handle products to site under provisions of Section 01600.
 - 2. Provide delivery schedule at least 10 days prior to delivery.
 - 3. Protect sprigs during shipping, handling and delivery to prevent desiccation, internal heat buildup, or contamination.
 - a. DO NOT damage sprigs during packing, handling and unloading.
 - b. DO NOT drop or dump materials from vehicles.
 - 4. Deliver grass seed mixture in the original, unopened containers. Seed in damaged packages is unacceptable.
 - 5. Deliver fertilizer in the original, unopened waterproof bags showing weight, chemical analysis, and name of manufacturer. Fertilizer in damaged packages is unacceptable.

6. Deliver soil amendments in the original, unopened containers bearing the manufacturer's chemical analysis. Soil amendments in damaged packages is unacceptable.
7. Soil amendments may be furnished in bulk.
8. Provide a chemical analysis for bulk deliveries.

B. Acceptance at Site

1. Inspect sprigs for:
 - a. conformity to cultivar and genetic purity;
 - b. attached roots with 2 to 3 nodes;
 - c. 4 to 6 in (100 to 150 mm) in length, with no adhering soil, weed stems, or roots.
 - d. Reject sprigs exposed to excessive heat or drying.
2. Inspect seed for:
 - a. conformity to cultivar and quality.
 - b. Conform to FS JJJ-S-181.
 - c. Weed seed less than 1 percent by weight of the total mixture.
 - d. Maximum 1 percent by weight other crop and/or inert seeds.
 - e. Restricted noxious weeds not to exceed 90 per pound.
 - f. Free of prohibited noxious weeds.
3. Reject wet, moldy, or damaged seed .
4. Reject seed that is wet, moldy, or bears a test date 5 months or older,
5. Reject sprigs harvested over 24 hours prior to planting.
6. Reject seed held in the slurry for more than 24 hours prior to hydroseeding.

7. Inspect other materials compliance.
 - a. Reject
 - 1) open soil amendment containers or wet soil amendments;
 - 2) topsoil containing slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 in (40 mm) diameter
 - 3) topsoil containing viable plants and plant parts.
 - 4) topsoil containing toxic substances, or other materials harmful to plant growth.
8. Remove unacceptable materials from the job site.

C. Storage and Protection

1. Store materials in areas designated by the Landscape Architect.
2. Sprigs (N/A):
 - a. Store in designated areas and cover with moist burlap, straw, or other covering.
 - b. Use covering that allows air circulation to prevent internal heat build-up.
 - c. Protect from exposure to wind, and direct sunlight until installed.
3. Store seed, lime, and fertilizer in cool, dry [designated] locations away from contaminants.
4. Store chemical treatment material according to manufacturer's instructions separate from plant material or other materials.

1.4 PROJECT/SITE CONDITIONS

Existing Conditions: For existing topsoil condition see the soil report. Contractor shall contact the local agricultural extension office and submit soil sample to determine if any amendment to the existing top soil is required. Submit the Test results to the Project Engineer.

1.5 SCHEDULING

- A. Coordinate the work of this Section with installation of underground sprinkler system piping and watering heads, installation of exterior plants and installation of site furnishing to prevent damage to plants and planting areas.
- B. Coordinate with the installation of other site work by other contractors.
- C. Planting Coordination: Plant trees, shrubs, groundcovers and vines after final grades are established and before planting of turf unless otherwise approved by the Landscape Architect. If planting of trees and shrubs occurs after turf installation, protect the lawn areas, and promptly repair damage which occurs.

1.6 WARRANTY

- A. Provide one year replacement warranty including one continuous growing season under provisions of Section 01700 including coverage of lawns or grass areas for death or unhealthy conditions. All turfgrass shall be uniform in color and care coverage, leaf texture and shoot density, reasonably free of weeds, diseases and other visible imperfections at acceptance.
- B. Replacements: Lawn or grass area of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

1.7 MAINTENANCE

Maintain installed lawn immediately after placement until grass is well established and exhibits a vigorous growing condition for two cuttings.

PART 2 PRODUCTS

2.1 GROWERS AND SEED PRODUCERS

- A. Advanta Seeds Pacific. Inc., 33725 Columbus Street, Albany, Oregon 97321-0452, (800) 266-7333
- B. Barenbrug USA, 33477 Highway 99E, Tangent, Oregon 97389 (541) 926-5801
- C. Ernst Conservation Seeds, 9006 Mercer Pike, Meadville, Pennsylvania 16335, (800) 873-3321
- D. Georgia Coastal Plains Experimental Station, Tiffin, Ga.
- E. Lofts Incorporated, Bound Brook, New jersey 08805 (800) 526-3890

- F. Lofts Affiliate, Sunbelt Seeds, Incorporated, 5172 Indian Trail, Industrial Parkway, Suite A, Norcross, Georgia 30093, (404) 448-9932
- G. Kansas Agricultural Experiment Station, Manhattan, Ks.
- H. Pennington Seed Company, P.O. Box 290, Madison, Georgia 30650, (800) 285-7333
- I. Sunmark Seeds International, 503 NW Irving Street #200a, Portland, Oregon 97209 (503) 241-7333
- J. The Scotts Company, 41 South High Street. Suite 3500, Columbus, Ohio 43215, (614) 719-5500, <http://www.scottscompany.com>.
- K. Quail Valley Farm, Inc.. Little Rock, Arkansas.
- L. Winrock Grass Farm, Inc.. Little Rock, Arkansas.
- M. Substitutions: Under provisions of Section 01600.

2.2 **SPRIGS (N/A)**

- A. 100 percent healthy living stems, stolons or rhizomes of *Cynodon dactylon* 'Tifway T-419' (Tifway Hybrid Bermuda grass) with attached roots from 4 to 6 inches (100 to 150 mm) long and 2 to 3 nodes.
- B. Sprig species comply with HORTUS THIRD.
- C. Grown under climatic conditions similar to those in the locality of the project.
- D. Without adhering soil, weed stems, or roots.
- E. Obtained from heavy and dense sod, and free from material detrimental to a healthy stand of grass plants.
- F. Protected from excessive heat or drying.

2.3 **SEED**

- A. Provide state-certified seed of the latest season's crop in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material.
- B. Labels shall conform to AMS-01 and applicable state seed laws.

- C. Hydroseeding Mix: Bermuda Triangle Mix or approved equal.
 - 1. *Cynodon dactylon* (Bermuda Grass 'Mohawk'): 33 percent;
 - 2. *Cynodon dactylon* (Bermuda Grass 'Sultan'): 33 percent;
 - 3. *Cynodon dactylon* (Bermuda Grass 'Sydney'): 33 percent.
- D. Temporary Seed Species:
 - 1. *Lolium multiflorum* (Annual Rye Grass): 100 percent.

2.4 SOD/TURFGRASS

1. *Turfgrass Sod Composition*: Turfgrass sod shall consist of a dense, well rooted growth of permanent and desirable grasses, indigenous to the locality it is being

placed, that is practically free from weeds or undesirable grasses. When cutting the sod, the grass should be approximately 2 inches long.

2. *Turfgrass Sod Quality*: Turfgrass sod shall be of good quality, free of weeds, disease and insects and of good color and density.

3. *Thickness of Cut*: Turf shall be machine-cut at a minimum uniform soil thickness necessary for plant viability during the Harvest-Transport-Installation cycle (at least $\frac{3}{4}$ " thick or more, depending on the nature of the sod, so that practically all of the dense root system is retained, but exposed, in the sod strip and so that handling the sod causes no undue tearing or breaking).

4. *Pad Size*: Individual pieces of turfgrass sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5 percent.

5. *Strength of Turfgrass Sod Sections*: Standard size sections of turfgrass sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10 percent of the section.

6. *Replacement*: The policy for replacement of turfgrass sod is dependent upon each individual farm. Most replacements extend only to the cost of the turfgrass sod involved, not labor or transportation expenses. Notification of defective turfgrass sod must be made within 24 hours of delivery. Failure to notify the turf farm within the specified time period can result in the farm's refusal to replace the turfgrass sod.

2.5 SUBSTITUTIONS

Substitutions are not be allowed without written request and approval of Landscape Architect.

2.6 SOIL MATERIALS

- A. Topsoil: Excavated from site and free of weeds.
- B. Imported Topsoil: Imported, ASTM D 4972 and D 5268, fertile, friable, clean, rich, dark, surface, agricultural soil (loamy sand, sandy loam, clay loam or sandy clay loam), approved by the Landscape Architect, capable of sustaining vigorous plant growth; secured from a well drained arable site with minimum topsoil depth of 4 in (10 cm); containing a minimum 4% and a maximum of 25% of decayed organic matter (humus); reasonably free of subsoil, clay, stones, earth clods or impurities, plants, weeds, sticks, roots, or toxic substances or any other material harmful to plant growth. Minimum pH 5.4 and maximum 7.0. Maximum soluble salts 600 ppm (or 4 mmhos). Mix and test random samples of the topsoil as a composite in accordance with standard practices. Process the testing through the County Extension Office or approved independent laboratory. Provide test results to the Landscape Architect. Determine amendments required from the test results. Contractor will pay for sampling and testing. If needed, amend topsoil to adjust Ph.
 - 1. River sand is NOT acceptable.
 - 2. DO NOT obtain from bogs, marshes or steep clayey slopes.
 - 3. DO NOT strip, collect or deposit topsoil while soil is wet.
 - 4. DO NOT deliver topsoil in a frozen or muddy condition.

2.7 SOIL AMENDMENTS

pH adjusters, fertilizer, organic material, and soil conditioners meeting the following requirements.

- A. DO NOT use vermiculite.
- B. pH Adjuster: an agricultural liming material in accordance with ASTM C 602 (i.e. burnt lime, hydrated lime, ground limestone, or shells. The pH adjuster shall be used to create a favorable soil pH for the plant material specified.
 - 1. Ground Limestone: ground agricultural limestone.
 - a. Minimum calcium carbonate equivalent of 90 percent.

- b. Minimum 90 percent passing a #10 (2 mm) sieve.
 - c. Minimum 50 percent passing a #60 (0.250 mm) sieve.
- 2. Hydrated Lime:
 - a. Minimum calcium carbonate equivalent of 110 percent.
 - b. Minimum 100 percent passing a #8 sieve (2.36 mm).
 - c. Minimum 97 percent passing a #60 sieve (0.250 mm).
- 3. Burnt Lime
 - a. Minimum calcium carbonate equivalent of 140 percent.
 - b. Minimum 95 percent passing a #8 sieve (2.36 mm).
 - c. Minimum 35 percent passing a #60 sieve (0.250 mm).
- 4. Soil sulphur (Flowers of sulphur):
 - a. Minimum 90 percent passing a #10 (2 mm) sieve.
 - b. Minimum 50 percent passing a #60 (0.250 mm) sieve.
- 5. Aluminum sulfate:
 - a. Minimum 90 percent passing a #10 (2 mm) sieve.
 - b. Minimum 50 percent passing a #60 (0.250 mm) sieve.
- 6. Ferrous sulphate:
 - a. Minimum 90 percent passing a #10 (2 mm) sieve.
 - b. Minimum 50 percent passing a #60 (0.250 mm) sieve.
- C. Fertilizer: FS O-F-241, Type I Grade A controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylene diurea (IBDU)] recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil as indicated in analysis.
- D. Greensand: a potash-based exchange mineral, commercially packaged and free flowing.
 - 1. Minimum 7 percent total potash.
 - 2. Minimum 1 percent phosphorous.
 - 3. Minimum 22 percent trace minerals.

- E. Rock Phosphate
 - 1. Contain a minimum of 18-30 percent phosphorous.
 - 2. Minimum of 3 percent initial availability.
 - 3. Commercially packaged and free flowing.

- F. Organic Material: peat, bonemeal, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.
 - 1. Peat: A natural, granulated, or shredded commercial Sphagnum Peat Moss or Peat Humus derived from a bog, swampland or marsh, containing not more than fifteen (15) percent decomposed organic matter

by weight, low in content of woody material, free of materials harmful to plant life; with a pH of from 4 to 6, a moisture content of not over 30% and a moisture absorbing capacity from 1100% to 2000%.
 - 2. Bonemeal: finely ground, steamed bone product, containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.
 - 3. Rotted Manure: unleached horse, chicken, or cattle manure, heat treated to kill weed seeds, containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials, free of stones, sticks, soil, and toxic substances harmful to plants.
 - 4. Compost: Commercially produced stable humus mixture of well aerobically decomposed, stable, weed free organic matter source derived from food, agricultural, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste free of objectionable odors and toxic substances harmful to plants
 - a. cleaned of all plastic materials;
 - b. composted for a minimum of five weeks;
 - c. one to three percent nitrogen, phosphorus, and potassium;
 - d. pH 5.5 to 8.0;
 - e. 35 - 55% moisture content by weight;
 - f. maximum one percent man-made material;
 - g. no glass or metal shards;
 - h. Screened
 - 1. 100% passing a 3/8 in (10 mm) screen
 - 2. Minimum 95% by weight less than 1/4 inch (6 mm) diameter.

3. maximum 5% greater than 1/4 inch (6 mm) diameter.
 4. maximum 65% greater than 3/64 inch (1 mm) diameter.
 5. minimum 35% less than 3/64 inch (1 mm) diameter.
- i. fecal coliform populations less than 1,000 MPN/ gm total solids dryweight;
 - j. salmonella species populations 3 MPN/gm total solids dryweight.
5. Worm Castings: commercially packaged, screened from worms and food source.
- G. Soil Conditioner: sand, calcined clay, or gypsum for use singly or in combination to meet the requirements for topsoil.
1. Sand
 - a. Sand shall be clean and free of toxic materials.
 - b. Gradation: A minimum 95 percent by weight shall pass a 2 mm No. 10 sieve and a minimum 10 percent by weight shall pass a 1.18 mm No. 16 sieve.
 - c. Greensand shall be balanced with the inclusion of trace minerals and nutrients.
 2. Calcined Clay
 - a. Calcined clay shall be granular particles produced from montmorillonite clay calcined to minimum temperature of 650 degrees C. 1200 degrees F.
 - b. Gradation: A minimum 90 percent passing 2.36 mm No. 8 sieve; a minimum 99 percent shall be retained on a 0.250 mm No. 60 sieve; and a maximum 2 percent shall pass a 0.150 mm No. 100 sieve.
 - c. Bulk density: A maximum 640 kilogram per cubic meter 40 pounds per cubic foot.
 3. Gypsum: commercially packaged, free flowing, and a minimum 95 percent calcium sulfate by volume.
 4. Expanded Shale, Clay, or Slate (ESCS): ASTM D5883.

2.7 MULCH

Free from weeds, mold, and other deleterious materials and native to the region.

A. Wood Cellulose Fiber Hydro-Mulch:

1. Conwed Hydro-Mulch 2000 or Silva Fiber Plus or approved equal;
2. Does not contain any growth or germination-inhibiting factors.
3. Dyed an appropriate color to facilitate visual metering during application with integral tactifier.
4. Composition on air-dry weight basis:
 - a. 9 to 15 percent moisture.
 - b. pH range from 4.5 to 6.0

2.8 WATER

Clean, fresh, and free of substances or material which could inhibit vigorous growth of grass.

2.9 HERBICIDE

Systemic: Glyphosate (Roundup® or Kleenup®)

2.10 ACCESSORIES

A. Stakes: Softwood lumber, chisel pointed.

B. String: Organic fiber.

C. Edging

D. MANUFACTURERS

1. Collier Metal Specialties Incorporated, 3333 Miller Park South, Garland Texas 75042, (800) 829-8225, <http://www.colmet.com>.
2. Joseph T. Ryerson and Son Incorporated, P.O. Box 8000, Chicago, Illinois 60680, (773) 762-2121].

3. ProSteel, 5121 Kaltenbrun Road, Fort Worth, Texas 76119, (800) 542-4518, <http://www.prosteel.com>.
 - a. Substitutions: Under provisions of Section 01600.
4. 3/16 inch x 5 inch (5 mm x 13 cm) galvanized steel edging band.
5. Pre-formed stake straps, stakes and end stakes.
6. Rust resistant painted or powder coat finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site verification of Conditions:
 1. Prior to the commencement of hydroseeding and sprigging operation, verify finished grades, and topsoil placement, finish grading, and compaction requirements are complete.
 2. Verify subsoil is not frozen, muddy, excessively wet or in conditions detrimental to grading or turfgrass installation.
 3. Verify sufficient time has elapsed to ensure dissipation of all toxic materials (chemicals, herbicides, pesticides, etc.) from the subsoil and topsoil.
 - a. Contractor is responsible for any loss or damage to turfgrass arising from improper use of chemicals or due to failure to allow sufficient time to permit dissipation of toxic residues.
 4. Verify that prepared soil base is ready to receive the work of this Section.
 5. Beginning of installation means acceptance of existing site conditions.

3.2 PREPARATION

- A. Protection: Protect areas with prepared surfaces from compaction and damage by vehicular or pedestrian traffic and surface erosion.
- B. Preparation of Subsoil and Sprig, Seed Planting Bed:
 1. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.

2. Remove foreign materials, weeds, and undesirable plants and their roots. Remove contaminated subsoil.
3. Eliminate all existing vegetation from seedbed by herbicide.
 - a. Spray seedbed with glyphosate herbicide following manufacturer's instructions.
 - b. Maintain seedbed bare and moist for three weeks.
 - c. Spray seedbed with second herbicide application.
 - d. Maintain seedbed bare and moist for one week following second herbicide application.
 - e. DO NOT apply seed or sprigs for at least one week after last herbicide application to allow herbicide to completely breakdown.
 - f. Scarify subsoil to a depth of 3 inch (75 mm) where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

C. Surface Preparation:

1. Clear the turfgrass planting bed to a depth of 4 inch (10 cm) of all roots, brush, wire, grade stakes, surface trash or other objects that would hinder installation or maintenance of turfgrass and other plantings.
2. Remove debris and stones over 5/8 inch (16 mm).
3. Set the prepared surface a maximum of 1 inch (25 mm) below the adjoining grade of any surfaced area.
4. Blend new surfaces to existing areas.
5. Roll prepared surface and complete by a light raking to remove debris.

3.3 SITE PREPARATION

A. Application of Soil Amendments

1. pH Adjustment:
 - a. Apply pH adjustment, fertilizer and soil conditioning at the rate recommended by the soil test.

- b. Incorporate pH adjustment, fertilizer and soil conditioning into the soil to 6 inch (15 cm) depth as part of the tillage operation.

B. Tillage

1. Till level soil and slopes less than 33 percent (gentler than 3:1) to a minimum depth of 6 inches (150 mm). Till soil on slopes less than 33 percent (gentler than 3:1) to a minimum depth of 6 inches (150 mm). Till soil on slopes between 33 percent to 100 percent (between 3:1 and 1:1) to a minimum depth of 2 inches (50 mm) by scarifying with heavy rakes, or other method. No tilling is required on slopes 100% (1:1) and steeper, scarify with rake.
2. Use mechanical and powered tillers where soil conditions and length of slope permit.
3. Maintain drainage patterns indicated on drawings.
4. Completely pulverize areas compacted by construction by tilling.
5. Repair surface erosion or grade deficiencies with topsoil.
6. The pH adjustment, fertilizer and soil conditioner may be applied during tilling.

C. Placing Topsoil

1. Scarify areas to receive topsoil to a depth of 3 inches (76 mm) to bond topsoil with subsoil.
2. Spread topsoil to a minimum depth of 4 inches (10 cm) over area to be seeded. Rake until smooth.
3. Place topsoil during dry weather and on dry unfrozen subgrade.
4. Remove vegetable matter, debris and stones larger than 5/8 inch (16 mm) in any dimension, and foreign non-organic material from topsoil while spreading.
5. Grade topsoil to eliminate rough, low, or soft areas, and to ensure positive drainage.
6. Install edging at periphery of lawn areas in as indicated on drawings to consistent depth.

3.4 INSTALLATION

- A. Prior to installing sod, seed and sprigs, repair any previously prepared surface compacted or damaged.

- B. SODDING
 - 1. *Moistening the Soil:* After all grading has been completed, the soil shall be irrigated within 12 to 24 hours prior to laying the turfgrass sod. Turfgrass sod should not be laid on soil that is dry and powdery.

 - 2. *Starter Strip:* The first row of turfgrass sod shall be laid in a straight line, with subsequent rows placed parallel to, and tightly against, each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the turf is not stretched or overlapped, and that all joints are butted tight in order to prevent voids, which would cause air-drying of the roots.

 - 3. *Sloping Surfaces:* On sloping area where erosion may be a problem, turfgrass sod shall be laid with staggered joints and secured by pegging.

 - 4. *Watering:* The contractor shall be responsible for watering turfgrass sod immediately during and after installation to prevent drying. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new turfgrass sod pad and soil immediately below the turfgrass sod are thoroughly wet (usually 1 inch of water is needed). The general contractor shall be responsible for having adequate water available at the site prior to and during installation of the turfgrass sod.

 - 5. Maintenance of installed turfgrass sod: Unless stated otherwise, the contractor shall furnish all labor material and equipment required to complete the work described herein in strict accordance with the drawings and/or terms of the contract. The general contractor shall supply adequate water to the site.

TIME LIMITATION: Duration of maintenance responsibilities by landscape contractor shall be for 30 days or until otherwise specified in writing by the owner, architect, or general contractor.

C. WATERING:

1. *First Week*: The landscape contractor shall provide all labor and arrange for all watering necessary for establishment of the turfgrass sod. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least 4 inches. Watering should also be done during the heat of the day to help prevent wilting.

2. *Second and Subsequent Weeks*: The landscape contractor shall water the turfgrass sod as required to maintain adequate moisture in the upper 4 inches of soil. Avoid application of too much water. Turfgrass sod should not be continually saturated. Depending on the sprinkler, as little as 20 to 30 minutes of water application may be sufficient; other sprinklers may require longer water application times.

D. MOWING: For bluegrass or bluegrass/fescue turfgrass sod, turfgrass height shall be maintained between 1 1/2 and 2 1/2 inches unless otherwise specified. Not more than 1/3 of the grass leaf shall be removed by the initial cutting or subsequent cuttings. For bentgrass sod, initial turfgrass height shall be maintained as specified by the grower or installer. Not more than 1/3 of the grass leaf shall be removed by the initial cutting or subsequent cuttings. Height of bentgrass turf may be gradually reduced to the desired cutting height by weekly or more frequent lowering of the mower setting as specified by the grower or installer.

E. DISCLAIMER: The landscape contractor shall not be held liable for damages to turfgrass sod caused by de-icing compounds, fertilizers, pesticides, herbicides and other materials not applied by him or her or under his or her supervision nor those caused by acts of God or vandalism.

F. GUARANTEE: The landscape contractor shall guarantee work covered by this specification.

G. Sprigging (N/A)

1. Sprig areas as indicated.

2. Sprigging Seasons:

a. Install Bermuda grass sprigs from April 15 to June 15 for spring establishment; from June 15 to August 1 for summer establishment.

b. Sprigging Conditions

- c. Perform sprigging only during periods when beneficial results can be obtained.
 - d. Stop sprigging when drought, excessive moisture, or other unsatisfactory conditions prevail.
 - e. Submit proposed alternate for approval, when special conditions warrant a variance to the sprigging season or operations.
3. Use broadcast, hydrosprigging or row sprigging method and ensure even coverage.
4. Broadcast Sprigging:
 - a. Broadcast sprigs uniformly with mechanical equipment or other approved method.
 - b. Plant sprigs to provide a minimum 50 viable sprigs/square yard (60 viable sprigs/sq m).
 - c. Space sprigs a maximum 6 inches (300 mm) apart.
 - d. Force sprigs into the soil a minimum 1 inch (25 mm) depth by disk-rolling, pressing with steel matting, or other approved method.
5. Hydrosprigging:
 - a. Mix sprigs with water and hydromulch and uniformly apply under pressure over the entire area to provide a minimum 50 viable sprigs/square yard (60 viable sprigs/sq m).
 - b. Cover sprigs by distributing a topdressing of topsoil uniformly and evenly to a minimum 1 inch (25 mm) depth.
6. Mechanical Sprigging:
 - a. Plant sprigs in rows spaced a maximum 12 inches (300 mm) apart and to a minimum 1 inch (25 mm) depth, with mechanical sprig planter or other methods to provide a minimum 50 viable sprigs/square yard (60 viable sprigs/sq m).
 - b. Place sprigs in the rows a maximum 6 inches (150 mm) apart.

H. Mulching

1. Wood Cellulose Fiber:
 - a. Apply wood cellulose fiber mulch as part of the hydrosprigging and hydroseeding operation.
 - b. Apply and mix mulch in accordance with the manufacturer's recommendations.

I. Hydroseeding

1. Hydroseed areas as indicated.
2. Hydroseeding Seasons:
 - a. Hydroseed Bermuda grass from April 15 to June 15 for spring establishment; from June 15 to August 15 for summer establishment.
3. Hydroseeding Conditions:
 - a. Perform Hydroseeding only during periods when beneficial results can be obtained.
 - b. Stop Hydroseeding when drought, excessive moisture, or other unsatisfactory conditions prevail.
 - c. Submit proposed alternate for approval, when special conditions warrant a variance to the sprigging season or operations.
4. Apply mulch/seed slurry to slopes of 33% (3:1) or less at a rate of 1500 lbs/acre (1700 kg/ha) evenly in two intersecting directions, with a hydraulic seeder.
5. Apply mulch/seed slurry to slopes exceeding 33% (3:1) at a rate of 2000 lbs/acre (2,300 kg/ha) evenly in two intersecting directions, with a hydraulic seeder.
6. Maintain clear of shrubs and trees.
7. Apply water with a fine spray immediately after each area has been hydroseeded. Saturate to 4 inches (10 cm) of soil.

J. Hydromulching

1. Apply mulch slurry to slopes of 33% (3:1) or less at a rate of 1500 lbs/acre (1700 kg/ha) evenly in two intersecting directions, with a hydraulic seeder.
2. Apply mulch slurry to slopes exceeding 33% (3:1) at a rate of 2000 lbs /acre (2,300 kg/ha) evenly in two intersecting directions, with a hydraulic seeder.
3. Mix hydromulch for a minimum of 8-15 minutes before application to activate tackifier.
4. Immediately following broadcast or mechanical row sprigging, apply mulch to a thickness of 1/8 inch (3 mm).
5. Maintain clear of shrubs and trees.
6. Apply water with a fine spray immediately after each area has been hydroseeded. Saturate to 4 inches (10 cm) of soil.

K. Rolling

1. Firm the sprigged area with a roller not exceeding 90 lbs/ft (130 kg/m) of roller width.
2. DO NOT roll slopes over 4:1 (25%).

L. Finishing

A minimum 25 percent of the installed sprigs shall extend above the ground surface upon completion of the sprigging operation.

M. Watering Sprigs

1. Begin watering sprigged and seeded areas immediately after completing sprigging operations for the day.
2. Apply water at a rate to moisten soil to minimum 1 inch (25 mm) depth.
3. Prevent run-off, puddling, wilting and over watering of adjacent areas or plant material.
4. DO NOT drive watering trucks over turf areas.

3.5 TEMPORARY SEEDING

- A. Apply seed at 10 lbs/1,000 square yards (2.3 kg/sq m.)
- B. Seed designated areas when directed or during delays affecting the hydroseeding or sprigging operation to provide quick cover to prevent erosion.
- C. Soil Amendments
 - 1. If temporary seeding areas have not been prepared with soil amendments, apply 1/2 of the required soil amendments and till the area.
 - 2. Water the area as required.
 - 3. Apply the remaining soil amendments when the surface is prepared for installing sprigs.

3.6 APPLICATION OF PESTICIDE

- A. Submit pesticide treatment plan, when application of a pesticide becomes necessary to remove a pest or disease, and coordinate with the installation pest management program.
- B. Technical Representative
 - 1. The certified installation pest management coordinator is the technical representative.
 - 2. Technical Representative shall be present at all meetings concerning treatment for pest or disease control and during treatment application.
- C. Application
 - 1. Use a state certified applicator to apply pesticides in accordance with EPA label restrictions and recommendations.
 - 2. Utilize protective clothing and equipment as specified on the pesticide label.
 - 3. Water for formulating shall only come from designated locations.
 - 4. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards.
 - 5. Prevent overflow during filling operation.

6. Inspect application equipment prior to each day of use for leaks, clogging, wear, or damage. Perform any repairs immediately.

3.7 REPAIR/RESTORATION

Repair existing turf areas, pavements, and facilities damaged by hydroseeding or sprigging operations to original condition at Contractor's expense.

3.8 FIELD QUALITY CONTROL

A. Site Tests, Inspection:

1. Equipment Calibration:

- a. Immediately prior to the commencement of sprigging operations, conduct calibration tests on the equipment to be used.
- b. Confirm that the equipment is operating within the manufacturer's specifications and can meet the specified criteria.
- c. Calibrate equipment a minimum of once every day during the operation.
- d. Provide the calibration test results within 1 week of testing.

2. Soil Test

- a. Test delivered topsoil, existing soil in smooth graded areas, and stockpiled topsoil in accordance with ASTM D 5268 and ASTM D 4972 to determine the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis.
- b. Samples:
 - 1) Sample soil to provide a representative sample of the soil type being tested.
 - 2) Take existing soil samples at random locations on site over the entire sprig bed.
 - 3) Take stockpiled topsoil samples at different levels in the stockpile.
- c. Use tests to determine the quantities and type of soil amendments required to meet local growing conditions for the sprig cultivar specified.

B. Quantity Check

1. Retain the empty bags for materials provided in bags to record the amount used.
2. Retain the weight certificates For materials provided in bulk, the weight shall be retained as a record of the amount used.
3. Compare amount of material used with the total area covered to determine the rate of application used.
4. Compare quantity of sprigs used against the total area sprigged.
5. Adjust differences between the quantity applied and the quantity as directed.

3.9 MAINTENANCE

A. Lawn Establishment Period:

1. The establishment period begins on the first day of work under this contract and ends three months after the last day of installation operations.
2. Submit written calendar time period for the lawn establishment period.
 - a. When there are multiple lawn establishment periods describe the boundaries of the lawn area covered for each establishment period.
 - b. Modify lawn establishment period for inclement weather, shut down periods, or for separate completion dates of areas.

B. Satisfactory Stand of Grass Plants:

1. Evaluate grass plants for cultivar and health when grass plants are a minimum 1 inch (25 mm).
2. Reject stand as unsatisfactory:
 - a. If there are less than 6 grass plants /square foot (60 grass plants/sq m).
 - 1) DO NOT count the annual grass plants when annual seed is applied over the sprigs.

- b. If there are bare spots greater than 9 inch square (230 mm square).
 - c. If the total bare spots exceed 2 percent of the total sprigged area.
- C. Maintenance During Establishment Period:
 - 1. Eradicating weeds, insects, and diseases.
 - a. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.
 - b. Remedy damage resulting from improper use of herbicides or pesticides.
 - 2. Protect embankments and ditches from surface erosion.
 - 3. Maintain erosion control materials and mulch.
 - 4. Mow, water, and fertilize to establish lawns.
- D. Mowing and Trimming:
 - 1. Baseball Field Areas:

Mow grass at regular intervals to maintain at a maximum height of 1 inch (5 cm). Do not cut more than 1/3 of grass blade at any one mowing.
 - 2. Other Turf Areas:

Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches (65 mm). Do not cut more than 1/3 of grass blade at any one mowing.
 - 3. Neatly trim edges and hand clip where necessary.
 - 4. Immediately remove clippings after mowing and trimming.
- E. Post Hydroseeding or Sprigging Fertilization:
 - 1. Apply the fertilizer as recommended by soil test.
 - 2. Provide a maximum 1 lb/1,000 square foot (8 kg/ha) of available nitrogen to the grass plants.
 - 3. Schedule the application prior to the advent of winter dormancy.

4. DO NOT burn the installed grass plants.

F. Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

G. Repair

1. Repair or reinstall unsatisfactory stand of grass plants.

2. Repair eroded areas with topsoil and reinstall sprigs.

H. Maintenance Record

Submit record of each site visit describing the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

3.10 CLEANING

A. Keep pavements broom clean and work area in orderly condition.

B. Promptly remove any soil brought on the surfacing by hauling operations.

C. Keep wheels of all vehicles clean to avoid tracking soil on the surfacing of paved areas.

D. Remove excess and waste material from the sprigged areas and dispose off site.

E. Keep pavements broom clean and work area in an orderly condition.

F. Clean and remove surplus materials, temporary structures, discarded materials and debris from work site.

G. Leave stockpile area and site clean and raked, ready to receive landscaping.

H. Leave the site in a clean, neat, orderly condition.

3.11 PROTECTION

Protect areas immediately upon completion of the sprigging or hydroseeding operation in an area against traffic or other use by erecting barricades and providing signage as required, or as directed.

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number–150302CPAG

3.12 INSPECTION AND ACCEPTANCE

Landscape Architect will, upon request, make an inspection to determine acceptance, after completion of installation, maintenance and warranty period.

END OF SECTION 02920

SECTION 03300 - CONCRETE WORK

PART 1 – GENERAL

- 1.01 SCOPE: Provide concrete work, complete, unless otherwise specified. Provide reinforcing steel& dowel bars for masonry work. Tie bars after they are in place.
- 1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:
- A. Excavation and filling, including base course and cushion fill: Section 02200.
 - B. Furnishing of structural steel base-plates, anchor bolts and other metal accessories for insertion in concrete: Section 05500.
 - C. Joint sealants: Section 07900.
- 1.03 CODES AND STANDARDS:
- A. Reference Standards and Specifications: Comply with the provisions of the following specifications and standards, except as otherwise noted or specified, or as accepted or directed by the Architect during unusual climatic conditions.
 - 1. ACI 301, "Specifications for Structural Concrete for Buildings".
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete".
 - 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
 - B. Local Codes and Ordinances: Wherever provisions of the International Building Code or the local current ordinances are more stringent than the above specifications and standards, the local codes and ordinances shall govern.
- 1.04 TESTS:
- A. For first batch of concrete placed for each type of concrete and for each 40 cubic yards of each type of concrete placed each day. Samples and tests shall be performed by independent testing laboratory. Contractor shall pay for testing.
 - B. Each time a batch of concrete is tested, Independent Lab Personnel shall make test cylinders in cylinder molds in accordance with ASTM C31 and prepare them for transporting to independent testing laboratory. One specimen shall be tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - C. Tests are not required for quantities of concrete less than six yards unless requested by Architect.

- D. Contractor may observe all testing performed by the independent testing laboratory.
- E. Any re-tests of samples due to failure to meet or exceed minimum requirements shall be paid for by the Contractor.
- F. All field samples shall be made by the testing lab personnel who are ACI Certified for samples, and samples shall be properly marked as to date, number and location taken.

1.05 SUBMITTALS:

- A. Product Data: Submit manufacturer's product data for reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, and others as required by Architect.
- B. Shop Drawings: Submit to the Architect for review prior to installation, shop drawings of all reinforcing steel, including bar cutting lists, construction of forms including jointing, reveals, location and pattern of form tie placement, and construction joint schedule with details. DO NOT reproduce Engineer's Drawings for submittals. This will be cause for rejection.
- C. Prior to placement of concrete, submit concrete mix designs proposed by the concrete supplier, for class of concrete, including recent test results substantiating the strength and quality of concrete produced by each mix.
- D. Submit weekly reports of all compression, slump, and air content tests from the testing laboratory.

1.06 ENVIRONMENTAL REQUIREMENTS:

- A. Allowable Concrete Mix Temperatures: ACI 301-89
 - 1. Cold Weather: Minimum of 55°F.
 - 2. Hot Weather: Maximum of 90°F.
- B. Do not place concrete during rain, sleet or snow, unless protection is provided.
- C. Keep accurate thermometer on job site. A slump cone and thermostat shall be on the job at all times during concrete placement.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Form Materials:

1. For Exposed Finish Concrete: Plywood, metal, or other acceptable panel-type materials, to provide continuous, straight, smooth exposed surfaces.
 2. For Unexposed Finish Concrete: Use plywood, lumber, metal, or other acceptable material. If lumber is used, it must be dressed on at least 2 edges and 2 sides for a tight fit.
- B. Form Coatings: Commercial formulation form coating compound that will not bond with, stain, nor adversely affect concrete surfaces, will not impair subsequent treatments or finishes requiring bond or adhesion, nor impede wetting of concrete surfaces by water or curing compound.
- C. Steel Reinforcement:
1. Reinforcing Bars: ASTM A 615(S1), grade 60 deformed billet steel bars of sizes as indicated on the structural drawings, free from loose rust, scale and other coatings that may reduce bond.
 2. Mesh or Fabric Reinforcement: ASTM A 185, welded wire fabric, of sizes and types as indicated on the drawings.
 3. Accessories: Include spacers, chairs, ties, and other devices necessary for properly spacing and fastening reinforcement in place. Use plastic protected reinforcing bar supports conforming with CRSI Class 1 specification for exposed finish concrete.
 4. Tie Wires: Soft annealed iron wire not smaller than 18 gage.
- D. Concrete Materials:
1. Portland Cement: ASTM C 150, Type I.
 2. Normal Weight Concrete Aggregates: ASTM C 33, and the following:
 - a. Fine Aggregate: Clean, sharp, natural or manufactured sand, free from loam, clay, lumps, or other deleterious substances
 - b. Coarse Aggregate: Clean, uncoated, processed, locally available aggregate, containing no clay, mud, loam or foreign matter; maximum size of 1-1/2 inches at foundations and 1 inch at slabs
 - c. Fly Ash: ASTM C618 - Type C. DO NOT MIX TYPES. Fly ash shall not exceed 20% of Portland cement by weight. Fly ash shall not be used in cold temperature conditions (below 60°F).

3. Mixing Water: Clean, free from oil, acid, salt, injurious amounts of vegetable matter, alkalies, and other impurities; potable
4. Admixtures:
 - a. Air Entrained Admixture: ASTM C 260, 5-1/2%, plus 1-1/2% for exterior concrete.
 - b. Waltools TruHue pre-packaged integral color pigment. See Plans for locations of integrally colored concrete and colors.
 - c. Anti-crack polypropylene fibers, dosage per manufacturer.
 - d. Do not use other admixtures unless accepted by the Architect.
- E. Miscellaneous Materials:
 1. Connectors: Provide all metal connectors required for placement in cast-in-place concrete, for the attachment of structural and non-structural members.
 2. Expansion Joint Filler: ASTM D 1751, non-extruding premolded material, 1/2 inch thick, unless otherwise noted, composed of fiberboard impregnated with asphalt.
 3. Vapor Retarder: Polyethylene film, 10 mil thick, Visqueen or approved equal.
 4. Concrete Sealer: "WR Meadows Deck-O-Grip. Two coats applied at right angles to each other.
 6. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout. Non-Metallic: Master Builders "Set Grout", Sonneborn "SonogROUT", Euclid "Euco-NS", or L & M "Crystex", W.R. Meadows Sealtight CG86 Grout or approved equal.
 7. Bonding Agent: Polyvinyl acetate, rewettable type; W.R. Grace "Daraweld C", Sonneborn "Sonocrete", Euclid "Euroweld", W.R. Meadows Sealtight Intralok, or L & M "Everbond".
 8. Epoxy Adhesive: ASTM C881, two component material, suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit project requirements.
 9. Waterstops: Waterstop RX. See structural drawings for locations.

2.02 PROPORTIONING OF MIXES:

A. Strength: Concrete minimum ultimate strength at 28 days.

1. Footings: 3,000 psi
2. Interior slab on grade:4,000 psi
3. Pedestals: 4,000 psi
4. Exterior Concrete: 4,000 psi with air entrainment

For mixes receiving air entrainment, refer to Part 2 - Products, Paragraph D, Sentence 4.

B. Mix Design:

1. Prepare design mixes for each type of concrete, in accordance with ACI 301 and ACI 318, except as otherwise specified.
2. Proportion design mixes by weight for class of concrete required, complying with ACI 211, except as otherwise specified.

C. Provide test results from the concrete supplier for proposed design mix, to establish the following:

1. Gross weight and yield per cu. yd. of trial mixtures.
2. Measured slump.
3. Measured air content.
4. Compressive strength developed at 7 days and 28 days, from 4 test cylinders cast for each 7- and 28-day test, and for each design mix.

D. Submit written reports to the Architect of each proposed design mix and for each class of concrete at least 15 calendar days prior to the start of work. Do not begin concrete production until mixes have been reviewed by the Architect.

E. Use air-entrained admixture in strict compliance with manufacturer's directions.

F. Slump Limits: Not less than three inches and not more than five inches.

2.03 BATCHING AND MIXING: Concrete may be ready-mixed or job- mixed at the Contractor's option, in accordance with the governing building code and with the

referenced ACI 318. No hand mixing allowed.

PART 3 - EXECUTION

3.01 FORM WORK:

- A. Design, erect, support, brace, and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment elevations, and position.
- B. Construct forms in accordance with ACI 347, to sizes, shapes, lines and dimensions indicated, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, chamfers, blocking, anchorages and inserts, and other features required in work. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- C. Fabricate forms for easy removal without hammering or prying against the concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
- D. Chamfer exposed corners and edges 3/4 inch unless otherwise indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
- F. Preparation of Form Surfaces: Coat the contact surfaces of forms with a form-coating compound where applicable before reinforcement is placed.
- G. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from appropriate trades. Accurately place and securely support items built into form.
- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Re-tighten forms after concrete placement, if required, to eliminate mortar leaks.

3.02 PLACING REINFORCEMENT: Comply with the Concrete Reinforcing Steel Institute (CRSI) "Recommended Practice for Placing Reinforcing Bars", and as herein specified.

- A. Clean reinforcement of loose rust, mill scale, dirt, and other materials or coatings which reduce or destroy bond with concrete.
- B. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by chairs, spacers, and hangers as required. Set wire ties so ends are pointed into concrete.
- C. In all cases, provide required minimum concrete coverage over bar reinforcement.
- D. Do not place bars more than 2 inches beyond the last leg of continuous support. Do not use bar supports to hold runways for conveying equipment.
- E. Install mesh welded wire fabric reinforcement in as long lengths as practicable, lapping pieces at least one mesh plus 2 inches but in no case less than 8 inches. Offset end laps to prevent continuous laps in either direction. Support mesh using plastic support chairs.

3.03 JOINTS AND INSERTS:

- A. Construction Joints: Provide construction joints. Locate and install construction joints so as not to impair the strength and appearance of the structure. Submit construction joint schedule and details to the Architect at least 15 days before proposed pour.
- B. Expansion Joints: Provide expansion joints. Do not permit reinforcement to extend continuously through any expansion joint unless noted or detailed otherwise.
- C. Inserts: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, concrete. Properly locate embedded items in cooperation with other trades, and secure in position before concrete is poured. Use setting drawings, diagrams, instructions, and directions provided by suppliers of the items to be attached thereto.

3.04 CONCRETE PLACEMENT: Comply with ACI 304, and as herein specified.

- A. Pre-Placement Inspection: Before placing concrete, clean and inspect formwork, reinforcing steel, and items to be embedded or cast-in. Notify other crafts in ample time to permit the installation of their work, and cooperate with them in setting such work, as required. Coordinate the installation of joint materials and vapor retarder with placement of forms and reinforcing steel.
- B. Vapor Retarder: Apply directly over fill. Lay dry with 6 inch wide dry side laps

and end laps. Lay film just before reinforcement is placed and concrete is poured, and protect against punctures. Repair punctures with adhesive applied extra sheet before proceeding.

- C. Notify the Architect 24 hours before placing any concrete.
 - D. Conveying: Convey concrete from the mixer to the place of final deposit by methods which will prevent the separation or loss of materials. Provide equipment for chuting, pumping, and pneumatically conveying concrete of proper size and design as to insure a practically continuous flow of concrete at the point of delivery and without segregation of the materials. Keep open troughs and chutes clean and free from coatings of hardened concrete. Do not allow concrete to drop freely more than 10 feet. All equipment and methods used for conveying are subject to the approval of the Architect.
 - E. Depositing: Deposit concrete continuously or in layers of such thickness that no concrete will be placed on hardened concrete so as to cause seams or planes of weakness. If a section cannot be placed continuously, provide vertical construction joints as specified. Deposit concrete near or in its final location to avoid segregation due to rehandling or flowing, and displacement of the reinforcement.
 - F. Cold Weather Placing: Comply with the requirements of ACI 306. When the air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees Fahrenheit and not more than 80 degrees at the point of placement.
 - G. Hot Weather Placing: Comply with the requirements of ACI 305.
 - H. Compaction: Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- 3.05 FIELD SAMPLING AND TESTING: The following tests will be performed by an independent testing laboratory provided. Refer to paragraph 1.04 TESTS, for responsibility for payment of tests. Samples for slump and test cylinders will be prepared by the Independent Testing Lab Personnel.
- A. Samples:
 - 1. Field samples shall be made and cured in accordance with ASTM C 31, for each concrete strength, at the rate of 4 test cylinders and one slump test for each 40 cubic yards of concrete from each day's pour.

2. Test cylinders as follows: One at 7 days, two at 28 days, and reserve the remaining for testing after a longer period as required by the Architect, if the 28 day tests do not meet the required strength. In accordance with ASTM C 173 Volumetric Method, or ASTM C231 Pressure Method, make air content check for each set of test cylinders.
3. The taking of samples from small pours of 6 cubic yards or less may be omitted at the discretion of the Architect.
4. Additionally, test slump every 25 cu. yds., recording location for report.
5. When early form removal is requested, field cured cylinders shall be tested at 7 or less days to determine sufficient strength.

B. Testing:

1. Where strength of any group of 3 cylinders or of any individual cylinder fall below minimum compressive strength specified, the Architect shall have the right to require that test specimens be cut from the structure. Specimens shall be selected by Architect from location in structure represented by test specimen or specimens which failed.
2. Specimens shall be secured, prepared, and tested in accordance with ASTM C 42, within a period of 60 days after placing concrete.
3. Concrete shall be considered to meet the strength requirement of this specification if it meets the strength requirements of paragraph 5.3.2 of ACI 318.
4. Should laboratory analysis indicate that the proper concrete mix has not been used by the Contractor, all such concrete poured using the improper mix shall be subject to rejection.
5. The cost of cutting specimens from the structure, patching the resulting holes, and making the laboratory analysis shall be borne by the Contractor.
6. The holes from which the cored samples are taken shall be packed solid with no slump concrete proportioned in accordance with the ACI 211 "Recommended Practice for Selecting Proportions of No-Slump Concrete". The patching concrete shall have the same design strength as the specified concrete.

7. If any of the specimens cut from the structure fail to meet the requirements outlined in paragraph 5.6.4 of ACI 318, the Architect shall have the right to require any and all defective concrete to be replaced, and all costs resulting there from shall be borne by the Contractor.

3.06 FINISH OF FORMED SURFACES:

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

3.07 SLAB FINISH:

- A. After striking off and consolidating concrete, smooth the surface by screeding and floating. Use a wood float. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
- B. After floating, test surface for trueness with a 10 foot straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous, smooth finish.
- C. Work edges of slabs and joints with an edging tool, and round to 1/4 inch radius, unless otherwise indicated. Eliminate any tool marks on concrete surface.
- D. Where Broom Finish Concrete is noted: After completion of floating and when excess moisture or surface sheen has disappeared, broom finish by drawing a fine hair broom across the concrete surface, perpendicular to the line of traffic. Repeat operation if required to provide a fine line texture acceptable to the Architect.

3.08 CONCRETE CURING, SEALING AND PROTECTION:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or

hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Concrete (other than high-early-strength shall be maintained above 50°F (10°C) and in a moist condition for at least the first 7 days after placement. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, or by combinations thereof, as herein specified.
 - 1. Provide moisture curing by keeping concrete surface continuously wet by covering with water, by water-fog spray, or by covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.
 - 2. Provide moisture-cover curing by covering concrete surface with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- C. Curing Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing until forms are removed. If forms are removed, continue curing by methods specified above as applicable.
- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs and other flat surfaces by application of appropriate curing and sealing compound. Final cure concrete surfaces by moisture-retaining cover, unless otherwise directed.
- E. Concrete Sealing: provide concrete sealer and hardener to interior and exterior concrete slabs as follows:

After the curing period, remove any concrete laitance and patch and fix all cracks and damaged areas. Apply sealer in accordance with manufacturer's directions. Apply only when temperatures are above 40 degrees F (4 degrees C). Avoid contact with glass, aluminum, and polished metal surfaces. If contact occurs, wash immediately with water. Apply second coat in a similar manner.

3.09 PROTECTION:

- A. No wheeling, working, or walking on finished surfaces will be allowed for 16 hours after the concrete is placed.

- B. Provide plywood or other acceptable protective cover at all traffic areas throughout the job.
 - C. Protect all exposed concrete floors, steps, and walks from paint, plaster, and other materials or equipment which may mar or damage these surfaces.
- 3.10 REMOVAL OF FORMS: Do not remove forms until the concrete has attained 67 percent of 28 day strength or a minimum of 4 days. Use a method of form removal which will not cause overstressing of the concrete.
- 3.11 MISCELLANEOUS ITEMS: Fill in holes and openings left in concrete for the passage of work by other trades after their work is in place. Mix, place, and cure concrete to blend with in-place construction. Provide all other miscellaneous concrete filling required to complete work.
- 3.12 CONCRETE SURFACE REPAIRS: Repair and patch defective areas with cement mortar of the same type and class as the original concrete, immediately after removal of forms. Cut out honeycomb, rock pockets, voids over 1/2 inch diameter, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface, before placing cement mortar in the same manner as adjacent concrete. Proprietary patching compounds may be used when acceptable to the Architect.
- 3.13 CLEAN-UP: Do not allow debris to accumulate. Clean up all concrete and cement materials, equipment and debris upon completion of any portion of the concrete work, and upon completion of concrete work.
- 3.14 TOLERANCES - CAST-IN-PLACE CONCRETE: Tolerances apply to concrete dimensions and locations only, and shall meet standard tolerances for concrete construction and materials (ACI 117-81).

Tolerances for finished slab surfaces:

Class AA Surface Finish Tolerance: Depressions in floors between high spots shall not be greater than 1/8" below a 10 ft long straightedge.

END OF SECTION

SECTION 04100

CONCRETE UNIT MASONRY

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SCOPE:

- A. Furnish labor and materials necessary to complete concrete masonry work as indicated.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS:

- A. Joint Sealants: Section 07900

1.04 QUALITY ASSURANCE:

- A. Codes and Standards: Provide material and work complying with referenced codes, regulations and standards.
- B. Manufacturer: Obtain each type of unit from one manufacturer, cured by one process, and of uniform texture and color.

1.05 SUBMITTALS:

- A. Certification: Submit certification that each type of unit complies with specified requirements.
- B. Manufacturer's Data: Submit manufacturer's technical data and installation instructions for insulation material.

1.06 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion and other causes.
- C. Store cementitious materials off ground, under cover and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained.
- E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.07 JOB CONDITIONS:

- A. Protect masonry materials during storage and construction from wetting by rain,

- snow or ground water and from soilage or intermixture with earth or other materials. Do not use metal reinforcing or ties having loose rust or other coatings, including ice, which will reduce or destroy bond.
- B. During erection, cover top of wall with heavy waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.
 - D. Prevent grout or mortar from staining the face of masonry to be left exposed or painted. Immediately remove grout or mortar in contact with masonry. Protect sills, ledges and projections from droppings of mortar.
 - E. Do not lay masonry when the temperature of outside air is below 40EF, unless means are provided to heat and maintain temperature of masonry materials and protect completed work from freezing. Protection shall consist of heating and maintaining temperature of masonry materials to at least 40EF, and maintaining an air temperature above 40EF on both sides of masonry for at least 48 hrs.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS:

- A. General:
 - 1. Comply with referenced standards and other specified requirements for each type of masonry unit required.
 - 2. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding, cap, cove, bullnose and other special conditions.
- B. Concrete Block: Provide units complying with characteristics specified below for Grade, Type, face size, exposed face, and weight classifications.
 - 1. Grade N.
 - 2. Size: Manufacturer's standard units with nominal face dimensions of 16" long X 8" high X thicknesses indicated.
 - 3. Type I, moisture-controlled units.
 - 4. Exposed Faces: Manufacturer's standard color and texture, except where otherwise indicated or specified.
 - 5. Hollow Load-bearing Block: ASTM C 90; lightweight, except use normal weight block for all work below grade.
 - 6. Curing: Cure units in a moisture-controlled atmosphere or in an autoclave at normal pressure and temperature to comply with ASTM C 90 Type I requirements.

2.02 MORTAR AND GROUT MATERIALS:

- A. Portland Cement: ASTM C150 Type I, except Type III may be used for cold weather construction.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Aggregate for Mortar: Sand, conforming to ASTM C144 or ASTM C404, Size No. 2.
- D. Aggregate for Grout: ASTM C404, Size No. 8 or Size No. 89.
- E. Water: Clean, drinkable.

2.03 MASONRY INSULATION:

- A. Fill all open cells and voids in hollow concrete masonry walls where shown on Drawings and all cells not solid grouted with pressure injected foam such as "Core-Fill 500" or equal. The foam shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells, (every 8" o.c.) beginning at an approximate height of 4 feet from finished floor level. Repeat this procedure at approximate height of 10 feet above the first horizontal row of holes until the void is filled. Ensure that no insulation gets into cells which are to be grout filled.

PART-3 - EXECUTION

3.01 EXAMINATION:

- A. Examine the areas and conditions under which masonry is to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

- A. CMU: Do not wet concrete masonry units.
- B. Cleaning Reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.

3.03 CONSTRUCTION TOLERANCES:

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines do not exceed 1/4" in any story of 20' maximum, nor 1/2" in 40' or more.
- B. Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 3/4" in 40" or more.
- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20'

maximum, nor 3/4" in 40' or more.

3.04 INSTALLATION, GENERAL:

- A. Thickness: Build composite/cavity walls to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.
- B. Build chases and recesses as indicated or required for the work of other trades. Provide not less than 8" of masonry between chases or recess and jamb openings, and between adjacent chases and recesses.
- C. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.
- D. Cut masonry units using motor-driven saws to provide clean, sharp, un-chipped edges. Cut units as required to fit adjoining work neatly. Use full-size units without cutting wherever possible.

3.05 LAYING MASONRY WALLS:

- A. Lay walls plumb and true to comply with specified tolerances, with courses level, accurately spaced and coordinated with other work.
- B. Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with grout. Lay CMU in running bond with vertical joint in each course centered on units above and below.
- C. Build-in items specified under this and other sections of this specification. Fill in solidly with masonry around built-in items. Fill space between hollow metal frames and masonry solidly with mortar.
- D. Joints: Lay walls with 3/8" joints. Use mortar mix as dry as practicable and compress joints as much as possible to produce a dense tight joint.
 - 1. Concealed joints: Strike flush.
 - 2. Exposed CMU joints: Tooled.

3.06 HORIZONTAL JOINT REINFORCING:

- A. Reinforce walls with continuous horizontal reinforcing. Fully embed longitudinal side rods in mortar for their entire length. Lap reinforcement a minimum of 6" at ends of units. Do not bridge control joints with reinforcing. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcing as directed by the manufacturer for special conditions. Space reinforcing 16" o.c. vertically.

- B. Reinforce masonry openings greater than 12" wide with horizontal joint reinforcing placed in 2 horizontal joints approximately 8" apart, both immediately above the lintel and below the sill. Extend reinforcing a minimum of 2' beyond jambs of the opening bridging control joints where provided.

3.07 CONTROL AND EXPANSION JOINTS:

Install vertical expansion and control joints. Build-in related items as masonry work progresses. Refer to Section 07900 for sealants.

3.08 REPAIR, POINTING AND CLEANING:

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of placement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up joints at corners, openings and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.
- C. Clean exposed CMU masonry by dry brushing at end of each day's work and after final pointing to remove mortar spots and drippings.

END OF SECTION 04100

SECTION 04110 - PRE-BLENDED MORTAR

PART 1 - GENERAL

- 1.01 SCOPE: Furnish labor and materials to provide pre-blended mortar required to complete masonry work shown in Drawings and Specified.
- 1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:
- A. Masonry Accessories: Section 04150
 - B. Concrete Unit Masonry: Section 04200
 - C. Waterproofing & Dampproofing: Section 07150
 - D. Hollow Metal Doors & Frames: Section 08110
- 1.03 REFERENCES:
- A. ASTM C91-91, American Society for Testing Materials, Specification for Masonry Cement.
 - B. ASTM C144-91, American Society for Testing Materials, Specification for Aggregate for Masonry Mortar.
 - C. ASTM C150-92, American Society for Testing Materials, Specification for Portland Cement.
 - D. ASTM C207-91 (1992), American Society for Testing Materials, Specification for Hydrated Lime and Masonry Purposes.
 - E. ASMT C270-92, American Society for Testing Materials, Specification Mortar for Unit Masonry.
 - F. ASTM C780-91, American Society for Testing Materials, Test for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- 1.04 DELIVERY, STORAGE AND HANDLING:
- A. Provide pre-blended mortar manufacturer's dispensing equipment for storage and controlled dispensing of the dry pre-blended mortar mixture.
 - B. Deliver pre-blended mortar in reusable packages. Mark packages with the pre-blended manufacturer's name.

PART 2 - PRODUCTS

2.01 MORTAR MATERIALS:

- A. Portland Cement: ASTM C150, Type I (and Type II). (Use Type II Portland cement for masonry in contact with earth. Use Type I for all other masonry work.)
- B. Hydrated Lime: ASTM C207, Type S.
- C. Masonry Cement: ASTM C91.
- D. Sand: ASTM C144. Aggregate for mortar joints less than 1/4" wide shall pass a No. 16 sieve.
- E. Mortar Pigments: Synthetic iron and chromium oxides compounded for use in mortar mixes. Provide integral mortar color for blockwork. Submit samples.
- F. Water: Clean, potable and free of deleterious amounts of acids, alkali and organic materials.

2.02 MORTAR:

- A. Mortar shall be a pre-blended mortar manufactured by Spec Mix. All cementitious materials, aggregate and admixtures shall be blended in the factory under controlled conditions, and the mortar mix shall only require the addition of water at the jobsite.
- B. Proportions and Strength:
 - 1. Mortar shall conform to the "Proportion Specifications" of ASTM C270.
 - 2. Mortar shall be a Portland cement-lime mortar.
 - 3. Use no admixtures, salts or anti-freeze compounds.
 - 4. Use Type S mortar for masonry work in contact with earth and elsewhere where indicated on the Drawings. Use Type N mortar for all other masonry work.
 - 5. Mortar for exposed blockwork shall be colored. Mix mortar pigments at the rate of not more than 25 pounds of pigment per sack of Portland cement or 10 pounds of masonry cement. Exact color shall be as selected by the Architect. Colored mortar shall meet all specified requirements for mortar.

C. Mixing:

1. Add water to bring mortar to proper consistency for use. Mix for at least 4 minutes after water is added. Thoroughly clean mixer after discharging each batch.
2. Use mortar within 2-1/2 hours after initial mixing, and discard mortar not used within this time. Mortar may be re-tempered by adding water and remixing at any time within 2 hours after its initial mixing.

D. Waterproof Admixtures: Hydrocide or Omicron, mixed as per manufacturer's instructions and incorporated in all mortar used on exterior of the building and areas in contact with the earth or fill.

2.03 SOURCE QUALITY CONTROL:

A. Mortar Mix Designs:

1. The Contractor shall employ an independent testing laboratory to test the proposed aggregate and design mortar mixes for each type of mortar to be used.
2. Test aggregate for conformance to ASTM C144 and these specifications.
3. Test mortar for water retentivity and 28 day compressive strength in accordance with ASTM C270.
4. Submit aggregate test reports and mix designs to the Architect and Structural Engineer in duplicate for approval at least 14 days prior to beginning masonry work. Lay no masonry until the aggregate test reports have been reviewed and mix designs approved by the Architect.
5. The approved mix designs shall be used as long as aggregate characteristics remain unchanged. Upon significant changes in aggregate, prepare new mix design and submit copies to the Architect.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL:

- A. Mortar Tests: The Contractor shall employ an independent testing laboratory to test the mortar in accordance with ASTM C270. Make one test for each type of mortar and each 500 square feet of wall constructed with that mortar.

City of Paragould
150302CPAG
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-

- B. Submit test reports to the Architect, Structural Engineer, and General Contractor.

END OF SECTION

SECTION 04150 - MASONRY ACCESSORIES

PART 1 - GENERAL

- 1.01 SCOPE: Furnish materials and labor necessary to complete masonry work indicated in Drawings and specified.
- 1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:
- A. Unit Masonry: Division 4
 - B. Mortar: Division 4
 - C. Waterproofing and Dampproofing: Division 7
 - D. Insulation: Division 7
- 1.03 SUBMITTALS: Prior to delivery of any masonry accessories to the job site, submit technical data describing the herein specified materials to the Architect for approval. No materials shall be delivered to the job site until submittals have been approved in writing.

PART 2 - PRODUCTS

- 2.01 MATERIALS:
- A. General:
 - 1. Masonry Joint Reinforcement: Shall be factory fabricated from zinc-coated cold-drawn steel wire per ASTM A 823. Reinforcement shall consist of the two or more deformed longitudinal wires minimum size No. 9 gauge, weld connected with minimum No. 9 gauge cross wires, forming a truss or ladder design.
 - a. Zinc coating, ASTM A 116 shall be Class 1, except that cross wires used for cavity wall ties shall be Class 3. Out-to-out spacing of longitudinal wires shall be approximately 2 inches less than the normal width of the block or the way in which it is placed. Distance between welded contacts of cross wires with each longitudinal wire shall not exceed 16 inches.
 - b. Joint reinforcement shall be furnished in flat sections 10 to 20 feet in length, except that factory-formed corner reinforcements and

other special shapes may be less in length.

- c. Reinforcing for casting into lintel blocks shall be pre-formed steel bars sized as shown in the drawings and in lengths beyond complete length of lintel span as shown on structural.

PART 3 - EXECUTION

3.01 WORKMANSHIP:

- A. Metal masonry-course reinforcing shall be used in all partitions, spaced 16 inches o.c. vertically, joints lapped 6 inches. Place reinforcing in first bed joint above and below all concrete slabs and wall openings.
- B. Masonry joint reinforcement shall be placed so that longitudinal wires are located over face-shell mortar beds and are fully embedded in mortar for their entire length with minimum mortar cover of 5/8 inch on exterior side of walls and 1/2 inch at other locations.
- C. Reinforcement at openings shall extend not less than 24 inches beyond the end of sills or lintels or to the end of the panel if the distance to the end of the panel is less than 24 inches. Reinforcement shall not be continuous through a control joint or an expansion joint.
- D. Reinforcement shall be lapped 6 inches or more. Factory-fabricated sections shall be installed at corners and wall intersections.
- E. Reinforcing metal ties, and anchors shall be protected from contact with soil and before being placed shall be free from loose rust and other coatings that will destroy or reduce the bond.

END OF SECTION

SECTION 04210

STRUCTURAL BRICK MASONRY UNITS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Brick masonry units.
- B. Related Sections:
 - 1. Section 07190 - Water Repellents.
 - 2. Section 07900 - Joint Sealers.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C 33 - Specification for Concrete Aggregates.
 - 2. C 67 - Test Methods of Sampling and Testing Brick and Structural Clay Tile.
 - 3. C 126 - Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
 - 4. C 216 - Specification for Facing Brick.
 - 5. C 270 - Specification for Mortar for Unit Masonry.
 - 6. C 652 - Specification for Hollow Brick.
 - 7. C 1019 - Method of Sampling and Testing Grout.
- B. International Building Code (ICC) adopted addition
- C. Building Code Requirements for Masonry Structures (ACI 530, 530.1) adopted addition

1.03 SUBMITTALS

- A. Product Data, and Evaluation Reports as required for installation.
- B. Shop Drawings: Include elevations of each wall indicating type and layout of units.
- C. Samples: Include samples of units in sufficient quantity to illustrate color range.
- D. Test Reports from an independent testing laboratory showing compliance with applicable specifications.

1.04 QUALITY ASSURANCE

- A. Continuous Inspection:
 - 1. Employ a qualified masonry inspector for periodic inspection of the masonry work. Acceptance by a State or municipality having a program of examining and certifying masonry inspectors will be considered adequate qualifications. The masonry inspector shall perform the following duties:
 - a. Review Drawings and Specifications and meet with the CONTRACTOR to discuss requirements before work commences.

- b. Before masonry work commences, CONTRACTOR and the Contractor's Quality Control Representative shall attend meeting with ENGINEER to review the requirements for surveillance and quality control of the masonry work.
 - c. Ensure that foundation is clean, rough, and ready to receive units.
 - d. Check reinforcing steel dowels for straightness, proper alignment, spacing, size, and length.
 - e. Observe field proportioning of mortar. Visually check aggregate to determine uniformity of grading, cleanliness, and moisture.
 - f. Ensure that joints are full of mortar and kept tight during work. Inspect grout cells to assure that fins will not interfere with grouting. Ensure that masons keep grout cells clean of mortar droppings and inspect to determine compliance.
 - g. Observe placing of grout.
 - h. Perform or supervise performance of required sampling and testing.
 - i. Keep complete record of inspections.
- B. Mock-up:
- 1. Prior to starting construction of masonry, construct minimum 4 foot square mock-up.
 - 2. Use accepted materials, containing each different kind and color of brick masonry units to illustrate wall design.
 - 3. Show color range, texture range, bond, mortar color, joint tooling, critical design details and quality of workmanship.
 - 4. Masonry construction may not proceed until the Architect./ Engineer approves mock-up.
 - 5. When not accepted, construct another mock-up.
 - 6. When accepted, mock-up will be standard of comparison for remainder of masonry work.
 - 7. Upon completion and acceptance of Project, dispose of mock-ups in legal manner at offsite location.
- C. Pre-installation Conference: Conduct as specified in Section 01200.
- D. Masonry Prism Testing: Perform masonry prism testing in accordance with ASTM C1314 Standard Test Method for Compressive Strength of Masonry Prisms.
- E. Certification: Furnish manufacturer's certification that clay brick units provided meet or exceed the requirements of this specification.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units above ground to prevent contamination by mud, dust or other materials likely to cause staining or other defects.
- B. Cover and protect masonry units from inclement weather to maintain quality control and physical requirements.
- C. Transport and handle brick masonry units as required to prevent discoloration, chipping, and breakage.
- D. Locate storage piles, stacks, and bins to protect materials from heavy traffic.

- E. Remove chipped, cracked, and otherwise defective units from jobsite upon discovery.

1.06 PROJECT CONDITIONS

- A. Cold Weather Requirements:
 - 1. In accordance ACI 530.1 1.8.c
 - 2. Provide adequate equipment for heating masonry materials when air temperature is below 40 degrees Fahrenheit.
- B. Hot Weather Requirements:
 - 1. In accordance with ACI 530.1 1.8.d
 - 2. When ambient air temperature exceeds 100 degrees Fahrenheit, or when ambient air temperature exceeds 90 degrees Fahrenheit and wind velocity is greater than 8 miles per hour, implement hot weather protection procedures.
 - 3. Wet mortar board before loading and cover mortar to retard drying when not being used.
 - 4. Do not spread mortar beds more than 48 inches ahead of placing masonry units.
 - 5. Place masonry units within one minute of spreading mortar.
- C. Wetting of Brick: shall be required at the time of laying if the unit's initial rate of absorption (IRA) exceeds 30 grams per 30 square inches per minute or 1 g/645mm².

1.07 SEQUENCING AND SCHEDULING

- A. Because structural brick fall in the critical path of construction, the General contractor should contact the supplier for availability and scheduling prior to selecting a mason contractor to assure adequate time for manufacturing.

PART 2 PRODUCTS

2.01 HOLLOW LOAD BEARING BRICK MASONRY UNITS

- A. Manufacturers: One of the following or equal:
 - 1. Interstate Brick Co.
 - 2. Other manufacturers will be considered. Submit Substitution requests, per 01300.
- B. Type: ASTM C 652, Grade SW, Type HBS with minimum compressive strength of 9000 psi.
- C. Surface Texture: **Matte** unless otherwise noted on drawings: (To be selected by Architect from manufacturer's full range of available textures.)
- D. Colors:
 - 1. Color as selected by Architect from standard colors. Allow for 2 colors. Refer to the Colors and Materials Schedule, Sheet A 1.0 for specific color selections.
- E. Sizes: Shall be; 8 in. x 4 in. x 16 in., 8x8x16, & 10x8x16.

- F. Special Sizes and Shapes: As required for window and door coursing and custom sills where indicated, corners, bond beams, piers, lintels, control joints, and other special applications to minimize cutting.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protect adjacent construction with appropriate means from mortar droppings and other effects of laying of brick masonry units.
- B. Thoroughly clean foundations of laitance, grease, oil, mud, dirt, mortar droppings, and other objectionable matter.

3.02 BRICK MASONRY UNITS

- A. Provide Custom Level of Quality in accordance with ASTM C652 and C216.
- B. Lay units in uniform and true courses, level, plumb, and without projections or offset of adjacent units.
- C. Lay units to preserve unobstructed vertical continuity of cells to be filled with grout or insulation.
- D. Protect cells intended to remain free of grout using grout stops, mortar dams, or by other means.
- E. Align vertical cells to be filled with grout to maintain clear, unobstructed continuous vertical cell measuring not less than 2 by 3 inches.
- F. Butter vertical head joints for thickness equal to face shell thickness of units, and shove joints tightly together so that mortar bonds to both masonry units.
- G. Solidly fill joints from face of units to inside face of cells.
- H. Lay units to desired height with joints of uniform thickness.
- I. Bond shall be plumb throughout.
- J. Lay units to avoid formation of cracks when units are placed. Keep cells of units as free of mortar as possible as masonry wall height increases.
- K. Lay masonry plumb, true to line, with courses level. Keep bond pattern plumb throughout. Lay masonry within the tolerances of ACI 530.1 Section 3.3 F.
- L. When positions of units shift after mortar has stiffened, bond is broken, or cracks are formed, relay units in new mortar.
- M. Remove mortar, mortar droppings, debris, and other obstructions and materials from inside of cell walls.
- N. Seal cleanouts after inspection and before grouting or placing insulation.

3.03 FOAMED-IN-PLACE INSULATION

- A. Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than three years direct experience in the installation of the product used.
- B. Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam shall be pressure injected through a series of 5/8" to 7/8"

holes drilled into every vertical column of block cells, (every 8” on center) beginning at an approximate height of 4 feet from finished floor level. Repeat this procedure at an approximate height of ten feet above the first horizontal row of holes until the void is completely filled.

- C. Ensure that no insulation gets into cells which are to be filled with grout.

3.04 MORTAR JOINTS

- A. Make joints straight, clean, smooth, and uniform in thickness.
- B. Pointing: Tool exposed joints, slightly concave. Strike concealed joints flush.
- C. Joint Thickness: Make vertical and horizontal joints as required to achieve nominal dimensions on drawings and within tolerances listed in ACI530.1 Section 3.3 F.
- D. Where fresh masonry joins totally or partially set masonry, clean and roughen set masonry before laying new units.

3.05 BOND PATTERN

- A. Lay brick masonry units in running bond pattern, unless otherwise **indicated on the Drawings.**

3.06 GROUTING AND REINFORCEMENT

- A. Provide splices in vertical and horizontal reinforcing as outlined in ACI 530 Section 1.14, 1.15, 1.16 and Section 2.3 and 3.3. Hold vertical reinforcing bars in position at top and bottom and at intervals not exceeding 200 bar diameters. Use steel wire bar positioners to position bars and tie reinforcing bars to dowels with wire ties.
- B. Obtain acceptance of reinforcement placement before grouting.
- C. Fill all spaces and cells containing reinforcing or intended to be grouted solidly with grout.
- D. Low-lift Grouting:
 - 1. Hollow unit masonry to be grouted by the low lift method shall be constructed and grouted in lifts not exceeding 4 feet. Double wythe masonry which will be grouted by the low-lift method shall be constructed and grouted in lifts not exceeding 8 inches. Slushing with mortar will not be permitted.
- E. High-lift Grouting:
 - 1. If grouting is accomplished by the high-lift method, double wythe masonry shall be allowed to cure at least 72 hours and hollow unit masonry shall be allowed to cure at least 24 hours before grouting.
 - 2. In double wythe construction, vertical grout barriers shall be built across the grout space to the height of the grout lift.
 - 3. Grout barriers shall not be spaced more than 30 feet apart. Grout shall be placed in lifts not to exceed 6 feet in depth.
 - 4. Each lift shall be allowed to set for 10 minutes after initial consolidation of grout before successive lift is placed.
 - 5. The full height of each section of wall shall be grouted in one day.

- F. Grout in cells shall have full contact with surface of concrete footings.
- G. When grouting stops for one hour or longer, form horizontal construction joints by stopping grout placement 1-1/2 inches below top of uppermost unit containing grout.
- H. After placement, consolidate grout using mechanical immersion vibrators designed for consolidating grout.
- I. Placement:
 - 1. Use a hand bucket, concrete hopper, or grout pump.
 - 2. Place grout in final position within 1-1/2 hours after mixing.
 - 3. Place grout so as to completely fill the grout spaces without segregation of the aggregates.
 - 4. Do not insert vibrators into lower grout placements that are in a semi-solidified state.

3.07 BOND BEAMS

- A. Place horizontal reinforcement and solidly grout bond beam units in place.
- B. Provide wire mesh at openings in bottom of bond beams to support grout where walls are not grouted solid.

3.08 CUTTING BRICK MASONRY UNITS

- A. When possible, use full units of the proper size in lieu of cut units. Cut units as required to form chases, openings, for anchorage, and for other appurtenances.
- B. Cut unites to fit rake roof conditions.
- C. Cut and fit units with power-driven carborundum or diamond disc blade saw.

3.09 CONTROL JOINTS / EXPANSION JOINTS

- A. Provide in masonry walls where **indicated on the Drawings.**
- B. Make full height and continuous in appearance.
- C. Run bond beams and bond beam reinforcing bars continuously through control joints. Stop horizontal reinforcing at expansion joints
- D. Insert control joint filler in joints as wall is constructed.
- E. Insert 50% compressible neoprene expansion joint material in expansion joints.
- F. Apply sealant as specified in Section 07900.

3.10 OPENINGS AND LINTELS

- A. Place horizontal reinforcement in fully grouted bond beam units.
- B. Use lintel units where underside of lintel will be exposed.
- C. Provide minimum of 8 inch bearing at each end of lintel.
- D. Embed reinforcing bars minimum 24 inches or 40 bar diameters, whichever is longer, into wall past edges of openings or as **indicated on the Drawings.**
 - 1. At corners, provide 90 degree bend with equivalent total embedment.

3.11 STEEL DOOR FRAMES

- A. Anchor and fully grout jambs and head of steel door frames connected to brick unit masonry.
- B. Fill frames with grout as each 2 feet of brick unit masonry is laid.

3.12 BEARING PLATES

- A. Provide minimum of 12 inches of grouted brick unit masonry below steel bearing plates and beams bearing on masonry walls.

3.13 ANCHOR BOLTS

- A. Hold anchor bolts in place with template during grouting to assure precise alignment.
- B. Do not cut or ream members being anchored or use other means to accommodate misaligned anchor bolts in roof deck support angles.
- C. Provide minimum 6 inch wide grouted brick unit masonry entirely around anchor bolts and other attachment devices.

3.14 ENCLOSURES

- A. Where brick masonry units enclose conduit, pipes, stacks, ducts, and similar items, construct chases, cavities, and similar spaces as required, whether or not such spaces are **indicated on the Drawings.**
- B. Point openings around flush mounted electrical outlet boxes with mortar, including flush joints above boxes.
- C. Do not cover enclosures until inspected and when appropriate, tested.

3.15 OTHER EMBEDDED ITEMS

- A. Build in wall plugs, accessories, flashings, pipe sleeves, and other items required to be built-in as the masonry work progresses.

3.16 PATCHING

- A. Patch exposed brick masonry units at completion of the Work and in such manner that patching will be indistinguishable from similar surroundings and adjoining construction.

3.17 MISCELLANEOUS

- A. Build in required items, such as anchors, flashings, sleeves, frames, structural steel, lintels, anchor bolts, and metal fabrications, as required for complete installation.

3.18 WATER REPELLENT

- A. Apply water repellent as specified in Section 07190.

3.19 FIELD QUALITY CONTROL

- A. Have minimum 3 masonry units of each type proposed for Project tested in accordance with ASTM C 67 to verify conformance to Specifications.
- B. Tests shall include compressive strength, absorption, Initial Rate of absorption and unit weight.
- C. Perform compressive strengths on structural units by cutting the units in half lengthwise and into rectangular unit without any flanges and cap according to ASTM C67 prior to testing.
- D. Employ and pay acceptable independent testing laboratory to perform testing.

3.20 CLEANING

- A. Exercise extreme care to prevent mortar splashes.
- B. Do not attach construction supports to masonry walls.
- C. Wash off brick scum and grout spills before scum and grout set.
- D. Remove grout stains from walls.
- E. Clean exposed masonry. Remove scaffolding and equipment. Dispose of debris, refuse, and surplus material offsite legally.
- F. Correct efflorescence on exposed surfaces with commercially prepared cleaning solution acceptable to masonry unit manufacturer.
 - 1. Apply cleaning solution in accordance with cleaning solution manufacturer's printed instructions.
 - 2. Do not use muriatic acid as cleaning solution.
 - 3. Do not use sandblast cleaning equipment.

3.21 FORMS AND SHORES

- A. Where required, construct forms to the shapes **indicated on the Drawings**.
 - 1. Construct forms sufficiently rigid to prevent deflection which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout.
 - 2. Do not remove supporting forms or shores until the supported masonry has acquired sufficient strength to support safely its weight and any construction loads to which it may be subjected.
 - a. Wait at least 16 hours after grouting masonry columns or walls before applying uniform loads.
 - b. Wait at least 64 hours before applying concentrated loads.

3.22 PROTECTION

- A. Provide temporary protection for exposed masonry corners subject to damage.
- B. Bracing:
 - 1. Adequately brace masonry walls over 8 feet in height to prevent overturning and to prevent collapse unless wall is adequately supported by permanent supporting elements so wall will not overturn or collapse.
 - 2. Keep bracing in place until permanent supporting elements of structure are in place.
- C. Limited Access Zone:

1. Establish limited access zone prior to start of masonry wall construction.
2. Zone shall be immediately adjacent to wall and equal to height of wall to be constructed plus 4 feet by entire length of wall on unscaffolded side of wall.
3. Limit access to zone to workers actively engaged in constructing wall. Do not permit other persons to enter zone.
4. Keep zone in place until wall is adequately supported or braced by permanent supporting elements to prevent overturning and collapse.

3.23 GROUTING EQUIPMENT

A. Grout Pumps:

1. Do not pump grout through aluminum tubes.
2. Operate pumps to produce a continuous stream of grout without air pockets.
3. Upon completion of each days pumping, eject grout from pipeline without contamination or segregation of the grout.
 - a. Remove waste materials and debris from the equipment.
 - b. Dispose of waste materials, debris, and all flushing water outside the masonry.

B. Vibrators:

1. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout.
2. Maintain at least one spare vibrator, at the site at all times.
3. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine.
4. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation.

END OF SECTION 04210

SECTION 04212 - BRICK MASONRY

PART 1 - GENERAL

1.01 SCOPE:

- A. Furnish materials and labor necessary to complete masonry work indicated in Drawings and specified.
- B. Work includes installation of items or materials furnished by other trades when required to be built into masonry work.
 - 1. Sheet metal flashings, counterflashings, through- wall flashings and like items of moisture protection built into masonry construction.
 - 2. Loose lintels and/or bearing plates anchored to or bearing upon masonry construction.
 - 3. Hollow metal door and window frames anchorage members.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:

- A. 04210 Structural Brick Masonry Units
- B. Massonry Water Repellant: Section 07150

1.03 HANDLING AND STORAGE:

- A. Handle, transport and deliver masonry in such manner as to prevent soiling, mutilation, chipping or breaking.
- B. Store masonry on platforms raised above grade. Protect from damage by dirt, mud, grease, weather or staining materials with suitable protective cover.

PART 2 - PRODUCTS

2.01 MATERIALS:

Face Brick: The Brick Veneer shall be supplied by the same manufacturer that supplies the Structural Brick Masonry units. The brick veneer shall match the Structural Brick Masonry Units in color and texture. Face Brick shall be in accordance with the requirement of A.S.T.M. C-62 specifications and shall meet SW

grade requirements. Brick to be selected by Architect.

PART 3 - EXECUTION

3.01 WORKMANSHIP:

- A. For actual cutting and placing of all masonry work, use only skilled masons who are thoroughly experienced with the materials and methods specified and thoroughly familiar with the design requirements.
- B. Lay masonry work plumb and true to lines, with level, accurately spaced coursing. Work masonry to course vertically and horizontally. Break each course joint with course below, keeping head joints of alternate courses in straight, vertical alignment. Lay corners and reveals plumb and true.
- C. Make all cuts in exposed masonry walls with masonry saw. Minimum length of any cut unit in exposed masonry work: one-half unit length. A masonry saw with a minimum of two spare blades shall remain on the job until all masonry work has been completed.
- D. Wet clay or shale brick 3 to 24 hours before laying if absorption of area immersed in 1/8 inch of water for one minute exceeds .025 ounces per square inch. Do not place freshly wetted brick having water or frost on surface in any walls.
- E. Work joints in brick to nominal 3/8 inch thickness. Compact mortar tightly against masonry on both sides of joint. Tool head joints first.
- F. Weep holes shall be provided 16 inches on center in mortar joints on exterior of cavity walls. Weep holes shall be kept free of mortar and other obstructions. Form weeps with 'Mortar Net' or equal.
- G. Extreme care shall be taken so as not to lay any brick in partitions or walls which will show any chipped or broken edges.
- H. Unless otherwise required, fill solidly with mortar all spaces in and around metal door frames and other built-in items. Where possible, build in work required to be built-in with masonry, including anchors, wall plugs and accessories, as erection progresses. All patching of masonry required to accommodate built-in items shall be done in a manner to match original work.
- I. Protect masonry against freezing at least 48 hours after laying. Unless adequate

precautions are taken to prevent freezing, do not lay masonry when temperature is below 40 degrees F. Post accurate thermometer directly adjacent to work in progress for temperature references.

- J. Protect tops and top 2 feet of each side of masonry walls with strong waterproof membrane securely anchored, except when masonry work is in progress or permanent protection is provided otherwise.

3.02 CUTTING AND PATCHING:

- A. Consult other trades in advance, provide for installation of such related work to avoid cutting and patching whenever possible. Supervise any subsequent cutting of masonry performed by other trades, and perform any necessary patching in connection therewith.
- B. Step back unfinished work for joining with new work. Tothing may be resorted to only when so approved. Before new work is started, remove loose mortar, expose joints and wet thoroughly at least twelve hours before laying new work.

3.03 CLEANING AND POINTING:

- A. Progress work in as clean a manner as possible. Remove excess materials and mortar droppings daily. Remove mortar droppings on connecting or adjoining work before its final set.
- B. On completion, point exposed masonry, fill holes, and joints, remove loose mortar, cut out defective joints and re-point where necessary. After pointing has thoroughly set, clean down all surfaces using stiff brushes, approved masonry cleaning detergents, and water, or other approved cleaning methods. No acids shall be used. Avoid staining masonry or damage to other work during cleaning operations.

END OF SECTION

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

- A. Structural steel work, complete at the Aquatic Center. All steel members, connections, miscellaneous plates, and bolts shall be hot-dip galvanized and epoxy painted in a duplex system.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS:

- A. Touch-up and repair painting of steel, Section 099000.
- B. Metal fabrications and miscellaneous metals, Section 055000.
- C. Sprayed Fireproofing, Section 072510.

1.3 SUBMITTALS:

- A. Shop Drawings: Submit shop drawings prepared by or under supervision of a qualified professional engineer;
 - 1. Submit shop drawings including complete details and schedules for fabrication and shop assembly of the members, and details, schedules, procedures and diagrams showing the sequence of erection. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld. Provide setting drawings, templates, and directions for the installation of anchor bolts and other anchorages to be installed by others.
 - 2. Qualification Data: Certificates to indicate compliance with quality assurance requirements.

1.4 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with the provisions of the following:
 - 1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
 - 2. AISC "Specifications for Structural Steel Buildings", including "Commentary".

3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.
 4. AWS D1.1 "Structural Welding Code - Steel".
- B. Qualifications For Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Testing and Inspection:
1. Contractor shall employ an independent testing agency, acceptable to Owner and Architect, to inspect welded and bolted connections. The following items will be included in testing agency inspections:
 - a. Visual inspection of welded and bolted connections for quality.
 - b. Check by ultrasonic (or other means approved by Architect) minimum of 10% of beam to beam/column and column to column full penetration welds if full penetration welds are indicated on contract drawings. After 2 beam (1 top and 1 bottom flange each) welds have been placed by each welder, the testing agency shall check and approve these welds before additional welds are placed.
 - c. Test approximately 10% of high strength bolts for correct nut tightness.
 - d. In addition to visual inspection, inspect and test field-welded shear connectors in compliance with AWS D1.1 requirements.
 2. Correct as directed, at Contractor's expense, connections that are found unsatisfactory to testing agency.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts or nuts become dry or rusty, clean and relubricate before using.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Structural Steel:
 - 1. W-Shapes: ASTM A 992, if unavailable, ASTM A572, $F_y=50$ ksi.
 - 2. Plates And Bars: A 36.
- B. Tube Sections:
 - 1. Cold-Formed; ASTM A500, Grade B, $F_y=46$ ksi.
 - 2. Hot-Formed; ASTM A501, $F_y=36$ ksi.
- C. Steel Pipe: ASTM A 53, Type E or S, Grade B, or ASTM A 501.
- D. Shear Connectors: ASTM A 108, 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.
- E. Anchor Rods, Bolts, Nuts, and Washers:
 - 1. Unheaded Anchor Rods: ASTM A 36.
 - 2. Headed Bolts: As indicated.
 - a. ASTM A 307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.
 - b. ASTM A 325, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
 - c. ASTM A 490, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
 - 3. Washers: ASTM A 36.

- F. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A; carbon-steel, hex-headed bolts; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish as indicated:
 - a. Plain, uncoated.
 - b. Hot-dip zinc coating, ASTM A 153, Class C.
 - c. Mechanically deposited zinc coating, ASTM B 690, Class 50.
- G. Electrodes For Welding: E70XX, in compliance with AWS Code.
- H. Non-Metallic Shrinkage-Resistant Grout: Conspec "100 Non-Shrink Grout (Non-Metallic)", Euclid "Euco N.S.", L & M "Crystex", MasterBuilders "Masterflow 713", W. R. Meadows "Sealtight 588 Grout", or approved equal; comply with CRD-C-621.
- I. Shop Paint: Lead free, alkyd primer; Tnemec 10-99 Series, Southern Coatings Enviro-Guard 1-2900, or approved equal, meeting performance requirements of TT-P-86, Type I and passing ASTM B 117 after 500 hours with no blistering, cracking, softening, delamination, or rust creepage at scribe and rusting at edges. For steel members exposed to weather and pool moisture, use TNEMEC 10-66 epoxy paint or equal.
- J. Galvanizing: Apply zinc coating by hot-dip process to structural steel members exposed to weather or moisture according to ASTM A 123. Vent holes shall be provided by the steel fabricator. Fill vent holes and grind smooth after galvanizing.
- K. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel work, complying with SSPC-Paint 20.

2.2 FABRICATION:

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

2. Where shop finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
1. Bolt field connections, except where welded connections or other connections are indicated.
 - a. Provide high-strength threaded fasteners for principal bolted connections, except where otherwise indicated.
 2. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts".
- C. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- D. Steel Wall Framing: Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.
- E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders in composite construction. Use automatic end of welding of headed stud shear connectors in accordance with manufacturer's printed instructions.
- F. Holes For Other Work: Provide holes for securing other work to structural steel framing and for passage of other work through steel framing members, as indicated on final shop drawings.
1. Provided threaded nuts welded to framing and other specialty items as indicated to receive other work.
 2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING:

- A. Shop paint all structural steel, except as follows:

05120-5

1. Members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on the exposed portions and the initial 2" of embedded areas only.
 2. Members to be welded.
 3. Members to receive sprayed fireproofing.
 4. Top of steel beams where headed studs will be attached by welding through steel deck.
- B. Surface Preparation: Before painting, thoroughly clean all surfaces of all grease, rust, welding droppings and loose mill scale by methods conforming to SSPC-SP-1 and SSPC-SP-3. After erection, wire-brush and touch-up welded or abraded areas. Touch-up with primer.
- C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with the manufacturer's instructions and at a rate to provide a uniform dry film thickness of 2.0 mils. Use painting methods which will result in full coverage of joints, corners, edges and all exposed surfaces.
- D. Duplex Systems: Painting over hot-dip galvanized steel. Steel is not quenched after galvanizing and any coating imperfections are remedied. Epoxy-Polyamide Cured paint is recommended. Consult the paint manufacturer for proper surface preparation.

PART 3 - EXECUTION

3.1 ERECTION:

- A. Brace and guy members until final connections are made. Structure is not stable until all members, connections, decking, slabs, bracing, and other structural components are in place and secured.
- B. Setting Bases and Bearing Plates: Clean bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom of base and bearing plates.
1. Set loose and attached bearing plates and bearing plates for structural members on wedges or other adjusting devices.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
4. For proprietary grout materials, comply with manufacturer's instructions.

C. Field Assembly:

1. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clear bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
2. Level and plumb individual members of structure within specified AISC tolerances.

D. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

1. Comply with AISC specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Do not enlarge holes in members by burning or by using drift pins.

3.2 TOUCH-UP PAINTING: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on structural steel is included in Section 099000.

END OF SECTION

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

- A. Section Includes:
 - 1. Load-bearing wall framing.
 - 2. Exterior non-load-bearing wall framing.
 - 3. Ceiling joist framing.
 - 4. Soffit framing.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

PREINSTALLATION MEETINGS

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

ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For non-load bearing cold-formed steel framing.

INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
 - b. Ceiling Joist Framing: Vertical deflection 1/360 of the span for live loads and 1/240 for total loads of the span.
 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.
 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
1. Floor and Roof Systems: AISI S210.
 2. Wall Studs: AISI S211.
 3. Headers: AISI S212.
 4. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: **ST50H (ST340H)**.
 2. Coating: [**G60 (Z180)**, **A60 (ZF180)**, **AZ50 (AZ150)**, or **GF30 (ZGF90)**].
- B. Steel Sheet for **Vertical Deflection** Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: **50 (340), Class 1**.
 2. Coating: **G60 (Z180)**.

LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As shown on the structural drawings.
 - 2. Flange Width: As shown on the structural drawings
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As shown on the structural drawings.
 - 2. Flange Width: As shown on the structural drawings
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As shown on the structural drawings.
 - 2. Flange Width: As shown on the structural drawings.

EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.
 - 2. Depth: 6 inches
 - 3. Flange Width: 2 inches .
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch
 - 2. .Retain "Vertical Deflection Clips," "Single Deflection Track," or "Double Deflection Tracks" Paragraph below for components to cope with vertical deflection of the primary structure.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.
 - 2. Flange Width: 1 inch plus the design gap.

- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch .
 - 2. Flange Width: 2 inches minimum.

SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch
 - 2. Flange Width: 2 inches minimum.

FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel and carbon-steel nuts; and flat, hardened-steel washers.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.

FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

- a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
1. Anchor Spacing: 18 inches.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
1. Stud Spacing: As indicated on structural drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

City of Paragould
Paragould Fire Station
No.1

- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically 48 inches . Fasten at each stud intersection.
 - 1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 12 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at 96-inch.
 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

City of Paragould
Paragould Fire Station
No.1

- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05500

METAL FABRICATIONS AND MISCELLANEOUS METAL WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide miscellaneous metal work, complete, including:
 1. Pipe railings and handrails.
 2. Metal pan stairs.
 3. Steel ladder with safety cage and landing.
 4. Steel supports for work of other trades.
 5. Miscellaneous metal steel attachments, anchors, plates, angles, etc.
 6. Anchors angles, bolts, expansion shields for items in this section only, and other accessories shown in details and or required for the complete installation of all work.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Cast-In-Place Concrete; Section 033000.
- B. Concrete Unit Masonry; Section 04100, 04200
- C. Structural Steel Framing; Section 051200

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit for products used in miscellaneous metal fabrications, including paint products and grout.
- C. Shop Drawings: Submit shop drawings for the fabrication and erection of all assemblies of miscellaneous metal work. Include plans, elevations, sections, and details of fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1.5 PROJECT CONDITIONS

- A. Field Measurements:
 1. Check actual locations of, walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

2. Where field measurements cannot be made without delaying work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, and roughness.
- B. Miscellaneous Steel Bars, Rods and Shapes: ASTM A 36, A 283, A 108, A 663, A 501, and A 575, as applicable.
- C. Pipe: ASTM A 53 black finish steel pipe, standard weight (Schedule 40) .
- D. Aluminum Extruded Bar and Tube: ASTM B 221, alloy 6063T5/T52.
- E. Bolts and Nuts: ASTM A 307, Grade A. High strength bolts; ASTM A 325. Hot-dip galvanize all items in accordance with ASTM A 153.
- F. Expansion Bolts Wedge Anchors: Ramset "Trubolt" or Hilti "Kwik Bolt."
- G. Adhesive Anchors: Hilti "HVA."
- H. Expansion Shields: F.S. FF-S-325
- I. Anchor Rods: Furnish and deliver to site, anchor rods and other items to be embedded in concrete. Provide necessary shop details and diagrams for concrete forms and, if required, provide templates to insure proper and accurate locations and setting of anchor rods.
- J. Toggle Bolts: Tumble-wing type F.S. FF-B-588 type, class and style as required.
- K. Lock Washers: F.S. FF-W-84, helical spring type carbon steel.
- L. Welding Rods And Electrodes: Select in accordance with AWS specifications for metal alloy to be welded.
- M. Miscellaneous Items: Furnish bent or otherwise custom fabricated bolts, plates, z-clips, anchors, hangers, dowels and other miscellaneous steel shapes as required for framing and supporting work and for anchoring or securing work to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Section 06100.
- N. Shop Paint: Lead free, alkyd primer; Tnemec 10-99, Southern Coatings Enviro-Guard 1-2900, or approved equal, meeting performance requirements of F.S. TT-P-86, and passing ASTM B 117 after 500 hours. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09900.
- O. Galvanizing Repair Paint: High zinc dust content paint for regalanizing welds in galvanized steel work, complying with SSPC-Paint 20.
- P. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

- Q. Non-shrink Nonmetallic Grout: Conspec "100 Non-Shrink Grout NonMetallic," Master Builders "Masterflow 713," Euclid "Euco N.S. Grout," L & M "Crystex," or U. S. Grout "Five Star Grout," or Sonneborn "Sonogrout," or W.
- R. Meadows "Sealtight 588 Grout".

2.2 FABRICATION, GENERAL

- A. Workmanship: Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise close up impairing work.
- C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use. Cut reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
- E. Shop Painting:
 - 1. Shop paint miscellaneous metal work, except concealed metal work, members or portion of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise specified.
 - 2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 or SSPC SP-3.
 - 3. Remove oil, grease and similar contaminants in accordance with SSPC SP-1.
 - 4. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.

2.3 MISCELLANEOUS METAL FABRICATIONS

A. Pipe Railings and Handrails:

- 1. Fabricate of standard weight steel pipe to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall

- thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.
2. Interconnect railing and handrail members using butt-welding or welding with internal connectors.
 3. Form changes in direction by insertion of prefabricated elbow fittings, by radius bends or by bending.
 4. Provide wall returns at ends of wall-mounted handrails.
 5. Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings.
 6. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete.
 7. Prime as specified in this section.
- B. Steel Wall Ladder: Steel bars, rods and shapes of sizes and designs indicated, and securely anchored to floor and wall.
- C. Metal Pan Stairs: Fabricate of 12 gage steel treads and risers bolted to angles and welded or bolted to stringers. Concrete fill is specified in Section 03300.
- D. Steel Supports: Provide structural steel lintels, channels, braces, angles, etc., as indicated and assemble as detailed. Secure all connections to provide rigid supports for all items required including supports not specifically specified in other sections.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to site.
- B. Set sleeves in concrete with, tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.2 INSTALLATION

- A. Fastening To In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for installation. Set metal fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true, and free of rack; measured from established lines and levels.

- C. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- D. Setting Loose Plates:
 - 1. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom of surface of bearing plates.
 - 2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
- E. Steel Pipe Railings and Handrails: Set pipe in concrete in non-corrosive pipe sleeves with non-shrink grout or anchor to supports as indicated or required by project conditions. Secure handrails to wall with wall brackets and end fittings.
- F. Ornamental Aluminum Grillwork: Mount grille to aluminum window frame using 1/2" X 10/24 undercut flathead machine screws. Drill and tap completely thru aluminum grill with screws and dress down any exposed portion of the screw. Isolate steel hinges from aluminum as recommended by hinge manufacturer. Coordinate with Section 08410 for steel backing and blocking as required to support grill weight.

3.3 TOUCH-UP SHOP PAINTING

- A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Use galvanizing repair paint on damaged galvanized surfaces.

END OF SECTION 05500

SECTION 06100

CARPENTRY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide carpentry work, complete. In general, this work includes the following:
 1. Braces, stripping, backing, blocking, cants, grounds, and nailers indicated or necessary to install cabinetwork, aluminum window framing systems, hollow metal door frames, toilet room accessories, roof systems and to receive or back work of other trades.
 2. Tongue and groove wood decking.

1.3 QUALITY ASSURANCE

- A. Grading Marks: Factory-mark each piece of lumber with type, grade, mill and grading agency identification; and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.
- B. Wood Preservative Treatment: Label each piece of pressure treated lumber with the Quality Control mark of the American Wood Preservers Bureau showing compliance with the appropriate standard.

1.4 PRODUCT HANDLING

- A. Keep carpentry materials dry during delivery, storage and handling. Store lumber in stacks for air circulation within stacks. Protect bottom of stacks against contact with damp surface. Protect exposed materials against weather. Do not store dressed or treated lumber outdoors.

PART 2 - PRODUCTS

2.1 SOFTWOOD

- A. Comply with the standards of WCLIB, "Standard Grading Rules for West Coast Lumber", for Douglas fir, and SPIB "Standard Grading Rules for Southern Pine Lumber", for Southern pine.

1. For structural light framing 2" to 4" thick, 2" to 4" wide, and studs use KD,

S4S, No. 2.

2. For light framing 2" to 4" thick, 2" to 4" wide, use KD, S4S, Construction Grade.

2.2 ROUGH HARDWARE

- A. Nails, metal connectors, bolts, nuts, screws, washers, staples, and other fasteners (except as specified or noted otherwise): hot-dip galvanized steel.

2.3 WOOD PRESERVATIVE TREATMENTS

- A. Pressure treat the following items with water-borne preservatives to comply with AWPB-LP-2. After treatment, kiln-dry lumber to a maximum moisture content, of 19 percent. Treat indicated items and the following:
 3. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
 4. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry and concrete.
 5. Wood framing members less than 18" above grade.
 6. Wood floor plates installed over concrete slabs directly in contact with earth.
- B. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPB M4.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
- C. Securely attach carpentry work to substrate by anchoring and fastening as indicated and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.
- D. Use common wire nails, except as otherwise indicated or specified. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.
- E. Anchor carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, strips, backing, and blocking, of thickness and shape required to secure work and equipment in place, as indicated on the drawings or required by conditions. Fasten wood grounds, furring and other engaging woodwork

to various types of walls with approved types and sizes of nails, ties, and inserts, spaced to provide rigid secure supports.

3.2 ROUGH CARPENTRY

- A. Provide wood grounds, strips, bucks, plates, backing, and blocking, of thickness and shape required to secure work and equipment in place, as indicated on drawings or required by conditions. Fasten with approved types and sizes of nails, ties, and inserts, spaced to provide rigid secure supports.

3.3 ROUGH HARDWARE

- A. Provide rough hardware necessary or required for installation of work specified. Use sufficient size and number of spikes, nails, screws, bolts, etc., to insure rigidity, security, and permanence.

3.4 CLEAN-UP

- A. Remove from the premises all rubbish, debris, and unused materials which may be accumulated during the progress of the work.

END OF SECTION 06100

SECTION 06151
WOOD ROOF DECKING

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

- A. Section includes solid-sawn wood roof decking
 - 1. Provide fire retardant material on all exterior exposed surfaces
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for dimension lumber items associated with wood roof decking.

ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: 24 inches long, showing the range of variation to be expected in appearance of wood roof decking.

DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of wood roof decking to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood roof decking with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

PART 2 - PRODUCTS

WOOD ROOF DECKING, GENERAL

- A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

SOLID-SAWN WOOD ROOF DECKING

- A. Standard for Solid-Sawn Wood Roof Decking: Comply with AITC 112.
- B. Roof Decking Species: southern pine.
- C. Roof Decking Nominal Size: 2 by 6.
- D. Roof Decking Grade: Dense Standard Decking.
- E. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that are not exposed to view.
- F. Moisture Content: Provide wood roof decking with 15 percent maximum moisture content at time of dressing.
- G. Face Surface: Smooth.
- H. Edge Pattern: Vee grooved.

ACCESSORY MATERIALS

- A. Fasteners for Solid-Sawn Roof Decking: Provide fastener size and type complying with AITC 112 for thickness of deck used.
- B. Nails: Common; complying with ASTM F 1667, Type I, Style 10.
- C. Fastener Material: Hot-dip galvanized steel.
- D. Bolts for Anchoring Roof Decking to Walls: Carbon steel; complying with ASTM A307 with ASTM A563 hex nuts and, where indicated, flat washers, all hot-dip zinc coated.
- E. Sealants: Latex, complying with applicable requirements in Section 079200 "Joint Sealants" and recommended by sealant manufacturer and manufacturer of substrates for intended application.

FABRICATION

- A. Seal Coat:
 - 1. After fabricating and surfacing roof decking, apply a saturation coat of penetrating sealer in fabrication shop.
 - 2. All exposed decking shall be coated with penetrating oil based stain
 - a. Color: As selected by Architect from manufacturer's full range.
 - b. Manufactures:
 - 1) Penofin or approved equal

PART 3 - EXECUTION

EXAMINATION

- A. Examine walls and support framing in areas to receive wood roof decking for compliance with installation tolerances and other conditions affecting performance of wood roof decking.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

INSTALLATION

- A. Install solid-sawn wood roof decking to comply with AITC 112.
 - 1. Locate end joints for combination simple and two-span continuous lay-up.
- B. Anchor wood roof decking, where supported on walls, with bolts as indicated.
- C. Apply joint sealant to seal roof decking at exterior walls at the following locations:
 - 1. Between roof decking and supports located at exterior walls.
 - 2. Between roof decking and exterior walls that butt against underside of roof decking.
 - 3. Between tongues and grooves of roof decking over exterior walls and supports at exterior walls.

ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged roof decking if repairs are not approved by Architect.

PROTECTION

- A. Provide water-resistive barrier over roof decking as the Work progresses to protect roof decking until roofing is applied.
- B. If, despite protection, inorganic boron (SBX)-treated roof decking becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061516

SECTION 06220 - MILLWORK

PART 1 - GENERAL

- 1.01 SCOPE: Furnish materials and labor necessary to fabricate and install counter tops as indicated on Drawings and specified. The Quality Standards of the Architectural Woodwork Industry are hereby made part of this Section.
- 1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:
Carpentry: Section 06100
- 1.03 SUBMITTALS: In accordance with Section 01300, Submittals.
- A. Samples:
Submit samples of plastic laminate
- B. Shop Drawings:
1. Show sizes, quantities, markings, finishes and installed hardware.
2. Submit assembly and installation drawings to show methods of fastening, bracing and connecting to work of other trades.

PART 2 - PRODUCTS

- 2.01 QUALITY GRADE AND MATERIALS:
- A. Countertops:
1. Quality grade and species called for herein under Interior Woodwork. Quality grade as defined in AWI Quality Standards, Section 400.
2. Framing Lumber, Blocking, Bracing: No 2 southern pine, S4S, kiln dried. Floor plates and blocking in contact with masonry or concrete shall be pressure treated.
3. Laminated Plastic: As manufactured by the Nevamar Corporation, or approved equal. Color and finish as selected by the Owner. Plastic laminate back-up shall be fir plywood.
- 2.02 SUPPORTING BRACKETS:
A. As indicated on the drawings.

Provide and install as detailed on the Drawings and per manufacturer's directions:

“Rakks” or equal aluminum vanity brackets

PART 3 - EXECUTION

- 3.01 **JOB ASSEMBLED WORK:** When installing items not shop assembled, distribute to best overall advantages defects allowed in quality-grade specified.
- 3.02 **DELIVERY AND STORAGE:** Do not deliver millwork until building and/or storage area is sufficiently dry so woodwork will not be damaged by excessive changes in moisture content.
- 3.03 **WORKMANSHIP:**
- A. Fabricate items of millwork to conform to "Custom" material and workmanship requirements as established by Architectural Woodwork Institute in the publication "Quality Standards of Architectural Woodwork Industry".
 - B. Verify all dimensions in the field prior to fabrication.
 - C. Accurately set all countertops and supporting brackets plumb, square, level and permanently secured in position as indicated.
 - D. Coordinate the work with other trades affected by installation, including electrical and telephone work. Provide other cut-outs as required for equipment. All cut-outs shall be finished same as finish on material cut-outs.
 - E. Provide all necessary rough wood framing, blocking, bracing, angle clips, rough hardware and fastenings as required to secure anchorage of carpentry work.
 - F. Pay particular attention to the timely installation of wood grounds, nailers and blocking so as not to delay job progress.
- 3.04 **CLEANING:** Remove all soil, stains, paint, prints and other matter from exposed faces and hardware. Clean adjacent surfaces of soiling incurred during installation.

END OF SECTION 06220

SECTION 07110 - SHEET MEMBRANE WATERPROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide rubberized asphalt sheet waterproofing system, or 15 mil vapor barrier Complete, as called for on the drawings.

1.3 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit product data and general recommendations from water-proofing materials manufacturer for types of materials required.
- C. Samples: Submit samples of sheet waterproofing and auxiliary materials as requested by Architect.
- D. Certificates: Include certificates substantiating that materials comply with specified requirements.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Obtain primary materials from a single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer: Firm with not less than three years of successful experience in installations similar to requirements of this project and which is acceptable to manufacturer of primary waterproofing system manufacturers.

1.5 PROJECT CONDITIONS

- A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed.
- B. Weather: Proceed with work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.6 WARRANTY

- A. Submit written warranty, executed by manufacturers, agreeing to repair and replace sheet membrane waterproofing system that fails in materials and workmanship.
- B. Warranty period is five (5) years.

PART 2 – PRODUCTS

2.1 MODIFIED BITUMEN UNDERLAYMENT (MBU) RUBBERIZED ASPHALT SHEET WATERPROOFING.

- A. Grace Ice & water shield self adhered roofing underlayment or equal.
- B. Self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting, formed into uniform flexible sheets of not less than 56 mils thick, complying with the following:
 - 1. Tensile Strength: 250 psi minimum, ASTM D 412.
 - 2. Ultimate Elongation: 300 percent minimum; ASTM C 412.
 - 3. Pliability Temperature: Minus 25 degrees F; ASTM D 146.
 - 4. Hydrostatic Head Resistance: 150 feet minimum.
 - 5. Water Absorption: Not more than 0.5 percent weight gain after 48 hours of immersion at 70 degrees F; ASTM D 570.

2.2 VAPOR BARRIER

- A. Provide 15 mil vapor barrier as called out on the Architectural Drawings at all areas under concrete floor slabs.

2.3 AUXILIARY MATERIALS

- A. Adhesives and Joint Tapes: Provide types of adhesive compound and tapes recommended by waterproofing sheet manufacture for bonding to substrate (if required), for waterproof sealing of joints between membrane and flashings, adjoining surfaces, and projections through membrane.
- B. Flashing Materials: **Except as otherwise indicated, provide types of flexible sheet material for flashing at brick veneer systems as recommended by waterproofing sheet manufacturer.**

PART 3 – EXECUTION

3.1 PREPARATION

- A. Comply with manufacturer's instructions for surface preparation.
- B. Chip off projections where necessary for proper placement and adhesion of waterproofing sheet.
- C. Apply primer to substrate at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by waterproof membrane in same working day; re-prime areas not covered by waterproof membrane within 24 hours.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions for handling and installation of sheet waterproofing materials.

- B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of manufacturers and installers involved in work. Schedule installation to minimize period of exposure of sheet waterproofing materials.
- C. Seal projections through membrane and seal seams. Bond to vertical surfaces.
- D. Extend waterproofing sheet as indicated and finish under flashing. Seal exposed edges with mastic or sealant.
- E. Install protection board over completed membrane, complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.

3.3 PROTECTION

- A. Provide for protection of completed membrane during installation of other materials or processes over membrane and throughout remainder of construction period.

END OF SECTION 07110

SECTION 07150 – MASONRY WATER REPELLANT

PART 1 - GENERAL

- 1.01 SCOPE: Furnish all labor, materials, and equipment necessary to complete the application of the Masonry Water Repellant.
- 1.02 RELATED WORK SPECIFIED IN OTHER SECTION:
- A. 04210 Structural Brick Masonry Units
 - B. 04212 Brick Veneer

PART 2 - PRODUCTS

- 2.01 SAMPLES: Submit complete samples of each coating specified with manufacturer's specifications attached.
- 2.02 GUARANTEES: Upon completion and acceptance of the work, provide the following written warranties to the Owner prior to final payment.
- A. Masonry Water Repellant Installer's Warranty: Provide Installer's written two (2) year guarantee against defects, water penetration, efflorescence, discoloring, etc.
- 2.03 MATERIALS:
- A. Masonry Water Repellant: Equal to Hydrozo Environmental Plus, V.O.C. Compliant with 10 year warranty, penetrating silane by Hydrozo, Lincoln, Nebraska.

PART 3 - EXECUTION

- 3.01 INSTALLATION OF MASONRY WATER REPELLANT:
- A. Structural Brick Masonry Units and Brick Masonry Veneer shall be treated with a siloxane type penetrating water repellant material. The water repellant shall not alter the natural appearance of the masonry. Surfaces to be treated may be "damp" but should be visually dry and thoroughly clean and free of surface dirt, dust, oils and other

contaminants.

Water repellent shall be applied in strict accordance with manufacturers printed instructions.

3.02 FIELD QUALITY CONTROL:

- A. Site Tests, Inspection: Masonry Water Repellent Rilem II, 4 Test.
- B. Manufacturer's Field Services: Provide manufacturer's representative to perform a Rilem II, 4 Test.

3.03 CLEANING:

- A. Remove all trash and debris from the site. Keep areas clean or excess materials and rubbish during and after application. Keep pavements broom clean and work area in orderly condition.
- B. Remove all spatters, spillage and soiling with appropriate cleaning agents and procedures from adjacent and surrounding equipment, surfaces and substrates and leave area in neat and clean condition.

3.04 PROTECTION: Protect finished installation until Final Acceptance.

END OF SECTION

SECTION 07190 - WATER REPELLANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes clear water-repellent coatings for the following vertical and nontraffic horizontal surfaces:
 - 1. Structural Brick Masonry Units/exterior walls.
 - 2. Brick veneer.
- B. Related Sections include the following:
 - 1. Division 3 Sections for concrete work including floor sealers and curing agents.
 - 2. Division 7 Section "Joint Sealants" for joint sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide water repellents with the following properties based on testing manufacturer's standard products, according to test methods indicated, applied to substrates simulating Project conditions using same materials and application methods to be used for Project.
 - 1. Absorption: Minimum 90 percent reduction of absorption after 24 hours in comparison of treated and untreated specimens.
 - 2. Water-Vapor Transmission: Maximum 10 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens, per ASTM E 96.
 - 3. Water Penetration and Leakage through Masonry: Maximum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, per ASTM E 514.
 - 4. Durability: Maximum 5 percent loss of water repellency after 2500 hours of weathering in comparison to specimens before weathering, per ASTM G 53.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's specifications, surface preparation and application instructions, recommendations for water repellents for each surface to be treated, and protection and cleaning instructions. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

- B. Samples: Of each substrate indicated to receive water repellent, 12 inches (300 mm) square, with specified repellent treatment applied to half of each sample.
- C. Applicator Certificates: Signed by manufacturer certifying that the applicator complies with requirements.
- D. Certification by water repellent manufacturer that products supplied comply with local regulations controlling use of VOCs.
- E. Material Test Reports: Indicate and interpret test results for compliance of water repellents with requirements indicated.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage a firm with no less than 3 years experience who employ only persons trained and approved by water repellent manufacturer for application of manufacturer's products.
- B. Regulatory Requirements: Comply with applicable rules of pollution-control regulatory agency having jurisdiction in Project locale regarding VOCs and use of hydrocarbon solvents.
- C. Field Samples: Architect will select one representative surface for each substrate to receive water repellents. Apply water repellent to each substrate, with either partial or full coverage as directed. Comply with application requirements of this Section.
 - 1. Obtain Architect's approval of field samples before applying water repellents.
 - 2. Maintain field samples during construction in an undisturbed condition as a standard for judging the completed Work.

1.6 PROJECT CONDITIONS

- A. Weather and Substrate Conditions: Do not proceed with application of water repellent under any of the following conditions, except with written instruction of manufacturer:
 - 1. Ambient temperature is less than 40 deg F (4.4 deg C).
 - 2. Concrete surfaces and mortar have cured for less than 28 days.
 - 3. Rain or temperatures below 40 deg F (4.4 deg C) are predicted within 24 hours.
 - 4. Application is earlier than 24 hours after surfaces have been wet.
 - 5. Substrate is frozen or surface temperature is less than 40 deg F (4.4 deg C).
 - 6. Windy condition exists that may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.

1.7 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty, executed by the applicator and water repellent manufacturer, covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within the specified warranty period. Warranty does not include deterioration or failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new joints and cracks in excess of **1/16 inch (1.5 mm)** wide, fire, vandalism, or abuse by maintenance equipment.
1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Products: For new Structural Brick Masonary Units, Brick Veneer, Prime-A-Pell H2O is the basis of design, others listed below are acceptable:
1. Siloxanes: With 3.3 lb/gal. **(400 g/L)** VOCs or less.
 - a. Prime A Pell H₂O; Chemprobe Technologies, Inc.
 - b. Diedrich 300-5 Water-Base Siloxane; Diedrich Technologies, Inc.
 - c. Diedrich 300-10 Water-Base Siloxane; Diedrich Technologies, Inc.
 - d. Diedrich 303S-15 Silox Seal; Diedrich Technologies, Inc.
 - e. Hydrozo Clear 16; Harris Specialty Chemicals, Inc.
 - f. Weather Seal Siloxane WB; ProSoCo, Inc.

2.2 WATER REPELLENTS

- A. Siloxanes: Penetrating water repellent. Alkylalkoxysiloxanes that are oligomeric with alcohol, ethanol, mineral spirits, water, or other proprietary solvent carrier.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to repellent manufacturer's written instructions, to ensure surface is sufficiently dry.
- B. Test for pH level, according to water repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.
- C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.
- D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
 - 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.
- E. Test Application: Before performing water-repellent work, including bulk purchase and delivery of products, prepare a small application in an unobtrusive location and in a manner approved by Architect to demonstrate the final effect (visual, physical, and chemical) of planned application. Proceed with work only after Architect approves test application or as otherwise directed.

3.2 APPLICATION

- A. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.
- B. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.3 FIELD QUALITY CONTROL

- A. **Manufacturer's Field Service:** Provide services of a factory-authorized technical service representative to inspect and approve the substrate before application and to instruct the applicator on the product and application method to be used.

3.4 CLEANING

- A. **Protective Coverings:** Remove protective coverings from adjacent surfaces and other protected areas.
- B. **Immediately clean water repellent** from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07190

SECTION 07210 - THERMAL INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide building and perimeter insulation, complete.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Gypsum Board Assemblies; Section 09250.

1.4 SUBMITTALS

- A. Comply with Section 01300. Submit manufacturer's installation instructions for each type of insulation. Include data substantiating that materials comply with physical and thermal properties, and other requirements of specified insulation.

1.5 PRODUCT HANDLING

- A. Do not allow insulation materials to become wet or soiled. Comply with manufacturer's instructions for handling, storage, and protection during installation.

1.6 JOB CONDITIONS

- A. Do not proceed with the installation of insulation until the work which follows (and which conceals the insulation) is scheduled to follow immediately.

PART 2 - PRODUCTS

2.1 THERMAL INSULATION, BUILDING WALLS with METAL STUDS

- A. Spray applied closed cell polyurethane insulation per the Drawings and Section 07214.
Provide 2” minimum at all exterior stud walls and where shown on the Drawings.

2.2 EXTERIOR WALL INSULATION

- A. AP Foil-Faced polyisocyanurate foam sheathing board. Composed of a uniform closed-cell polyisocyanurate foam core bonded on each side to a foil facer. The maximum flame spread index shall not exceed 75 and the smoke developed index shall not exceed 450. Complying with ASTM C1289, Type I, Class I. 2” thickness with an R-value of 6.5 per inch.
JohnsManville, AP Foil Faced Polyisocyanurate Foam Sheathing is the basis of design composed of a uniform closed-cell polyisocyanurate foam core bonded on each side

to a foil facer. One side has a printed foil reflective facer and the other side has a printed nonreflective foil facer.

Must comply with the following specification:

Specification Compliance

ASTM C1289, Type I, Class 1

ASTM D1621 Compressive Strength, 16 psi (110 kPa) and
20 psi (138 kPa)

ASTM D2126 Dimensional Stability, 2% max, 7 days (length
and width)

ASTM E96 Moisture Vapor Transmission*, < 1 perm (57.5 ng/
Pa·s·m²)

NFPA 285 Wall Assembly Testing

ASTM C209 Water Absorption*, <1% volume

ASTM E84 Flame Spread, 75 or less (4")

ASTM E84 Smoke Development, 450 or less (4")

Service Temperature: -100°F to 250°F (-73°C to 122°C)

California State Insulation Quality Standards

2.3 MISCELLANEOUS MATERIALS

- A. Provide adhesive for bonding insulation, mechanical anchors, or other required items, as recommended by the insulation manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **POLYISO FOAM SHEATHING BOARDS:** Comply with manufacturer's instructions. Extend insulation full thickness over entire surface to be insulated. Cut and fit tightly around obstructions. Fit between zee furring channels, mechanically anchor to steel stud framing over building wrap.

END OF SECTION 07210

SECTION 07214
SPRAY FOAM INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closed Cell Spray Foam Insulation.

1.2 REFERENCES

- A. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- C. ASTM C 1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
- F. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- G. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- H. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- I. ASTM D 1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- J. ASTM D 2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- K. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

1.3 PERFORMANCE REQUIREMENTS

- A. Conform to applicable code for flame and smoke, concealment, and over coat requirements.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.

- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.
- B. Installer Qualifications: Products listed in this section shall be installed by a single organization with at least five years experience successfully installing insulation on projects of similar type and scope as specified in this section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Storage: Store materials in dry locations with adequate ventilation, protected from freezing rain, direct sunlight and excess heat and in such a manner to permit easy access for inspection and handling. Store at temperature between 55 and 80 degrees F (12.7 to 26.6 degrees C).
- C. Handling: Handle materials to avoid damage.

1.7 PRE-APPLICATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

1.8 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not apply insulation when substrate temperatures are under 40 degrees F (4.4 degrees C) prior to installation.
- C. Surfaces must be dry prior to application of spray foam. Excess humidity may cause poor adhesion, and result in product failure.
- D. To avoid overspray, product should not be applied when conditions are windy.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

Acceptable Manufacturer: CertainTeed Corp., Insulation Group, which is located at: 750 E. Swedesford Rd. P. O. Box 860; Valley Forge, PA 19482-0860; Toll Free Tel: 800-233-8990; Fax: 610-341-7940

- A. Substitutions: Permitted.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 SPRAY FOAM INSULATION

- A. Insulation: HFC-blown type Closed Cell Foam: CertainTeed CertaSpray Closed Cell Foam is a medium-density, MDI-based polyurethane thermoset rigid foam. When CertaSpray A-side closed cell is mixed with CertaSpray B-side closed cell under pressure in a 1:1 volumetric ratio, they react and expand into a medium-density closed cell foam with an in-place core density of 1.9- 2.2 pcf:
 - 1. Physical and Mechanical Properties:
 - a. Core Density: 1.9-2.4 pcf when tested in accordance with ASTM D 1622.
 - b. Thermal Resistance (aged): 5.8 less than or equal to 2-1/2 inches / 6.4 when greater than 2-1/2 inches when tested in accordance with ASTM C 518 at 75 degrees F, (h-ft2- degrees F)/Btu.
 - c. Thermal Resistance (initial): 6.4 when tested in accordance with ASTM C 518 at 75 degrees F, (h-ft2- degrees F)/Btu.
 - d. Closed Cell Content: 88-95 percent when tested in accordance with ASTM D 2842.
 - e. Compressive Strength: Greater than 25 psi when tested in accordance with ASTM D 1621.
 - f. Tensile Strength: 23 psi when tested in accordance with ASTM D 1623.
 - g. Water Absorption: Less than 2 percent by volume when tested in accordance with ASTM D 2842.
 - h. Dimensional Stability: Less than 9 percent by volume when tested in accordance with ASTM D 2126 at 75 degrees F/95 percent RH, 28 Day.
 - i. Water Vapor Transmission: 1.3 perm/inch when tested in accordance with ASTM E 96.
 - j. Air Permeability: 0.013 when tested in accordance with ASTM E 283 at 1 inch thickness, L/s/m2.
 - k. Fungi Resistance: Pass, with no growth when tested in accordance with ASTM C 1338.
 - 2. Fire performance
 - a. Flame Spread: Less than 25 when tested in accordance with ASTM E 84.
 - b. Smoke: Less than 450 when tested in accordance with ASTM E 84.
 - 3. Thermal Performance (aged): Tested in accordance with ASTM C 518 and/or ASTM C 177 at 75 degrees F (24 degrees C) mean temperature.
 - a. Thickness 1 inch (25 mm), R-Value 5.8 (h-ft2-degreesF)/Btu (1.0 (m2-degreesC)/W).
 - b. Thickness 1-12 inches (38 mm), R-Value 8.7 (h-ft2-degreesF)/Btu (1.5 (m2-degreesC)/W).

- c. Thickness 2 inches (51 mm), R-Value 11.6 (h-ft2-degreesF)/Btu (2.0 (m2-degreesC)/W).
- d. Thickness 2-12 inches (64 mm), R-Value 16.0 (h-ft2-degreesF)/Btu (2.8 (m2-degreesC)/W).
- e. Thickness 3 inches (76 mm), R-Value 19.2 (h-ft2-degreesF)/Btu (3.4 (m2-degreesC)/W).
- f. Thickness 3-12 inches (89 mm), R-Value 22.4 (h-ft2-degreesF)/Btu (3.9 (m2-degreesC)/W).
- g. Thickness 4 inches (102 mm), R-Value 25.6 (h-ft2-degreesF)/Btu (4.5 (m2-degreesC)/W).
- h. Thickness 4-12 inches (114 mm), R-Value 28.8 (h-ft2-degreesF)/Btu (5.1 (m2-degreesC)/W).
- i. Thickness 5 inches (127 mm), R-Value 32.0 (h-ft2-degreesF)/Btu (5.6 (m2-degreesC)/W).
- j. Thickness 5-12 inches (140 mm), R-Value 35.2 (h-ft2-degreesF)/Btu (6.2 (m2-degreesC)/W).
- k. Thickness 6 inches (152 mm), R-Value 38.4 (h-ft2-degreesF)/Btu (6.8 (m2-degreesC)/W).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that all exterior wall assembly construction has been completed to the point where the insulation may correctly be installed.
- C. Verify that substrate and cavities are dry and free of any foreign material that will impede application.
- D. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Mask and protect adjacent surfaces from overspray or dusting.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Product must be installed according to local code, and must be applied by a qualified applicator.
- B. Apply insulation by spray method, to uniform monolithic density without voids.

- C. Apply to minimum cured thickness as indicated on the Drawings or as scheduled at the end of this Section.
- D. Apply to minimum cured thickness of 2 inches.
- E. Apply to achieve thermal resistance R-Value of 11.6.
- F. Seal plumbing stacks, electrical wiring and other wall penetrations to control air leakage.
- G. Apply insulation to fill voids.
- H. Apply insulation to fill voids around windows. Apply insulation to fill voids around accessible service and equipment penetrations.
- I. Do not install spray foam insulation in areas where it will be in contact with equipment or materials with operating temperatures of 180 degrees F (82 degrees C) or greater.
- J. Patch damaged areas.

3.4 FIELD QUALITY CONTROL

- A. Inspection will include verification of insulation and density.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 SCHEDULES

- A. For the following locations, apply the average cured thickness indicated.
 - 1. exterior wood frame walls: 2 inches.

END OF SECTION

Section 07220 – Roof and Deck Insulation

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. HCFC FREE Polyiso Rigid board type roof insulation(s) for thermal protection as part of roofing assemblies.
- B. Roofing crickets.

1.2 RELATED SECTIONS

- A. Section 053100 - Steel Decking.
- B. Section 06100 - Carpentry

1.3 REFERENCES

- A. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Insulation Board.
- B. ASTM D 312 - Standard Specification for Asphalt Used in Roofing.
- C. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
- D. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- E. FM 4450 - Approval Standard - Class I Insulated Steel Roof Decks.
- F. FM 4470 - Approval Standard - Class I Roof Covers.
- G. LTTR – Long Term Thermal Resistance predicted by CAN/ULC-S770-03.
- H. UL 263 - Fire Tests of Building Construction and Materials.
- I UL 790 - Standard Test Methods for Fire Tests of Roof Coverings.
- J UL 1256 - Fire Test of Roof Deck Constructions.

1.4 DEFINITIONS

- A. LTTR (Long Term Thermal Resistance) is defined as using techniques from ASTM C1303

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300 and 01600.
- B. Product Data:
 - 1. Manufacturer’s specifications.
 - 2. Installation instructions for insulation board and fasteners.
 - 3. Product Data as per ASTM 2129 – 01 Standard for Data Collection for Sustainability Assessment of Building Products.
- C. Samples:
 - 1. Submit 6 by 6 inch (152 by 152 mm) samples of each board type required.
 - 2. Submit samples of each fastener type required.
- D. Shop Drawings: Roof plan showing layout of boards and fastening patterns.
- E. Certificates: System Manufacturer’s or insulation manufacturer’s certification that the insulation meets Zero ODP (Ozone Depletion Potential) and Zero GWP (Global Warming Potential) specification requirements.
- F. Thermal Warranty: Submit sample warranty indicating conditions and limitations.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. American Society for Testing and Materials (ASTM).

2. Federal Specifications (FS).
3. Factory Mutual (FM).
4. Underwriters Laboratories Inc. (UL) Classification.
5. IBC Sections on Foam Plastic Insulation.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Comply with general requirements specified in Section 01600.
- B. Deliver insulation in packages labeled with material name, thermal value and product code.
- C. When stored outdoors, stack insulation on pallets above ground or roof deck and cover with tarpaulin or other suitable waterproof coverings. Slit or remove manufacturer's packaging before covering with waterproof covering.

1.8 PROJECT CONDITIONS

- A. Do not apply roofing materials when substrate is damp or wet.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Atlas Roofing Corporation, or approved equal. Atlas Roofing Corporation, 2000 River Edge Pkwy, Suite 800, Atlanta, GA 30328. Ph. (770) 952-1442
Fax (770) 952-3170
- C. Substitutions: Submit per Section 01630.
- D. Provide polyiso roof board insulation from a single manufacturer.

2.2 MATERIALS

- A. Polyiso Roof Board Insulation: Provide products that comply with the following:
 1. ASTM standards specified.
 2. Factory Mutual (FM) approvals specified.
 3. Underwriters Laboratories Inc. (UL) classifications specified.
 4. IBC Building Code Section on Foam Plastic Insulation.
- B. AC Foam-II: Closed-cell HCFC FREE "Green" polyisocyanurate foam core manufactured using [HCFC] [AC Ultra Hydrocarbon] blowing agent and integrally laminated to heavy non-asphaltic fiber-reinforced felt facers; FM 90 wind uplift classification; compressive strength - 20 psi. for use with single ply fully adhered roofing membrane & metal roofing system. Thicknesses indicated on the Drawings.
- C. AC Foam Nail Base: Closed-cell HCFC FREE "Green" polyisocyanurate foam board manufactured using [HCFC] [AC Ultra Hydrocarbon] blowing agent and bonded to 7/16 inch thick APA/TECO rated OSB on the top side and a fiber-reinforced felt facer on the bottom; for use with metal roofing FM 90 wind uplift rating; compressive strength - 20 psi-in Thickness indicated on Drawings

FM Standard 4450/4470 Approval

AC Foam-II, are approved for Class 1 insulated steel, wood, concrete and gypsum roof deck

UL Standard 1256 Classification

Insulated metal deck construction assemblies - Construction #120 and #123.

UL Standard 790 (ASTM E 108) Classification
Class A

UL Standard 263 Fire Resistance Classification (ASTM E 119)
UL Standard 1897 Uplift Resistance
120 psf,

LTTR - Insulation "R" Value:: 6 per inch

D. Related Materials:

1. Fasteners: Factory Mutual approved.
2. Base Ply: As recommended by membrane manufacturer.
3. Fasteners: For Nail Base Atlas Nail Base Fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roof deck for suitability to receive insulation. Verify that substrate is dry, clean and free of foreign material that will damage insulation or impede installation.
- B. Verify that roof drains, scuppers, roof curbs, nailers, equipment supports, vents and other roof accessories are secured properly and installed in conformance with Contract Drawings and submittals.
- C. Verify that deck is structurally sound to support installers, materials and equipment without damaging or deforming work.
1. Start of installation indicates installer accepts conditions of existing deck surfaces.

3.2 APPLICATION / INSTALLATION

- A. Install specified insulation using approved mechanical fasteners in accordance with manufacturer's latest written instructions and as required by governing codes and Owner's insurance carrier.
- B. Install with end joints staggered to avoid having insulation joints coinciding with joints in deck. Install in multiple layers as indicated on the Drawings. Stagger joints in top and bottom layers.

3.3 CLEANING / PROTECTION

- A. Remove trash and construction debris from insulation surface prior to application of roofing membrane.
- B. Do not leave installed insulation exposed to weather. Cover and waterproof with completed roof system immediately after installation.
1. Temporarily seal exposed insulation edges at the end of each day.
 2. Remove and replace installed insulation that has become wet or damaged with new insulation.
- C. Protect installed insulation and roof cover from traffic by use of protective covering materials during and after installation.

END OF SECTION 07220

SECTION 07274

COMMERCIAL BUILDING WRAP

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Includes but not limited to:
 - 1. Furnish and install air barrier/weather resistant barrier over exterior of wall sheathing at all locations regardless of whether or not indicated on drawings to protect exterior sheathing and interior walls.

1.03 RELATED SECTIONS

- A. Section 054000 – Cold Formed Metal Framing

1.04 REFERENCES:

- A. American Society for Testing and Materials
- B. Technical Association of Pulp and Paper Industry
- C. American Association of Textile Chemists and Colorists

1.05 SUBMITTALS:

- A. General: Submit each item in this Article according to the conditions of the Contract and Division I Specifications Sections.
- B. Product Data: Submit product specifications, technical data and installation instructions of manufacturer equaling or exceeding those specified.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer with successful experience in the installation of air barrier/secondary weather resistant barriers.
- B. Install job mock-up using specified air barrier/secondary weather resistant barrier with system of fastening and taping seams as per manufacturer's instructions. Obtain architect's and manufacturer's approval of system for appearance and workmanship standard.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Tyvek, by DuPont Weatherization Systems is the basis of design. Other manufacturers may be acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitutions.

2.02 MATERIALS

- A. A flash spun-bonded olefin, non-woven, non-perforated secondary weather resistant barrier.
- B. Performance Characteristics:
 - 1. AATCC-127, Water Penetration Resistance, exceeded at 280.
 - 2. TAPPI T-460, Gurley Hill (sec/100cc) Air infiltration at >1500 seconds.
 - 3. ASTM E 96 Method B (g/m²-24hr.) Water vapor transmission of 200.
 - 4. TAPPI T-41D, Basis weight of 2.7 oz/yd.
 - 5. ASTM E96 Method B, Water Vapor Transmission, 28 perms.
 - 6. ASTM E1677, Air Retarder Material Standard Specification, Type I air barrier.
- C. Sealing Tape/Fasteners
 - 1. DuPont Tyvek Tape, DuPont Weatherization Systems.
 - 2. For steel frame construction: DuPont Tyvek Wrap Cap Screws. DuPont Weatherization Systems. 1 5/8" rust resistant screws with 2" diameter plastic cap.
 - 3. Caulks or Sealants: polyurethane or elastomeric sealants
 - a. Available Products:
 - 1. OSI[®] Quad Pro-Series[®], solvent release butyl rubber sealant.
 - 2. DAP[®] Dynaflex 230[™].
 - 3. Other products as approved and recommended by air barrier/weather resistant barrier manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install Air Barrier over exterior side of exterior wall sheathing.
 - 1. Install Air Barrier after sheathing is installed and before windows and doors are installed. Install lower level barrier prior to upper layers to ensure proper shingling of layers.
 - 2. Overlap Air Barrier at corners of building by a minimum of 12 inches.
 - 3. Overlap Air Barrier vertical seams by a minimum of 6 inches.
 - 4. Ensure barrier is plum and level with foundation, and unroll extending Air Barrier over window and door openings.

5. Attach Air Barrier to wood, insulated sheathing board or exterior gypsum with plastic cap nails every 12” to 18” on vertical stud line with wood stud framing, and screws with washers to metal stud framing. When attaching to masonry, use adhesive recommended by manufacturer.
6. Prepare window and door rough openings as follows:
 - a. Prepare each window rough openings by cutting a modified “T” pattern in the Air Barrier.
 1. Horizontally cut Air Barrier along bottom of header.
 2. Vertically cut Air Barrier down the center of window openings from the top of the window opening down to 2/3 of the way to the bottom of the window openings.
 3. Diagonally cut Air Barrier from the bottom of the vertical cut to the left and right corners of opening.
 4. Fold side and bottom flaps into window opening and fasten every 6 inches. Trim off excess.
 - b. Prepare each rough door opening by cutting a standard “T” pattern in the Air Barrier.
 1. Horizontally cut Air Barrier along bottom of door frame header and along top of sill.
 2. Vertically cut Air Barrier down the center of the door openings from the top of the door opening (header) down to the bottom of the door opening (sill).
 3. Fold side flaps inside around door openings and fasten every 6 inches. Trim off excess.
7. Tape all horizontal and vertical seams of Air Barrier with air barrier manufacturer’s tape.
8. Seal all tears and cuts in Air Barrier with air barrier manufacturer’s tape.

END OF SECTION 07274

SECTION 07410 – EXPOSED FASTENER

FACTORY MANUFACTURED PREFORMED WALL PANELS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. This section covers the pre-finished, pre-fabricated exposed fastener metal wall system panels. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.
- B. Drawings and general provisions of the Contract, including general and Supplementary Conditions and Division 01 Specifications, apply to this section.

1.2 SUMMARY

- A. Section Includes
 - 1. Factory formed exposed fastener metal wall panels
- B. Related work specified elsewhere.
 - 1. Section 054000 – Cold Formed Metal Framing
 - 2. Section 06100 – Carpentry
 - 3. Section 07274 - Commercial Building Wrap
 - 4. Section 07210 – Thermal Insulation
 - 5. Section 07600 - Flashing and Sheet Metal
 - 6. Section 07900 - Joint Sealants

1.3 DEFINITIONS

- A. Metal Wall Panel Assembly: Wall panels, attachment system components, miscellaneous metal framing, wood sheathing, thermal, and accessories necessary for a complete weathertight wall system.
- B. References:
 - 1. American Society for Testing and Materials (ASTM)
 - a. ASTM B 209: Aluminum and Aluminum Alloy Sheet and Plate
 - 2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - a. SMACNA Architectural Sheet Metal Manual, 1993 edition
 - 4. Aluminum Association
 - a. Aluminum Design Manual
 - 5. Metal Construction Association
 - a. Preformed metal Wall Guidelines
 - 6. Code References
 - a. ASCE, Minimum Loads for Buildings and Other Structures
 - b. IBC International Building Code

1.4 QUALITY ASSURANCE

- A. Manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.
- B. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.

1.5 WALL SYSTEM PERFORMANCE TESTING

- A. General Performance: Metal Wall panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.
- B. Panels to meet:
 - 1. Wall System shall be designed to meet applicable Local Building Code and the System shall have been tested by the Manufacturer and have the applicable Load Tables published from this testing for loads.

1.6 SUBMITTALS

- A. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.
- B. Provide finish samples.
- C. Shop drawings: Show fabrication and installation layouts of metal roof panels, metal wall panels or metal soffit panels, details of edge conditions, side-seam joints, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work
- D. Coordination Drawings: Building elevations drawn to scale, on which the following are shown and coordinated with each other, based on input from installer of the items involved:
 - 1. Wall panels, trims and attachments.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instruction and lead time requirements to avoid construction delays.
- B. Deliver components, sheets, metal wall panels and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- C. Unload, store and erect metal roof/wall panels in a manner to prevent bending, warping, twisting and surface damage.
- D. Stack metal panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof/wall panels to

ensure dryness. Do not store metal panels in contact with other materials that might cause staining, denting or other surface damage.

- E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: proceed with installation only when existing and forecasted weather conditions permit metal wall panel work to be performed.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.9 COORDINATION

1.10

- A. Coordinate metal panels with rain drainage work, flashing, trim and other adjoining work to provide a leakproof, secure and noncorrosive installation.

PART 2 – PRODUCTS

2.1 PANEL DESIGN

- A. General: Provide factory-formed, prefinished, lappable exposed fastener, structural wall panel system, that has been pretested and certified by manufacturer to comply with specified requirements under installed conditions.
- B. Wall panels shall be exposed fastener:
 - PBR/R type panels, with 2.67" x 1 1/4" deep profile ribs, total coverage of Wall panels when installed shall be 34.67" coverage with 1 lapped rib for siding.
- C. Structural Requirements: Engineer panels for structural properties in accordance with latest edition of American Iron and Steel Institute's Cold Formed Steel Design Manual using effective width concept and Aluminum Associations Aluminum Design Manual.
- D. Forming: Use continuous end rolling method. No end laps on panels. No portable rollforming machines will be permitted on this project, no installer-owned or installer-rented machines will be permitted. It is the intent of the Architect to provide Factory-Manufactured panel systems only for this project.
- E. Panels shall be directly fastened to the substrate.
- F. The panel shall have an overlapping sidelap feature.

2.2 MATERIALS AND FINISHES

- A.** Preformed wall panels shall be fabricated of
- Gauge - 24 GA, grade 40 (40 KSI yield strength) structural steel
ASTM A366 CRCQ.
FINISH: Paint Kynar 500/Hylar 5000 (color to be selected by Architect)
- B.** Texture: Panel shall be smooth.
- C.** If Strippable coating is to be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and handling, film shall be removed before installation.
- D.** Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting. Trim to be fabricated in accordance with standard SMACNA procedure and details.
- E.** Closures: shall be pre-molded polyethylene to match the profile of the exposed fastener panel and shall be in lengths as supplied by the panel manufacturer.
- F.** Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the roof panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces, except at designed points of roof panel fixity
1. Fasteners shall have combination steel and EPDM washers
 2. Screws for panel to girt/purlins shall be sufficient to penetrate the supporting member by 1". All fasteners shall be applied in accordance with the fastening schedule as provided by panel manufacturer.
 3. Screws for flashings and sidelaps shall be #14 HHA x 3/4" sheet metal stitch screws. All accessories, flashings and sidelaps shall be fastened 12" OC.
- G.** Substrate shall be
- FRT Plywood
- H.** Caulking: All caulking and sealing shall be done in a neat manner with excess caulking or sealant removed from exposed surfaces.
- I.** Caulking shall be non-skinning, non hardening gun grade butyl sealant or butyl sealant tape with a minimum thickness of 1/4" where it is concealed and where thermal movement must be accommodated. All caulking or sealing shall be done in a neat manner with excess caulking or sealant

- removed from exposed surfaces.
- J. Vapor Retarder: retarder with a permeance of 0.05 or less as determined by ASTM 98.

2.3 FABRICATION

- A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.
- B. Fabricate components of the system in factory, ready for field assembly.
- C. Fabricate components and assemble units to comply with fire performance requirements specified.
- D. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.
- E. Panels are lappable. It is recommended that individual steel wall panels not exceed 16' in length for thermal movement reasons.
- F. Panels shall be roll formed on a stationary industrial type rolling mill to gradually shape the sheet metal. Portable rollformers rented or owned by the installer, are not acceptable.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine alignment of supports, primary and secondary roof framing, and solid roof sheathing, prior to installation. Components should comply with shop drawings and be smooth, even, sound and free of depressions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FASTENERS

- A. Secure units to supports
- B. Place fasteners as indicated in manufacturer's standards.

3.3 INSTALLATION

- A. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years successful experience with similar applications.
- B. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation. Conform to standards set forth in SMACNA architectural sheet metal manuals and approved shop drawings for this project.
- C. Remove all strippable coating and provide a dry-wipe down cleaning of the

- panels as they are erected.
- D.** Install panel system so it is watertight, without waves, warps, buckles or distortions, and allow for thermal movement considerations.
 - E.** Abrasive devices shall not be used to cut on or near roof or wall panel system.
 - F.** Apply sealant tape or caulking as necessary at flashing and panel joints to prevent water penetration.
 - G.** Remove any strippable film immediately upon exposure to direct sunlight.
 - H.** Vapor retarder: The joints, perimeter, and all openings shall be sealed per the manufacturer's instructions to provide a continuous vapor retarder.
 - I.** Underlayment (solid substrate):
 - 1. Provide one layer of 30# felt with horizontal overlaps and endlaps staggered between layers.

3.4 DAMAGED MATERIAL

- A.** Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

END OF SECTION 07410

SECTION 07411 – STANDING SEAM METAL ROOF

Part - GENERAL

1.01 DESCRIPTION

A. General

1. Furnish all labor, material, tools, equipment and services for all preformed metal roofing as indicated, in accord with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and completion installation.
4. See Division 1 for General Requirements.

B. Related Work Specified Elsewhere:

1. Structural Steel Framing: Section 051200.
2. Flashing and Sheet Metal: Section 07600.
3. Roof Insulation: Section 07220
4. Waterproof Membrane: Section 07110

1.02 QUALITY ASSURANCE

A. Applicable Standards:

1. SMACNA: “Architectural Sheet Metal Manual”, Sheet Metal and Air Conditioning Contractors National Association, Inc.
2. AISC: “Steel Construction Manual”, American Institute of Steel Construction.
3. AISI: “Cold Form Steel Design Manual”, American Iron and Steel Institute (1996 Edition).
4. UL580: “Tests for Uplift Resistance of Roof Assembles”, Underwriters Laboratories, Inc.
5. ASTM E-283: “Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems”, American Society for Testing and Materials.
6. ASTM E-331: “Standard Test Method for Water Penetration Through Exterior Metal Roof Panel Systems”, American Society for Testing and Materials.
7. ASTM A 792-83-AZ50 (Painted) & ASTM A792-83-AZ55 (Bare Galvalume Plus®)”, American Society for Testing and Materials.
8. ASTM E 1514-93: “Standard Specification for Structural Standing Seam Steel Roof Panel Systems”, American Society for Testing and Materials.

B. Manufacturer’s Qualifications:

1. Manufacturer has a minimum of five years experience in manufacturing metal roof systems of this nature. Panels specified in this section shall be produced in a permanent manufacturing facility or on manufacturing owned and operated roll-former equipment.

C. Installation Contractor’s Qualifications:

1. Installation contractor shall be an approved installer, certified by the manufacturer before the beginning of installation of the metal roof system.
2. Provide five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installation contractor.

D. Pre-Installation Conference:

1. Prior to installation of roofing system, conduct a pre-installation conference at the project site.
2. Attendance: Owner, Architect, Contractor, Project Superintendent and Installer.
3. Agenda:
 - a. Roofing details and agenda.
 - b. Critical work sequencing and review of phasing plan.
 - c. Inspection sequencing.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Performance Testing:

1. Metal roof system must be tested in accordance with **Underwriters Laboratories, Inc. (UL) Test Method 580** “Tests for Uplift Resistance of Roof Assemblies”.
2. Metal roof system must meet the air infiltration requirements of ASTM E-283 when tested with a (20 PSF).
3. Metal roof system must meet the water penetration requirements of ASTM E-331 when tested with a (20 PSF) pressure differential with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.

1.04 DESIGN REQUIREMENTS

A. Roof Design Loads:

1. Design criteria shall be in accordance with the most current version of the applicable local building code.
2. Dead Loads
 - a. The dead load shall be the weight of the SSMR system. Collateral loads, such as sprinklers, mechanical and electrical systems, and ceilings shall not be attached to the panels.
3. Live Loads
 - a. The panels and concealed anchor clips shall be capable of supporting a minimum uniform live load of 20 psf.
4. Roof Snow Loads
 - a. The design roof snow loads shall be as shown on the contract drawings.

5. Wind Loads
 - a. The design wind uplift pressure for the roof system shall be as shown on the contract drawings.
6. Thermal Loads
 - a. Roof panels shall be free to move in response to the expansion and contraction forces resulting from a total temperature range of 100 degrees F during the life of the structure.

1.05 SUBMITTALS

A. Shop Drawings:

1. Submit complete shop drawings and erection details, approved by or supplied by the metal roofing manufacturer, to the architect for review. Do not proceed with manufacture of roofing materials prior to review of shop drawings and field verification of all dimensions. Do not use drawings prepared by the architect for shop or erection drawings.

B. Performance Tests:

1. Submit certified test results by a recognized testing laboratory or manufacturer's lab (witnessed by a professional engineer) in accordance with specified test methods for each panel system.

C. Samples:

1. Submit samples and color chips for all proposed finishes.
 - a. Submit one 8-inch long sample of panel, including clips.

D. Warranties:

1. Finish Warranty:

- a. Panel manufacturers' 20-year warranty against structural defects or corrosion and the 20 year warranty on finish durability.

2. Weathertightness Warranty:

- a. Subcontractor's 5 year guarantee on workmanship and leaks.
- b. Manufacturer's standard 20 year Weathertight Warranty.

F. Test Reports:

1. Submit Test Reports showing that metal panels have been tested in accordance with the Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference of ASTM E 1592-95. Metal roof system must meet the air infiltration requirements of ASTM E 1680-95 when tested with 20 PSF.
2. Submit Test Reports showing that metal panels meet the water penetration requirements of ASTM E 1646-95 when tested with a 20 PSF pressure differential

with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.

G. Metal Roof System Fabrication Certification:

1. Submit a letter from the metal roof system manufacturer certifying the panels have been produced in a manner to meet this specification.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver metal roof system to job site properly packaged to provide protection against transportation damage.

B. Handling:

1. Exercise extreme care in unloading, storing and erecting metal roof system to prevent bending, warping, twisting and surface damage.

C. Storage:

1. Store bundled sheets off the ground sufficiently high enough to allow air circulation beneath bundle and to prevent rising water from entering bundle. Slightly elevate one end of bundle. Prevent rain from entering bundle by covering with tarpaulin, making provision for air circulation between draped edges of tarpaulin and the ground.

1.07 WEATHERTIGHTNESS WARRANTY

- A.** The Contractor shall provide to the Owner, a 20 year warranty signed by the roofing manufacturer of the Standing Seam Roof System.
- B.** An employee of the manufacturer shall inspect the installation at least twice before warranty is issued.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Petersen Pac-Clad** is the basis of design. Other manufacturers, such as MBC1 may be equal and acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitutions.

1. At the Apparatus Room with 1:12 pitch: **Tite-Loc**, 16” coverage, 2” high x 3/8” wide mechanically seamed ribs. Provide warranty for 1:12 roof pitch. Finish: **Galvalume Plus**

2. At the Administration area: **Snap-Clad**, 16” coverage, 1¾” high x 3/8” wide ribs 16” wide panel. Provide warranty for 2:12 roof pitch. Finish: **Galvalume Plus**.

Metal roof system style:

Architectural Structural Panel

1. Vertical leg, concealed fastener, standing seam, utilizing male and female rib configuration, with factory applied hot metal mastic in female rib, continuously locked together by an electrically powered mechanical seaming device during installation.
2. Vertical leg, concealed fastener, standing seam, utilizing male and female rib configuration, with factory applied hot metal mastic in female rib with a continuous interlocking system.

D. Gauge:

1. Roof panels shall be 24 gauge galvanized sheet steel.

E. Substrate:

1. Galvalume® steel sheet, minimum yield of 50,000 PSI.

F. Clips:

1. One piece fixed clip, 22 gauge, with factory-applied mastic. (#UL90 rated-Underwriters Laboratories).
2. Two piece floating clip, 18 gauge base, 24 gauge top, with factory applied mastic.
3. Manufacturer shall provide documentation for clip performance, ability to accommodate thermal movement.

G. Texture:

1. Panels shall be have a smooth surface texture.

H. Finish:

1. Galvalume Plus.

2.02 MISCELLANEOUS MATERIALS

A. Fasteners:

1. All self-tapping/self-drilling fasteners, bolts, nuts, self-locking rivets and other suitable fasteners shall be designed to withstand specified design loads.
2. Use long life fasteners for all interior and exterior metal roof system applications.
3. Provide fasteners with a factory applied coating in a color to match metal roof system application.
4. Provide neoprene washers under heads of exposed fasteners.

5. Locate and space all exposed fasteners in a true vertical and horizontal alignment. Use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the neoprene washer.

B. Accessories:

1. Provide all components required per the metal roof system manufacturer's approved shop drawings for a complete metal roof system to include panels, panel clips, ridge, closures, and any other required items.
 - a. All outside closures will be fabricated from material of the same gauge, finish and color as the panels.
 - b. All tape seal is to be a pressure sensitive, 100 percent solids, polyisobutylene compound sealing tape with a release paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape seal approved by the metal roof system manufacturer.
 - c. All tube sealant is to be a one-part elastomeric polyurethane sealant approved by the metal roof system manufacturer.

2.03 FABRICATION

- A.** Where possible roll form panels in continuous lengths, full length of detailed runs.
- B.** Fabricate trim/flashing and accessories to detailed profiles.
- C.** Fabricate trim/flashing from same material as panel.
- D.** Installer owned or operated roll forming equipment will not be acceptable.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Examination:

1. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions. This specifically includes verifying that secondary structural members and/or decking are installed to meet UL and building code requirements. Coordinate with metal roof system manufacturer to insure that reduced clip spacings at eave, rake, ridge and corner areas are accommodated.

B. Discrepancies:

1. In event of discrepancy, notify the architect.
2. Do not proceed with installation until discrepancies have been resolved.

3.02 INSTALLATION

- A. Install metal roof system so that it is weathertight, without excessive warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
- B. Install metal roof system in accordance with manufacturer's instructions and shop drawings.
- C. Provide concealed anchors at all panel attachment locations.
- D. Install panels plumb, level and straight with seams and ribs parallel, conforming to design as indicated.

3.04 CLEANING, PROTECTION

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the architect (owner), any work that becomes damaged prior to final acceptance.
- D. Touch up minor scratches and abrasions with touch up paint supplied by the metal roof system manufacturer.
- E. **Do not allow panels or trim to come in contact with dissimilar metals such as copper, lead, or graphite. Water run-off from these materials is also prohibited.**

END OF SECTION 07411

SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide all sheet metal work, complete, including flashing and counterflashing at roof-to-wall locations and installation of flashing and brake metal at aluminum glass setting heads, jambs & sills and under glulam beams at clerestory locations.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Sealants; Section 07900.
- B. Thru-wall flashing @ masonry walls- Section 04200.

1.4 SHOP DRAWINGS

- A. Comply with Section 01300. Prior to fabrication, submit shop drawings for each typical sheet metal item indicating materials, gages, jointing, and fastening.

1.5 JOB CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. At roof related locations: Sheet Metal: 24 gauge pre-finished sheet metal with Galvalume Plus finish coating.
- B. At aluminum glass setting locations: Aluminum sheets: ASTM B 209, alloy 3003, temper, clear anodized aluminum finish.
- C. At Metal Siding related locations: Sheet Metal 24 gauge pre-finished sheet metal With "Kynar 500" or equal coating. Color shall match siding panels.

- D. Nails, Screws, and Rivets: Same metal as flashing/sheet metal or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with materials being fastened.
- E. Solder: ASTM B32, 50% tin and 50% lead, used with rosin flux.
- F. Roofing Cement: ASTM D4586, Type I.
- G. Bitumastic Coating: F.S. TT-C-494, MIL-C-18480, or SSPC - Paint 12, cold applied solvent type bitumastic coating for application in dry film thickness of 15 mils per coat.
- H. Metal Accessories: Sheet metal clips, cleats, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.
- I. Sealants: As specified in Section 07900.
- J. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by manufacturer for non-moving joints including riveted joints.
- K. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- L. Polyethylene Underlayment: 6 mil carbonated polyethylene film.

2.2 FABRICATION

- A. Fabricate metal flashings, counterflashings, trim and similar items to comply with the profiles and sizes indicated. Fabricate to comply with "SMACNA Architectural Sheet Metal Manual", metal manufacturer's recommendations, and recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer's instructions and recommendations. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems. Fabricate work of the following metals:
 - 1. Flashing, Counterflashing, and fascia and soffit Trim Exposed to View: 22 gage material with finish appropriate for the condition and location.
 - 2. Flashing and Counterflashing Concealed from View: .032" thick aluminum.
- B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic sealant (concealed within joints).
- D. Separate dissimilar metals from each other by painting each metal surface in area of

contact with a heavy application of bitumastic coating, or by other permanent separation as recommended by manufacturers of dissimilar metals.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine substrates and conditions under which metal flashing and trim will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. SMACNA Details: Except as otherwise indicated or specified, comply with applicable recommendations and details of "Architectural Sheet Metal Manual" by Manufacturer's Recommendations: Except as otherwise indicated or Specified, comply with recommendations and instructions of manufacturer of sheet metal being installed.
- B. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.
- C. Underlayment: Where aluminum is to be installed directly on cementitious or wood substrates, install a course of paper slip sheet and a course of polyethylene underlayment.
- D. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- E. Roofing Cement Edges: Where indicated, seal edges of metal flashings to substrates with roofing cement; install bed or bead of cement in manner which will maintain a watertight seal.

3.3 CLEAN-UP

- A. After completion of work, clean roofing cement, sealant and bituminous paint from flashing, floors, and all surfaces so defaced. Remove all excess materials and scraps from the job and leave all surfaces neat and clean.

END OF SECTION 07600

SECTION 07900 - JOINT SEALANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Completely close with sealant all joints. Include joints around frames of doors, windows, or other openings in exterior walls, flooring joints, joints at penetrations of walls, decks, and floors by piping and other services and equipment, joints between items of equipment and other construction, and other joints indicated or specified to be sealed. **Use Fire Rated Caulk at Fire Rated Wall Assemblies.**

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Aluminum Framing; Section 08410.

1.4 QUALITY ASSURANCE

- A. Obtain elastomeric materials only from manufacturer who will, if required, send a qualified technical representative to project site, for the purpose of advising the installer of proper procedures and precautions for the use of the material.

1.5 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit manufacturer's specifications, recommendations, and installation instructions for each type of sealant and miscellaneous materials. Include letter of certification, or certified test laboratory reports indicating that each material complies with the requirements and is intended for the applications indicated.
- C. Samples: Submit 12" long sample of each color required (except black) for each type of sealant exposed to view. Samples will be viewed for color only.
- D. Provide Compatibility Statement & Certification for each type of sealant.

1.6 JOB CONDITIONS

- A. Examine joint surfaces, backing, and anchorage of units forming sealant rabbet. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Do not proceed with installations of sealants under adverse weather conditions, or when temperatures are above or below manufacturer's recommended limitations for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Compatibility: Provide joint sealers, 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 testing and field experience.
- B. Provide in colors as selected by Architect from manufacturer's standard colors.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated with complies with ASTM C 920 requirements, including those for Type, Grade Class, and Uses.
 - 1. Two-Or-More Component Nonsag Urethane Sealant: Type M, Grade NS, Class 25. Tremco "Dymeric", Sonneborn "Sonolastic NP 2", Bostik "Chem-Calk 500", Pecora "Dynatrol II", or Mameco "Vulkem 922".
 - 2. Two-Component Pourable Urethane Sealant: Type M, Grade P, Class 25. Tremco "THC 900", Sonneborn "Sonolastic SL2", Bostik "Chem-Calk 550", Pecora "NR-200 Urexpan", or Mameco "Vulkem 245".
 - 3. One-Component Mildew-Resistant Silicone Sealant: Type S, Grade NS, Class 25. GE "SCS 1702", Dow Corning "786", Tremco "Proglaze White", or Pecora "898".
 - 4. Glazing system perimeter framing; Dow Silicone 795.

2.3 ACRYLIC EMULSION SEALANT

- A. One component, nonsag, acrylic, paintable, complying with ASTM C 834.
 - 1. Tremco "Acrylic Latex 834", Sonneborn "Sonolac", Pecora Corp. "AC-20", or Bostik "Chem-Calk 600".

2.4 MISCELLANEOUS MATERIALS

- A. Joint Cleaner: Type of joint cleaning compound recommended by sealant manufacturer for joint surfaces to be cleaned.
- B. Joint Primer/Sealer: Type recommended by the sealant manufacturer for the joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.
- D. Sealant Backer Rod: Compressible rod stock closed cell polyurethane foam. Provide size and shape of rod which will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion

when joint is compressed.

PART 3 - EXECUTION

3.1 JOINT TYPES AND USAGES

- A. Acrylic Emulsion Sealant: All interior joints except joints with metal, aluminum, ceramic tile and wet work.
- B. Urethane Sealants: Multi-component. All exterior joints and interior joints with aluminum or metal. Use minimum 35 Shore A hardness urethane sealant for horizontal joints subject to pedestrian and vehicular traffic.
- C. Silicone Sealants: Use mildew resistant silicone sealant at ceramic tile, sinks, plumbing fixtures and other wet work.

3.2 JOINT SURFACE PREPARATION

- A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture, and other substances which would interfere with bond of sealant.
- B. For elastomeric sealants, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating. Remove coating or treatment from joint surfaces before installing sealant.
- C. Etch concrete and masonry joint surfaces to remove excess alkalinity. Etch with 5% solution of muriatic acid; neutralize with diluted ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.
- D. Roughen joint surfaces on vitreous coated and similar non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or wool to produce a dull sheen.

3.3 INSTALLATION

- A. Comply with sealant manufacturer's printed instructions, except where more stringent requirements are indicated or specified and except where manufacturer's technical representative directs otherwise.
- B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
- C. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.
- D. Install bond breaker tape wherever shown and wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.
- E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete

"wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

- F. Install sealants to depths as shown or, if not shown, as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead.
 - 1. For sidewalks and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.
 - 2. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
 - 3. For joints sealed with non-elastomeric sealants, fill joints to a depth in the range of 75% to 125% of joint width.
- G. Do not allow sealants to overflow or spill onto adjoining surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant.
- H. Remove excess and spillage of sealants promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to the adjoining surfaces of finishes.

3.4 CURE AND PROTECTION

- A. Cure sealants in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability. Cure and protect sealants in a manner which will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorated during construction period.

END OF SECTION 07900

SECTION 08110 - METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division1 Specification Sections, apply to this Section.

1.2 SCOPE

- A. Provide metal frames, hollow metal doors, and related items required to complete the Project. Doors and frames requiring labeled construction are indicated on Door Types and on Door Schedule.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Hardware; Section 08710.
- B. Painting; Section 09900.

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit copy of manufacturer's technical data and installation instructions.
- C. Shop Drawings: Prior to fabrication of work, submit shop drawings indicating gage of metals, details of construction, profile of moldings, connections to other work, fastenings and anchors.

1.5 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100), and as specified.
- B. Provide metal doors and frames manufactured by a single firm.
- C. Fire Rated Units: Provide fire-rated units complying with NFPA 80 "Standard for Fire Doors and Windows", and units tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction. Labels must be affixed to the frame; do not paint labels.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store metal doors and frames in a manner to prevent damage and deterioration.
- B. Provide packaging such as cardboard or other containers, separators, banding,

spreaders, and paper wrappings as required to completely protect metal doors and frames during transportation and storage.

- C. Store doors upright, in a protected dry area, at least 1" off ground and with at least 1/4" air space between individual pieces. Protect primed and hardware surfaces as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steelcraft is specified as basis of design. Equivalent products of Republic, Ceco, and Curries are acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitutions.

2.2 MATERIALS

- A. Steel Sheet:
 - 1. Doors: 18 gage cold rolled, stretcher leveled; free of scale, pitting or other surface defects.
 - 2. Frames: 16 gage (interior) and 14 gage (exterior) hot rolled, pickled and oiled, or cold rolled as specified above.
- B. Hollow Core: Continuously reinforced with a full core of resin-impregnated kraft fiber honeycomb with 1" nested, hexagonal-shaped cells. Bond core to inside of both face sheets.
- C. Primer: Manufacturer's standard rust inhibitive primer; do not paint testing agency labels.
- D. Anchors, Fasteners, Accessories: Manufacturer's standard, hot-dipped galvanized at exterior.
- E. Channel Fillers: Flush steel channel fillers for top channel of exterior doors.

2.3 FABRICATION

- A. General:
 - 1. Fabricate steel doors and frames rigid, neat in appearance and free from defects, warp, or buckle. Provide clean cut, straight and true molded members, well formed and aligned miters, dressed and ground smooth, and where applicable, concealed fasteners. Reinforce at corners as required to prevent sagging. Accurately form metal to required sizes and profiles, including astragals.
 - 2. Fit, assemble, and weld units at factory or shop.
- B. Doors:
 - 1. Astragals: Provide standard Z or T astragals for pairs of exterior doors.
- C. Frames: Combination stop and frame channel section, rabbeted for doors, of type and

styles indicated.

1. Anchors/Fasteners: Supply the proper fastenings and/or anchors to secure frames in each type of structural framing indicated.
2. Silencers/Mutes: Drill stops to receive a minimum of 3 silencers on strike jamb on single swing frames and 2 on heads of double swing frames.
3. All frames to be mitered welded and ground smooth at corners.

2.4 HARDWARE

- A. Preparation: Prepare hollow metal units to receive mortised and concealed finished hardware, including cutouts, reinforcing, drilling and tapping, in accordance with final Finish Hardware Schedule and templates provided by the hardware supplier. Reinforce hollow metal units to receive surface-applied hardware. Drilling and tapping for surface-applied hardware will be done on the job site.
- B. Location of Hardware: Locate finish hardware as indicated in final Shop Drawings and/or in compliance with Door and Hardware Institute publication "Recommended Location for Builder's Hardware".

2.5 FINISH

- A. Dress tool marks and surface imperfections to smooth surfaces and remove irregularities. Chemically treat and clean doors and frames. Apply manufacturer's standard baked-on rust inhibitive primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install hollow metal units and accessories in compliance with final shop drawings, manufacturer's instructions, and as specified below.
- B. Set frames accurately in position, plumb and aligned, and securely anchor to adjacent construction.
- C. Erect fire doors and frames in compliance with NFPA 80.
- D. Clearances: Provide clearances of not more than 1/8" at jambs and heads and not more than 3/4" from floor or 3/16" from thresholds.
- E. Hardware: Install hardware, adjust as required to provide smooth and proper operation with secure latching or locking.
- F. Rust Prevention: Prior to installation, coat back of all exterior H.M.,- restroom & janitors door frames, 1'-0 above finish floor with bituminous paint. Coordinate painting of the tops and bottoms of all doors prior to setting door.

3.2 PRIME COAT TOUCH-UP

- A. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up with compatible air-drying primer.

END OF SECTION 08110

SECTION 08110.1 - TORNADO-RESISTANT DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide metal frames, hollow metal doors, and related items required to complete the Project. Doors and frames requiring labeled construction are indicated on Door Types and on Door Schedule.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Hardware; Section 08710.
- B. Painting; Section 09900.

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit copy of manufacturer's technical data and installation instructions.
- C. Shop Drawings: Prior to fabrication of work, submit shop drawings indicating gage of metals, details of construction, profile of moldings, connections to other work, fastenings and anchors.

1.5 QUALITY ASSURANCE

- A. Provide doors and frames that are **UL certified to FEMA 361, 320 and ICC500.**
- B. Provide metal doors and frames manufactured by a single firm.
- C. Provide units tested, listed and labeled in accordance with FEMA 361, 320, and ICC500, do not paint labels.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store metal doors and frames in a manner to prevent damage and deterioration.
- B. Provide packaging such as cardboard or other containers, separators, banding, spreaders, and paper wrappings as required to completely protect metal doors and frames during transportation and storage.
- C. Store doors upright, in a protected dry area, at least 1" off ground and with at least 1/4" air space between individual pieces. Protect primed and hardware surfaces as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

CECO Tornado-Resistant Doors and Frames (The StormPro System) is specified as basis of design. Equivalent products are acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitutions.

2.2 MATERIALS

- A. Steel Sheet:
 - 1. Doors: 16 gage cold rolled, stretcher leveled; free of scale, pitting or other surface defects.
 - 2. Frames: 14 gage hot rolled, pickled and oiled, or cold rolled as specified above.
- B. Door Core: Polystyrene Honeycomb cells. Bond core to inside of both face sheets.
- C. Primer: Manufacturer's standard rust inhibitive primer; do not paint testing agency labels.
- D. Anchors, Fasteners, Accessories: Manufacturer's standard, hot-dipped galvanized at exterior. **Refer to Drawings for Frame Anchoring Details.**
- E. Channel Fillers: Flush steel channel fillers for top channel of exterior doors.

2.3 FABRICATION

- A. General:
 - 1. Fabricate steel doors and frames rigid, neat in appearance and free from defects, warp, or buckle. Provide clean cut, straight and true molded members, well formed and aligned miters, dressed and ground smooth, and where applicable, concealed fasteners. Reinforce at corners as required to prevent sagging. Accurately form metal to required sizes and profiles, including astragals.
 - 2. Fit, assemble, and weld units at factory or shop.
- B. Frames: Combination stop and frame channel section, rabbeted for doors, of type and styles indicated.
 - 1. Anchors/Fasteners: Supply the proper fastenings and/or anchors to secure frames in each type of structural framing indicated to comply with **FEMA 361, 320 and ICC500. Anchor Frames per Drawings.**
 - 2. Silencers/Mutes: Drill stops to receive a minimum of 3 silencers on strike jamb on single swing frames and 2 on heads of double swing frames.
 - 3. All frames to be mitered welded and ground smooth at corners.

2.4 HARDWARE

- A. Preparation: Prepare metal units to receive mortised and concealed finished hardware, including cutouts, reinforcing, drilling and tapping, in accordance with final Finish Hardware Schedule and templates provided by the hardware supplier. Reinforce metal units to receive surface-applied hardware. Drilling and tapping for surface-applied hardware will be done on the job site.
- B. Location of Hardware: Locate finish hardware as indicated in final Shop Drawings and/or in compliance with Door and Hardware Institute publication "Recommended Location for Builder's Hardware".

2.5 FINISH

- A. Dress tool marks and surface imperfections to smooth surfaces and remove irregularities. Chemically treat and clean doors and frames. Apply manufacturer's standard baked-on rust inhibitive primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install metal units and accessories in compliance with final shop drawings, manufacturer's instructions, and as specified below.
- B. Set frames accurately in position, plumb and aligned, and securely anchor to adjacent construction.
- C. Erect fire doors and frames in compliance with NFPA 80.
- D. Clearances: Provide clearances of not more than 1/8" at jambs and heads and not more than 3/4" from floor or 3/16" from thresholds.
- E. Hardware: Install hardware, adjust as required to provide smooth and proper operation with secure latching or locking.
- F. Rust Prevention: Prior to installation, coat back of all exterior H.M.,- restroom & janitors door frames, 1'-0 above finish floor with bituminous paint. Coordinate painting of the tops and bottoms of all doors prior to setting door.

3.2 PRIME COAT TOUCH-UP

- A. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up with compatible air-drying primer.

END OF SECTION 08110.1

SECTION 08200 - WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide wood doors, complete. Type of doors required are solid core flush wood doors with wood veneer faces.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Metal Doors and Frames; Section 08110.
- B. Hardware; Section 08710.

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit door manufacturer's product data for each type of door, including details of core and edge construction, trim for openings, and veneer sample.
- C. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, and other pertinent data.
- D. Warranty: Submit executed warranty.

1.5 QUALITY ASSURANCE

- A. Quality Standards: Comply with the following standards:
- B. Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Flush Doors" for grade of door, core construction, finish and other requirements.
- C. Fire-Rated Doors: Provide doors which comply with the requirements of ASTM E 152 and which are labeled and listed for ratings indicated by U.L., Warnock-Hersey, or other testing and inspection agency acceptable to authorities having jurisdiction.
- D. Manufacturer: Obtain doors from a single manufacturer.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of WDMA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as with manufacturer's instructions.
- B. Identify each door with numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.7 WARRANTY

- A. Submit written agreement on door manufacturer's standard form, signed by manufacturer, installer, and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced standards. Warranty shall be in effect for lifetime of installation for solid core interior doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Marshfield is the basis of design, Equivalent products of Graham, Algoma, Eggers or Oshkosh Door Co. are acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitution.

2.2 INTERIOR FLUSH WOOD DOORS

- A. Refer to Door Schedule for size and location.
- B. Solid Core Doors For Transparent Finish:
 - 1. WDMA Grade: Premium.
 - 2. Faces: Plain Sliced Red Oak.
 - 3. Veneer Grade: "A"
 - 4. Veneer Match: Book Matched.
 - 5. Veneer Face Assembly: Center Balanced Matched.
 - 6. Construction: PC-5
 - 7. Vertical Edges: Stiles to be veneered with same species as the face.
- C. Fire-Rated Solid Core Doors:
 - 1. Faces And WDMA Grade: Match non-rated doors.
 - 2. Construction: Manufacturer's standard core construction to provide fire resistance rating indicated.
 - 3. Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance as compared to edges composed of single layer of treated lumber.

2.3 ACCESSORIES

- A. Moldings For Light Openings: Manufacturer's standard beveled solid stock wood molding, in species to match face veneer.

2.4 FABRICATION

- A. Fabricate flush wood doors to produce doors complying with following requirements:
- B. Factory-prefit and premachine doors to fit frame opening sizes indicated with the following uniform clearances and bevels.
 - 1. Comply with tolerance requirements of WDMA for prefitting. Comply with final hardware schedules and door frame shop drawings and with hardware templates.

2. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory premachining.
- C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kinds of doors required.
 1. Light Openings; Trim openings with moldings of material and profile specified and indicated.

2.5 FINISH OF WOOD DOORS

- A. Finish of Wood Doors: Doors to be pre-finished at factory. Finish as selected by Architect from manufacturer's standard selection of wood finishes during the submittal phase of the Project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and door frames prior to hanging to:
 1. Verify that frames comply with indicated requirements for type, size, and location, and swing characteristics, and, frames have been installed with plumb jambs and level heads.
 2. Verify that doors are free of defects that could cause their rejection.

3.2 INSTALLATION

- A. Install wood doors to comply with manufacturer's instructions referenced AWI standards, NFPA for fire-rated doors, and as specified.
- B. Condition doors to average prevailing humidity in installation area prior to hanging.
- C. Fit to frame for uniform clearance at each edge.
- D. Hardware: For installation refer to Section 08700.
- E. Veneer panel installation is specified in Section 06400.

3.3 ADJUSTING AND PROTECTION

- A. Rehang or replace doors which do not swing or operate freely, as directed by Architect.
- B. Take protective measures to assure that wood doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08200

**SECTION 08330
OVERHEAD SECTIONAL ALUM/GLASS DOORS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Overhead coiling service door.

1.2 RELATED SECTIONS

- A. Section 04200 – Structural Brick Masonry Units.

1.3 REFERENCES

- A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Overhead Sectional Aluminum Glass Doors:
 - 1. Wind Loads: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) without damage to door or assembly components.
 - 2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Details of construction and fabrication.

4. Installation instructions.
- C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 1. Finish areas designated by Architect.
 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 OVERHEAD SECTIONAL ALUMINUM GLASS DOORS

- A. Commercial Aluminum Doors: Overhead Door Corporation, Model 521. Aluminum Glass doors per drawings w/standard powder coat color. Color to be selected.
 - 1. Finish:
 - a. Aluminum Panels :
 - 1) Powder coat: PowderGuard
 - (a) PowderGuard Premium: Weather resistant polyester powder coat color as selected by the Architect.
 - 2) Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.
 - 2. Weatherseals: Vinyl bottom seal.
 - 3. Bottom Bar: Extruded aluminum.
 - 4. Guides: Roll-formed galvanized steel shapes attached to continuous galvanized steel wall angle.
 - a. Finish: PowderGuard Weathered finish with iron/black powder.
 - 5. Brackets: Galvanized steel to support counterbalance and curtain.
 - 6. Provide & Install RHX Commercial Door operator for each door.
 - 7. Wall Mounting Condition: Face-of-Wall.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable.

- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
- F. Install perimeter trim and closures.
- G. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.

- C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

SECTION 08410 - ALUMINUM FRAMING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide the various types of aluminum framing systems complete.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Glazing requirements; Section 08800.
- B. Aluminum Swinging Doors, Section 08901
- C. Section 07900 for sealant installation procedures.

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Shop Drawings: Submit shop drawings for the fabrication and installation of framing and associated components. Include wall elevations at 1/2 scale, and half size detail sections of every typical composite member. Show anchors, joint system, expansion provisions, glazing and sealing details, finishes.
- C. Warranty: Submit executed warranty.
- D. Samples: Submit sample of finish and glass specified for Architect's verification.
- D. Product data for sealants and compatibility statement, and manufactures' approval of installer.

1.5 WARRANTY

- A. Submit a warranty signed by the manufacturer, contractor, and installer, agreeing to replace glazing which fail in materials and workmanship within 2 years of the date of acceptance. Failure of materials or workmanship shall include, but not be limited to, excessive leakage of air infiltration, excessive deflections, delamination of panels, deterioration of finish or metal in excess of normal weathering, and defects in accessories, and other components of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Kawneer is specified, as basis of design. Equivalent systems of Oldcastle, US Aluminum, and Efcu are acceptable. Any substitutions must be submitted as per

Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and

acceptability of any substitution requests.

- B. Sealant System: Dow 795 silicone with closed cell backer rod.

2.2 FRAMING

System : Kawneer TriFab VG 451, 2" X 4-1/2" framing members designed for center glazing applications, with 1" insulated glass units. Finish of aluminum shall be clear anodized.

2.3 FINISH

- A. Kawneer #14 Clear Anodized Aluminum, Aluminum Association Specification, AA-M12C22A41, Architectural Class 1. Anodic finishes shall meet the requirements of the Aluminum Association DAF-45 and AAMA 611 for anodized architectural aluminum.

2.4 OTHER MATERIALS

- A. Provide all other materials, not specifically described but required for a complete, weathertight, and proper installation of framing systems, subject to acceptance by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in compliance with manufacturer's specifications, recommendations and final shop drawings.
- B. Set units plumb, level and true to line, without warp or rack of framing. Anchor securely in place. Secure to structure with non-staining, non-corrosive shims, anchors, fasteners, spacers, and fillers. Use care in erection so as not to mar, abrade, or stain finished surfaces.
 - 1. Seal frames with an approved sealant in color to match frames, making a neat fully weatherproof job. Refer to Section 07900, and comply with requirements of that section. Clean and prime surfaces as required by manufacturer for sealant adhesion.
- C. Paint concealed contact surfaces of dissimilar materials, including metal in contact with masonry or concrete work, with heavy coating of bituminous paint, or provide other separation as recommended by manufacturer.

3.2 CLEANING

- A. Clean metal surfaces promptly after installation, exercising care to avoid damage to coatings.
- B. Clean glass surfaces after installation. Remove excess glazing and sealant compounds, dirt, and other substances.

3.3 PROTECTION

- A. Institute protective measures required throughout remainder of construction period to ensure that units will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08410

SECTION 08710 HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Include screws, special screws, bolts, special bolts, expansion shields, and other devices for proper application of hardware.
2. If an opening is omitted from the hardware groups, provide hardware of type and quality for similar door operation.
3. Includes furnishing all items of finish hardware as hereinafter specified or obviously necessary for all swinging, sliding, folding and other doors. Except items, which are specifically excluded from this section of the specification or of unique hardware, specified in the same sections as the doors and frames on which they are installed.
4. Provide items, articles, materials, operations and methods listed, mentioned or scheduled herein or on drawings, in quantities as required to complete project. Provide hardware that functions properly. Prior to furnishing hardware, advise Architect of items that will not operate properly, are improper for conditions, or will not remain permanently anchored

B. Related Sections:

1. 06100 – Carpentry
2. 08110 – Metal Doors and Frames
3. 08200 – Wood Doors
4. 08410 – Aluminum Framing

C. Related Documents:

1. Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section.

1.02 REFERENCES

A. Standards

1. ANSI A156.1 – Butts and Hinges
2. ANSI A156.2 – Bored Locks and Latches
3. ANSI A156.3 – Exit Devices
4. ANSI A156.4 – Door Controls – Door Closers
5. ANSI A156.5 – Auxiliary Locks and Associated Products
6. ANSI A156.6 – Architectural Door Trim
7. ANSI A156.7 – Template Hinge Dimensions
8. ANSI A156.8 – Door Controls – Overhead Holders
9. ANSI A156.13 – Mortise Locks and Latches
10. ANSI A156.15 – Closer Holder Release Devices
11. ANSI A156.16 – Auxiliary Hardware
12. ANSI A156.18 – Material and Finishes
13. NFPA 80 – Fire Doors and Windows
14. UL10C – Positive Pressure Fire Tests of Door Assemblies

B. Codes

1. NFPA 101 – Life Safety Code
2. IBC 2003 – International Building Code
3. ANSI A117.1 – Accessible and Usable Buildings and Facilities
4. ADA – Americans with Disabilities Act

1.03 SUBMITTALS

A. General Requirements:

1. Submit copies of finish hardware schedule in accordance with Division 1, General Requirements.

B. Schedules and Product Data

1. Schedules to be in vertical format, listing each door opening, and organized into “hardware sets” indicating complete designations of every item required for each door opening to function as intended. Hardware schedule shall be submitted within two (2) weeks from date the purchase order is received by the finish hardware supplier. Furnish four (4) copies of revised schedules after approval for field and file use. Note any special mounting instructions or requirements with the hardware schedule. Schedules to include the following information:
 - (a) Location of each hardware set cross-referenced to indications on drawings, both on floor plans and in door and frame schedule.
 - (b) Handing and degree of swing of each door.
 - (c) Door and frame sizes and materials.
 - (d) Keying information.
 - (e) Type, style, function, size, and finish of each hardware item.
 - (f) Elevation drawings and operational descriptions for all electronic openings.
 - (g) Name and manufacturer of each hardware item.
 - (h) Fastenings and other pertinent information.
 - (i) Explanation of all abbreviations, symbols and codes contained in schedule
 - (j) Mounting locations for hardware when varies from standard.
2. Submit catalog cuts and/or product data sheets for all scheduled finish hardware.
3. Submit separate detailed keying schedule for approval indicating clearly how the owner’s final instructions on keying of locks has been fulfilled.

C. Samples

1. Upon request, samples of each type of hardware in finish indicated shall be submitted. Samples are to remain undamaged and in working condition through submittal and review process. Items will be returned to the supplier or incorporated into the work within limitations of keying coordination requirements.

D. Templates

1. Furnish a complete list and suitable templates, together with finish hardware schedule to contractor, for distribution to necessary trades supplying materials to be prepared for finish hardware.

E. Operations and Maintenance Manuals

1. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:
 - (a) Approved hardware schedule, catalog cuts and keying schedule.
 - (b) Hardware installation and adjustment instructions.
 - (c) Manufacturer’s written warranty information.
 - (d) Wiring diagrams, elevation drawings and operational descriptions for all electronic openings.

1.04 QUALITY ASSURANCE

A. Substitutions

1. All substitution requests must be submitted before bidding and within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his hardware consultant.

B. Supplier Qualifications

1. A recognized architectural door hardware supplier who has maintained an office and has been furnishing hardware in the project's vicinity for a period of at least three (3) years.
2. Hardware supplier shall have office and warehouse facilities to accommodate this project.
3. Hardware supplier shall have in his employment at least one (1) Architectural Hardware Consultant (AHC) who is available at reasonable times during business hours for consultation about the project's hardware and requirements to the owner, architect and contractor.
4. Hardware supplier must be an authorized factory distributor of all products specified herein.
5. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
 - a. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 - b. Review sequence of operation for each type of electrified door hardware.
 - c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Review required testing, inspecting, and certifying procedures.

C. Manufacturer Qualifications

1. Use only the manufacturer's listed in Part 2 products.
2. Use only BHMA (Builders Hardware Manufacturer's Association) certified products unless the product specified is unavailable as certified.

D. Installer Qualifications

1. Firm with 3 years experience in installation of similar hardware to that required for this project, including specific requirements indicated.

E. Regulatory Label Requirements

1. Provide door hardware for fire-rated openings that comply with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed by Underwriter's Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.
2. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies.
 - a. Hardware required for fire doors shall be listed with Underwriters Laboratories for ratings specified.
 - b. Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.

F. Handicapped Requirements

1. Doors to stairs (other than exit stairs), loading platforms, boiler rooms, stages and doors serving other hazardous locations shall have knurled or other similar approved marking of door lever handles or cross bars in accordance with local building codes.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver hardware to jobsite in manufacturer's original packaging, marked to correspond with approved hardware schedule. Do not deliver hardware until suitable locked storage space is available. Check hardware against reviewed hardware schedule and lay out on shelves by hardware group. Store hardware to protect against loss, theft, or damage.
- B. Deliver hardware required to be installed during fabrication of hollow metal, aluminum, wood, or stainless steel doors prepaid to manufacturer.

1.06 WARRANTY

- A. All items, except as noted below, shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to the owner.
 1. Cylindrical locksets – Heavy Duty: Five (5) years
 2. Mortise locksets: Five (5) years
 3. Exit Devices: Five (5) years
 4. Door closers: Ten (10) years
- B. Replace shortages and incorrect items with correct material at no additional cost to Owner.
- C. At completion of project, qualified factory representative shall inspect closer installations. After this inspection, letter shall be sent to Architect reporting on conditions, verifying that closers have been properly installed and adjusted.

1.07 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 PRODUCTS

2.1 BUTTS AND HINGES

- A. Hinges shall be certified to comply to ANSI A156.1 and have the number of knuckles as specified, oil-impregnated bearings as specified with NRP (non-removable pin) feature, at all lockable reverse bevel doors.
- B. Acceptable Manufacturers and Types:

Type	McKinney	Hager	Stanley
Type 1	T4A3795	BB1262	FBB268
Type 2	TA2714	BB1279	FBB179
Type 3	TA2314	BB1191	FBB191
Type 4	T4A3786	BB1168	FBB168
Type 5	T4A3386	BB1199	FBB199

C. Application:

- | | | |
|----|---|--------------|
| 1. | Exterior out-swinging doors | Type 5 x NRP |
| 2. | Exterior in swinging doors and vestibule doors | Type 4 |
| 3. | Interior doors with closers | Type 2 or 4 |
| 4. | Interior doors over 36 inches wide | Type 4 |
| 5. | Interior doors 36 inches or less without closer | Type 2 |

D. Size:

- | | | |
|----|------------------|--------------------------|
| 1. | 2-1/4 inch Doors | 5 inch by 5 inch |
| 2. | 1-3/4 inch Doors | 4-1/2 inch by 4-1/2 inch |
| 3. | 1-3/8 inch Doors | 3-1/2 inch by 3-1/2 inch |

E. Quantity:

1. 2 - hinges per leaf for openings through 60 inches high.
2. 1 - additional hinge per leaf for each additional 30 inches in height or fraction thereof.
3. 4 - Dutch doors up to 90 inches in height.

F. Drill 5/32 inch hole and use No. 12, 1-1/4 inch steel threaded to the head wood screws for hinges on wood doors.

G. See Schedule for Special Hinges required for Tornado Resistant Door/Frame/Hardware System

2.2 FLUSH BOLTS AND DUSTPROOF STRIKES

A. Acceptable manufacturers:

McKinney	Door Controls	Trimco
FB01M	780	3915
FB06M	842NH	3810
FB10W	942NH	3815
DPS1	80	3910

B. Non-labeled Openings: Provide 2 flush bolts FB01M for inactive leaf of pairs of locked and latched doors. Locate centerline of top bolt not more than 78 inches from finished floor. Provide dustproof strike FB06M for bottom bolt.

C. Labeled Openings: Provide automatic flush bolt set FB06M or FB10W, as applicable, for inactive leaf of pairs of doors. Provide dustproof strike DPS1 for bottom bolt.

2.3 LOCKSETS – MORTISE

A. Acceptable Manufacturer and Series:

Manufacturer	Series
Sargent	8200 x LNL
Yale	8800FL x AUR
Corbin/Ruswin	ML2000 x NSA
Best	45H X 15

B. Provide lock functions specified in Hardware Groups, with following provisions:

1. Cylinders: Manufacturer's removable core 6-pin.

2. All locksets shall be ANSI 156.13 Series 1000, Grade 1 Certified. Operational Grade 1, and Security Grade 1.
3. Backsets: 2-3/4 inches.
4. Strikes: Provide wrought boxes and strikes with proper lip length to protect trim but not to project more than 1/8 inch beyond trim, frame or inactive leaf. Where required, provide open back strike and protected to allow practical and secure operation.

2.4 EXIT DEVICES

A. Acceptable Manufacturers:

Sargent	Yale	Corbin-Russwin
8600 & 8800 Series	7000 Series	ED5000 Series

- B. Provide Mortise Lock Exit Devices Sargent Series NB-WD8600 Concealed Vertical Rod Exit Device for Interior Pairs of Doors as Scheduled and functions with key outside to unlock/lock trim, with cylinder provided as specified in Hardware Groups. Provide 8800 Series @ Exterior HM Door as Scheduled with key outside to unlock/lock trim with cylinder provided.
- C. . Sargent product numbers are referenced in the Hardware Groups.
- D. All exit devices shall be ANSI A156.3, Grade 1 Certified and shall be listed by Underwriters Laboratories and bear the UL label for life safety in full compliance with NFPA 80 and NFPA 101.
- E. All exit devices shall be UL listed for panic. Exit devices for labeled doors shall be UL listed as "Fire Exit Hardware".
- F. Provide lever trim for all exit devices. Provide lever design to match lockset levers.
- G. Provide cylinders for exit devices with locking trim and cylinder dogging.
- H. Provide cylinder dogging feature for non-rated exit devices.
- I. Provide keyed removable mullions, as specified in the Hardware Groups.

2.5 KEYING

- A. Master key or Grand master key cylinders and key in groups, unless otherwise specified. Factory masterkey with manufacturer retaining permanent keying records.
- B. Provide 6 masterkeys for each masterkey set. Provide 3 change keys for each lock. Provide 2 control keys for core removal. Stamp keys "DO NOT DUPLICATE."
- C. Submit proposed keying schedule to Architect. If requested, meet with Owner and Architect to review schedule.
- D. Provide high security removable core cylinders, with patented key control, for each lock with construction masterkeying. Permanent cores shall be installed upon completion of the project.
- E. Cylinders shall meet the requirements of UL437.

2.6 DOOR TRIM

A. Acceptable Manufacturers and Types:

McKinney	Trimco
P054	1001-9
P053	1001-3
PB801	1741
OP9013	1191-3
DP08	1195-2
DP04	1194-2
EG11	KE36-1

B. Push Plates:

1. McKinney type P054 6 inches by 16 inch unless otherwise indicated.
2. Where width of door stile prevents use of 6 inch wide plate, provide push plate one inch less than width of stile but not less than 4 inches wide.

C. Push Bars:

1. McKinney type PB801, unless otherwise indicated.

D. Pulls:

1. McKinney Series OP9013, unless otherwise indicated.
2. Where required, mount back to back with push bars.

E. Kick Plates and Armor Plates: Minimum of 0.050 inch thick, beveled 4 edges.

1. At single doors provide width 1-1/2 inch less than door width on stop side and one inch less than door width on face side.
2. At pairs of doors provide width one inch less than door width on both sides.
3. Height of 10 inches, unless otherwise indicated.

F. Edge Guards: Minimum .050" thick, stainless steel,

1. McKinney type EG11 x 42 inches high as noted in Hardware Groups.

2.7 COORDINATORS

A. Acceptable Manufacturers:

Trimco	Quality	Door Controls
3094 Series	CMS 500 Series	600

B. Provide 3094 Series coordinator for labeled pairs of doors equipped with automatic flush bolts and those with vertical rod/mortise lock fire exit device combinations with astragals.

C. Provide filler bars for total opening width, closer mounting brackets, carry bars, and special preparation for top latches where applicable.

2.8 DOOR CLOSERS

A. Acceptable Manufacturers and Types of Exposed Closers:

Sargent	Yale	Corbin Russwin
351/351-P10	4400/PR4400	DC8000

- B. Provide non-sized closers, adjustable to meet maximum opening force requirements of ADA.
- C. All door closers shall be ANSI 156.4, Grade 1 Certified.
- D. Provide drop plates, brackets, or adapters for arms as required to suit details.
- E. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- F. Provide back-check for closers.
- G. Provide hold-open arms where indicated.
- H. Provide closers for doors as noted in Hardware Groups and, in addition, provide closers for labeled doors whether or not specifically noted in group.
- I. Provide closers meeting the requirements of IBC 2003 and UL 10C positive pressure tests.

2.9 BI-FOLDING DOOR HARDWARE

- A. Acceptable Manufacturers and Types:

Pemko	Grant	Lawrence
100	1260	ED600

- B. Provide complete hardware sets for each opening specified with bi-folding door hardware.
- C. Include track, hangers, fasteners, guides, and all hardware required for a complete installation.

2.10 WALL STOPS AND HOLDERS

- A. Acceptable Manufacturers and Types:

McKinney	Door Controls	Trimco
WS01	3211	1270WXCP
DS20	3260X	1205
DS22	3267X	1207

- B. Provide WS01 Series wall stop where scheduled or as applicable, for each door leaf except where wall stops DS20 are specified in Hardware Groups, or where conditions require the use of an overhead stop.
- C. Provide Sargent 590 Series overhead stops for doors that swing more than 140 degrees before striking a wall.
- D. Floor or base stops shall be used only where definitely specified or where scheduled wall stops are functional.

2.11 THRESHOLDS

- A. Acceptable Manufacturers: McKinney, Pemko, and Reese Enterprises.

McKinney	Pemko	Reese
MCK171A	As Noted	S205A

- B. Where thresholds are specified in hardware groups, provide MCK171A or Pemko thresholds unless detailed otherwise.
- C. Refer to drawings for special details. Provide accessories, shims and fasteners.
- D. Where thresholds occur at openings with one or more mullions, they shall be cut for the mullions and extended continuously for the entire opening.

2.12 WEATHERSTRIPPING

- A. Acceptable Manufacturers and Product:

	McKinney	Pemko	Reese
Sweeps	MCK315CN	315CN	323A
Jams	MCK316AV	316AV	DS75A
Door top drips	MCK346C	346C	R201A

- B. Where weatherstripping is specified in hardware groups, provide MCK316AV unless detailed otherwise.
- C. Provide self-tapping fasteners for weatherstripping being applied to hollow metal frames.
- D. Where sweeps are specified in hardware groups, provide MCK315CN unless detailed otherwise.
- E. Where rain drips are specified in hardware groups, provide MCK346C x full frame width, unless detailed otherwise.

2.13 GASKETING

- A. Acceptable Manufacturers: McKinney, Pemko, and Reese Enterprises. Refer to drawings for special details. Provide accessories, shims and fasteners.

McKinney	Pemko	Reese
MCKPK55D	PK55D	F-897B

- B. Where smoke gasket is specified in hardware groups, provide MCKPK55D, unless detailed otherwise.
- C. Provide gaskets for 1 1/2 hour doors and doors designated for smoke and draft control.
- D. Where frame applied intumescent seals are required by the manufacturer, provide gaskets that comply with UBC 7-2, 1997 and UL 10C positive pressure tests.

2.14 KEY CABINET

- A. Provide key cabinets by Lund Equipment, Telkee Incorporated, or Key Control.
- B. Lund Deluxe wall type cabinet, Series 1200.
- C. Provide cabinet with one hook for each lock or cylinder plus at least 50 percent extra hooks.

- D. Provide each hook with one non-removable security key tag and one snap-on link duplicate key tag.
- E. Provide tools, instruction sheets and accessories required to complete installation.
- F. Owner will place keys in key cabinet and complete index cards furnished with key system.

2.15 KEY MANAGEMENT SOFTWARE

- A. Provide Key Wizard® key management software.
- B. Software shall provide tracking, issuing, collecting and transferring information regarding keys, doors, and hardware.
- C. Provide training for Owner's personnel on the proper operation and application of the key management software.

2.16 FASTENERS

- A. Including, but not limited to, wood or machine screws, bolts, bolts, nuts, anchors, etc. of proper type, material, and finish required for installation of hardware.
- B. Use phillips head for exposed screws. Do not use aluminum screws to attach hardware.
- C. Provide self-tapping (TEC) screws for attachment of sweeps and stop-applied weatherstripping only.

2.17 TYPICAL FINISHES AND MATERIALS

- A. Finishes, unless otherwise specified:
 - 1. Butts: Exterior Doors
 - a. US32D (BHMA 630) on Stainless Steel
 - 2. Butts: Interior Doors Exterior Doors
 - a. US26D (BHMA 652) on Stainless Steel
 - 3. Continuous Hinges:
 - a. US28 (BHMA 628) on Aluminum
 - 4. Flush Bolts:
 - a. US26D (BHMA 626) on Brass or Bronze
 - 5. Exit Devices:
 - a. US32D (BHMA 630) on Stainless Steel
 - 6. Locks and Latches:
 - a. US26D (BHMA 626) on Brass or Bronze
 - 7. Push Plates, Pulls and Push Bars:
 - a. US32D (BHMA 630) on Stainless Steel
 - 8. Coordinators:
 - a. USP (BHMA 600) on Steel
 - 9. Kick Plates, Armor Plates, and Edge Guards:
 - a. US32D (BHMA 630) on Stainless Steel
 - 10. Overhead Stops and Holders:
 - a. US26D (BHMA 626) on Brass or Bronze
 - 11. Closers: Surface mounted.
 - a. Sprayed Aluminum Lacquer.
 - 12. Latch Protectors:
 - a. US32D (BHMA 630) on Stainless Steel
 - 13. Miscellaneous Hardware:
 - a. US26D (BHMA 626) on Brass or Bronze

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine doors, frames, and related items for conditions that would prevent the proper application of finish hardware. Do not proceed until defects are corrected.

3.2 INSTALLATION

- A. Install finish hardware in accordance with reviewed hardware schedule and manufacturer's printed instructions. Prefit hardware before finish is applied, remove and reinstall after finish is completed. Install hardware so that parts operate smoothly, close tightly and do not rattle.
- B. Installation of hardware shall comply with NFPA 80 and NFPA 101 requirements.
- C. Set units level, plumb and true to line and location. Adjust and reinforce attachment to substrate as necessary for proper installation and operation.
- D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant, forming tight seal between threshold and surface to which set. Securely and permanently anchor thresholds, using countersunk non-ferrous screws to match color of thresholds (stainless steel screws at aluminum thresholds).
- F. Lead Protection: Lead wrap hardware penetrating lead-lined doors. Levers and roses to be lead lined. Apply kick and armor plates with 3M adhesive #1357, as recommended by 3M Co., on lead-lined doors.

3.3 FIELD QUALITY CONTROL

- A. After installation has been completed, provide services of qualified hardware consultant to check Project to determine proper application of finish hardware according to schedule. Also check operation and adjustment of hardware items.
- B. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.4 ADJUSTING AND CLEANING

- A. At final completion, hardware shall be left clean and free from disfigurement. Make final adjustment to door closers and other items of hardware. Where hardware is found defective repair or replace or otherwise correct as directed.
- B. Adjust door closers to meet opening force requirements of Uniform Federal Accessibility Standards.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of space or area, return to work during week prior to acceptance or occupancy, and make final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors.
- D. Instruct Owner's personnel in proper adjustment and maintenance of door hardware and hardware finishes.
- E. Clean adjacent surfaces soiled by hardware installation.

3.5 PROTECTION

- A. Provide for proper protection of items of hardware until Owner accepts Project as complete.

3.6 HARDWARE GROUPS

- A. The following schedule of hardware groups shall be considered a guide only, and the supplier is cautioned to refer to general conditions, special conditions, and the preamble to this section. It shall be the hardware supplier's responsibility to furnish all required hardware.
- B. Refer to the door schedule for hardware group required at each door opening.

3.7 HARDWARE GROUPS

SET #1.0:

DOORS: 100.1, 100.2, 100.3, 100.4, 100.5, 100.6 - FOUR FOLD STEEL AND GLASS
ENGINEERED DOORS

ALL HARDWARE BY DOOR MANUFACTURER

SET #2.0:

DOORS: 100.1R, 100.2R, 100.3R, 100.4R, 100.5R, 100.6R – OVERHEAD SECTIONAL
ALUMINUM/GLASS DOORS

ALL HARDWARE BY DOOR MANUFACTURER

SET #3.0:

Doors: 100.7, 100.8, 101, 106, 121 – Hollow Metal Exterior Doors

3 Hinges	TA2714 4 ½ x 4 1/2	26D	MC
1 Exit Device	SA 8800	26D	SA
1- Lever Trim	Function 13	26D	SA
1 Closer	SA 351	EN	SA
1 Cylinder Lock			SA
1- Threshold	MCK171A		MC
1 Weather Strip	MCK316 AV		MC
1 Sweep	MCK315CN		MC

SET #4.0:

Doors: 103, 104, 105

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Lockset (Passage)		26D	SA
1 Closer	1431 CPS	EN	SA
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

Set: #5.0 Tornado-Resistant Door and Frame System (Hardware for this door must be UL Certified to FEMA Guidelines and Compliant with ICC500)

Doors: 122 (Safe Room Door)

1	3 Hinges	McKinney SP-1 Tornado Resistant	US26D	MK
1	1 Multi-Point Exit Device	SA FM87000 Tornado Resistant Exit Device	US32-316	SA
1	Door Closer (surface)	SA 351	EN	SA
3	Door Silencers	S1M		MC
1	Threshold	MCK171A		MC

SET #6.0 - Pairs of Aluminum/Glass Entrance/Exit Doors

Doors: 131

1 Mortise Cylinder	63 41	26D	SA
--------------------	-------	-----	----

NOTE: Balance of hardware by Aluminum Door Supplier. Verify cylinder quantity and type. Exit Device & Closer by Aluminum Door Supplier.

SET #7.0 - Single Aluminum/Glass Entrance/Exit Doors

Doors: 126, 126.1, 131.1, 131.2, 132.1, 142, 145

1 Mortise Cylinder	63 41	26D	SA
--------------------	-------	-----	----

NOTE: Balance of hardware by Aluminum Door Supplier. Verify cylinder quantity and type. Exit Device & Closer by Aluminum Door Supplier.

SET #8.0 Restroom Doors

Doors: 133, 134

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 set Push/Pulls		26D	SA
1 Closer	SA 351	EN	SA
3 Door Silencers	S1M		MC
1-Kickplate			MC

SET #9.0

Doors: 117, 117.1

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Lockset (Privacy)		26D	SA
1 Closer	1431 CPS	EN	SA
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC
1 Threshold	Pemko 274	C	PK
1 Weather Strip	MCK316 AV		MC
1-Kickplate			MC

SET #10.0

Doors: 107, 108, 109, 110, 111, 112, 113, 114

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Lockset (Privacy)		26D	SA
1 Closer	1431 CPS	EN	SA
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #11.0

Doors: 123, 128, 138, 139, 140, 141

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Lockset (Entrance)		26D	SA
1 Wall Stop	WS01	US32D	MC
1 Closer	SA 351	EN	SA
3 Door Silencers	S1M		MC

SET #12.0

Doors: 119, 130, 133.1, 135, 137, 144, 125.1, 125.2, 125.3

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Lockset (Storeroom)		26D	SA
1 Wall Stop	WS01	US32D	MC
1 Closer	SA 351	EN	SA
3 Door Silencers	S1M		MC

END OF SECTION 08710

SECTION 08800 - GLAZING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide glass and glazing, complete, for each of the specific types of glazing systems specified for this project.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Metal Doors and Frames; Section 08110.
- B. Wood Doors; Section 08200.

1.4 QUALITY ASSURANCE

- A. Provide safety glass (tempered, laminated) complying with requirements of ANSI Z97.1 and CPSC 16 CFR 1201 CII.
- B. Label each piece of glass designating type and thickness of glass. Do not remove label prior to installation.
- C. Permanently identify each unit of tempered glass. Etch or ceramic fire identification on glass; identification shall be visible when unit is glazed.

1.5 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit copy of manufacturer's specifications and installation instructions for each type of glass and glazing material. Include test data or certification substantiating that glass complies with specified requirements.
- C. Samples: Prior to ordering, submit minimum 6" x 6" sample of each type and thickness of glass required for review by Architect.

1.6 PROTECTION

- A. Protect glass surfaces and edges at all times during the construction period. Keep glass free from contamination by materials capable of staining glass.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. PPG Industries, Inc. is the basis of design. Other manufacturers may be equal and acceptable. Any substitutions must be submitted as per Section 01300 and within

60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitutions.

2.2 SEALED INSULATED UNITS/GLASS MATERIALS AND PRODUCTS

- A. Preassembled units consisting of the following organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other specified requirements:
1. 1" Insulated Vision Unit:
 - Outer lite, 1/4" PPG SOLARGRAY, Tempered where required by code
 - 1/2" air space.
 - Inner lite, 1/4" PPG SOLARBAN on Clear, Tempered where required by code
 -
 - B. Glazed Units shall meet the following minimum design criteria:
 1. SHGC = 0.25
 2. Winter U-value = 0.29

2.3 GLAZING MATERIALS

- A. Provide materials with proven record of compatibility with surfaces contacted in installation.
1. Glazing Sealants: Tremco "Proglaze", Bostik Chem-Calk 1200", Pecora "836", Sonneborn "Omniglaze", or other approved by system manufacturer.
 2. Glazing Gaskets: Structural rubber, molded neoprene, or cellular neoprene as recommended by manufacturer of glazing system.
 3. Glazing Tape: Bostik "Chem Tape 60", Pecora "Shim-Seal", or Tremco "Pre-shimmed Tremco 440 Tape".
 4. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness, adhesively backed on one face only, tested for compatibility with specified glazing sealants.
 5. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, tested for compatibility with specified glazing sealant.
 6. Compressible Filler Rod: Closed-cell or waterproof-jacketed foam of polyethylene, butyl rubber, neoprene, polyurethane or vinyl, tested for compatibility with specified glazing sealants, of 5 to 10 psi compression strength (25% deflection), recommended by sealant manufacturer for use in glazing channel to prevent sealant exudation from the channel.
 7. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors by spot application method (25% coverage) without support, to be used in 1/8" to 1/2" thickness.

PART 3 - EXECUTION

3.1 PERFORMANCE REQUIREMENTS

- A. Watertight and airtight installation of each piece of glass is required. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials, and other defects in work. The design wind speed criteria shall be 90 mph.

3.2 INSTALLATION

- A. Comply with recommendations of glass manufacturers and manufacturers of sealants and other glazing materials, unless otherwise indicated or specified, including preparation of surfaces.
- B. Clean channel surfaces and prime as recommended by sealant manufacturer.
- C. Cut glass to size as required for measured opening, provide adequate edge clearance and glass bite all around. Cut prior to tempering.
- D. Do not install sheets which have edge damage or face imperfections.
- E. Miter-cut and bond (weld) ends of channel gaskets at corners to provide a continuous gasket.
- F. Seal face gaskets at corners with liquid elastomeric sealant to close openings and prevent withdrawal of gaskets from corners.
- G. Remove and replace glass which is broken, chipped, cracked, abraded or damaged during construction period.

3.3 CURING

- A. Cure glazing sealants and compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

END OF SECTION 08800

SECTION 08901 - ALUMINUM SWINGING DOORS

PART 1-GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide aluminum swinging doors, glass and glazing, and hardware.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Aluminum Framing Systems AL-1, AL-2 and AL-3, Section 08410.
- B. Glazing requirements; Section 08800.
- C. Lock cylinders and panic devices; Section 08710.

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Shop Drawings:
 - 1. Doors: Submit shop drawings for the fabrication and installation of doors, framing and associated components. Include wall elevations at ½ scale, and half size detail sections of every typical composite member. Show anchors, joint system, expansion provisions, glass enclosure, glazing and sealing details, finishes, speed control units, and hardware.
- C. Samples: If requested, submit sample of specified finish on aluminum for Architect's verification.
- D. Maintenance Instructions: Submit manufacturer's maintenance and service instructions for adjustment, operation, and maintenance of revolving door. Include instructions for maintenance of finish.
- E. Warranty: Submit executed warranty.

1.5 WARRANTY

- A. Provide written 2 year warranty, signed by Contractor and Installer, agreeing to repair or replace defective materials and workmanship.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Kawneer is specified as the basis of design, equivalent systems from Oldcastle, Efcu or U S Aluminum are acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitution request.

2.2 SWINGING DOORS

- A. Exterior Doors; Kawneer 350 Medium Stile doors, 3-1/2” vertical stiles, 3-1/2” top 3-1/2" mid-rail, and 6-1/2” bottom rail. Offset pivots, surface mounted closures.
- B. Hardware:
 - 1. Pull: 1” diameter round bent bar with 90 degree offset (3-1/2”+), 12” length center to center.
 - 2. Push: 1” diameter round bent bar; Kawneer CPII, (for non-egress doors).
 - 3. Closers: Shall be rated for the size and weight of the door it is matched with.
 - a. Regular 3’-0 x 7’-0 entrance door; LCN 4040 Super Smoothee, parallel arm mounting. # 14 clear anodized finish.
 - b. Closures for H.M. exterior and interior doors shall be listed in the Hardware Schedule, Section 08710.
 - 4. Pivots: Manufacturer’s standard top, intermediate and bottom offset pivots.
 - 5. Threshold: Manufacturer’s with anchors and clips, coordinate with offset pivots and closer. Maximum 1/2” height. Thresholds shall be ADA compliant.
 - 6. Weatherstripping; Thermoplastic elastomer weathering on tubular shape with semi-rigid polymeric backing, or EPDM blade gasket sweep strip applied with concealed fasteners.
 - 7. Locks; Adams Rite MS 1850 deadlock (active leaf) and one pair flush bolts (inactive leaf).
 - 8. Panic hardware for egress doors.
- D. Glazing: 1/4” thick float, tempered, meeting requirements specified in Section 08800.

2.3 FINISH

- A. Clear anodized to match aluminum glass setting system.

2.4 OTHER MATERIALS

- A. Provide all other materials, not specifically described but required for a complete, weathertight, and proper installation of doors and framing systems, subject to acceptance by Architect.

PART 3 – EXECUTION

3.1 INSTALLATION – DOORS

- A. Set units plumb, level and true to line, without warp or rack of doors and framing.

Anchor securely in place. Secure to structure with non-staining, non-corrosive shims, anchors, fasteners, spacers, and fillers. Use care in erection so as not to mar, abrade, or stain finished surfaces.

1. Seal frames with an approved sealant in color to match frames, making a neat fully weatherproof job. Refer to Section 07900 & 08800 and comply with requirements of that section.
- B. Paint concealed contact surfaces of dissimilar materials, including metal in contact with masonry or concrete work, with heavy coating of bituminous paint, or provide other separation as recommended by manufacturer.

3.2 ADJUSTING

- A. Adjust doors to provide tight fit at contact points and weatherstripping, for smooth operation and weathertight closure, and to operated smoothly with hardware and operators functioning properly. Lubricate hardware and other moving parts.

3.3 CLEANING

- A. Clean completed system, inside and out, promptly after erection and installation of glass and sealants, allowing for normal curing of sealants. Protect systems from damage and deterioration for remainder of construction period.

END OF SECTION 08901

SECTION 09250

GYPSUM BOARD ASSEMBLIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide gypsum wallboard work, complete, including non-load bearing metal studs and gypsum board partitions, furred walls, furred areas, and metal trim and accessories. Provide sound insulation in partitions. At exterior gypsum board wallsheathing, provide building wrap completely covering the sheathing boards, and with and weeps at bottom of wall.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Painting; Section 09900
- B. Flashing and Sheet Metal; Section 07600
- C. Commercial Building Wrap; Section 07274
- D. Cold-Formed Metal Framing; Section 054000
- E. Thermal Insulation; Section 07210

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit manufacturer's installation instructions for each gypsum wallboard component.
- C. Shop Drawings: Submit drawings showing typical and special partition and ceiling assemblies. Include materials, material gages, stud spacing, and bracing of studs.

1.5 QUALITY ASSURANCE

- A. Allowable tolerances; 1/8" offsets between planes of board faces, and 1/4" in 8 ft. for plumb, level, warp, and bow.
- B. Fire Resistance Rating: Where work is indicated for fire-resistance ratings, provide materials and installations identical with assemblies which have been tested and listed by recognized authorities, including U.L., O.S.U., and U.S.G.

1.6 DELIVERY, STORAGE AND PRODUCT HANDLING

- A. Deliver materials in original packages, containers and bundles, fully identified with manufacturer's name, brand, type and grade. Store in dry, well ventilated space, protected from the weather under cover and off the ground. Stack flat to prevent

sagging. Handle to prevent damage to edges, ends and surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. U.S. Gypsum System is specified; equivalent systems of Gold Bond and Georgia Pacific are acceptable.
- B. Georgia Pacific is specified for exterior gypsum board building wall sheathing system.
- C. Refer to Section 07274 for commercial building wrap.

2.2 MATERIALS

- A. Studs, Channels And Runners: Roll-formed, 20 gage except where otherwise indicated, electro-galvanized steel. 7/8" furring channels. Stud sizes 6", 3-5/8" and 2-1/2", as indicated. Punch holes near each end of the stud to facilitate installation of horizontal electrical wiring or conduit; punch as required for piping.
- B. Hangers: 8 gage galvanized soft annealed wire.
- C. Tie Wire: 18 gage galvanized soft annealed wire.
- D. Interior Gypsumboard: Sheetrock Firecode (Type X), where indicated on the Drawings 5/8" thick with tapered edges. All other locations Sheetrock 5/8" thickness with tapered edges.
- E. Tile Backer Board: Georgia-Pacific "DensShield" Tile Backer Board; 5/8" thick.
- F. Exterior Gypsum Sheathing: DensGlass Gold, exterior sheathing by Georgia Pacific. 5/8" thick with glass mat facers each side, 4'-0 wide by 8'-0, 9'-0 or 10'-0 long, in accordance with ASTM C1177 and water-resistant core, or approved equal.
 - 1. Install DensGlass Gold in accordance with manufacturer's instructions, Gypsum Association document GA-253 or ASTM C01280.
 - 2. Install sheathing with joints staggered.
 - 3. Fasteners should be driven flush with the panel surface, (not countersunk) and into the framing system.
 - 4. Completely cover sheathing with commercial grade building wrap.
- G. Roof Cover Board @ Single Ply Membrane Roof System: Georgia Pacific Dens Deck Roof Board.
- H. Trim Accessories: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide all corner beads, edge trim-beads, and control joint beads, types as indicated, and as required by project conditions.
- I. Fasteners:
 - 1. Self-drilling, self-tapping screws for power driving with special head design for gypsum board attachment (Type S), producing surface depression for proper concealment; 1" long for single layer and 1-5/8" long for double

- layer.
2. Provide other fasteners as required by project conditions and as recommended by manufacturer.
- J. Acoustical Sealant: U.S.G. Acoustical Sealant, or approved equal.
- K. Laminating Adhesive: Type recommended by gypsum wallboard manufacturer.
- L. Sound Attenuation Batts: Schuller's, "Sound-SHIELD" sound control batts, complying with performance requirements of ASTM 665, Type 1. 4" thick batts for 35/8" stud walls, and 63/4" batts for 6" stud walls. As manufactured by Schuller International, Inc. Denver, Colorado. Knauf, "Quietherm" is acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with ASTM C 840, manufacturer's instructions, as specified and as indicated on the drawings.
- B. Partitions: Provide partition assemblies as indicated; space studs 16" o.c., unless otherwise indicated.
1. Provide floor and ceiling runner designed to hold and align studs. Provide additional studs at door frames.
 2. At insulated walls, wedge insulation between studs, and fit snugly against floor and ceiling runners and against protrusions. At sound insulated walls, cut board neatly in around openings, pipes, ducts, electrical boxes, outlets, fixtures, etc. Seal to fill all gaps and around entire perimeter with acoustical sealant, including floor and ceiling joints and intersections with vertical surfaces to provide a completely airtight wall.
 3. At fire rated assemblies, provide tested assemblies for ratings indicated.
- C. Furred Walls/Areas: 5/8" thick gypsum board, as indicated, on studs and furring channels, as indicated.
- D. Suspended Ceiling: 5/8" thick gypsum board on furring channels at 24" o.c., attached to carrying channels at 4' o.c. suspended by hanger wire from the structural bracing at 4' o.c.
1. Note: Drywall suspension system may be used; direct hung heavy-duty single-web steel main tees with furring channels and cross tees at light fixtures; similar to U.S.G. (Donn) Rigid X or Chicago Metallic 640 Furring.
- E. Exterior Walls: 5/8" thick DensGlass Gold exterior sheathing on exterior side of framing studs (specified in Section 05400), insulation (specified in Section 07210), and 5/8" thick gypsum wall board on interior side; studs spaced 16" o.c., unless otherwise indicated.
- F. Encasement of Steel: 5/8" thick gypsum board on studs as indicated.
- G. Application: Except where specified otherwise:
1. Apply gypsum board parallel to studs with single panels in longest length available.
 2. Provide casing beads where edges of gypsum board meet dissimilar

- materials.
3. Grout hollow metal frames solid with portland cement grout in framed wall construction. Provide double studs at door frames.
 4. Fasten gypsum board with specified screws.
 - a. Space screws 16" o.c. for walls and 12" o.c. for single layer. Space screws 24" o.c. for walls and 16" o.c. for base layer of double layer (both layers mechanically attached) and 16" o.c. for walls and 12" o.c. for ceilings of face layer.
 - b. At fire rated assemblies, conform to fastening required of rated assembly.
 5. Cooperate with the other trade contractors in placing of backing and blocking required as backing for all millwork, fixtures, fittings, and accessories. Reinforce and brace studs in partitions supporting fixtures, to provide firm backing and prevent deflection of the wall.
 6. Brace studs in compliance with manufacturer's recommendations for wall height, stud spacing, and other project conditions indicated. Include bracing in shop drawing submittal.
 7. Arrange gypsum board joints on opposite sides of partitions to occur on different studs.
 8. Install expansion/control joints in partition and wall runs exceeding 30'. Do not exceed a distance of 30' between control joints in walls.
 9. Treat all internal angles formed by the intersection of either wall board surfaces with metal trim and/or a taped joint system as indicated or required.
 10. Treat all vertical and horizontal external corners with metal bead corner reinforcement applied in accordance with manufacturer's instructions.
 11. Comply with mfg. requirements for installation of fire rated sealants at fire rated partitions and acoustical sealants at sound rated partitions

END OF SECTION 09250

SECTION 09300 - TILE

PART 1 - GENERAL

1.01 SCOPE: Provide labor, materials and equipment necessary to complete porcelain tile work indicated in the Drawings and specified.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:

Concrete Work: Section 033000.

1.03 QUALITY ASSURANCE:

A. Tile: The Certification mark of the Tile Council of America shall appear on each label or carton of tile. All tile shall be Standard Grade and containers grade-sealed in accordance with minimum grade specifications established in TCA 137.1. In addition to grade seal, furnish master grade certificate stating grade, kind of tile, identification marks for tile packages, name and location of job; signed by the manufacturer and the tile contractor.

B. Setting Methods: Materials and workmanship for installation of tile shall conform to recommendations set forth for conventional and/or thin-set methods in the current "Handbook for Ceramic Tile Installation" as published by the Tile Council of America, Inc., P. O. Box 326, Princeton, New Jersey 08540.

1.04 SUBMITTALS: Submit panels not less than 8 inches square for each pattern and type of tile/grout to be used.

PART 2 - PRODUCTS

2.01 A. FLOOR TILE: QUARRY TILE: Quarry floor tile field and accent shall be as selected from American Olean, 7834 C.F. Hawn Fwy., P.O. Box 17130, Dallas , TX75217, 214-398-1411 or equal.

1. Series: QUARRY NATURALS

2. Floor field sizes: 8" x 8"

3. Moisture absorption: less than .3%

4. Surface finish: Plain

5. Trim: Cove Base (p-36o9TB), Sanitary Cove Base Corner (SCRL-3619T), other trim as required

B. WALL TILE: GLAZED CERAMIC WALL TILE: Glazed ceramic wall tile shall be as selected from Daltile, or equal.

1. Series: ELEVARE
2. Wall field tile sizes: 4" x 16"
3. Moisture absorption: less than 20%
4. Surface finish: Glazed
5. Trim: Bullnose S-44D9 (16" side) & S-4D49 (4" side), other trim as required

2.02 SETTING MATERIALS:

- A. Thin-Set Mortar: Materials shall conform to requirements of ANSI Standard A118.1 for thin set mortar materials.
- B. Grout: 100% epoxy grout conforming to ANSI 118.4. or: Laticrete Grout and Joint Filler and #3701 admix in proportions as recommended by manufacturer, Color of grout to be selected by the Architect.
- D. Waterproofing: Laticrete 9235 Cold Applied Waterproofing Membrane
- E. Anti-Fracture Membrane: Laticrete Blue 92 Anti-Fracture Fabric Membrane

2.03 SETTING METHODS Building A:

- A. Floors shall be thin set Mortar method per ANSI-A-118.1 over "LATICRETE" waterproofing and anti-fracture membrane or equal over concrete subfloor. Grout shall conform to ANSI 118.4 for 100% epoxy grout.
- B. Walls adjacent to and surrounding the shower shall be thin set Mortar over "LATICRETE" waterproofing and anti-fracture membrane or equal over "DENS-SHIELD" tile backer board over metal studs. Grout shall conform to ANSI-118.4 for 100% epoxy grout.
- C. All other Bathroom Walls shall be thin-set Mortar over "DENS-SHIELD" tile backer board over metal studs. Grout: Grout shall conform to ANSI-118.4 for 100% epoxy grout.

2.03.1 SETTING METHODS Building B:

- A. Exterior Restroom Walls with metal stud furring shall be thin-set Mortar over "DENS-SHIELD" tile backer board over metal studs. Grout: Laticrete Grout and Joint Filler and #3701 admix in proportions as recommended by manufacturer, colors as selected by Architect.
- B. Interior CMU Restroom walls shall be furred with 7/8" galv. furring strips

with "DENS- SHIELD" tile backer board and thin-set Mortar.
Grout: Laticrete Grout and Joint Filler and #3701 admix in proportions
as recommended by manufacturer, colors as selected by Architect.

2.04 PROTECTION: Provide Schluter-Schene-E stainless steel edge protecting between tile and adjacent finishes (800) 472-4588. Provide height appropriate to conditions.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Substrate Surface:

1. Remove soap scum, wax, coatings, oil, and other contaminants from all floor surfaces.
2. Rinse floor surfaces thoroughly with clear water and allow them to dry completely.

B. Field Measurements/Verifications: Field measure and verify dimensions as required.

C. Do not start tile work until work of other trades which goes through or in the space behind tile has been completed.

D. Protect adjacent areas or surfaces from damage as a result of the Work of this Section.

3.02 INSTALLATION:

A. Install all tile, setting and grouting materials according to particular installation method indicated or scheduled.

B. Do not apply mortar or adhesives to surfaces covered by frost.

C. Maintain minimum temperature of 50 degrees Fahrenheit for tile installation.

D. Prevent rapid evaporation of moisture from mortar bed.

3.03 WORKMANSHIP:

A. All tile and workmanship shall be in accordance with the Tile Council of America (TCA) and in a manner conforming with the best current practice of the industry.

- B. Center fields and patterns on applied areas so that no tile is less than half size.

3.04 CLEANING:

- A. Immediately remove all spots, smears, stains, residues, adhesives, etc., from the work of this section and/or upon adjacent areas or surfaces.
- B. Sponge and wash tile thoroughly with clear water after the grout has stiffened. Then clean by rubbing with damp cloths or sponges, and polish with clean dry cloth.

3.05 CURING: Cure tile in accordance with ANSI Standard Specifications.

3.06 SEALANT: After tile has cured apply two coats of water based silicone sealant.

3.06 PROTECTION:

- A. Close off spaces in which tile is being set to traffic and other work during installation and for at least 48 hours after completion of tile work.
- B. After installation and until acceptance, protect the tile from damage.
- C. Remove damaged materials and replace with new, undamaged materials all at no cost to the Owner.

END OF SECTION 09300

SECTION 09510 - ACOUSTICAL CEILING SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide acoustical ceilings complete, including elements of the suspension system, trim, and facilities for the support and attachment of lighting fixtures, air diffusers, grilles and registers. See Finish Schedule and Reflected Ceiling Plans for location.

1.3 SUBMITTALS

- A. Comply with requirements of Section 01300.
- B. Shop Drawings: Submit shop drawings, for review by Architect, indicating location of ceiling units and items of work which are to be coordinated with the ceiling, and framing and support details for all work supported by the suspension system.
- C. Samples: Submit sample of ceiling panel material, grid and wall molding proposed for use for acceptance by Architect.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original unopened packages, fully identified with type, finish, performance data and compliance labels. Handle and store in accordance with manufacturer's instructions and recommendations.

1.5 JOB CONDITIONS

- A. Do not install interior acoustical tile units until space has been enclosed and is weathertight, wet work has been completed and is dry, until work above ceiling is complete, and until temperature and humidity conditions will be continuously maintained at values near those indicated for final occupancy.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Armstrong Ultima is the basis of design Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of substitution requests.

2.2 ACOUSTICAL LAY-IN CEILING.

A. Lay-In Panel:

1. Characteristics:
 - a. Material: Wet formed mineral fiber with acoustically transparent membrane.
 - b. Surface Finish: Factory-applied acrylic latex paint.
 - c. Color: White.
 - d. Light Reflectance: LR 0.80.
 - e. Size: 24" X 24" X 5/8".
 - f. Edge Detail: Beveled tegular lay-in.
 - g. NRC: 0.70.
 - h. CSTC: Minimum 35.
 - i. Surface Burning Characteristics: Class A (Flame Spread 25 or under), UL labeled.
 - j. Insulation Value: Average R factor (at 75°F), 1.5.
 - k. RH90 Performance: No visible sag under conditions not to exceed 90%.
 - l. Warranty: 10 years dimensional stability (subject to conditions printed).
 - m. Pattern: **Armstrong Ultima RH90, 1911.**

2.3. SUSPENSION SYSTEM MATERIALS

- A. General: Provide suspension system materials conforming to ASTM C 635.
- B. Attachment Devices: Type recommended by suspension system manufacturer for attachment or anchorage of ceiling hangers to structure above ceiling, sized for not less than 5 times the hanger design load for the structural classification indicated.
- C. Hanger Wire: Minimum No. 12 gage, galvanized annealed steel wire.
- D. Exposed Grid System:
 1. Armstrong 15/16" Prelude Exposed Tee;
 - a. Material: Double-web electrogalvanized steel.
 - b. Face Dimension: 15/16".
 - c. Profile: Expose tee.
 - d. Surface Finish: Baked Polyester paint.
 - e. Color: White.
 - f. Structural Classification: Intermediate Duty.

PART 3 - EXECUTION

3.1 INSTALLATION AND WORKMANSHIP

- A. Install mechanical suspension system and acoustical units in strict accordance with ASTM C 636 and manufacturer's directions, using experienced acoustical

mechanics.

- B. Install in the patterns indicated on the drawings in such a manner to permit border units of the greatest possible size, unless otherwise indicated.
- C. Refer to drawings for quantities and locations of lighting fixtures, air supply and return diffusers, grilles and registers, and fire sprinkler heads, which will be installed in the ceilings, and which will replace and/or pierce the acoustical unit.
- D. Exposed Grid:
 - 1. Install acoustical ceiling suspension system level and true to line, with neat and close-fitting joints between spliced and intersecting members. Grid to be square, and ends and cross tees tightly butted, and all faces in the same plane. Do not rest flanges of the cross tees on the flanges of the main runners.
 - 2. Neatly and accurately cut and place acoustical panels to fit snugly into the main and cross tees, with no space between the bottom of the acoustical panels and grid system, and without gaps and edges (except at tegular edges) showing in the finished installation.

3.2 CLEANING

- A. Clean soiled or discolored acoustical units, trim, moldings, and suspension members after installation. Touch up scratches, abrasions, voids, and other defects in painted surfaces. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09510

SECTION 09678 - RESILIENT WALL BASE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide resilient wall base and accessories, complete. See Finish Schedule for locations and extent of floor accessories as well as the Finish Plans A 701.

1.3 SUBMITTALS

- A. Product Data: Submit copy of manufacturer's technical data, installation instructions, and maintenance instructions for each accessory.
- B. Samples: Submit full color range samples for type and pattern of each accessory specified for verification by Architect.

1.4 DELIVERY AND STORAGE

- A. Delivery: Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern gage, lot number and sequence of manufacture.
- B. Storage: Store in original container at not less than 70 F for at least 48 hours before start of installation.

1.5 JOB CONDITIONS

- A. Maintain minimum temperature of 70 F for minimum of 48 hours prior to installation. Maintain 70 temperature continuously during and after installation as recommended by the flooring manufacturer, but in any case not less than 48 hours.

PART 2 - PRODUCTS

2.1 RUBBER BASE

- A. Flexco is basis of design, Roppe, Johnsonite, Burke, are acceptable, 4" top set cove, with preformed or molded interior and exterior corners; colors as selected and indicated on the Materials List, Section 09200.
- B. Refer to the Finish Schedule and Finish Plans for specific locations.

2.3 OTHER MATERIALS

- A. Provide adhesives, primers, crack fillers and other materials required but not specifically described, as recommended by the resilient flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions under which rubber base work is to be placed. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by flooring manufacturer. Do not proceed until unsatisfactory conditions have been corrected.
- B. Use trowleable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil or silicone.
- E. Broom clean or vacuum substrates to be covered immediately before installing products specified. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.

3.2 INSTALLATION

- A. Install products using methods indicated according to manufacturer's installation directions.
- B. Resilient Base: Apply resilient base to walls, columns, pilasters, casework, and other permanent fixtures in rooms or areas where base is indicated. Install base in as long lengths as practicable. Tightly bond base to backing throughout the length of each piece, with continuous contact at horizontal and vertical surfaces. Do not stretch resilient base during installation. Flexco 106 Wall Base Adhesive must be used with Flexco wall base.
 - 1. Preformed Corners: Install inside and exterior corners before installing straight pieces.
 - 2. Formed corners:
 - a. Form inside corners from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of rubber base at the point where corner is formed. Shave back of base where necessary to produce snug fit to substrate.
 - b. Form outside corners from straight pieces of maximum lengths possible by shaving back of base at point where bending will occur. Remove a strip perpendicular to length of base only deep enough to produce a snug fit without bends whitening or removal of more than half the thickness of rubber base.

3.3 CLEANING

- A. Immediately after installation perform the following operations:
1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturer of rubber base involved.
 2. Damp-wipe rubber base to remove marks and soil.

END OF SECTION 09678

SECTION 09680- CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Install broadloom carpet and accessories where indicated on the Finish Schedule.
- B. Provide carpet accessories, complete.
- C. Refer to Floor Finish Plans and Finish Schedule for locations which are to be carpeted.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Transition nosing; Section 09678 – Resilient Wall Base.
- B. Section 01030; Allowances.

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit manufacturer's technical product data, including test laboratory reports, installation instructions and maintenance instructions.
- C. Samples: Submit minimum 6" length of edge guards.
- D. Shop Drawings: Prior to ordering carpet, submit carpet layout drawings at same scale as contract drawings, showing carpet seam locations, direction of pattern, and location and type of edge treatment.
- E. Maintenance Materials: Deliver usable scrap materials to Owner's designated storage space as directed, properly packed/protected and identified.

1.5 QUALITY ASSURANCE

- A. Installation: Use thoroughly trained and experienced carpet installers who are completely familiar with materials specified and manufacturer's recommended methods of installation for specified materials.

1.6 PRODUCT STORAGE

- A. Store inside, protected from weather, moisture and soiling.

PART 2 - PRODUCTS

2.1 CARPET

- A. Broadloom carpet is by allowance and shall be selected by the Architect.
- B. Carpet Tiles are by allowance and shall be selected by the Architect.
The basis of design for Carpet Tiles is EVOLVE by J&J Flooring.

2.2 CARPET ACCESSORIES

- A. Carpet Edge Guard: Extruded or molded vinyl or rubber carpet edge guard of size and profile indicated, in colors selected by Architect from manufacturer's standard colors.
- B. Installation Adhesive: Water-resistant, non-staining as recommended by carpet manufacturer, which complies with requirements for installed carpet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which carpeting is to be installed. Do not proceed with installation of carpeting until unsatisfactory conditions have been corrected. Do not install carpet over concrete with either excess moisture or dust producing surface which is not adequately sealed.

3.2 PREPARATION

- A. Repair minor holes, cracks, depressions, and rough areas using material recommended by carpet or adhesive manufacturer.
- B. Clean surfaces to be carpeted immediately prior to installation of carpeting materials, by vacuum cleaning.
- C. Dimensions: Prior to start of carpet installation, check critical dimensions of spaces to be carpeted, to ensure that planned use of materials will fulfill requirements, including locations for seam joints, and edging.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's recommendations for glue-down installation.
- B. Lay carpet to provide as few seams as possible. Cross seams are not acceptable. Maintain direction of pattern and texture. Do not seam weft to warp, except as specifically indicated for a direction change. At doors, center seams under doors; do not place seams in traffic direction at doorway.
- C. Extend carpet under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.
- D. Provide cut-outs where required, and bind cut edges properly where not concealed by protective edge guards or overlapping flanges.

- E. Install carpet edge guard at locations where edge of carpet is exposed to traffic except where another device such as a threshold is indicated. Anchor edge guard to substrate.

3.4 GLUE-DOWN INSTALLATION

- A. Apply primer to entire substrate where necessary for adequate bond of carpet.
- B. Fit sections of carpet into each room or space prior to application of adhesive. Trim off mill edges unless carpet has been pre-trimmed. Maintain straight seams, true to lines of building.
- C. Apply seaming cement on cut edges of carpet at seams, without being in evidence on face of carpet but securing base of pile at cut.
- D. Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt carpet edges tightly together to form seams without gaps. Roll lightly to eliminate air pockets and ensure uniform total-area bond of carpet to substrate. Remove adhesive promptly from face of carpet.

3.5 CLEANING

- A. Remove and dispose of debris and unusable scraps. Vacuum carpet using commercial machine with rotating agitator or beater nozzles. Remove spots, and replace carpet where spots cannot be removed. Remove protruding face yarn using sharp scissors.

3.6 PROTECTION

- A. In public areas, provide temporary non-staining paper pathway in direction of traffic.

END OF SECTION 09680

SECTION 09670
Epoxy 335 Epoxy Floor Coating

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section Includes

1. Chemical Resistant Epoxy Floor Coating including underlayments, fillers, and other applied materials used as prime, body coat and finish coats and the application of these materials.

B. Related Section

1. Section 09770 Special Protective Wall Coatings

- C. Provisions established within the Contract, Division 1, General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUBMITTALS

- A. Prior to commencing work, submit manufacturer's technical information and installation details to describe materials to be used. The same manufacturer shall supply all polymer wall and floor finishes.
- B. Owner and Contractor shall review and mutually agree upon color, grade and final texture of chemical resistant epoxy floor coating system before starting installation.
- C. Before beginning work, samples of the type of flooring shall be provided for the architect's approval.

1.03 QUALITY ASSURANCE

- A. Contractor shall be an established firm regularly engaged in satisfactory installations of similar materials and provide a list of 5 projects of similar nature and complexity completed in the past five (5) years. Contractor shall provide a letter of certification by manufacturer that Contractor is a current qualified installer.**

- B. Single source responsibility: Provide underlayments, fillers, epoxy primers, body coats, grout coats and top coats produced by the same manufacturer with not less than 10 years of experience in the manufacture and supply of principal materials for work in this section.

- C. Prior to commencing the installation, the Contractor shall install, with Owner's approval, a mutually agreed upon test sample to show final color and texture of the system. This test area shall serve as a job standard for the final installation.

1.04 PROJECT CONDITIONS

- A. Evaluate the substrate condition, including moisture content and extent of substrate leveling and repairs required, if any.
- B. Coordinate flooring work with other trades to ensure adequate illumination, ventilation, and dust free environment during application and curing of flooring.
- C. Comply with material manufacturer's recommended temperature limitations for flooring application.

1.05 DELIVERY AND STORAGE

- A. Material shall be delivered to project site in manufacturer's original unopened containers bearing manufacturer's name, product and color.
- B. Materials shall be stored indoors, protected from damage, moisture, direct sunlight and temperatures below 50 degrees F or above 90 degrees F.

1.06 GUARANTEE

- A. Contractor shall furnish a written warranty covering both material and workmanship for a period of one full year from date of installation.

PART 2 PRODUCTS

2.01 MANUFACTURER

KreteTek Industries Inc.
66 C River Road
Hudson, NH 03051
www.ghostshield.com

2.02 MATERIALS

- A. Epoxy 335: A two component 93% solids epoxy colored coating designed for applications where a high solids primer is needed before applying a high solids or 100% solids topcoat for build coats over concrete.

2.03 PHYSICAL PROPERTIES

- A. Flooring system shall comply with the following minimum test standards:

Abrasion, ASTM D 4060	
CS17 wheel, 500 cycles, 1000 gram load	45 mg loss
Hardness, Shore D	80
Adhesion, Elcometer	430 psi, concrete failure, no delamination
Flexural Strength ASTM D790	8200 psi
Compressive Strength ASTM D695	8300 nsi
Tensile Strength ASTM D638	6800 psi

- B. Flooring system shall show no chemical attack or discoloration when tested in accordance with ASTM D-1308 at 72° F against the following reagent and concentrations noted.

Reagent:	Reagent:
10% Sodium Hydroxide	Skydrol
10% Sulfuric	10% HCl
70% Sulfuric Acid	
50% Sodium Hydroxide	
5% Acetic Acid	
Xylene	
Butanol	
1,1,1 Trichloroethane	
Ethyl Alcohol	

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. After concrete curing period (28 days minimum) has elapsed, surface must be clean and dry, physically sound and free of contamination. Surfaces must be free of holes, voids or defects. Cracks and abrupt changes in surface profile must be corrected. Fins and projections must be removed. All curing compounds and sealers must be removed.
- B. Verify that moisture content is within range acceptable to flooring manufacturer using calcium chloride test kit in accordance with ASTM F 1869.
- C. Contractor must report, in writing, surfaces left in improper condition by other trades. Application will constitute acceptance of surfaces by the applicator.

3.02 PREPARATION

- A. Prepare surfaces as required, per manufacturer's printed instructions. Preferred surface preparation is shotblast or similar mechanical method.
- B. Patch all depressions, divots, honeycombed or scaled concrete with filler as recommended by manufacturer.
- C. Fill all non-moving cracks or control joints with joint filler as recommended by manufacturer.
- D. Fill all moving cracks or expansion joints with a firm but flexible (or non-rigid) sealant material as recommended by manufacturer. Expansion joints should be re-cut in finished floor, if required, and filled with sealant.
- E. Masking: Mask surfaces that require protection.

3.03 INSTALLATION

- A. Comply with flooring system manufacturer's recommendations.
1. Primer: Epoxy 335: Trowel or squeegee apply primer as recommended by coating manufacturer at a rate of 100-250 square feet per gallon to achieve a sealed surface with a minimum dry film thickness of 8 mils.

2. Finish: Apply pigmented chemical resistant urethane at a rate of 150-350 square feet per gallon to achieve a total dry film thickness of 5 mils.
3. Finished system shall be a minimum dry film thickness of 10 mils excluding aggregate.
4. Apply 2-coats of "Urethane 645" as a topcoat/sealer.

3.04 CLEANUP

- A. Remove waste materials, rubbish and debris and dispose of them in accordance with local regulations. Leave work areas in a clean condition.

3.05 PROTECTION

- A. Protect the completed work from water, airborne particles or other surface contaminants until cured, tack free, approximately 18-24 hours after application.
- B. Protect completed system from immersion and chemical exposure until thoroughly cured, approximately seven (7) days.
- C. The General Contractor shall protect the finished floor from the time that the subcontractor completes the work until substantial completion or acceptance by the owner.

END OF SECTION
REV 04/19

Disclaimer

This information and all further technical advice are based on KreteTek Industries Inc. present knowledge and experience. However, KreteTek Industries Inc. assumes no liability for providing such information and advice including the extent to which such information and advice may relate to existing third party intellectual property rights, especially patent rights. In particular, KreteTek Industries Inc. disclaims all CONDITIONS AND WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY. KreteTek Industries Inc. SHALL NOT BE RESPONSIBLE FOR CONSEQUENTIAL, INDIRECT OR INCIDENTAL DAMAGES (INCLUDING LOSS OF PROFITS) OF ANY KIND. KreteTek Industries Inc. reserves the right to make any changes according to technological progress or further developments. It is the customer's responsibility and obligation to carefully inspect and test any incoming goods. Performance of the product(s) described herein should be verified by testing and carried out only by qualified experts. It is the sole responsibility of the customer to carry out and arrange for any such testing. Reference to trade names used by other companies is neither a recommendation, nor an endorsement of any product and does not imply that similar products could not be used.

SECTION 09900 - PAINTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide painting and finishing of interior and exterior items and surfaces throughout the project, except as otherwise indicated. Provide field painting of hangers, exposed steel and iron work, of primed metal surfaces and exposed-to-view prefinished metal surfaces of items, as required to match adjacent surfaces, and equipment installed under mechanical and electrical work. Refer to those respective sections for painting requirements. Provide touch-up of pre-finished items as required to match original finish.
- B. Do not paint brick, water repellent coating, acoustical ceiling, anodized aluminum, surfaces indicated not to receive paint, and pre-finished items except as noted above.

1.3 SUBMITTALS

- A. Comply with Section 01300.
- B. Paint Schedule: Submit paint schedule listing each material cross-referenced to the specific paint and finish system and application. Identify by manufacturer's catalog number and general classification.
- C. **Samples: Painting subcontractor shall submit two 12"x12" sample boards for each paint color called for in the Color and Materials Schedule. Samples shall be 12"x12" pieces of 5/8" gyp. bd. with tape around edges. Each sample shall be a finished product consisting of primer and two coats of the finished paint for that color. The color name and number as well as manuf. is to be written on the back of each sample legibly with black felt tip pen. Samples shall be delivered to the Architect's office at least two weeks prior to the beginning of any painting, and prior to the purchasing of bulk quantities of paint by the subcontractor.**

1.4 DELIVERY AND STORAGE

- A. Deliver materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide all paints, enamels, stains, varnishes, and admixtures of first line quality.

Benjamin Moore is the basis of design. Sherwin Williams, PPG Industries, Inc., are acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitution request.

2.2 MATERIALS

- A. See paragraph 3.5, SCHEDULE OF GENERIC PAINT TREATMENT for typical painting procedures. All finish coats shall contain mildewcides. Grind in the factory all exterior colors. Shop mixing is not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions under which painting work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected. Starting of painting work will be construed as acceptance of the surfaces within any particular areas.

3.2 SURFACE PREPARATION

- A. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified. Remove all hardware, plates, lighting fixtures, and similar items in place and not to be finish painted, or provide protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Reinstall the removed items by workmen skilled in the trades involved, after painting is completed.
- B. Gypsum Wall Board: Treat all joints, nail heads and other depressions in the surface of the wallboard, in accordance with the recommended manner, with a taped joint system by the gypsum wallboard manufacturer. Do not paint over gypsum wallboard work until taped joints are thoroughly dry.
- C. Wood: Clean wood surfaces to be painted of all dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those surfaces exposed to view, and dust off. Prime, stain, or seal wood required to be job painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood. Scrape and clean small, dry seasoned knots, and apply thin coat of white shellac or other recommended dnot sealer, before application of the priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
- D. Ferrous Metals: Touch-up shop-applied prime coats which have damaged or bare areas. Wire-brush, solvent clean, and touch up with the same primer as the shop coat.
- E. Galvanized Surfaces: Clean free of oil and surface contaminates with an acceptable

non-petroleum based solvent.

3.3 APPLICATION

- A. Apply paint by brush, roller, spray, or other acceptable practice in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheeps wool as recommended by the manufacturer for material and texture required.
- B. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel coat application with fine sand paper, or rub surfaces with pumice stone where required to produce an even smooth surface in accordance with the coating manufacturer's directions.
- C. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.
- D. Give special attention to insure that all surfaces, including edges corners, crevices, welds, and exposed fasteners receive a film thickness equivalent of that of flat surfaces.

3.4 CLEAN-UP

- A. Thoroughly clean all spots, smears, spills, etc., remove from the site all discarded paint materials, rubbish cans and rags at the end of each work day.

3.5 SCHEDULE OF GENERIC PAINT TREATMENTS

Treatment No.	Location	Coats	Materials
1	Ext. & Int. ferrous metal	3	Shop priming is specified under the respective metal section. <u>1st Coat:</u> Rust primer <u>2nd & 3rd Coats:</u> Ext. alkyd semi-gloss enamel paint.
2	Ext. & Int. galvanized metal	3	Shop priming is specified under the respective metal section. Pretreatment: Chemical wash. <u>1st Coat:</u> Galvanized iron primer. <u>2nd & 3rd Coats:</u> Ext. alkyd semi-gloss enamel paint.

3	Other metal surfaces	2	Clean and prime abraded (factory finished, primed or spots as specified in metal pre-finished) sections and finish in 2 coats specified for adjoining surfaces.
4 filler	Interior CMU to receive Epoxy Coat	2	1 st Coat: High build acrylic block primer 2 nd & 3 rd Coats: TILE CLAD II Epoxy Coating
5	Int. gypsum board, except as specified below	2	<u>1st Coat:</u> Latex wall primer. <u>2nd and 3rd Coats:</u> Semi-gloss acrylic latex enamel.
6	Int. wood and plywood (stained)	3	<u>1st Coat:</u> Paste wood filler/stain. <u>2nd and 3rd Coats:</u> Polyurethane varnish.
7	Int. wood and plywood (painted)	3	<u>1st Coat:</u> Wood and wall primer. <u>2nd and 3rd Coats:</u> Semi-gloss acrylic latex.
8	Accent colors and dark	2	Allow 5% of surfaces to be painted in accent or intense toned colors as directed by Architect. Trim will not necessarily be same color as walls.

END OF SECTION 09900

SECTION 10165 - PLASTIC LAMINATE TOILET PARTITIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide plastic laminate toilet partitions, complete.

1.3 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation.
- C. Shop Drawings: Submit shop drawings for the fabrication and erection of toilet partition assemblies not fully described by manufacturer's data. Show all anchorages, gages of laminated plastic, hardware, fittings and fastenings. Submit setting drawings, templates and instructions for the installation of anchorage devices built into other work. **Shop drawings shall be minimum 1/4" scale, clearly indicating dimensions, plan layouts, elevations and details such that the Architect can readily compare and check the shop drawings to the original contract drawings.**
- D. Samples: Submit full color range of plastic laminate samples for selection by Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Bobrick Washroom Equipment is the basis of design. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitutions.
- B. Bobrick, Classic Series 1540, overhead braced (#1542) w/ high pressure plastic laminate finish, 4516 density impregnated particle board stiles, panels & doors.

2.2 TYPE:

- A. Flush construction, floor mounted overhead braced type partitions. Width, length, and height as indicated on the Drawings.

2.3 MATERIALS AND FABRICATION

- A. Laminated Plastic: NEMA Std. LDS-1985, minimum .050" thick in pattern and color as selected by the Architect.
- B. Door, Panel, Pilaster Core, Screens: High density particleboard or close-grained hardwood-faced plywood. Finished pilasters 1 - 1/4" thick (1 - 1/8" core); finished doors, partition and screen panels 1" thick (7/8" core).
- C. Sealer: Seal core surfaces exposed by machining for hardware attachment with sealer as recommended by the manufacturer.
- D. Adhesive: Urea resin glue for permanent water resistant heat resistant bonding.
- E. Pilaster Shoes: 3" high, 20 gauge type 302/304 polished stainless steel.
- F. Stirrup Brackets: Manufacturer's standard design for attaching panels to walls and pilasters of stainless steel or chrome-plated brass to match hardware finish.
- G. Hardware and Accessories: Polished stainless steel or chrome-plated brass hardware and accessories, including cutout insert type (not surface mounted) gravity or spring action cam type hinges, latch/keeper, and coat hook. **Provide one s.s. coat hook on the back of every stall door.**
- H. Headrails: Continuous full length headrails, minimum 1" x 1 - 1/2", of stainless steel, extruded anodized aluminum, or anodized aluminum tubing, set into the top of the pilaster in a reinforced channel.
- I. Anchorages and Fasteners: Exposed fasteners of stainless steel, or brass finished match hardware. Use theft resistant (one way) type heads and nuts for exposed screws. Use stainless steel for concealed anchors.

2.4 FABRICATION

- A. Furnish standard doors, panels, screens, and pilasters fabricated for floor mounted and overhead braced partition system. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as specified.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install partitions and screens rigid, straight, plumb and level, in strict accordance with manufacturer's instructions and final shop drawings.
- B. Provide uniform clearance of not more than 1/2" between pilasters and walls, and not more than 1" between panels and walls.
- C. Secure panels to wall with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so that holes for wall anchorages occur in tile joints. Secure panels to pilasters with not less than 2 stirrup brackets located to align with stirrup brackets at wall.

- D. Secure panels in position with manufacturer's recommended anchoring devices.
- E. Secure pilasters to floor and level, plumb and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead-brace when doors are in closed position.
- F. Attach screens with full length and continuous stainless steel, anodized aluminum or chrome plated brass channel supports, as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.

3.2 ADJUST AND CLEAN

- A. Adjust and lubricate hardware for proper operation. Set hinges on inswinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges outswinging doors to return to fully closed position.
- B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION 10165

SECTION 10800 - TOILET ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide toilet accessories, complete.

1.3 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit technical data and installation instructions for each toilet accessory.
- C. Shop Drawings: Submit shop drawings showing grab bar installation. Provide setting drawings, instructions and directions for installation of anchorage devices in other work.

1.4 JOB CONDITIONS

- A. Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Bobrick, Classic Series is the basis of design. Bradley, or ASI are acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed. The Architect shall be the judge of the equivalency and acceptability of any substitutions.

2.2 MATERIALS

- A. Stainless Steel: ANSI Type 302/304, No. 4 finish, 22 gage minimum.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 ACCESSORIES

Refer to Accessories Schedule Sheet A43 for toilet accessory designations and interior toilet elevations for their corresponding location in the project.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install toilet accessory units in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacture of unit.
- B. At grab bars strongly secure fastenings to steel backing plate or by other accepted methods. Submit shop drawings of anchoring methods.
- C. Install units plumb and level, firmly anchored in location and at heights indicated or directed by Architect. Comply with all ADA regulations for grab bars and accessory installations.

END OF SECTION 10800

SECTION 10990 - MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Provide miscellaneous specialties, complete.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Painting; Section 09900.

1.4 SUBMITTALS

- A. Comply with Section 01300.
- B. Product Data: Submit manufacturer's technical data and installation instructions for accessory item specified.
- C. Shop Drawings: Submit shop drawings indicating location, details of installation, finishes, and other pertinent data.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The manufacturer listed for each of the following products is the basis of design. Other manufacturers may be equivalent and acceptable. Any substitutions must be submitted as per Section 01300 and within 60 days of the start of construction as indicated by the date of the Notice to Proceed.

2.2 FIRE EXTINGUISHERS, CABINETS & BRACKETS

- A. Larsen's Manufacturing Company is specified. Equivalent product of J. L. Industries and Potter Roemer are acceptable.
- B. Cabinet: Model 2409-6R steel cabinet for semi-recessed installation, with Vertical Duo Panel door glazed with clear float glass. Provide in manufacturer's standard white color de-glossed for field painting. Provide flat square trim in same finish as cabinet.
- C. Extinguisher: MP10 4A-60B: C multipurpose, 10 lb. heavy duty steel extinguisher.
- D. Wall mounted extinguisher: provide Standard Bracket No. 817 at all locations showing a wall mounted fire extinguisher on the plans.

2.3 KNOX BOXES

- A. Provide Knox Boxes as manufactured by Knox Company, telephone 800-552-5669, model 3200 recessed mounted: 5" high x 4" wide x 3 1/4" deep with 7" x 7" flange aluminum box with 3200 recessed mounting kit. Refer to Architectural Building Elevations and Floor Plans for location.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each accessory in compliance with manufacturer's instruction and final shop drawings.
- B. Install at locations and mounting heights indicated or as directed by Architect.

END OF SECTION 10990

SECTION 13100 - PRE-ENGINEERED METAL BUILDING SYSTEM

PART 1 - GENERAL

- 1.01 SCOPE: Furnish materials and labor necessary to complete pre-engineered metal building system, complete with all accessories, as indicated in the drawings and as specified.
- 1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:
- A. Building Insulation: Section 07210
 - B. Flashing and Sheet Metal: Section 07600
 - C. Joint Sealants: Section 07900
- 1.03 DESIGN CRITERIA:
- A. The latest issue of the following standards and criteria shall be used where applicable in the structural design of the building covered by this specification:
 - "Manual of Steel Construction", AISC
 - "Cold Formed Steel Design Manual", AISI
 - "Code for Welding in Building Construction", AWS
 - "2006 International Building Code"
 - Structural Steel Painting Council Standards
 - ASTM Standards
 - B. Design Loads - General: The basic design loads shall include live, snow, wind, seismic loads, in addition to dead load.
 - C. Vertical Live and Snow Loads: Vertical live loads shall be considered in addition to the applicable dead loads and shall be applied to the horizontal projection of the roof.
 - 1. Roof covering shall be designed for either 50 psf uniformly distributed or a 200 lb concentrated (point) load (over a 1' x 1' area) located at the center of maximum roofing (panel) span. The most severe conditions shall govern.
 - 2. Purlins shall be designed for 20 psf uniformly distributed over the roof area which they support, plus 10 psf collateral loading and specific equipment loads. No live load reduction is allowed.

3. Primary framing shall be designed for 20 psf uniformly distributed over the roof area which it supports, plus 10 psf collateral loading and specific equipment loads. No live load reduction is allowed.
 4. All the above loads to be in addition to the applicable dead loads and shall be applied to the horizontal projection of the roof.
 5. Roof covering, purlins or secondary support members and primary framing shall be designed for a snow load accumulation as specified in the applicable code.
- D. Wind Loads: The wind load on the structure shall be proportioned as horizontal and uplift forces according to and as recommended by the applicable code of current use, but not less than 90 MPH (3 second gust) wind load, Exposure C.
- E. Seismic (Earthquake) Loads: Buildings in areas subject to earthquakes shall be designed for Seismic Forces. The provisions for determining seismic forces shall be those as recommended by 2006 International Building Code. See structural plans for working stress loads on frames.
- F. Combination of Loads: The combining of normal loads and auxiliary loads for design purposes shall be as prescribed and recommended by the applicable code.
- G. Maximum purlin live load deflection shall not exceed $\text{Span}/360$ or 1", whichever is less.
- H. Frame live load deflection shall not exceed $\text{Span}/360$.
- I. Maximum girt lateral deflection from wind or seismic loads shall not exceed $\text{Span}/240$ for girts providing lateral support for metal siding only. Maximum girt lateral deflection from wind or seismic load shall not exceed $\text{Span}/360$ for girts providing lateral support for brick.
- J. Maximum building sideways (drift) from wind or seismic loads shall not exceed the limits listed on the structural drawings.
- K. Certification:
1. All bidders must submit with their bid proposal a letter from the metal building manufacturer certifying that the building proposed will be furnished to meet or exceed all the above design load criteria, meet all requirements listed or detailed on the structural and that all structural design will be in strict conformance with the applicable code and listed

specifications.

2. After the awarding of the contract, complete structural analysis shall be submitted by the metal building manufacturer to the Architect.
3. Metal Building Contractor shall comply with the requirements of American Institute of Steel Construction (AISC) for Category MB, Metal Building System. Contractor shall submit the following:
 - a. Submit for approval the components and samples as specified.
 - b. Submit for approval complete engineering calculation sealed by a Structural Engineer, registered in the State of Arkansas and employed full time by the metal building supplier or approved by the Architect.
 - c. Submit for approval evidence of A.W.S. Welder Certification.
 - d. Submit for approval Mill Certificate on steel to be used in this job.

1.04 SUBMITTALS: Submit shop drawings indicating design loads, profiles, sizes, spacings and locations of structural members, connections, attachments and anchor bolt layout. The drawing shall bear the seal and be signed by the metal building fabricator's engineer.

PART 2 - PRODUCTS

2.01 MANUFACTURER: Pre-engineered metal structure shall be as manufactured by CECO OR VARCO PRUDEN, or approved equal.

2.02 DESCRIPTION:

A. The pre-engineered metal building covered by this specification is to be a Rigid Frame, Low Profile steel frames, rafter beams and columns as shown on the contract documents.

1. All base plates, cap plates, compression/splice plates and stiffener plates shall be factory welded into place and have the connection holes shop fabricated unless noted otherwise on the contract documents. Columns and roof beams shall be fabricated complete with holes in webs and flanges for the attachment of secondary structural members and bracing except for fieldwork as noted on manufacturer's erection drawings. Columns in some cases must have holes punched to receive members that will not be furnished by the Metal Building Supplier (MBS). The MBS shall coordinate all such work with the Structural Steel Supplier (SSS)

during the production of the shop drawings for both the metal building and conventional steel framing to ensure proper fit-up in field. The MBS and SSS shall exchange shop drawings and shall check and coordinate

their work before submitting shop drawings for review by the engineer of record. This coordination shall be directed and monitored by the General Contractor.

2. All bolts for field assembly of frame members shall be high strength bolts as indicated on erection drawings.

2.03 PRIMARY FRAMING STEEL:

- A. Steel for hot-rolled structural sections shall conform to the requirements of ASTM Specification A99.
- B. Steel for all built-up sections shall meet as applicable the physical and chemical properties of:
 1. ASTM A572 modified to 55,000 psi minimum yield and 70,000 psi minimum tensile strength, or ASTM A607, Grade 55, or ASTM A570, Grade 55,
OR
 2. ASTM A572, Grade 50, or ASTM A607, Grade 50, or ASTM A570, Grade 50.

2.04 SECONDARY FRAMING STEEL: Steel used to form purlins, girts, eave struts and "C" sections shall meet the physical and chemical properties of ASTM A570, Grade 55.

2.05 STRUCTURAL FRAMING:

- A. General:
 1. All framing members shall be shop fabricated for field bolted assembly. The surfaces of the bolted connections shall be smooth and free from burrs or distortions.
 2. All shop connections shall be in accordance with the American Welding Society Code for Building Construction. Certification of welder qualification will be furnished when required and specified.
 3. All framing members where necessary shall carry an easily visible identifying mark.

4. Fixed base design is not allowed on this project.

B. Primary Framing:

1. Rigid Framing: All rigid frames shall be welded, built-up "I" sections. The columns and the rafters may be either uniform depth or tapered but shall not exceed the depth restrictions shown on the Contract Documents.
2. Plates, Stiffeners, etc.: All base plates, splice plates, cap plates, and stiffeners shall be factory welded into place on the structural members.
3. Bolt Holes, etc.: All base plates and flanges shall be shop fabricated to include bolt connection holes. Webs shall be shop fabricated to include cable brace or rod brace holes and flange brace holes.

C. Secondary Framing:

1. Purlins and Girts: Shall be cold-formed "Z" or "C" sections with stiffened flanges. They shall be pre-punched at the factory to provide for field bolting to the primary framing. They shall be simple or continuous span as required by design.
2. Eave Struts: Shall be unequal flange, cold-formed "C" sections.

D. Bracing:

1. Portal Frames: Portal Frames where indicated in the sidewall shall be used to resist longitudinal loads (wind, seismic, etc.) from the structure.
2. Flange Braces: The compression flange of all primary framing shall be braced laterally with angles connecting to the webs of purlins or girts so that the flange compressive stress is within allowable limits for any combination of loadings.
3. Roof Bracing: Wind / Seismic bracing in the roof and/or walls must be furnished. Diaphragm strength consideration of the roof and/or wall covering is not allowed.

E. All steel shall be furnished with a shop coat of Red Oxide Primer.

2.06 FASTENERS:

- A. Structural Bolts: All bolts used in primary splices and secondary framing connections shall be ASTM A307 or ASTM A325 as required by design.

- B. Fasteners for Roof Panels: All roof panels shall be attached to the secondary framing members by the following:
 - 1. Premium roof fasteners shall be No. 12-14 x 1-1/4" or No. 14-14 x 1" self-drilling carbon steel screws with a molded zinc alloy or capped stainless steel cupped hex washer head. Roof fasteners shall be assembled with an EPDM washer. Premium roof fasteners shall be used on all pre-finished or warranted roofs.
 - 2. Standard roof fasteners shall be No. 12-14 x 1-1/4" or No. 14-14 x 1" self-drilling carbon steel screws with an integral hex washer head. Roof fasteners shall be assembled with an EPDM washer. Standard roof fasteners shall have a long life coating over zinc plating. Standard fasteners shall be used on unwarranted aluminum-zinc alloy-coated roofs only.

2.07 GUTTER, FLASHING AND DOWNSPOUT:

- A. Gutters and Flashings: All standard exterior gutters are 24 gauge G90 zinc-coated (galvanized) or AZ50 aluminum-zinc alloy-coated steel with a pre-painted finish. Standard rake flashing is 22 gauge G90 zinc-coated (galvanized) or AZ50 aluminum-zinc alloy-coated steel with a pre-painted finish. All other flashings shall be a minimum 22 gauge steel in a GALVALUME PLUS finish.
- B. Downspouts: All downspouts shall be 24 gauge zinc-coated (galvanized) or aluminum-zinc alloy-coated steel with color coordinated, pre-painted finish, CIRCULAR in shape.

2.08 ROOF PANELS:

- A. Material to comply with:
 - 1. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
 - 2. REFER TO DRAWINGS AND ATANDING SEAM METAL ROOFING SECTION, Minimum 24 GA.
- B. Finish: GALVALUME PLUS

2.09 ROOF SYSTEM PERFORMANCE TESTING

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.
- B. Roof System shall be designed to meet Standard Building Code Wind Load requirements.
- C. Panels to meet:
 - 1. Water Penetration: When tested per ASTM E-283/1680 and ASTM E-331/1646 there shall be no uncontrolled water penetration or air infiltration through the panel joints.
 - 2. Roof System shall be designed to meet a UL Class 90 wind uplift in accordance with UL standard 580 and panel system shall be ASTM 1592 Tested and approved
 - 3. UL 2218 - Impact Resistance rated.

2.10 ROOF PANEL WARRANTIES

- A. Weathertight warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 Years from date of Substantial Completion
- B. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace standing seam metal roof panels that show evidence of deterioration of factory-applied finish within specified warranty period.
 - 1. Exposed Panels Finish - deterioration includes the following:
 - a. Color fading more than 5 hunter units when tested according to ASTM D 2244
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214
 - c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.
 - 2. Warranty Period: 20 Years from the date of substantial completion

PART 3 - EXECUTION

- 3.01 ERECTION: Erection of the pre-engineered metal building shall be in strict accordance with the metal building manufacturer's erection procedures.

- 3.02 Erection shall be performed by a qualified erector using proper tools and equipment. It shall be the responsibility of the erector to comply with all applicable legal and safety requirements. It shall further be the responsibility of the erector to determine and provide any and all temporary bracing, bridging, blocking, shoring, and/or securing of components, etc. as required for stability during the entire erection process.
- 3.03 Erector shall not make any field modifications to any structural member except as authorized and specified by manufacturer and reviewed by the Architect.

PART 4 - WARRANTIES

- 4.01 Material and Workmanship Warranties
- 4.02 Building manufacturer shall furnish, a three (3) year limited warranty against failures caused by faulty or substandard material within limits set by the warranty. This “Building Manufacturer Limited Warranty” shall also certify the design criteria used for the structural design of the building.
- 4.03 The “Building Manufacturer Limited Warranty” shall also include a one (1) year workmanship guarantee against failures caused by faulty erection. This workmanship clause is only applicable if Building manufacturer erects the building material and accessories.
- 4.04 The “Building Manufacturer Limited Warranty” also includes the standard roof and wall paint warranties. The type of panel and finish are to be written in on the warranty document and this establishes the applicable warranty period.
- Paint Warranties
- 4.05 Twenty (20) Year Warranty – Manufacture’s Standard Paint:
All roof panels which are color coated with Manufacture’s Standard Paint shall be warranted, within limits set by the warranty, for a period of 20 years against chalk, fade, crack, check, blister or peel.

END OF SECTION

SECTION 15000 – BASIC MECHANICAL REQUIREMENTS

PART 1- GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

1.2 CONTRACT DOCUMENTS

- A. Refer to and comply with all provisions of the General Conditions, Supplementary General Conditions, Information for Bidders, and other technical Sections of these Specifications in the installation of all mechanical work.
- B. Drawings are diagrammatic; therefore, all offsets, fittings, valves and accessories are not shown. Plan work around building details and other crafts.
- C. See Supplementary General Conditions for conflicts between Plans and Specifications.
- D. In case of interferences between trades, Architect will decide which work is to take precedence regardless of work that might be installed.

1.3 CODES, ORDINANCES, INSPECTIONS, AND PERMITS

- A. Work is to be executed and inspected in accordance with Local and State codes, laws, ordinances, rules and regulations applicable to a particular class of work, and any fees in connection therewith are to be paid by the Contractor.
- B. Should any part of Drawings or Specifications be found to be in conflict with applicable codes or ordinances, notify the Architect in writing, seventy-two (72) hours prior to receiving of bids. After receiving bids, complete all work necessary to meet requirements of all codes or ordinances without additional expense to Owner or his representative.
- C. All pressure and heating vessels, including hot water storage containers, shall be constructed in compliance with rules and regulations of Boiler Inspection Division of the State of Arkansas and all installations of such equipment shall be made by firm licensed and approved by Boiler Inspection Division before they are placed in service.
- D. All plumbing work shall comply with latest local codes, Arkansas Plumbing Code and Arkansas State Gas Code.
- E. All mechanical work shall comply with latest local codes and Arkansas Mechanical Code
- F. Arrange with City, or State, if City has no ordinances covering work, for complete inspection, paying all charges pertaining thereto. Give proper authority all

requisite notice relating to work under such. Afford for inspection and be responsible for all violations of law. Upon completion of work, have work inspected, if required, obtaining Certificate of Inspection and approval from inspecting agency and deliver such certificate to Architect.

1.4 MATERIAL, EQUIPMENT, AND SUBCONTRACTOR LISTS

- A. Submit within thirty (30) days after award of Contract, a complete list of materials, equipment, and Subcontractors.
- B. This list shall include manufacturer's and Subcontractor's names.
- C. Items to be included in the list are plumbing fixtures, plumbing specialties, plumbing equipment, HVAC Equipment, HVAC Piping Specialties, Insulation, and Air Distribution Devices.
- D. Subcontractors to be included in the list are insulation, sheet metal, controls and other subcontracted work.
- E. This list does not in any way take the place of Shop Drawings and Submittals.

1.5 SHOP DRAWINGS AND SUBMITTALS

- A. Submit manufacturer's catalog sheets and/or Shop Drawings covering all phases of work included in this Contract.
- B. Submittals shall be arranged in sets and bound in folders. General folders may be used, but material must be directed into logical categories. No loose sheets will be acceptable.
- C. All submittals shall bear written certification to the effect that the General Contractor has examined them and found them to be in accordance with Specifications and to be dimensionally correct with reference to available space and to related trades.
- D. Submittals are required even though equipment being furnished is exactly as specified.

1.6 SUBSTITUTION OF MATERIALS

- A. Final decision as to whether or not a specific piece of equipment meets Specifications shall rest with Architect.
- B. It is the intent of these specifications to establish quality standards of materials and equipment installed. Therefore, specific items are identified by manufacturer, trade name or catalog designation.
- C. Should the Contractor propose to furnish material and equipment other than specified, he shall submit a written request for any or all substitutions to the Architect in conformance with other sections of these specifications. Such requests shall be alternatives to the original bid, and shall be submitted complete with descriptive (manufacturer, brand name, catalog number, etc.) and technical data for all items.

- D. Where such substitutions alter the design or space requirements indicated on the drawings, include all items of cost for the revised design and include cost of all allied trades involved.
- E. Acceptance or rejection of the proposed substitutions shall be subject to the approval of the Architect. If requested by the Architect, the Contractor shall submit for inspection samples of both the specified and proposed substitute items.
- F. In all cases where substitutions are permitted, the Contractor shall bear any extra cost of evaluating the quality of the material and the equipment to be installed.
- G. Should a substitution be accepted and subsequently proven unsatisfactory for service intended within warranty period, replace this material or equipment with that as originally specified, or as directed by Architect.

1.7 LOCAL SITE CONDITIONS

- A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed.
- B. Make determination of soil conditions before bidding. These Specifications and accompanying Drawings in no way imply as to condition of soil to be encountered.

1.8 GUARANTY-WARRANTY

- A. This guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the true intent and purpose of these Specifications. Conduct such tests as herein specified or as may be required by the Architect to demonstrate capacity and performance ability of various systems to maintain specified conditions.
- B. All materials and equipment shall carry a full year's warranty from time Owner accepts building or the date of substantial completion; whichever is earlier, regardless of start-up date of equipment.
- C. The Owner and Architect will not accept the building until the mechanical system has been properly started up, balanced, and is operating as per this Engineer's design. If for any reason the Contractor does not perform the work as specified in this Section, the final payment will be used to hire a qualified "start-up and system commissioning firm" to complete the work.

1.9 OPERATION INSTRUCTIONS

- A. Provide a bound manual containing complete repair parts' lists, and operating service and maintenance instructions for all equipment provided.
- B. The Contractor shall carefully instruct the Owner's operations' man during the adjustment and testing period of the equipment for such length of time as may be necessary to thoroughly familiarize him with the proper care, operation and maintenance of the equipment.

1.10 AS-BUILT DRAWINGS

- A. At completion of this project, provide the Owner with one (1) set of reproducible Drawings showing all work installed under this Contract.
- B. These Drawings shall incorporate all changes made in the course of the project so as to enable the Owner to properly maintain, operate and repair both exposed and concealed work.

1.11 CLEAN UP

- A. Do not allow waste material or rubbish to accumulate in or about job site.
- B. At completion of work, remove all rubbish, tools, scaffolding and surplus materials from and about building, leaving work clean and ready for use. Clean all equipment, piping, valves, fixtures, and fittings of grease, metal cuttings, insulation cement, dust, dirt, paper labels, etc.
- C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep clean mechanical systems shall be repaired without cost to Owner.

1.12 TESTING AND ADJUSTING

- A. Each and every phase of the plumbing, air conditioning, heating and ventilating plant shall be operated separately, or in conjunction, one with the other, for a sufficient period of time to demonstrate to the entire satisfaction of the Architect the ability of the plant to meet the capacity and the performance requirements while maintaining design conditions in accordance with the true intent and purpose of these Specifications.
- B. Previous to any performance tests, this Contractor shall have set and adjusted all valves, dampers, motors, controllers, thermostats, and other items as are necessary to properly balance all phases of the plant and shall have the plant operating and maintaining design temperatures, humidity and air circulation throughout all areas of the building.
- C. See other Sections of these Specifications for other possible records and tests to be made.
- D. During the First-Year Warranty, this Contractor will be required to make some or all of the readings above to assure the system is functioning properly through the various seasons. Contractor shall make additional adjustments as required.

1.13 EQUIPMENT CONNECTIONS

- A. Each equipment item, with drain connections, shall be provided with a properly sized drain run to the nearest floor drain or as directed.
- B. Rough-in and make final connection to all equipment furnished under other Divisions of these Specifications or by the Owner.

01. Provide necessary labor and materials, including stop valves, traps, pressure-reducing valves, etc. necessary. Trap and vent drainage connections as required.
02. If equipment or fixtures are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.

1.14 ELECTRICAL

- A. Furnish and install all electrical interlock, control and other wiring, not covered specifically under the Electrical Plans and Specifications, for proper operation and control of all equipment specified under this Division of the Specifications.
- B. Supervise and coordinate all electrical work in connection with mechanical system.

1.15 MOTOR CONTROLLERS

- A. Furnish all motor controllers or contactors, not furnished as part of a motor control center, for proper operation of all motors. See Electrical Specifications for Controller Specifications.
- B. Where motor controllers or contactors are furnished as part of a motor control center, provide a schedule of every motor or equipment item furnished, its voltage requirements, type controller required, accessories required and interlocks. Submit schedule within sixty (60) days of award of the Contract to Architect and supplier of Motor Control Center for approval.
- C. Except where shown on Drawings, provide starters and control equipment for single-phase motors larger than 1/2 horsepower and all three phase motors. Starters for three- phase motors shall have three pole overload protection. All starters shall have pilot lights. Starters being controlled by other devices shall have "MANUAL" - "OFF" - "AUTO" Switches. Starters being controlled locally shall have push button stations mounted on starter or remote. Provide auxiliary contacts as required.
- D. All starters shall be identified with engraved laminated plastic label.

1.16 FLASHINGS

- A. Roof flashings are to be furnished and installed under the Roofing Division of these Specifications.

1.17 CUTTING AND PATCHING

- A. Provide all cutting and patching required to perform the Mechanical Work.
- B. Cutting of structural members will not be permitted, except through explicit instructions from the Architect. Reinforcing will be required where members are cut.
- C. Workmen skilled in the trade required will do all patching.

1.18 ACCESS PANELS

- A. Provide access panels as required to service valves in piping, controls, items in duct, etc.
- B. Access doors shall be provided under this Section of the Specifications and installed under other applicable Sections.
- C. Access doors shall be equal to the following MILCOR Types:
 - 01. Style A Door for Acoustical Tile.
 - 02. Style B Door for Acoustical Plaster.
 - 03. Style K Door for Plastered Surfaces.
 - 04. Style M Door for Masonry, Wallboard, Etc.
 - 05. Fire-Rated Door where required.
- D. Size and type shall be as required for proper service and as directed by Architect.

1.19 EXCAVATION, TRENCHING, AND BACKFILLING

- A. All excavation, trenching and backfilling in connection with the Mechanical System is included as part of this Division.
- B. All excavation required shall be done as part of the Bid Price regardless of any implied conditions on the Plans or in these Specifications.
- C. Do not carry excavation below required level. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel or concrete, as directed by Architect and thoroughly compacted. Remove unstable soil and replace with gravel, crushed stone or clean sand and thoroughly compact. Architect will determine depth of removal of unstable soil. Grade ground adjacent to excavations to prevent water running in. Remove, by pumping or other means approved by Architect, any water accumulated in excavation.
- D. Banks of trenches shall be vertical or as shown on the Drawings. Width of trench to be five-inch (5") minimum, eight-inch (8") maximum on each side of pipe bell. Bottom of trench for sewers and culverts shall be rounded so that an arc of circumference equal to 0.6 of outside diameter or pipe rests on undisturbed soil wherever practicable. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried eight inches (8") below bottom of pipe. Use loose earth or gravel for backfill and compact thoroughly.
- E. Bracing, sheathing and shoring shall be performed as necessary to complete and protect excavations indicated on the Drawings, as required for safety, as directed by Architect, or to conform to governing laws.
- F. After piping, conduit, ducts, etc. have been installed, inspected, tested and approved by Architect, backfill trenches with clean, stable soil free from large stones. Place backfill in layers, tamped under and around pipe and conduit to height of at least two (2') feet above pipe. Compaction shall be done in such

manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand.

- G. Replace existing appurtenances removed or damaged in connection with work. Restore to original conditions, unless otherwise directed.

1.20 PAINTING

- A. All gas piping, roof drains, mechanical piping, etc. exposed outside the building shall be painted with one coat of primer and two coats of enamel paint. Color to be coordinated with Architect/Engineer.
- B. All gas piping, roof drains (not insulated), mechanical piping, etc. exposed inside the building in a finished area shall be painted with one coat of primer and two coats of enamel paint. Color to be coordinated with Architect/Engineer.

(END OF SECTION)

SECTION 15110 - PIPING

PART 1- GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

1.2 REFERENCE

- A. For specific piping requirements and materials, refer to the respective Sections for the various systems.
- B. See other Sections of these Specifications for Valves, Piping Specialties and Supports.

- 1.3 THERMAL EXPANSION:** Swing joints, turns, expansion loops or long offsets will be provided where necessary to allow for expansion and contraction. Pipe, fittings or equipment, broken during warranty, will be replaced.

- 1.4 OPEN ENDS:** Keep ends of pipe, including those extending through and above roof, drains, equipment and fixture branches, closed with caps or plugs to prevent dirt or building material from entering the pipe and traps during construction.

- 1.5 NOISE CONTROL:** Piping shall be free of any objectionable self-generated noise. Isolate piping from building where required to prevent transmission of noise.

- 1.6 CROSS CONNECTIONS:** No piping shall be installed which will provide a cross-connection between potable water system and a polluted supply.

PART 2- PRODUCTS

2.1 MATERIALS

- A. For materials to be used on the various piping systems, refer to the specific piping Section.

PART 3 - EXECUTION

3.1 ARRANGEMENT

- A. Exposed lines are to be run parallel with, or perpendicular to, building lines and wherever possible shall be grouped together for easier service and identification. Lines requiring a definite grade for drainage shall have precedence in routing over other lines. Wherever possible, horizontal and vertical lines shall be held as close as possible to walls, ceilings, struts and members so as to occupy minimum space consistent with the proper requirements for insulation, expansion, removal of pipe and access to valves. All concealed work shall finish off within limits permitted by vertical or horizontal chases. Arrange for concealment of all piping in finished area of buildings unless otherwise noted.

- B. Piping shall be worked into place without springing and/or forcing. All piping shall be arranged so as not to interfere with removal of other equipment or devices, nor to block access to doors, windows, manholes, or other access openings.
- C. All piping shall be installed so as to avoid liquid or air pockets throughout the work. Piping shall be erected and pitched to insure proper draining.
- D. All exposed fixture branches shall be chrome-plated.

3.2 ASSEMBLY

- A. All pipes shall be cut square and shall have burr and cutting slag removed by reaming or other cleaning methods.
- B. Unions or flanges shall be used at all connections to all equipment to facilitate dismantling, and elsewhere as required, in the erection of pipe or installation of valves.
- C. All joints and changes of direction shall be made with standard fittings. Bending of pipe will be permitted providing a hydraulic bender is used. Reducers shall be used at pipe size changes.
- D. Where required to prevent electrolysis or corrosion, an insulating coupling shall be used between dissimilar metal fitting and/or pipe. Provide insulating coupling on all underground metallic utility lines where they connect to building.
- E. Nipples shall be of same material and composition as pipe on which they are installed, and shall be extra heavy when unthreaded shoulder is less than 1-1/2". No running thread nipples will be permitted.
- F. Joints between steel or copper pipe and cast iron shall be made with caulking ferrules.
- G. Cast iron soil pipe and fittings shall be assembled with approved molded push-on type gaskets. State-approved no hub pipe may be used where applicable.
- H. Galvanized steel pipe 2" and smaller shall be assembled with galvanized screwed fittings.
- I. Black steel pipe shall be assembled with screwed or welded fittings. Grooved type mechanical pipe couplings and fittings equal to that manufactured by Victaulic may be used. Weld-O-Let or Thread-O-Let fittings may be used where branch outlet is at least one pipe size smaller than the main.
- J. Copper pipe shall be assembled with wrought copper fittings. Above grade 95/5 solder shall be used. Below grade joints shall be made with "SIL-FOS".
- K. PVC pipe shall be assembled with solvent weld joints. Solvent cement used shall be suitable for the type of plastic specified. The ends of the pipe shall be cut square and all burrs removed. The jointing sections of pipe and fitting shall be cleaned with suitable pipe cleaner for the plastic specified. After application of

the solvent cement the pipe end shall be inserted with the pipe bottoming against fitting pipe stop. All solvents and cleaners used shall be within the shelf life as listed on the containers. At no time shall solvents and cleaner be used without shelf life identification attached to the container.

3.3 SLEEVES AND PLATES

- A. Sleeves shall be used where piping passes through exterior walls; poured-in-place concrete walls, floors or roofs; where required for sealing to meet any sanitation codes, ordinances or laws; and areas where water may accumulate.
- B. Sleeves in poured wall construction, and where collapse is possible, shall be Schedule 40 pipe. Other sleeves shall be minimum 22-gauge sheet metal.
- C. Sleeves accommodating insulated pipe shall be of sufficient diameter to pass piping and full size of insulation.
- D. In toilets, kitchens, equipment rooms and other areas where water may accumulate on the floor, sleeves shall extend one-half (1/2) inch above the finished floor. Other sleeves shall be flush with finished floor.
- E. After all piping has been inserted in sleeves; voids between pipe or insulation and sleeve shall be filled with suitable non-run non-stain mastic.
- F. Spring clamp plates (escutcheons) shall be provided where pipes are exposed in occupied rooms and where walls, floors or ceilings are finished. Plates on extended sleeves shall have chrome-plated skirts.

3.4 TESTING

- A. Test all piping systems provided under this Contract and obtain approval from Architect before acceptance.
- B. Piping located underground shall be tested and inspected before backfilling.
- C. Equipment and personnel required for these test shall be furnished without additional cost. Testing equipment shall be as required for particular test, with all equipment and gauges accurate and in good working order.
- D. Equipment subject to damage at given test pressure is to be removed from line before pressure is applied. Use proper plugs or caps.
- E. See specific piping system Specification for test pressure, duration and medium.

(END OF SECTION)

SECTION 15120 - VALVES

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

- 1.2 Valves specified in this Section are for general use. See Specifications for specific system for special valves.

- 1.3 Submit brochures and other data for approval of all items differing from those specified.

PART 2 - PRODUCTS

2.1 GATE VALVES

- A. 1/4" through 2" - Crane No. 484½, or NIBCO SCOTT T-113, 125-lb SWP, 200-lb WOG, bronze, screw-in bonnet, threaded ends, non-rising stem, solid wedge.
- B. 1-1/2" through 12" - Crane No. 473, or NIBCO SCOTT F-619, 125-lb SWP, 200-lb WOG, iron body, inside screw, bronze mounted, flanged ends, non-rising stem, and solid wedge.

2.2 GLOBE VALVES

- A. 1/8" through 2" - Crane No.1, or NIBCO SCOTT T-211, 125-lb SWP, 200-lb SWP, 200-lb WOG, bronze, screw-in bonnet, threaded ends, Buna-N Seat Disc for water, oil or gas (W), Teflon seat disc for steam (Y).

2.3 SWING CHECK VALVES

- A. 1/4" through 2" - Crane No. 37, or NIBCO SCOTT T-413, 125-lb SWP, 200-lb WOG, bronze, threaded ends, Buna-N Seat Disc for water, oil or gas (W), Teflon Seat Disc for Steam (S).

2.4 GAS COCKS

- A. 1/2" through 3" - Crane No. 1232, 125-lb WOG, iron body, brass plug, flat head, screwed ends.

2.5 REDUCED PRESSURE BACKFLOW PREVENTER

- A. 3/4" through 2" Wilkins model #975 reduced pressure principle backflow preventer consisting of a pressure differential relief valve located between two independently operated spring loaded "Y" type center guided check valves. Unit shall be provided with two ball valves for shut-off and four ball valve tests cocks. Unit shall be constructed using a bronze body rated for a maximum operator pressure of 175 psi. Unit shall conform to ASSE (No. 1013), IAMPO, AWWA, CSA B64.4, USC/FCCC and HR.

PART 3- EXECUTION

3.1 ARRANGEMENT OR LOCATION

- A. Valves shall be located in an accessible position or made accessible through access panel.
- B. Where several valves are related as to function, they shall be grouped in a battery.

3.2 No valves shall be installed with stem below horizontal position.

3.3 Provide special handles or operators as might be required or as indicated on the Drawings.

3.4 Valves specified under specific systems shall take precedence.

3.5 Valves in copper pipe shall have threaded ends (except where size dictates flanged ends), use copper to MPT adapters.

3.6 The use of threaded ends or flanged ends is the Contractor's option within the size listed.

3.7 VALVE BOXES

- A. All valves located below slabs or grade shall be housed in cast iron boxes and covers. Covers shall be properly marked.
- B. Furnish Owner proper key or valve-operator extension.

(END OF SECTION)

SECTION 15140 - MECHANICAL SUPPORTING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.
- B. Provide adequate pipe, equipment foundation and suspension systems in accordance with recognized engineering practices using where possible standard commercially accepted hangers and accessories.

1.3 CODES

- A. All pipe hangers and supports shall conform to the requirements of the Code for Pressure Piping, Refrigeration Piping, ANSI/ASME B31.5-74, and Manufacturers' Standardization Society of Valve & Fittings Industry Documents MSS-SP-58 and MSS-SP-69.
- C. All auxiliary steel necessary for the installation of the pipe hangers and supports shall be designed in accordance with the requirements of AISC Specification for the Design, Fabricating, and Erection of Structural Steel for Buildings, 1978 Edition.

1.4 DESIGN

- A. Where thermal movement in the pipeline will occur, the pipe hanger assembly must be capable of supporting the line in all operating conditions. Accurate weight balance calculations shall be made to determine the supporting force at each hanger in order to prevent excessive stress in either pipe or connected equipment.

PART 2- PRODUCTS

- 2.1** Numbers refer to Grinnell hangers and pipe supports. Approved equal hangers and pipe supports are acceptable. Submit all substitutes for approval.
- 2.2 CONCRETE INSERTS:** Inserts shall be Figures 281, 282 or Power-Strut 349 where a continuous insert is required.
- 2.3 BEAM CLAMPS:** Clamps shall be Figures 133, 134, 218, 14, 227, 228, or 292. Welded beam attachments shall be Figure 66.
- 2.4 RISER CLAMPS:** Riser clamps shall be Figure 261 for steel pipe or Figure CT121 for copper tubing.
- 2.5 HANGER RODS:** Hanger rods shall be Figures 140 and 146. Eye rods shall be Figures 248 and 278.

- 2.6 PIPE HANGERS:** All hangers for piping two (2) inches or larger shall be provided with means of vertical adjustment.
- A. On un-insulated steel pipe, hangers shall be Figures 104, 108, 212, or 260. On piping two (2) inches and smaller, Figures 70, 97, or 138R will be permitted.
 - B. On un-insulated copper tubing, hangers shall be Figures CT65, CT69, CT99, or CT138R.
 - C. On hot insulated steel pipe, hangers shall be Figure 295 or welded attachments, Figures 47, 49, 52, 54 or 55. Where thermal movement causes the hanger rod to deviate more than five (5) degrees from the vertical, or where longitudinal expansion causes a movement of more than one-half (1/2) inch in the piping supported from below, roller hangers Figures 171, 181, 271, or 281 shall be used in conjunction with a protection saddle. Figures 160, 161, 162, 163, 164, 165, and 166 to suit the insulation thickness. On insulated steel pipe for chilled water or similar service, the hanger must be placed on the outside of the insulation with a Figure 167 Shield.
 - D. On insulated copper tubing, hangers shall be Figures 70, 97, 104, or 108 and shall be placed on the outside of the insulation with a Figure 167 Shield. The Figures 167 Shield shall be applied to distribute the hanger load over the insulation and to eliminate damage to the vapor barrier on the covering.
 - E. Base supports shall be Figures 259 or 264.
- 2.7 BRACKETS AND RACKS:** Welded steel brackets shall be Figures 194, 195 and 199. Multiple pipe racks or trapeze hangers shall be fabricated from Power-Strut channel, clamps, and accessories.
- 2.8 SPRING HANGERS**
- A. For light loads and non-critical movement less than one-fourth (1/4) inch, Figures 82, 98 or B268 Variable Spring Hanger shall be used.
 - B. On critical systems, where movement is in excess of one half (1/2) inch, constant supports, Figures 80V or 81H shall be used.
 - C. For vibration and/or shock loadings, use Figures 296, 297 or 299 sway braces.
- 2.9 ANCHORS, GUIDES AND SLIDING SUPPORTS:** Pipe anchors shall be Figures 258, 259 or 264. Guides shall be Figures 177, 255, or 256. Sliding supports shall be Figures 280, 280A, 435 used in conjunction with Figure 438.
- 2.10 INSULATION INSERTS -** Thermal hanger shield model designations indicated below are manufactured by Pipe Shields, Inc. Equal models by Insul-Shield or Uni-Grip.
- A. ALL INSULATED PIPE:
 - 01. Chilled water and refrigerant lines use PSI Model CS- CW Series.
 - 02. All other insulated lines, use PSI Model CS Series.

- 03. Use Model CSX and CSX-CW Series if pipe hanger span is greater than ten feet and for all pipe roller applications.

B. FIRE-WALL & FLOOR PENETRATIONS:

- 01. Bare pipe; use PSI Model WFB Series.
- 02. Insulated Pipe
 - a. Chilled water and refrigerant lines: use PSI Model WFB-CS-CW Series.
 - b. All other insulated lines: use PSI Model WFB-CS Series.

PART 3 - EXECUTION

3.1 ATTACHING TO STRUCTURE

- A. Where equipment or piping is supported off a concrete structure, inserts shall be used. Where support rod sizes exceed 7/8" diameter or where the pipe load exceeds the recommended load for the insert, use two (2) inserts with a trapeze type-connecting member below the concrete. In cases where pipes are supported from existing slab, use Phillips' "RED HEAD" or equal, sized for Safety Factor 4.
- B. Where equipment or piping is supported from building steel beam, clamps or welded beam attachments shall be used. Holes drilled in building steel for hanger support rods will not be permitted.
- C. All vertical runs of piping shall be supported at each floor.

3.2 HANGER RODS AND SPACING

- A. Where hanger rod sizes are catalog-listed for a specified hanger, this size shall govern. Where hanger rod sizes are not catalog-listed, the load on the hanger shall be the determining factor and the maximum recommended hanger rod load as catalog-listed, shall govern.
- B. Pipe hanger spacing shall not exceed:

PIPE SIZE	STEEL PIPE	COPPER PIPE	CAST IRON PIPE/PVC
to ¾"	7'	5'	Sanitary Waste and Vent:
1" to 2"	10'	8'	Provide Hanger at each joint
2 ½" to 4"	12'	10'	with 5' maximum spacing
5" to 8"	16'	10'	Cast Iron and 4' maximum
10" to 16"	22'	10'	spacing for PVC.)

- C. Provide supports at concentrated loads such as pumps, valves and other piping specialties, to prevent line sag and/or excess stress in the piping systems.

3.3 AUXILIARY STEEL

- A. Furnish all miscellaneous structural members necessary to hang or support pipe or mechanical equipment. Material or members shall be consistent with that of the main structural system.
- B. All auxiliary steel shall receive one shop coat of primer paint.
- C. Arrange for any adjustment necessary in main structural system for proper support of major equipment.

3.4 CONCRETE PADS

- A. Provide concrete pads under all floor-mounted equipment and apparatus.
- B. All pads shall be nominal 4" thick except 12" for pumps.
- C. Chiller pads shall be 12" thick and isolated from area floor slab with a bituminous strip.

3.5 INSULATION INSERTS

- A. Provide insulation inserts as specified above at all points of support on insulated pipe. Insert to be same thickness as adjoining pipe insulation.
- B. Provide insulation inserts as specified above on all pipe penetrations of firewalls or floors. Fill hole around insert with material compatible with wall construction.

(END OF SECTION)

SECTION 15160 - MECHANICAL SYSTEMS INSULATION

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.
- B. Furnish and install all insulation for HVAC Piping, Duct and Equipment and for Plumbing Piping.
- C. Insulation by other manufacturers will be considered provided that samples of each substitute item are submitted for approval.
- D. Specifications apply to supply and associated return system unless specifically specified otherwise.

PART 2 - PRODUCTS

2.1 PLUMBING

- A. DOMESTIC COLD WATER (ABOVE-GRADE): Owens-Corning one-half (1/2) inch thick fiberglass, one-piece, pipe insulation with factory applied White All-Service (ASJ/SSL-II) Vapor Barrier Jacket. Fittings shall be molded or mitered fiberglass for sizes under 3" and molded fiberglass for sizes 3" and larger. Armstrong's "AP ARMAFLEX", one-half (1/2) inch thick may be used at Contractor's option.
- B. DOMESTIC HOT WATER (ABOVE-GRADE): Owens-Corning one-half (1/2) inch thick fiberglass, one-piece, pipe insulation with factory applied White All-Service (ASJ/SSL-II) Vapor Barrier Jacket. Fittings shall be OC-110 Cement for sizes under 3" and molded fiberglass for sizes 3" and larger. Armstrong's "AP ARMAFLEX", one-half (1/2) inch thick may be used at Contractor's option.

2.2 HVAC PIPING

- C. CONDENSATE DRAIN (OVERHEAD-HORIZONTAL): Armstrong's "AP ARMAFLEX" pipe insulation one half (1/2) inch thick.
- D. REFRIGERANT SUCTION: Armstrong's "AP ARMAFLEX" pipe insulation 3/4"-thick.

2.3 HVAC DUCTWORK AND FLUES

- A. DUCTWORK (EXTERNALLY INSULATED): Owens-Corning 2" thick SoftR® fiberglass duct wrap Type 100 1.0 lb/cf with factory-applied flame retardant foil-reinforced Kraft Facing (FRK).

- B. ROUND DUCT WORK: Owens-Corning 2" thick fiberglass All Service Faced Duct Wrap 3/4 lb. density with factory- applied flame-retardant foil-reinforced Kraft Facing (FRK).
- C. Kitchen Hood Exhaust Duct shall be installed with 3-inch thick Pyroscat FP Duct wrap. Insulation shall be on two layers with the outer layer foil facing.

PART 3 - EXECUTION

3.1 GENERAL

- A. The application of all insulation shall be performed by experienced mechanics, regularly employed in the trade, in a neat and workmanlike manner. Unless otherwise specified, the application of all insulation shall be in accordance with the manufacturer's recommendations.
- B. Omit insulation from the following items:
 - 01. Exposed plated plumbing pipe.
 - 02. Valves, unions, flanges, traps, strainers and devices in hot only piping.
 - 03. Vents to atmosphere, discharge from safety and relief valves, overflow and hot only drain pipes.
 - 04. Exhaust Ducts unless specifically noted on Drawings.
- C. All insulation shall be made mildew-proof.
- D. Provide semicircular protection saddles of #16-gauge galvanized steel, 12" long, for insulated piping where hangers occur. On pipe sizes 2" and over, provide 12" length of high-density insulation at hangers.
- E. Foil-Faced (FF) Duct Insulation shall be acceptable to NFPA Standards 90A and 90B.
- F. All exposed ends of pipe insulation shall be pointed up neatly with appropriate insulating cement.
- G. Piping systems shall be tested and cleaned before insulation is applied.

3.2 FIBERGLASS FOR COLD OR DUAL TEMPERATURE PIPING: Adhere factory laps with white vapor barrier adhesive. Adhere three-inch butt joint strips over all end joints with vapor barrier adhesive to insure a continuous vapor barrier. Insulate all fittings, molded fittings, or mitered segments to same thickness as the adjacent insulation vapor seal with two (2) one-eighth (1/8") inch wet coats of White vapor barrier mastic reinforced with glass fabric extending two (2) inches onto the adjacent insulation. Cover fitting with pre-formed PFC covering.

3.3 FIBERGLASS FOR HOT PIPING: Apply insulation to pipe with side and end joints butted tightly. Seal jacket laps and butt joint strips with an approved lagging adhesive. Jacket fittings with six-ounce (6 oz.) canvas saturated with lagging adhesive. At

Contractor's option, fittings may be finished as specified under "COLD PIPING". Cover fitting with pre-formed PVC covering.

- 3.4 FOAMGLASS INSULATION (BELOW-GRADE):** Regular unwrapped insulation shall first be tack-coated with fibrated asphalt cutback (similar to Pittsburgh-Corning Pittcote 300), using approximately 4 gallons/100 square feet of cutback.
- 3.5 AP ARMAFLEX PIPE INSULATION:** Apply in accordance with latest Edition of Armstrong's "INSTALLATION INSTRUCTIONS TO THE CONTRACTOR." On outdoor or underground application, apply two (2) coats of Armstrong's Weatherproof Plastic, reinforced with glass mesh.
- 3.6 FIBERGLASS DUCT WRAP TYPE INSULATION:** Adhere to duct surface with approved adhesive applied in strips approximately 6" wide on approximate 12-inch centers. In addition, secure insulation to the bottom and/or sides of rectangular ductwork with a dimension of 24" and above with mechanical fasteners at not more than 18" on center. Butt edges of insulation and seal joints with mastic, adhering the flange over each joint. Insulation shall extend to and cover air devices.
- 3.7 FIBERGLASS DUCT BOARD TYPE INSULATION:** Impale the insulation over welded pins, spaced a minimum of two (2) rows per side. Seal all breaks, punctures, and joints by adhering a four-inch wide strip of glass fabric embedded between two (2) coats of vapor barrier mastic equal to Benjamin Foster #60-55 fire- resistive aluminum pigmented vapor barrier mastic. (All duct insulation within mechanical spaces shall be board type.)
- 3.8 DUCTWORK EXPOSED TO WEATHER:** Weatherproof all outside ductwork by covering all joints and holes with two (2) coats of 1/8-inch wet coats of vapor barrier mastic reinforced with glass fabric. Over entire surface, apply two (2) 1/8-inch thick coats of breather mastic reinforced with glass fabric, lapping all joints a minimum of two (2) inches.

(END OF SECTION)

SECTION 15180 - TESTING, BALANCING AND ADJUSTING

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

1.2 SCOPE OF WORK

A. AIR AND WATER BALANCE

- 01. A complete air and water balance of this project will be required as specified in Sections herein.

1.3 QUALIFICATIONS

- A. The Testing, Balancing, and Adjusting Subcontractor shall be independent of any Design Engineer or any Contractor performing work on this project since one of his primary functions will be to verify the Contractor's performance as a third party Professional Representative.
- B. The agency shall specialize in testing and balancing of heating, ventilating, and air conditioning systems and shall have successfully completed at least ten (10) projects of similar size and scope within the past three (3) years in which they have performed both a temperature and an energy balance.
- C. All work shall be done under the supervision of a Registered Professional Engineer in the State of Arkansas who is a full-time employee of the agency with at least five (5) years' experience in HVAC "System Commissioning." All reports shall bear this engineer's professional seal and signature certifying accuracy and corrections.
- D. Membership in the AABC will be acceptable for qualification in lieu of having work done under a Registered Engineer.

1.4 OMISSIONS OF MATERIALS AND EQUIPMENT

- A. All abnormal conditions shall be corrected and/or explained in the report. The TBA Contractor shall not be required to correct Engineer or Contractor errors and/or omissions. It will be the responsibility of the Testing Engineer to notify the Architect of mistakes found and work with him toward finding the solution.

1.5 SUBMITTALS

- A. The Contractor shall submit, within thirty (30) days after receipt of Contract, twelve (12) copies of submittal data on the qualifications of the Testing Company to which he has awarded the Subcontract. If this submittal is not received within

this period of time, the Architect reserves the right to select a testing firm to perform this specified work.

- B. Submittal shall include Arkansas Professional Engineer Registration Number, Arkansas Contracting License Number, and name of the proposed resident Engineer on the project.
- C. Mechanical Contractor shall furnish to the Testing Agency two (2) copies of approved submittal on all HVAC equipment and two (2) sets of HVAC plans.

1.6 APPROVAL

- A. No work shall be performed until this Architect has stamped "APPROVED" on the qualification submittal of the Testing Agency. Mechanical Contractors, Sheet Metal Contractors or Controls Contractors will not be permitted to verify and check their own work on this job.

1.7 WARRANTY

- A. The Test and Balance Agency shall include an extended warranty of one (1) year after submission of report during which time the Engineer may request a recheck or resetting of any item included in the report. Should the Engineer find that the system has not been properly and completely balanced, the warranty period will be extended until the Engineer is completely satisfied.

1.8 REPORT

- A. The certified report shall include the following information:
 - 01. Complete testing and balancing data.
 - 02. All equipment start-up logs.
 - 03. All installation, operation, and maintenance instructions.
 - 04. All system control and equipment wiring diagrams.

1.9 START-UP

- A. All major equipment (Chiller, Boiler, Air Handling Units, Etc.) shall be started by a factory trained service mechanic, a UA-MCA Certified Technician, or a Registered Professional Engineer that is experienced in the service and operation of that piece of equipment.
- B. A representative of the Testing Agency shall accompany the start-up technician and verify the unit performance.
- C. The Testing Agency shall include all these start-up logs in his report for submission to the Owner and Architect.
- D. The Mechanical Contractor shall start up and place into operation all auxiliary equipment such as fans, pumps, etc.

1.11 ACCEPTANCE

- A. The Owner and Architect will not accept the building until the system has been properly started up, balanced, and is operating as per this Engineer's design. If for any reason the Contractor does not perform the work as specified in this Section, the final payment will be used to hire a qualified "start-up and system commissioning firm" to complete the work.

PART 2 - PRODUCTS

2.1 INSTRUMENTS

- A. The Testing Agent shall own all the instruments, gauges, thermometers, etc. necessary to properly do the work. These instruments shall include the following:
01. Tachometer.
 02. Stroboscope.
 03. Pyrometer.
 04. Ammeter.
 05. Manometer.
 06. Anemometer.
 07. Magnehelic Gauges.
 08. Psychrometer.
 09. Orsat.
 10. Velometer.
 11. Type I Sound Level Meter with Octave Band Analyzer.

2.2 CALIBRATION

- A. All instruments shall have been re-calibrated within 180 days of performance of work. Certificates verifying the performance of calibration work shall be submitted to this Architect with the final report. Final payment will be withheld until this data is received by this Engineer.

PART 3 - EXECUTION

3.1 CO-ORDINATION

- A. The Mechanical Contractor shall coordinate with Testing Agency giving advance notice before testing and balancing is required. Testing Agency shall provide the Mechanical Contractor with a pre-balancing check list which shall be reviewed by the job Superintendent and returned to the Testing Agency when all items are complete.

3.2 PREPARATION

- A. The Sheet Metal Contractor shall review the Plans with the Testing Agency prior to installing ductwork system to ensure the proper placement of all balancing

devices. The Sheet Metal Contractor shall have completed all duct work and installed all grilles, registers, diffusers, dampers, access doors, turning vanes, air monitors, etc., before Testing and Balancing Agent begins his work.

- B. The Heating and Air Conditioning Contractor shall have completed all piping and placed into operation all mechanical equipment (i.e. Chillers, Boilers, Air Handlers, Pumps, etc.). All start up logs for the equipment shall be given to the Testing Engineer for inclusion in the final testing report.
- C. The Insulation Contractor shall have completed all insulation on the duct work and piping...etc.
- D. The Controls Contractor shall have completed the installation of all controls, pneumatic or electric, and shall have thoroughly checked out the piping and action of all control devices and place the entire system into operation.

3.3 PROCEDURE PHASE I - JOB VISITS

- A. The Agent shall make at least four visits to the project site during construction. The purpose of these visits is to ensure that all required test points, balancing dampers, flow measuring devices, etc., are being properly installed. The Agent shall report to the Architect any and all project discrepancies or short comings he may find during each visit. The Testing and Balancing Agent shall be given access to the project site at all times; he shall not be required to make prior arrangements with the Contractor for site visiting.

3.4 PROCEDURE PHASE II - TBA SYSTEM

- A. The Air Balance Agency shall perform the following tests and balance system in accordance with the following requirements:
 - 01. Test and adjust blower R.P.M. to design requirements.
 - 02. Test and record motor full load amperes.
 - 03. Make pitot tube traverse of main supply ducts and obtain design cfm at fans.
 - 04. Test and record system static pressures, suction and discharge.
 - 05. Test and adjust system for design re-circulated air, cfm.
 - 06. Test and adjust system for design cfm outside air.
 - 07. Test and record entering air temperatures. (DB heating and cooling).
 - 08. Test and record entering air temperatures. (WB cooling).
 - 09. Test and record leaving air temperatures. (DB heating and cooling).
 - 10. Test and record leaving air temperatures. (WB cooling).
 - 11. Adjust all main supply and return air ducts to proper design cfm.
 - 12. Adjust all zones to proper design cfm, supply and return.

13. Test and adjust each diffuser, grille and register to within $\pm 10\%$ of design requirements.
14. Each grille, diffuser, and register shall be identified as to location and area on a reduced scale set of drawings.
15. Size, type and manufacturer of diffusers, grilles, registers and tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.
16. Readings and tests of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required cfm and test resultant cfm after adjustments.
17. In cooperation with the Control Manufacturer's Representative, setting adjustments of automatically operated dampers to operate as specified, indicated, and/or noted. Testing Agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.
18. All diffusers, grilles, and registers shall be adjusted to minimize drafts in all areas.
19. As a part of the work of this Contract, the MECHANICAL CONTRACTOR shall make any replacements of the pulleys, belts, and dampers of the addition of dampers required for correct balance as recommended by Air Balance Agency, at no additional cost to the Owner.

3.6 PROCEDURE - PHASE III

- A. Upon completion of Phase I and II, the Balance Technician shall proceed with Phase III as follows:
 01. After adjustments to coils are made, recheck settings at the pumps, chillers, and boilers and readjust if required.
 02. Install pressure gauges on coil, read pressure drop through coil, and set flow rate on call for full cooling and on full heating. Set pressure drop across bypass valve to match coil full flow pressure drop. This prevents unbalanced flow conditions when coils are on full bypass.
 03. Same procedure on chiller to adjust chiller bypass valve.
 04. Record and check the following items at each cooling and heating element:
 - a. Inlet water temperatures.
 - b. Leaving water temperatures.
 - c. Pressure drop of each coil.
 - d. Pressure drop across bypass valve.
 - e. Pump operating suction and discharge pressure and final TDH.

05. List all mechanical Specifications of pumps.
06. List rated and actual running amperage of pump motor.
07. List water metering device readings.

3.7 PROCEDURE - PHASE IV - CONCLUSIONS AND RECOMMENDATIONS

- A. After the above phases are completed, the Project Engineer supervising the testing and balancing shall analyze the data and send the Design Consulting Engineer a letter with his conclusions and recommendations outlining any possible improvements of the system operation, increasing the system efficiency, reducing the energy costs, reducing noise and vibration levels, and suggestions to reduce maintenance cost.

(END OF SECTION)

SECTION 15210 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

1.2 SCOPE

- A. Furnish and install all fixtures, equipment and specialties shown on the Plans or specified herein.
- B. Provide all necessary support, trim and accessories required.

- 1.3** Fixtures shall be equal to those scheduled on the drawings. All substitutions shall be approved by the Engineer.

- 1.4** All items furnished under this Section shall be submitted for approval.

- 1.5** Fixtures shall meet all applicable code requirements.

PART 2 - PRODUCTS

2.1 FIXTURES

- A. Fixtures shall be nonabsorbent throughout and free from waves, kiln marks or discoloration.
- B. All surfaces coming in contact with walls, floors or other flat surfaces shall be flat.
- C. All enameled iron ware shall be acid-resisting.

2.2 TRIM

- A. All exposed finished metal parts shall be chromium-plated; except, rough-bodied parts shall be nickel-plated.
- B. All supplies shall be IPS brass; except, where otherwise specified.
- C. All fixtures will be provided with some form of supply stop.
- D. Traps for lavatories and sinks shall be chrome-plated cast brass P-traps with clean-out.
- E. Provide cast brass, chrome-plated, set screw type, escutcheons on supply and waste piping.

2.3 CARRIERS

- A. Chair carriers shall be approved models of ZURN, JOSAM, or J. R. SMITH.

2.4 CLEAN OUTS

- A. Caulking Plugs shall be equal to ZURN Z-1440-A cleanout with Dura-Coated cast iron ferrule and cadmium plated cast iron raised head plug.
- B. Wall Cleanouts for dry wall or block construction shall be equal to ZURN Z-1440-1 cleanout with Dura-Coated cast iron ferrule and cadmium plated cast iron countersunk plug complete with round, smooth stainless steel access cover with securing screw.
- C. Wall Cleanouts for plaster or tile wall construction shall be equal to ZURN Z-1441 cleanout with Dura-Coated cast iron ferrule and cadmium plated cast iron countersunk plug complete with round smooth Nickel Bronze wall access cover.
- D. Floor Cleanouts shall be equal to ZURN ZN-1400 "Level-Trol Tuf-Top" Dura-Coated cast iron cleanout with round, scoriated Nickel Bronze top, adjustable to finished floor after concrete has set. When cleanout occurs in tile floor, provide ZURN ZN-1600-6. Provide carpet retainer when cleanout occurs in carpet.
- E. Cleanouts to grade shall be equal to ZURN Z-1400 "Heavy Duty" Dura-coated cast iron cleanout with round heavy duty, scoriated non-tilt cast iron top, adjustable to finished floor or grade level.

2.5 WATER HEATERS AND CIRCULATORS

- A. Water heaters shall bear ASME Symbol where required by code.
- B. Provide T&P relief valve for each heater or storage tank, pipe to drain.
- C. Heaters and storage tanks shall be complete with all necessary controls and insulation.
- D. Circulators, where used, shall be all bronze or stainless steel.

PART 3 - EXECUTION

- 3.1** All fixtures subject to damage prior to completion of building shall be protected in an approved manner. Job must be turned over to Owner with all fixtures clean and free from damage.
- 3.2** All wall-hung water closets and urinals with lip extending more than 15" from wall shall be supported on chair carriers.
- 3.3** Unless specifically specified to be furnished with chair carrier, wall-hung lavatories, sinks, etc. shall be secured to wall with back-up plate and threaded rods. This Contractor shall furnish and install all backing, reinforcing, hangers, bolts, anchors and brackets required.
- 3.4** Fixtures mounted on uneven surfaces shall be bedded in an approved manner.
- 3.5** All hot and cold water supplies to plumbing fixtures or to showerheads shall have a drop-ear fitting secured to prevent movement.

(END OF SECTION)

SECTION 15220 - DOMESTIC WATER SYSTEM

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

1.2 SCOPE

- A. The domestic water system shall consist of all hot and cold water piping required for each fixture or equipment item, needing same, installed under this Contract.
- B. Unless otherwise shown, domestic water shall stop five (5) feet outside building line. See Civil Section of these Specifications for continuation.

- 1.3** See Other Sections for basic pipe and pipe fitting requirements, valves, pipe specialties, hangers, and insulation.

- 1.4** This system shall be installed in accordance with State and Local Codes regardless of possible conflicts in these Specifications or on the Drawings. Contractor shall call to the attention of the Architect any changes required by codes that will change the design of the building.

PART 2- PRODUCTS

2.1 PIPE

- A. ABOVE GROUND: Type L Copper, hard-drawn.
- B. UNDER GROUND: Type K Copper, hard- or soft-drawn.

- 2.2 FITTINGS:** Wrought Copper.

PART 3 - EXECUTION

- 3.1** Provide service gate valves in the hot and cold water at each fixture group, major equipment, and water heaters.
- 3.2** Disinfect potable water piping by filling with a solution containing 50 parts per million of available chlorine. This solution shall be allowed to stand six (6) hours. Flush all piping and equipment.
- 3.3** At end of runouts to each individual fixture or fixture group, provide water hammer arrester on cold and hot water lines.
- 3.4** Test water system with air to a pressure of 125 PSI for a period of two (2) hours. Prove tight by maintaining pressure without adding air.

(END OF SECTION)

SECTION 15230 - SOIL AND WASTE SYSTEM

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

1.2 SCOPE

- A. The soil and waste system shall consist of all sanitary waste and vent piping required for each fixture, drain or equipment installed or connected under this Contract.
- B. Unless otherwise shown, soil and waste system shall stop five (5) feet outside of building line. See Civil sections of the Specifications for continuation.

- 1.3 See Other Sections for basic piping requirements, specialties, hangers, etc.

- 1.4 This system shall be installed in accordance with State and Local Codes regardless of possible conflicts in these Specifications or on the Drawings. Contractor shall call to the attention of the Architect any changes required by codes that will change the design of the building.

PART 2 - PRODUCTS

2.1 SANITARY WASTE AND VENT (CAST IRON)

- A. Waste and vent lines 2" and above - service weight cast iron pipe and fittings (ASTM A-74). Bell and spigot shall be used below the floor slab. No hub shall be used above the floor slab. All gaskets shall be per ASTM C-564. No hub pipe shall be installed with stainless steel couplings equal to Husky Series 4000.
- B. Waste and vent line 1-1/2" and below - "DWV" copper above grade and Type "L" copper below grade with cast brass drainage fittings.

2.2 SANITARY WASTE AND VENT (PVC)

- A. The installation shall satisfy the special precautions under the General Requirements Section 15000 and Piping Section 15110. No PVC piping will be allowed to penetrate or route inside a firewall.
- B. Waste and vent lines 1-1/2" and below: "PVC", SDR-35, and ASTM D-3033. Fittings shall match pipe. Joints shall be solvent weld type.
- C. Waste and vent line 2" and above: "Schedule 40 PVC", ASTM D-1785. Fittings shall be per ASTM-D-2665. Joints shall be solvent weld type.

PART 3 - EXECUTION

- 3.1** Cleanouts shall be located as required by State and Local Codes and as shown on the Drawings. Cleanouts shall occur at intervals of not more than 50'- 0". Cleanouts to be brought to an accessible location, flush with grade or floor, and terminated with fitting equal to that specified elsewhere.
- 3.2** Entire waste and vent system shall be tested to a minimum head of ten (10) feet. This pressure shall be maintained a minimum of twenty-four (24) hours.
- 3.3** Horizontal drainage piping shall be installed at a uniform slope. All installation shall follow the requirements of the Arkansas State Plumbing Code.

(END OF SECTION)

SECTION 15250 - GAS PIPING SYSTEM

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

- 1.2** This system shall consist of all gas piping as shown on the Drawings to five (5) feet outside building line, including distribution and connection to every gas appliance furnished, installed or connected under this Contract.
- 1.3** All work to comply with the requirements of the gas utility company, local codes, NFPA Pamphlet No. 54 and other Sections of these Specifications.

PART 2 - PRODUCTS

- 2.1** Pipe shall be Schedule 40 Black steel assembled with malleable iron or welding fittings. Use welded fittings on 2-1/2" and above.
- 2.2** Pipe below grade shall be coated and wrapped. Straight lengths shall be furnished with factory-applied coating. Fittings and damaged coating shall be wrapped with tape coat CT applied in accordance with manufacturer's latest printed instructions.
- 2.3 REGULATORS**
- A. Appliance regulators shall be equal to Reynolds Gas Appliance Regulator. Model and size as applicable.
- B. Pounds-to-ounce and ounce-to-ounce regulators shall be equal to Reynolds Service Regulators with full capacity internal relief. Model and size as applicable.

PART 3 EXECUTION

3.1 INTERNAL PIPING

- A. Provide pound to ounce regulators as indicated on the plans.
- B. Provide a gas cock at each gas-using appliance.
- C. Provide steel sleeves under all concrete floors. Vent end of sleeve with pipe equal in size to gas line sleeved and protect with cap.
- D. Piping shall be run in ventilated spaces. Lay-in type ceiling will be considered ventilated. Where pipes run in hollow walls, vent cavity at top, bottom or both.
- E. Vent each pound-to-ounce regulator to the outside.

3.2 TEST

- A. After completion of work and before backfilling, the entire system shall be tested to an air pressure of 125 PSI for a period of two (2) hours and proved tight by inspection and to the satisfaction of the Architect.

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-150302CPAG

(END OF SECTION)

SECTION 15306 - GAS-FIRED MAKEUP VENTILATING UNITS

A. Standards

- a. ETL certified duct furnace and blower to UL 1995/CSA C22.2 No. 236 "Heating and Cooling Equipment" and UL 795 "Commercial – Industrial Gas Heating Equipment" for electrical and mechanical safety.

B. Mechanical Configuration

- a. Furnace section with 80% minimum efficiency provided by an indirect-fired heat exchanger with dimpled tube pattern for efficient heat transfer.
- b. Blower section containing a supply blower and motor with bottom support to provide rigidity. The blower connection shall be flexible with ¼" gasket to prevent sound transmission into the supply ductwork.
- c. Electrical section isolate from the supply air stream including a hinged access door. Separate knock-outs shall be provided for both high and low voltage electrical connections. Provisions must be included for side access electrical connections for slab mounted units and bottom electrical connections for roof curb mounted or suspended units.

C. Indoor Separated Combustion Venting Arrangements

- a. The unit casing shall be designed for the venting/combustion air arrangement to be separated from the room atmosphere. The unit shall have a factory mounted power exhauster enclosed in the unit casing to prevent the motor from being subjected to the room atmosphere. The unit shall also include a factory mounted differential pressure switch designed to prevent pilot and main burner ignition until positive venting has been proven. A removable gasketed door shall contain both the vent and combustion air connection collars to allow for servicing of the power exhauster.
- b. The unit shall include a factory supplied vertical concentric vent kit allowing for a single penetration of the roof for both the combustion air supply and flue product exhaust.
- c. The unit shall include two factory supplied vent caps for both the combustion air supply and flue product exhaust.

D. Indoor Unit Casing

- a. The duct furnace unit casing shall be constructed of not less than 20 gauge aluminized steel.
- b. The blower section shall be constructed of not less than 18 gauge aluminized steel
- c. All blower section exterior casing parts shall be painted with a baked-on gray-green polyester powder paint (7 mil thickness) for corrosion resistance.
- d. All blower section access side doors shall have heavy duty, draw tight, quarter turn latches.
- e. Blower section shall include 1 inch, 1 ½ lb density acoustical and thermal insulation. The insulation shall be made of glass fibers bonded with a thermosetting resin and overlaid with a fire-resistant black acrylic coating for

additional strength. The acrylic coating must meet the requirements of ASTM C 665 for fungi resistance.

- f. The duct furnace shall include separate access doors for the power exhauster, electrical controls, and gas train to allow for simplified service of the unit.
 - g. All duct furnace doors shall be fully gasketed to prevent infiltration of the room air into the combustion process.
- E. Furnace Section
- a. The heat exchangers shall be made of 20 gauge 409 stainless steel tubes and headers.
 - b. The thermal efficiency of the unit shall be a minimum of 80% efficient for all air flow ranges. The restrictor shall be sized to maintain the unit efficiency of 80% in the temperature range of 20°F-60°F
 - c. Each heat exchanger tube shall be contoured and dimpled to provide efficient heat transfer and crimped to allow for thermal expansion and contraction. The flue collector box shall be made of 20 gauge aluminized steel.
 - d. The heat exchanger seams and duct connections shall be certified to withstand 3.0" W.C. external static pressure without burner flame disturbance.
 - e. The burner shall be made of the same material as the heat exchanger with a thickness of not less than 28 gauge. Burners shall have non-clogging, slotted ports with a stainless steel separator strip designed for good lighting characteristics without noise of extinction for both natural and propane gas. The burners shall be located for service removal without disconnecting the main gas supply piping.
 - f. The bottom of the unit shall be angled for draining any condensation to the corners of the unit. The condensation shall be removed through openings in the bottom pan. The drain pan shall be constructed of 20 gauge 409 stainless steel.
 - g. The gas manifold piping shall allow for gas piping connection through the unit bottom . The manifold shall include a ground joint union for ease of servicing of the orifices without removing the burner assembly or main gas valve string.
 - h. The orifices shall be provided on both natural and propane gas with adjustable air shutters for controlling the primary air mixture.
 - i. The ignition controller shall be 100% shut-off with continuous retry for natural gas.
 - j. The gas pressure shall be between 6-7" W.C. for natural gas.
 - k. The solid state ignition system shall intermittently light the pilot each time the system is energized. Once the pilot is proven, the main gas valve shall open and allow gas flow to the main burner.
 - l. The unit gas controls shall be provided with the following:
 - i. Electronic modulation gas controls with an electronic modulating/regulating gas control, combination gas valve, an ignition control, modulating amplifier, and a remote temperature set point adjuster. The thermostat can modulate the system gas flow between 40% through 100% full fire. The firing rate shall be controlled by a duct sensor with remote temperature adjuster.

- m. A 1/8" manifold pressure tap shall be located after all valves to test the manifold pressure directly before the main burner orifices.
 - n. The unit shall be provided with a single gas control transformer to step down the supply voltage to 24V.
 - o. Separate line voltage and low voltage terminal strips shall be provided to prevent the unit from being miswired for premium unit and low voltage terminals for standard units
 - p. Automatic reset high limit switch.
 - q. Provide the following factory installed options:
 - i. An air flow proving switch shall be an adjustable differential pressure switch to insure air flow across the heat exchanger before allowing the gas controls to be energized.
- F. Electrical Section
- a. All electrical components shall carry UL, ETL, or CSA listing.
 - b. The unit shall be supplied with a disconnect switch to disconnect power to the unit for servicing. The disconnect switch style shall be.
 - i. Field installed non-fusible box type.
 - c. A single step down transformer shall be provided for all unit controls.
- G. Blower Section
- a. The blower motor shall meet the following requirements.
 - i. The motor shall be rated for 230V/60Hz/1Ph
 - ii. The motor wiring shall be in flexible metal BX conduit.
 - iii. The motor shall be controlled by a time delay relay and variable frequency drive.
 - 1. Provide floating building pressure sensing which utilizes a photohelic pressure controller to adjust the building pressure by varying the amount of makeup air supplied to the space.
 - b. The unit shall contain a single supply blower that is supported from the bottom to prevent the flower flanges supporting the weight of the motor. The blower shall be a double width, double inlet (DWDI), forward curved, belt driven, assembly with heavy duty, pillow block ball bearings.
 - c. The unit shall be provided with a filter rack with 2" permanent filters.
- H. Thermostats
- a. A factory installed electronic modulating duct thermostat with a range of 55°-90°F.
 - b. A remote set point adjuster for the electronic modulating duct thermostat.

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-150302CPAG

(END OF SECTION)

SECTION 15500 - HVAC SHEET METAL

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The general provisions of the Contract including General and Supplementary Conditions, Division One General Requirements, and Instructions to Bidders apply to the work included in this Division.

1.2 SCOPE

- A. All low-pressure ductwork including supply, return, exhaust, outside air to complete the systems as shown on the Drawings or specified herein.
- B. All flues or stacks.

1.3 SUBMITTALS

- A. Submit the following:
 - 01. Air Distribution Devices.
 - 02. Fire Dampers and Doors
 - 03. Boiler Stack.
 - 04. Flexible Duct
 - 05. Smoke Dampers.
 - 06. Fire Dampers
 - 07. Combination Fire/Smoke Dampers.
 - 08. Medium Press Duct Construction.
- B. Submit the following if not as specified by the Manufacturer.
 - 01. Flexible connections.
 - 02. Damper Hardware.
 - 03. Access Doors.
 - 04. Type "B" Flues.

1.4 GOVERNING PUBLICATIONS AND AUTHORITIES

- A. ASHRAE "GUIDE".
- B. SMACNA "Low Velocity Duct Construction Standards."
- C. SMACNA "High Velocity Duct Construction Standards."
- D. Underwriters' Laboratories, Inc.
- E. NFPA Pamphlets No. 90A, 90B, 91, and 96.

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

- A. Galvanized steel sheets shall be lock-forming quality (LFQ) and shall have a galvanized coating of 1-1/4 oz. total for both sides of one (1) square foot.
- B. Aluminum sheets shall be made from an aluminum base alloy having not more than 0.5% copper (for corrosion resistance), a minimum tensile strength of 16,000 P.S.I. and the ability to satisfactorily make a Pittsburgh lock seam without splitting.
- C. Black steel sheets shall be lock-forming quality (LQF) either hot or cold rolled.

2.2 FLEXIBLE CONNECTIONS

- A. Flexible connections in ordinary ventilating, air conditioning, and hot water heating systems shall be made from "VENTFAB", fire-, water- and weather-resistant fabric.
- B. Connections in duct exposed to the weather shall be made from "VENTGLAS", Neoprene coated glass fabric.

2.3 DAMPER HARDWARE

- A. Dampers on exposed duct with shaft length of 12" or less shall be equipped with "VENTLOCK" #620 1/4" dial regulator; with shaft length of 12" to 20" with "VENTLOCK" #635 3/8" dial regulators and #607 end bearings.
- B. Larger dampers shall be controlled with "VENTLOCK" self-locking regulators #640 or #641 in 3/8" or 1/2" size and shall be installed with #607 end bearings.
- C. Damper operators on finished ceilings shall be equipped with "VENTLOCK" #666 concealed damper regulators (or #677 concealed damper regulators). Where ceiling regulators must be flush mounted, "VENTLOCK" #688 exposed damper regulators shall be used.

2.4 ACCESS DOORS

- A. Access doors to 16" by 24" size shall be "VENTLOCK" stamped insulated access doors.
- B. Larger access doors shall be double panel construction with one (1) inch rigid insulation between panels. Doors with largest dimension over 24", but less than 48", shall use "VENTLOCK" series 200 latches, hinges and gaskets, and construction shall be 22-gauge galvanized steel. Doors with largest dimension over 48" shall use "VENTLOCK" series 300 latches, hinges and gaskets, and construction shall be 20-gauge galvanized steel.

2.5 AIR DISTRIBUTION DEVICES

- A. GENERAL

01. All outlet grilles shall have gaskets.
02. Unless otherwise noted, sidewall devices and door grilles shall be gray baked enamel; ceiling devices shall be off-white baked enamel and floor devices shall be natural anodized.
03. Furnish opposed blade volume controls on all supply outlets, except where duct system has only a single outlet. All return and exhaust grilles shall be furnished with opposed blade volume control where more than one grille is attached to duct system and where required to balance return air with outside air.
04. Where device is to lay in a tee bar ceiling, verify grid dimensions. Device shall be square with nominal dimension of side same as shorter grid dimension. That is, provide 24 x 24 nominal panel with 24 x 48 grid, etc.

B. DEVICES

01. Refer to schedule on Drawings for air devices.

2.6 FLUES

- A. Flues for gas-fired appliances shall be UL-Approved Type "B" Vent.
- B. Exhaust and Intake for condensing furnaces shall be schedule 40 PVC types 1120 or 1220 installed with PVC1 or PVC12 fittings. A concentric roof terminal shall be used at the roof penetration.

2.7 FIRE, SMOKE, AND COMBINATION FIRE/SMOKE DAMPERS

A. FIRE DAMPERS

01. Fire dampers shall be Dynamic type equal to those manufactured by the Ruskin Manufacturing Company, curtain type and UL 555 listed with 212F fusible link.
02. Dampers shall be equal to Model DIBD2 Style B.

B. SMOKE DAMPERS

01. Smoke dampers shall be equal to those manufactured by the Ruskin Manufacturing Company, parallel blade type with polyurethane foam blade seals and aluminum metal compression jamb seals.
02. Damper operator shall be heavy-duty type equal to Barber Coleman #MA418, 2-position and spring return. Operator shall be 120V, provide 60lb/in. torque, and be rated at 70 watts running and 20 watts holding.
03. Damper shall be equal to Model SD35.

C. COMBINATION FIRE/SMOKE DAMPER

01. Dampers shall be equal to those manufactured by the Ruskin Manufacturing Company.

02. Damper shall be combination of pipe damper and smoke damper listed above, furnished in integral housing with fire damper blades out of air stream.
03. Damper shall be equal to Model FSD-1.

2.8 LOUVERS

- A. Weatherproof louvers are scheduled on the drawings and in the Architectural Section of these Specifications.
- B. Location of the louvers shall be field verified to align with the Architectural drawings.
- C. Provide louvers with motor operators with 120-volt actuators as scheduled.

2.9 MEDIUM-PRESSURE DUCTS

- A. All round ductwork sixty inches (60") and smaller shall be spiral lock seam pipe as manufactured by United Sheet Metal Company. The spiral pipe shall have been tested for leakage rate, friction loss, bursting and collapsing strength by a reputable, independent engineering laboratory. Certified copies of these tests shall be supplied upon request. Sizes three inch (3") to fourteen inch (14") shall be twenty-six (26) gauge-galvanized steel. Sizes fifteen inch (15") to twenty-six (26") shall be twenty-four (24) gauge galvanized steel. Sizes twenty-seven inch (27") to thirty-six (36") shall be twenty-two (22) gauge galvanized steel. Sizes thirty-eight inch (38") to fifty inch (50") shall be twenty (20) gauge-galvanized steel. Sizes fifty-two (52") to sixty inch (60") shall be eighteen (18) gauge galvanized steel. Spiral duct shall be supplied in twelve (12') foot lengths.
- B. Fittings shall be equal to United Sheet Metal Company's machine-formed fittings.

2.11 MISCELLANEOUS DUCTWORK MATERIALS

- A. **GENERAL:** Furnish and install miscellaneous products and materials of sizes and types indicated and where not otherwise indicated, provide type and size necessary to comply with ductwork system requirements including proper connection of ductwork and equipment.
- B. **High Pressure Duct Sealant:** Duct shall be sealed with Hardcast, Inc. IG-601 Iron Grip duct sealer, sheet metal screws and Hardcast FS-150 fiberglass scrim tape. Sealer must be UL listed Class 1 with flame spread of 0 and a Smoke Developed of 0.
- C. **Low Pressure Duct Sealant:** Furnish and install a non-hardening, non-migrating mastic equal to "Hardcast" FTA-20 with DT tape.
- D. **Aluminum Foil Tape:** Furnish and install 3" width (minimum) aluminum tape equal to Hardcast "Foil Grip". Tape shall have 15 mils of elastomeric modified butyl adhesive on 2 mil foil backing. Tape shall comply with UL 181B-FX.

- E. Sealant for Exposed Low-Pressure Duct: Duct shall be sealed with Hardcast, Inc. IG-601 Iron Grip duct sealer at the fitting connection. Sealant must not be visible on the exposed ductwork.
- F. Sealant for lab exhaust duct flanges and joints shall be furnished with the pre-fabricated PVC duct.
- G. Flanged Joint Mastics: Furnish one-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.
- H. Ductwork Support Materials (Galvanized: Furnish and install hot-dipped galvanized steel fasteners, rods, straps, anchors, trim and angles for support of ductwork.

PART 3 - EXECUTION

3.1 GENERAL

- A. All ductwork not specifically indicated on Drawings or specified elsewhere to be medium- or high-pressure duct shall be fabricated, braced and erected in accordance with SMACNA "Low Velocity Duct Construction Standards" or the latest Edition of ASHRAE "Guide".
- B. Adhere to Drawings as closely as possible. However, where required to meet structural or other interferences, the Contractor shall vary run and shape of ducts and make offsets during progress of work. Duct routes shall be established and field measurements shall be taken before ductwork is fabricated. Where pipes or other items are "taken-in" to the duct, streamline collars shall be formed and placed around the item. If collar obstructs more than 20% of the cross sectional area, the duct shall be enlarged to accommodate obstruction.
- C. All changes of direction and elbows shall be fitted with turning vanes. Standard radius elbows may be used if space permits.
- D. Ductwork shall be free of any objectionable self-generating noise or rattles.
- E. All transverse seams on low-pressure ductwork shall be sealed.

3.2 MANUAL BALANCING DAMPERS

- A. All low-pressure branch ducts on either supply, return or exhaust shall be provided by some means of balancing in addition to dampers at registers.
- B. Splitter dampers shall be made of at least the same thickness material as duct (minimum thickness #22-gauge). They shall be securely hinged at air leaving edge and made of two (2) thicknesses so that entering edge presents a rounded surface to air flow.
- C. Butterfly dampers shall be made of #16-gauge galvanized steel. Butterfly dampers may be used in widths up to 10" wide. Dampers that require blades over 10" wide shall be multi-blade louver dampers.

- D. Multi-blade louver dampers used for balancing shall be of the opposed blade type. Damper blades shall be constructed of #16-gauge steel. Individual blade width shall not exceed 10" and blade length shall not exceed 48".
- E. All dampers shall be so constructed and installed that there shall be no vibration due to airflow over damper.

3.3 ACCESS DOORS

- A. Access doors shall be provided at all dampers, equipment in duct and as shown on Drawings.
- B. Access doors shall be minimum of 10" x 12" unless a larger size is required for maintenance of equipment or a smaller size must be used because of small duct size.

3.4 FLEXIBLE CONNECTIONS

- A. Furnish and install sound isolating flexible connections on the inlet and outlet of each fan and unit to which duct connectors are made.
- B. At least one (1") inch slack shall be allowed in these connections to insure that no vibration is transmitted from fan to ductwork.
- C. The fabric shall either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage.

3.5 FIRE, SMOKE, AND COMBINATION FIRE/SMOKE DAMPERS

- A. Fire dampers shall be installed in all duct penetrating of fire rated walls, ceilings, and floors and where indicated on Drawings.
- B. Fire dampers shall be installed exactly as tested and approved by Underwriters' Laboratories, Inc.

3.6 KITCHEN HOOD DUCT

- A. Ducts and plenums having an area of 4 sq. ft. or less shall be constructed of not less than 16-gauge galvanized steel sheet. Ducts and plenums greater than 4 sq. ft. shall be 14-gauge.
- B. Use no vibration isolation connectors.
- C. All seams and joints shall have a liquid-tight continuous external weld.
- D. Ducts shall be insulated as outlined under Specification Section 15160.

(END OF SECTION)

SECTION 15530 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of refrigerant piping work is indicated on drawings and schedules, and by requirements of this section.
- B. Refer to other Division-15 sections for testing, adjusting, and balancing of refrigerant piping, not works of this section.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of refrigerant piping products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with refrigerant piping work similar to that required for project.

1.4 CODES AND STANDARDS

- A. ANSI Compliance: Fabricate and install refrigerant piping in accordance with ANSI B31.5 "Refrigeration Piping", and extend applicable lower pressure limits to pressures below 15 psig.
- B. ASHRAE Compliance: Fabricate and install refrigerant piping in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for refrigerant piping materials and products.
- B. Brazing Certification: Certify brazing procedures, brazers and operators in accordance with ASME standards (ANSI B31.5).
- C. Record Drawings: At project closeout, submit record drawings of installed refrigerant piping and piping products, in accordance with requirements of Division 1.

- D. Maintenance Data: Submit maintenance data and parts lists for refrigerant piping materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual, in accordance with requirements of Division 1.

PART2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.5 Code for Refrigeration Piping where applicable, base pressure rating on refrigerant piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials that match pipe materials used in refrigerant piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION

- A. General: Provide identification complying with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification", in accordance with the following listing:
 - 01. Refrigerant Piping: Plastic pipe markers.

2.3 BASIC PIPES AND PIPE FITTINGS

- A. General: Provide pipes and pipe fittings complying with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
 - 01. Tube Size 3/4" and Smaller: Copper tube; Type ACR, soft annealed temper fittings; cast copper-alloy fittings for flared copper tubes; flared joints.
 - 02. Tube Size 7/8" through 4-1/8": Copper tube; Type ACR, soft annealed temper; wrought-copper, solder-joint fittings; soldered joints.
 - 03. Soldered Joints: Solder joints using silver-lead solder, ATSM B 32, Grade 96 TS.
 - 04. Brazed Joints: Braze joints using American Welding Society (AWS) classification BCup-4 for brazing filler metal.

2.4 BASIC PIPING SPECIALTIES

- A. General: Provide piping specialties complying with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties", in accordance with the following listing:

01. Pipe escutcheons.
02. Drip pans.
03. Sleeves.
04. Sleeve seals.

2.5 BASIC SUPPORTS AND ANCHORS

- A. General: Provide supports and anchors complying with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors", in accordance with the following listing:
01. Adjustable steel clevises, adjustable roller hangers and adjustable pipe roll stands for horizontal piping hangers and supports.
 02. Two-bolt riser clamps for vertical piping supports.
 03. Concrete inserts, C-clamps, and steel brackets for building attachments.
 04. Protection shields for insulated piping support in hangers.
 05. Copper flashings for piping penetrations.

2.6 REFRIGERANT SPECIALTIES

- A. Per system manufacturer

2.7 BASIC VIBRATION CONTROL

- A. General: Provide vibration control products complying with Division-15 Basic Mechanical Materials and Methods section "Vibration Control", in accordance with the following listing:
01. Isolation hangers.
 02. Riser isolators.
 03. Riser support isolators.
 04. Flexible pipe connectors.

PART 3 - EXECUTION

3.1 INSPECTION

- A. General: Examine areas and conditions under which refrigerant piping systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF BASIC IDENTIFICATION

- A. General: Install mechanical identification in accordance with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3 INSTALLATION OF REFRIGERANT PIPING

- A. General: Install refrigerant piping in accordance with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", and in compliance with equipment manufacturer's recommendations.
- B. Install refrigerant piping per manufacturer directions.
- D. Bleed dry nitrogen through refrigerant piping during brazing operations.

3.4 INSTALLATION OF PIPING SPECIALTIES

- A. Install piping specialties in accordance with requirements of Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".

3.5 INSTALLATION OF SUPPORTS AND ANCHORS

- A. Install supports and anchors in accordance with requirements of Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.10 CONTROL OF CFC/HCFC REFRIGERANTS:

- A. The contractor shall not vent or cause to be vented CFC and HCFC refrigerants (R-11, R-12, R-22, R-113, R-114, R-115, R-501, R-502, or other mixtures containing CFC's) to the atmosphere during repair or maintenance work on the equipment covered by this contract.
- B. The contractor shall have available refrigerant recovery or reclaim equipment to perform the work.
- C. Contractor personnel who operate refrigerant reclaim or recycling equipment shall possess the necessary state and local certificates for operating that equipment.
- D. The contractor shall be responsible for meeting all requirements, permitting, licensing and certification required by state or local ordinance to work on refrigeration systems.
- E. Replacement compressors and other replacement equipment used in repairing CFC-containing systems shall be compatible with CFC replacement refrigerants.

3.11 ADJUSTING AND CLEANING

- A. Cleaning and Inspecting: Clean and inspect refrigerant piping systems in accordance with requirements of Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

(END OF SECTION)

**SECTION 213260
STANDPIPE AND SPRINKLER SYSTEMS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies standpipe and sprinkler systems for buildings and structures.
- B. Products specified in this Section with installation not in Contract include sprinkler cabinets with spare sprinklers and sprinkler wrenches. Deliver to the Owner.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 28 Section "Fire Alarm Systems" for alarm devices not specified in this Section.
 - 2. Section 210548 "Mechanical Systems Vibration Control" for vibration isolation.
 - 3. Section 210549 "Fire Protection Systems; Supports, Bracing and Seismic Requirements".
 - 4. Section 210500 "Common Work Requirements for Fire Protection".

1.2 DEFINITIONS

- A. Pipe sizes used in this Section are nominal pipe size (NPS) specified in inches. Tube sizes are standard tube size specified in inches.
- B. Working plans as used in this Section refer to documents (including drawings and calculations) prepared pursuant to requirements in NFPA 13, Engineer and owners insurance underwriter for obtaining approval of authority having jurisdiction.
- C. Other definitions for fire protection systems are included in referenced NFPA standards.

1.3 SYSTEM DESCRIPTION

- A. Wet-Pipe Sprinkler System: System with automatic sprinklers attached to piping system containing water and connected to water supply so that water discharges immediately from sprinklers when they are opened by fire.
- B. Dry-Pipe Sprinkler System: System with automatic sprinklers attached to piping system containing water with a pre-action or pressure operated discharge valve operated by use of smoke detectors or sprinkler heads so that water discharges

from sprinklers when they are opened by fire.

- C. Sprinkler System Protection Limits: All spaces within areas indicated. Include closets, toilet and locker room areas, each landing of each stair, and special applications areas.
- D. Standpipe Systems: Systems that are wet or dry type, have water supply valve open and include branches extending from standpipes to sprinkler zone valves.
- E. Sprinkler System Protection Limits: All spaces within areas indicated. Include closets, toilet areas, each landing of each stair, and special applications areas.
- F. Guardian G500-B range hood fire suppression system: install unit in cabinet to the right of the hood. Install electrical conduit in wall with sweep elbows to run hose and wiring hidden from the cabinet to the hood. Install conduit in wall from the cabinet to the gas line behind the range for the gas shut-off valve.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Design and obtain approval from authority having jurisdiction and Owner for fire protection systems specified.
- B. Minimum Pipe Sizes: Not smaller than sizes indicated for connection to water supply piping, standpipes, and branches from standpipes to sprinklers.
- C. Hydraulically design sprinkler systems according to:
 - 1. Sprinkler System Occupancy Hazard Classifications: As follows:
 - a. Offices & Corridors: Light hazard.
 - b. Storage Areas: Ordinary hazard.
 - c. Equipment Rooms: Ordinary hazard.
 - 2. Minimum Density Requirements for Automatic Sprinkler System Hydraulic Design: As follows:
 - a. Light Hazard Occupancy: 0.10 GPM over 1500 sq. ft.
 - b. Light Hazard Occupancy: 0.15 GPM over 1500 sq. ft.
 - c. Ordinary Hazard, Group 1 Occupancy: 0.15 GPM over 2000 sq. ft.
 - d. Ordinary Hazard, Group 2 Occupancy: 0.20 GPM over 2500 sq. ft.
 - 3. Maximum Sprinkler Spacing: As follows:
 - a. Light Hazard: 200 sq. ft./sprinkler
 - b. Ordinary Hazard: 130 sq. ft./sprinkler
 - c. Mechanical Equipment Rooms: 130 sq. ft./sprinkler (12 sq. m/sprinkler).
 - d. Electrical Equipment Rooms: 130 sq. ft./sprinkler (12 sq. m/sprinkler).
 - e. Other Areas: According to NFPA 13.

- D. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.
 - 1. Sprinkler Systems: 175 psig.
 - 2. Standpipe and Hose Systems: 175 psig.

1.5 SUBMITTALS

- A. Product data for fire protection system components. Include the following:
 - 1. Valves.
 - 2. Specialty valves, accessories, and devices.
 - 3. Alarm devices. Include electrical data.
 - 4. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other data.
- B. Sprinkler system drawings identified as "working plans," prepared according to NFPA 13. Submit required number of sets to authority having jurisdiction and Owner for review, comment, and approval. Include system hydraulic calculations where applicable.
- C. Licensed engineer's sprinkler system drawings specified in "Quality Assurance" Article to authority having jurisdiction. Include system hydraulic calculations.
- D. Test reports and certificates as described in NFPA 13. Include "Contractor's Material & Test Certificate for Aboveground Piping" and "Contractor's Material & Test Certificate for Underground Piping."
- E. Maintenance data for each type of fire protection specialty specified, for inclusion in Operating and Maintenance Manual specified in Division 1 Section "Project Closeout."

1.6 QUALITY ASSURANCE

- A. Manufacturers: Except for products required to comply with a recognized product listing, provide system products of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Local Fire Department/Marshall Regulations: Comply with local regulations for sizes, threading and arrangement of connections for Fire Department equipment to standpipe and sprinkler systems.
- C. NFPA Code: Comply with National Fire Code No. 13 "Standard for the Installation of Sprinkler Systems" and National Fire Code No. 14 "Standpipes and Hose Systems".
- D. FM Approval: Provide fire and sprinkler piping products which have been approved and labeled by Factory Mutual system.

- E. Comply with requirements of authority having jurisdiction and Owner for submittals, approvals, materials, hose threads, installation, inspections, and testing.
- F. Licensed Engineer: Submit design drawings, design calculations, and installation inspection reports. Include seal and signature of registered engineer licensed in jurisdiction where Project is located, certifying compliance with specifications.
- G. Installer's Qualifications: Firms qualified to install and alter fire protection piping, equipment, specialties, and accessories, and repair and service equipment. A qualified firm is one that is experienced (minimum of 5 previous projects similar in size and scope to this Project) in such work, familiar with precautions required, and in compliance with the requirements of the authority having jurisdiction. Submit evidence of qualifications to the Engineer upon request.
- H. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:
 - 1. NFPA 13 "Standard for the Installation of Sprinkler Systems."
 - 2. NFPA 26 "Recommended Practice for the Supervision of Valves Controlling Water Supplies for Fire Protection."
 - 3. NFPA 70 "National Electrical Code."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. AvailableManufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Waterflow Indicators and Supervisory Switches:
 - a. Potter Electric Signal Co.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - 2. Sprinklers:
 - a. Viking Corp.
 - b. Gem.
 - c. Central Sprinkler Corp.
 - d. Reliable.
 - 3. Fire Protection Service Gate and Check Valves:
 - a. Kennedy Valve Div., McWane, Inc.
 - b. Nibco, Inc.
 - c. Stockham Valves and Fittings, Inc.
 - d. Victaulic Company of America.

4. Grooved Couplings for Steel Piping:
 - a. Grinnell Supply Sales Co., Grinnell Corp.
 - b. Victaulic Company of America.

2.2 PIPES AND TUBES

- A. Refer to Part 3 Articles "Sprinkler System Piping Applications" for identification of systems where pipe and fitting materials specified below are used.
- B. Steel Pipe: ASTM A 53, Schedule 40 galvanized, in sizes 2-1/2 inches (150 mm) and larger , cut groove joints.
- C. Steel Pipe: ASTM A53, Schedule 40 galvanized, in sizes 2" and smaller, threaded ends for threaded joints.
- D. CPVC Pipe: Sizes 2 inches and Smaller: CPVC plastic pipe and fittings, solvent welded joints.

2.3 PIPE AND TUBE FITTINGS

- A. Malleable-Iron Threaded Fittings: ASME B16.3, Class 125, standard pattern, with threads according to ASME B1.20.1.
- B. Grooved-End Fittings for Steel Pipe: UL-listed and FM-approved, ASTM A 536, Grade 65-45-12 ductile iron or ASTM A 47 Grade 32510 malleable iron, with grooves or shoulders designed to accept grooved couplings.

2.4 JOINING MATERIALS

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not included in this Section.
- B. Couplings for Grooved-End Steel Pipe and Grooved-End Ferrous Fittings: UL 213, AWWA C606, ASTM A 536 ductile-iron or ASTM A 47 malleable-iron housing, with enamel finish. Include synthetic-rubber gasket with central-cavity, pressure-responsive design; ASTM A 183 carbon-steel bolts and nuts; and locking pin, toggle, or lugs to secure grooved pipe and fittings. Similar to Victaulic Style 75.

2.5 FIRE PROTECTION SERVICE VALVES

- A. General: UL-listed and FM-approved, with 175-psig non-shock minimum working pressure rating.
 1. Option: Valves for use with grooved piping may be grooved type.

- B. Gate Valves, 2 Inches and Smaller: UL 262, cast-bronze, threaded ends, solid wedge, outside screw and yoke, rising stem.
- C. Gate Valves, 2-1/2 Inches and Larger: UL 262, iron body, bronze mounted, taper wedge, outside screw and yoke, rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.

2.6 SPRINKLERS

- A. Automatic Sprinklers: With heat-responsive element conforming to:
 - 1. UL 199, for applications except residential, quick response.
- B. Sprinkler types and categories are as indicated and as required by application. Furnish automatic sprinklers with nominal 1/2-inch (12.7 mm) orifice for "Quick Response" "Standard" temperature classification rating except where otherwise indicated and required by application.
- C. Sprinkler types, features, and options include:
 - 1. Concealed ceiling sprinklers, including cover plate.
 - 2. Semi-Recessed sprinklers, including escutcheon plate.
 - 3. Fully Recessed sprinklers, including escutcheon plate.
 - 4. Pendent sprinklers.
 - 5. Upright sprinklers.
- D. Sprinkler Finishes: Chrome-plated, bronze, and painted.
- E. Sprinkler Escutcheons: Materials, types, and finishes for following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: Chrome-plated steel, 1-piece, flat.
- F. Sprinkler Cabinets: Finished steel cabinet and hinged cover, with space for minimum of 6 spare sprinklers plus sprinkler wrench, suitable for wall mounting. Include number of sprinklers required by NFPA 13 and 1 wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each style sprinkler on Project.

2.7 ALARM DEVICES

- A. Alarm Devices: Types and sizes that will match piping and equipment connections.
- B. Waterflow Indicators: UL 346, electrical-supervision type, vane-type waterflow detector, rated to 250 psig (1725 kPa), and designed for horizontal or vertical installation. Include 2 SPDT (single-pole, double-throw) circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere, 125 volts a.c. (7 A, 125 V a.c.) and 0.25 ampere, 24 volts d.c. (0.25 A, 24 V d.c.); complete with

factory-set, field-adjustable retard element to prevent false signals and tamper-proof cover that sends a signal when cover is removed.

- C. Supervisory Switches: UL 753, for valves, electrical-supervision type, SPDT (single-pole, double-throw), normally closed contacts, designed to signal controlled valve in other than full open position.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for cabinets, and other conditions where cabinets are to be installed.
- B. Do not proceed until unsatisfactory conditions have been corrected.
- C. All piping installed in wet areas shall be galvanized steel or CPVC.

3.2 SPRINKLER SYSTEM PIPING APPLICATIONS

- A. Refer to Part 2 of this Section for detailed specifications on pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping may be joined with flanges instead of indicated joints. Use grooved-end fittings with grooved couplings that are made by the same manufacturer and that comply with listing when used together for grooved-coupling joints.
- B. Sizes 2 Inches and Smaller: Schedule 40 galvanized steel pipe, threaded ends, 125 lb. malleable iron threaded fittings.
- C. Sizes 2 inches and Smaller: CPVC plastic pipe and fittings, solvent welded joints.
- D. Sizes 2-1/2" and larger: Schedule 40 galvanized steel pipe, grooved end for cut grooved pipe.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use gate valves.

3.4 JOINT CONSTRUCTION

- A. Refer to Division 210500 Section "Common Work Requirements for Fire Protection" for basic piping joint construction.
- B. Grooved-End Pipe and Grooved-End Fitting Joints: Use grooved-end fittings and grooved couplings that are made by the same manufacturer and that are listed for use together. Groove pipe and assemble joints with grooved coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
 - 1. Groove Type: Rolled. (for schedule 10 pipe only)
 - 2. Groove Type: Cut (for schedule 40 pipe only)
- C. Brazed Joints: Use AWS A5.8, BCuP-3, or BCuP-4 filler metals.
- D. Dissimilar Materials Piping Joints: Make joints using adapters compatible with both piping materials.

3.5 PIPING INSTALLATIONS

- A. Refer to Division 21 Section "Common Work Requirements for Fire Protection" for basic piping installation.
- B. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved "working plans" for sprinkler piping require written approval from authority with jurisdiction. File written approval with the Architect prior to deviating from approved "working plans."
- C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes 2 inches (50 mm) and smaller. Unions are not required on flanged devices or in piping installations using grooved couplings.
- E. Install flanges or flange adapters on valves, apparatus, and equipment having 2-1/2-inch (65 mm) and larger connections.
- F. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13 or as located on the drawings. Terminate inspectors test over nearest janitors closet or as shown on the drawings within the sprinkler zone.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler zone control valves, test assemblies, and drain headers adjacent to standpipes when sprinkler piping is connected to standpipe.
- I. Install drain valves on standpipe systems, of sizes and in locations indicated.

- J. Install ball drip valves to drain piping between fire department connections and check valves, and where indicated. Drain to floor drain or outside building.
- K. Install alarm devices in piping systems.
- L. Hangers and Supports: Comply with NFPA 13. Install according to NFPA 13 and NFPA 14.
 - 1. Install hanger and support spacing and locations for steel piping joined with grooved mechanical couplings according to manufacturer's written instructions for rigid systems.
 - 2. Earthquake Protection: Install piping according to NFPA 13 to protect from earthquake damage.
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than 1/4 inch (7 mm) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

3.6 VALVE INSTALLATIONS

- A. Refer to Division 22 Section "Valves" for installation of general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13 and NFPA 14, manufacturer's written instructions, and the authority having jurisdiction.
- B. Gate Valves: Install fire-protection service valves supervised-open, located to control sources of water supply except from fire department connections. Where there is more than 1 control valve, provide permanently marked identification signs indicating portion of system controlled by each valve.

3.7 SPRINKLER APPLICATIONS

- A. Rooms without Ceilings: Upright and pendent sprinklers, as indicated.
- B. Rooms with Suspended Ceilings: Concealed sprinklers, Recessed sprinklers, Fully recessed sprinklers.
- C. Sprinkler Finishes: Use sprinklers with following finishes:
 - 1. Upright and Pendent Sprinklers: Chrome-plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax-coated where exposed to acids, chemicals, or other corrosive fumes.
 - 2. Concealed Sprinklers: Rough brass with white or chrome cover plate.
 - 3. Recessed Sprinklers: Chrome plated brass with chrome cover plate.
 - 4. Fully Recessed Sprinklers: Chrome plated brass with chrome cover plate.
- D. Unheated Ceiling spaces : Pendent, Upright, Concealed dry pendant sprinkler

heads.

- E. Sprinkler Cabinet and Wrench: Furnish steel baked red enameled, sprinkler box with capacity to store 12 additional sprinklers of each type installed and wrench sized to fit the sprinklers.

3.8 SPRINKLER INSTALLATIONS

- A. Install sprinklers in accordance with NFPA 13.

3.9 CONNECTIONS

- A. Electrical Connections: Power wiring is specified in Division 26.
- B. Connect alarm devices to fire alarm system.

3.10 FIELD QUALITY CONTROL

- A. Perform field acceptance tests of each fire protection system.
 - 1. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."
 - 2. Flush, test, and inspect standpipe systems according to NFPA 14 Chapter "Tests and Inspection."
- B. Replace piping system components that do not pass test procedures specified, then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
 - 1. Report test results promptly and in writing to Architect.
 - 2. Report test results promptly and in writing to authority having jurisdiction when required.

3.11 CLEANING

- A. Clean dirt and debris from sprinklers. Replace sprinklers having paint other than factory finish with new sprinklers. Cleaning and reuse of painted sprinklers is prohibited.

3.12 COMMISSIONING

- A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturer, proceed as follows:
 - 1. Verify that specialty valves, trim, fittings, controls, and accessories have been installed correctly and operate correctly.
 - 2. Verify that specified tests of piping are complete.

3. Check that damaged sprinklers and sprinklers with paint or coating not specified have been replaced with new, correct type of sprinklers.
 4. Check that sprinklers are correct type, have correct finish and temperature ratings, and have guards where required for applications.
 5. Check that hose valves and fire department connections have threads compatible with local fire department equipment and have correct pressure rating.
 6. Fill wet-pipe sprinkler systems with water.
 7. Fill wet standpipe systems with water.
 8. Check for correct type and size hose valves.
 9. Energize circuits to electrical equipment and devices.
 10. Adjust operating controls and pressure settings.
- B. Coordinate with fire alarm system tests. Operate systems as required.

3.13 DEMONSTRATION

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. Schedule demonstration with at least 7 days' advance notice.

PART 4 SPRINKLER SYTEM ACCESORIES

4.1 GENERAL

- A. Provide factory-fabricated system products of the size and type indicated. Where not indicated, provide products as determined by the Installer to comply with installation requirements and to comply with NFPA No. 13 and 14 where applicable. Provide sizes and types matching piping and equipment connections.

4.2 WATER MOTOR GONGS

A. Water-Motor-Operated Alarm:

- 1) Potter Roemer
- 2) Standard: UL 753.
- 3) Type: Mechanically operated, with Pelton wheel.
- 4) Alarm Gong: Cast aluminum with red-enamel factory finish.
- 5) Size: 8-1/2-inches (216-mm) diameter.
- 6) Components: Shaft length, bearings, and sleeve to suit wall construction.
- 7) Inlet: NPS 3/4 (DN 20).
- 8) Outlet: NPS 1 (DN 25) drain connection.

B. Electrically Operated Alarm Bell:

- 1) Potter Roemer

- 2) Standard: UL 464.
- 3) Type: Vibrating, metal alarm bell.
- 4) Size: 10-inch (250-mm) diameter.
- 5) Finish: Red-enamel factory finish, suitable for outdoor use.
- 6) Electrical: 120V AC
- 7) Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

4.6 BACKFLOW PREVENTERS

A. Backflow Preventers-Double Check Valve Type, U.L./F.M. Approved

1. Furnish and install in the Fire Protection water supply line where indicated on the Contract Drawings a Watts NO. 709-O.S.&Y double check valve assembly with U.L. & F.M. approved OS&Y gate valve shut-off, epoxy coated (FDA approved) cast iron check valve bodies with bronze seats (removable), stainless steel internal parts and bronze seats (removable), stainless steel internal parts and bronze body ball valve test cocks. Similar units as manufactured by Cla-Val or FEBCO will also be acceptable.
2. Refer to schedule of double check valve backflow preventers on the Contract Drawings for Number, Size, Capacity, etc.

END OF SECTION

SECTION 233521

SLIDING BALANCER TRACK / STRAIGHT RAIL VEHICLE EXHAUST REMOVAL SYSTEM

Magnetic Grabber®

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. Provide all labor, materials, and equipment necessary to put in working operation a complete turnkey system to remove both diesel and automotive exhaust gases and particulate of operating vehicles within the confines of specified fire station(s). All necessary controls, motors, fittings, ductwork, blower(s), labor and all other equipment and materials specified shall be part of the work.

- B. Section Includes:

1. Exhaust System General Components
 - a. Support Legs.
 - b. Upper Flexible Hose.
 - c. Lower Hose Assembly.
 - d. Safety Disconnect Coupling.
 - e. Collection Nozzle Assembly.
 - f. Manual Fill Valve.
 - g. Hose "Saddle" Rigid Elbow
 - H. Electrical Controllers.
 - h. Air Moving Devices.
 - i. Ductwork System.
2. Sliding Balancer Track Specific Components
 - a. Sliding Track.
 - b. Double Track Joiner Plate.
 - c. Track Splicing Assembly.
 - d. Riser Clamp Assembly.
 - e. Trolley/Balancer Assembly.
 - f. Regulator Assembly.
 - g. Uncoupling Valve Assembly. Straight Rail Specific Components
 - h. Rail Material.
 - i. Top Mounting Suspension.
 - j. Mechanical Brake System.
 - k. Rail Splicing Joint.
 - l. Middle Rail Duct Connection.
 - m. Trolley Assembly.
 - n. Regulator Assembly.
 - o. Uncoupling Valve Assembly.

3. Straight Rail Specific Components
 - a. Rail Material.
 - b. Top Mounting Suspension.
 - c. Mechanical Brake System.
 - d. Rail Splicing Joint.
 - e. Middle Rail Duct Connection.
 - f. Trolley Assembly.
 - g. Regulator Assembly.
 - h. Uncoupling Valve Assembly.

- C. All items of equipment and materials described in these specifications are to be furnished installed and placed into proper operating condition in accordance with good practice and manufacturer's written or published instructions.
 1. The exhaust removal system shall provide virtually 100 percent complete evacuation of all diesel fumes at the source from start up to exit of the apparatus from the fire station. The diesel exhaust removal system shall be capable of delivering complete coverage for bays up to 60 feet (18.3M) in length. The system must be able to accommodate drive through and back-in bays to meet all the needs of the fire department.
 2. System must be designed and installed to NIOSH recommendation, specifying that occupational exposures to carcinogens be limited to the lowest feasible concentration. Exposure in the human breathing zone should be limited to lowest feasible level, without any time delay required for the system to effectively capture the diesel fumes.
 3. System must also be capable to provide virtually complete capture and evacuation of carbon monoxide emitted as part of the vehicle exhaust.
 4. Systems that solely use filters, in which diesel particulate may accumulate, and that would potentially have to be treated as hazardous materials, will not be accepted.
 5. System must meet the guidelines for the International Mechanical code for Source Capture Systems. Such system is defined as a mechanical exhaust system designed and constructed to capture air contaminants at their source and to exhaust such contaminants to the outdoor atmosphere.
 6. The system shall not affect personnel boarding the apparatus. Hose loops shall not hang any lower than six feet from the bay floor. The hose assembly shall not come into contact with the vehicle other than one connection point to the vehicles tailpipe. The hose assembly shall not touch or drag on the bay floor.
 7. The exhaust system shall not block doorways, exits, and aisles in the apparatus bay, which could endanger the welfare of fire personnel or visitors.
 8. The exhaust system shall not need to be disconnected from the vehicle while shore lines are connected, during battery charging, or washing of the vehicle, as with other types of systems.

9. To protect the apparatus electrical system from possible damage, the system bid shall not incorporate any type of electromagnetic device that requires the apparatus to be utilized as an electrical ground for systems operation.
10. Due to the harmful effects of diesel exhaust, the system must be designed and capable of capturing virtually 100% of the exhaust gas and virtually 100% of the particulate even in the event of a complete power failure. The system shall not detach itself from the apparatus for any reason during a power failure other than normal exiting of the apparatus bay. System shall discharge exhaust outside the station even in the event of a power failure.
11. The system shall capture the exhaust gases and particulate directly from the tailpipe of the apparatus by a direct connected “visible” high temperature rated hose. Particulates emitted from the apparatus are known to be heavier than air and therefore must be captured by a directly connected hose with a tight seal, as loose nozzles or air filters cannot capture these heavy particulates. The particulates have been documented to be the main respirable carcinogen in diesel exhaust, and therefore are the primary concern of the fire department to capture virtually 100% of these particulates.

1.03 SUBMITTALS

- A. Product Data: Indicate manufacturer's model number, technical data including description of components and static pressure/air flow chart, and installation instructions.
 1. Details of wiring for power differentiating between manufacturer-installed and field-installed wiring.
- B. Closeout Submittals: Operation and Maintenance data manual including spare parts list.

1.04 QUALITY ASSURANCE

- A. Engage a factory certified installer to perform work of this Section who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance. No Exceptions.
- B. The manufacturer must be a ISO 9001:2000 certified www.iso.org manufacturer with certification issued to a United States facility, this shows a commitment to delivering the highest quality service and products to the end user. Manufacturer shall be UL and CUL Certified www.ul.com/database/ and certified by the Air Movement and Control Association (AMCA) www.amca.org/search.htm to ensure quality, consistency and reliability of products. All certification documents shall be provided and attached to the bid proposal. No exceptions.

- C. Engage a firm experienced in manufacturing vehicle exhaust systems similar to that indicated for this Project and with a record of successful in-service performance.
- D. Conduct conference at Project site. Review methods and procedures related to vehicle exhaust system installation.
 - 1. Review access requirements for equipment delivery.
 - 2. Review equipment storage and security requirements.
 - 3. Inspect condition of preparatory work performed by other trades.
 - 4. Review structural loading limitations.
 - 5. Review that all components specified in this Section and related components specified in other Sections are accounted for.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading: Deliver components with protective packaging. Store in original protective crating and covering and in a dry location.

1.06 PROJECT/SITE CONDITIONS

- A. Existing Conditions: Verify dimensions installation areas by field measurements.

1.07 COORDINATION

- A. Coordinate layout and installation with other work, including light fixtures, fixed equipment and work stations, HVAC equipment, and fire-suppression system components.
- B. Coordinate location and requirements of service-utility connections.

1.08 REFERENCES

- A. Air Movement & Control Association International, Inc.
 - 1. AMCA Standard 500-D-98, "Laboratory Methods of Testing Dampers for Rating".
- B. ASTM International.
 - 1. Stainless Steel:
 - a. A240/A240M-04 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - b. Bright, Directional Polish: No. 4 finish.
 - 2. Aluminum:
 - a. B209/209M-04 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - b. Powder-Coated Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

3. Galvanized Steel:
 - a. A653/A653M-04a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.09 BIDDER QUALIFICATIONS

- A. Bids will only be accepted from companies that have an established reputation in the business of system design, turnkey installation and long-term service of Automatic Emergency Response Vehicle Exhaust Removal Systems for a minimum of no less than five (5) years. Bidder shall be a registered corporation, partnership or sole proprietorship within the State where the installation is to take place. Bidder must have a current and valid state contractor's license, if required by the state for the work that is being bid. Bidder shall show proof that the system specified in this Bid Document has been field tested and proven by supplying a list of references with no less than 50 fire stations with systems installed by bidder (with comparable emergency and non-emergency run rates) within a 200 mile radius of municipality seeking bid. References shall be submitted with the Bid Document and shall include phone numbers and contact names.

1.10 MANUFACTURER QUALIFICATIONS

- A. Bids shall only be accepted by bidders supplying equipment from manufacturers that have an established reputation in the business of manufacturing Automatic Emergency Response Vehicle Exhaust Removal Systems for a minimum of no less than fifteen (15) years. The manufacturer must be a ISO 9001:2000 Certified in the United States www.iso.org, UL and CUL Certified www.ul.com/database/ and certified by the Air Movement and Control Association (AMCA) www.amca.org/search.htm to ensure quality, consistency and reliability of products. Certification documents shall be provided and attached to the bid proposal. No exceptions. Where the requirement calls for a packaged exhaust system to be provided, all items shall be the product of the manufacturer. The product offering must be a product that has been offered by that manufacturer for a minimum period of fifteen (15) years. No prototypes or private label products by other manufacturers will be allowed. System bid shall have a life of service of no less than 10 years to establish proof of quality, longevity and service. No exceptions.

PART 2: PRODUCTS

2.01 MANUFACTURER

- A. Air Cleaning Technologies, Inc.
The PlymoVent Corporation / PlymoVent Industrial Ventilation Systems
1300 West Detroit
Broken Arrow, Oklahoma 74012
Attn: Dave Duncan

Telephone: (918) 251-8000
Toll Free: (800) 351-1858
FAX: (918) 251-4977
WEB: www.aircleaningtech.com

E-Mail: dduncan@aircleaningtech.com

2.02 EXHAUST SYSTEM GENERAL COMPONENTS

A. SUPPORT LEGS

Support Legs: Manufactured and provided by the supplier of primary exhaust removal system (Equipment Manufacturer). Support Leg Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Supports: Standard in 19 feet lengths. A minimum of one support with appropriate bracing shall be provided for every 10 lineal feet (3 m) to 12 linear feet (3.7 m) of rail profile. The support legs shall consist of a square outer profile with dimensions no less than 2 inch (50.8 mm) OD by 0.1 inch (2.54 mm) by with 0.4 inch (10 mm) fastening hardware provided. The vertical adjustable mounting foot shall be capable of attaching the leg assembly to a ceiling with a 30-degree pitch, complete with 3/8-inch (9.5 mm) hardware necessary for mounting the leg assembly to the top suspension mount. The support leg shall be equipped with round tubular zinc-plated steel knee brace with pressed ends in standard lengths of 20 inch (508 mm), 30 inch (762 mm) and 72 inch (1828.8 mm). The angle shall be completely adjustable to the leg support and mounted perpendicular and parallel to direction of the rail. The typical support angle shall be 45 degrees from the centerline of the factory provided support leg. The standard leg shall be capable of meeting a Seismic Zone 4 requirement. Vertical support and bracing shall be provided to safely secure the rail profile in accordance with building code and seismic standards which may apply. A minimum of one support with appropriate bracing shall be provided for every 10 lineal feet (3 m) to 12 linear feet (3.7 m) of rail profile.

B. UPPER FLEXIBLE HOSE

Upper Hose: Flexible exhaust hose manufactured for the sole purpose of venting high temperature exhaust gases. Flexible Hose: Designed strictly for the harsh environment of rapid response and auto-release of a vehicle exhaust tailpipe. Hose: Range from 4 inch (101.6 mm) to 5-inch (127 mm) diameters with length of 25 feet (7.6 m) without joining or splicing connections. Hose Material: High temperature synthetic rubber impregnated into a high temperature laminated fabric with a minimum overlapping thickness of 2-7/16 inches (61.9 mm). This construction of hose must be capable of operating at continuous temperatures of 400 degrees F (204 degrees C) and intermittent temperatures of 500 degrees F (260 degrees C) such as are experienced when pump checks are performed inside the station. Wire Helix: Bound and protected in laminations of hose winding. This shall be accomplished in a fashion which eliminates any possibility of personnel coming in contact with an exposed hot metal helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. Wear Strip: 9/16 inch (14.28 mm) wide and be provided as a safety yellow color. The bend radius of the high temperature hose shall be no less than 1.5 times the diameter of hose to ensure that hot gases are not restricted as they pass through the system.

C. LOWER HOSE ASSEMBLY

Lower Hose: Rigid 4 inch (101.6 mm) to 5 inch (127 mm) diameter by 2 foot (609.6 mm) long section of yellow and black hose identical in appearance to the upper hose assembly. Lower Hose: Support the pneumatic connection nozzle and chrome reducing elbow in a rigid fashion to

allow for the operator to place hose collection nozzle onto the tailpipe without bending over. Lower hose is the only section of hose which shall disconnect from the upper hose assembly and act as a safety disconnect in the unlikely event the nozzle gets entangled.

D. SAFETY DISCONNECT COUPLING

Safety Disconnect Coupling: 4-part segmented coupling with removable wear strips to protect the vehicle and disconnect from wear shall be incorporated in the design of the system. Coupling: Consist of two spun aluminum collars connected by a reusable-segmented coupling band. The release tension of this device shall be preset at 130 pounds and adjustable from 20 pounds to 206 pounds of separating force to accommodate varying exit speeds of vehicles. Coupling: Reusable.

E. COLLECTION NOZZLE ASSEMBLY

1. Collection Nozzle Assembly: Provides a substantially air tight seal around exhaust tail pipe when connected thus allowing for virtually 100% source capture. The seal shall limit escape of life threatening exhaust gases, which may be present during the following conditions:

- a. In the event vehicle's engine is accelerated above normal idle resulting in an exhaust velocity greater than 5000 feet per minute (25.4 meters per second).
- b. In the event that the output velocity or CFM of the exhaust exceeds the manufacturers normal capture velocity or CFM of exhaust system.

2. Magnetic Nozzle: Engineered and specially designed Patent Pending exhaust system nozzle (female connection) that is specifically designed to fit tightly over the circumference of an engineered conical mating ring (male connection) that attaches to the tail pipe and attaches tightly around the ring to capture virtually 100% of the carcinogenic diesel exhaust

3. The Stainless-reducing elbow that connects to the connection nozzle shall be fabricated using continuous welded construction. Angle of Transition: No less than or greater than 67 degrees from the centerline of the reducer. stainless Reducer: Incorporate a primary expanded metal debris screen, which is permanently affixed by welded seams to the inside, opening of exhaust fitting.

F. HOSE "SADDLE" RIGID ELBOW

Hose Suspension Saddle: Fabricated of chrome steel specifically manufactured for the sole purpose of suspending high temperature exhaust ventilation hose in a rapid response and auto-release application. The design of the saddle shall smoothly transition the direction of the hose during its travel along the track. Securing clamps shall be provided including a link fastener, for the purpose of mounting it to the balancer safety link.

G. ELECTRICAL CONTROLLERS

Controller: Built and supplied by a UL recognized and listed exhaust system manufacturer. Controller shall carry the UL - CUL listing label as an "Enclosed Industrial Control Panel." Individual components listed by UL - CUL shall not satisfy the above requirement. Manufacturer shall undergo monthly inspections by UL to verify all requirements and standards are met as

outlined by UL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications to follow.

Electrical Controllers: Bear a visible UL listing label as proof of subscribership and shall be validated by UL www.ul.com/database/ as an "Enclosed Industrial Control Panel". Certification documents shall accompany bid documents. **No exceptions.**

1. Manufacturer Name: PLYMOVENT CORPORATION
115 MELRICH ROAD
CRANBURY, NJ 08512-3512

2. UL File No.: E212640

3. Electrical controller and manufacturer shall be recognized and listed by UL. Controller shall be manufactured in accordance with Underwriters Laboratories standard UL-508 for "Enclosed Industrial Control Panels". The electrical controller shall include a Class 1 limited energy control circuit. Enclosures shall be NEMA 12 rated and UL listed as Type 12. The electrical control components shall be provided and mounted in an electrical enclosure to restrict access to internal components of the controller by authorized personnel only.

Controller Performance: Designed to sense the output pressure and temperature change inside the ductwork system, which is normally generated by any internal combustion engine designed to propel a motor vehicle. The operating logic shall be designed to complete this cycle. At any point in time when a collection device is connected to a motor vehicle's exhaust tailpipe, as the operator starts the vehicle, the controller shall automatically sense the engine's output pressure or temperature of the exhaust and in turn energize the electrical contactor which will supply power to the AMCA certified spark resistant fan motor. Through the use of an adjustable timer the controller shall keep the contactors energized for up to six minutes in accordance with the stations response requirement. If the responding vehicle does not disconnect from the exhaust ventilation system in less than the designated setting, the temperature override switch shall override the time delay to ensure continuous system operation. This automated function will work for as long as the exhaust gas temperature is in excess of the setting on the heat sensor located in the ductwork system. This cycle shall not allow the electrical contactor, which energizes the exhaust fan, to short cycle or stop the fan while the system is connected to an operating vehicle.

Motor Control Contactor: Allen Bradley Industrial Electrical Contactor 100C series. The contactor shall be UL - CUL listed as an approved component.

Motor Control Overload Relay: Allen Bradley 193 ES series. Overload relay shall have an adjustable trip range to meet the proper full load amperage of the blower motor.

Soft Touch Controls: Incorporated on the face or the access door of the controller by the use of an adhesive backed Lexan membrane type label to prevent water infiltration, which would void the NEMA 12R rating. Label: Provided and secured permanently to the exterior of the electrical controller. Label: Include the name of the manufacturer, address, telephone number, user instructions and any warnings or cautions required by Underwriters Laboratories.

1. Auto Start: This mode of operation shall be strictly for normal day use, as it would apply to receiving an emergency call and leaving the station. Any one or combination of the three devices listed below in Paragraph H shall activate the system. The system shall maintain itself in the Auto Start mode and always return there after the Stop sequence has been initiated. The controller shall not

- have a permanent off position due to the potential health hazards of diesel exhaust components.
2. Stop: This mode of operation shall be a system override to shut down the system manually. Upon activating this mode of operation the exhaust system blower shall shut down. After a period not to exceed three seconds the controller shall automatically return to the Auto Start ready mode. This shall be a safety feature to prevent a potential health hazard from carcinogenic diesel exhaust leakage from systems having an undesirable open nozzle.
 3. This mode of operation shall be a system override to run the exhaust system blower continuously for the purpose of running the vehicles indoors for equipment checks during inclement weather. Upon activating this mode of operation the exhaust system blower shall start and run continuously until the Stop mode is activated at which point the system will automatically return to the Auto Start ready mode within a maximum three second time period.

System Indicator LED's: Show system status at all times.

1. Auto Start Indicator: Indicate the system is in the fully automatic mode of operation and that power is on to the controller.
2. Fan On Indicator: Indicate that power is being applied to the system blower and the controller is operating normally.
3. Filter Status Indicator: Indicate, if flashing, excessive pressure loss across the filter bank media. Consequently the filter must be serviced to maintain optimum efficiency of the system.
4. Stop Indicator: Indicate the fan has been manually de-energized and will return to the Auto Start ready sequence in less than three seconds to prevent the system blower from being left in the Off mode.
5. Manual Run Indicator: Indicate the fan is operating in a continuous run mode until interrupted by the stop mode activation.

Controller Transformer: UL listed industrial control circuit transformer sized to properly supply all components so that only one transformer shall be required. Transformer shall be provided with multi-tap primary for 115, 208, 240, 277, 400, 480, and 600VAC, and 24, 120, 230VAC secondary operating on 50 or 60 hertz with a capacity of 90-volt amperes.

Control Circuit Protection: By the use of primary and secondary fuses (NEC code ref. 430-72) to meet UL requirements. The primary shall be protected by a pair of FLQ style fuses rated at 1.6 amps for voltages under 400V and a pair of .75 amp fuses for voltages over 400V. The primary fuse holder shall have a standard indicator light feature to aid in troubleshooting blown fuses. A single glass fuse rated at 3 amps at 250V shall protect the secondary side of the control circuit.

Electronic Control Circuit Card: Solid state printed circuit board. The soft controls shall be an integral part of the control circuit card. The control circuit card shall utilize a potentiometer to adjust the length of the timing cycle from 7 to 360 seconds. It shall incorporate several different modes of operation and optional features.

Activation Devices:

1. Engine Start Switch: An engine pressure sensing type, capable of recognizing the output pressure of any type of motor vehicle exhaust. The electrical contact shall be dry type or not to exceed 24V ac. There shall be one sensor per vehicle.
2. Thermal Start Switch: Temperature sensing switch of the snap disc type and adjustable from 90 degrees F (32 degrees C) to 130 degrees F (55 degrees C)

- to configure the system based on different exhaust temperatures. There shall be one sensor per vehicle.
3. Remote Control Transmitter and Receiver: Shall be an optional feature with three independent channels of control. The receiver shall operate on 12V to 24 V AC or DC. The handheld transmitter shall be molded out of a highly visible orange composite with a visor clip on the back making it rugged and easy to locate. It shall be powered by a 9-volt battery for ease of replacement and cost savings. Utilizing three sets of normally open and normally closed contacts allows the device to be used to control three separate functions from up to one quarter of a mile away.
 - a. Channel A: Shall be capable of starting and stopping the exhaust system blower.
 - b. Channel B: Shall be capable of operating the apparatus bay door upon entering or leaving the fire station, if desired.
 - c. Channel C: Shall be capable of remotely controlling the traffic signal in front of the fire station, if so equipped.

Clean Filter Indicator Alarm: Used in conjunction with the optional Unifilter for filtering diesel exhaust particulate before release to the atmosphere. The clean filter indicator shall monitor the pressure loss across the filter bank media. Once the useful life of the filter has been depleted the pressure differential switch will signal a high-pressure loss and flash the “Fan On” indicator while the exhaust blower is running.

Carbon Monoxide Alarm: Shall monitor the carbon monoxide levels inside the apparatus bay area.

Electrical Wiring: Run in wire channel to allow for easier identification of the wiring circuits and for a neat appearance. All wiring circuitry shall meet International Electrical Code and UL standards for proper size, bending radiuses (International Electrical Code) and terminations.

Electrical Terminal Block: 600 V, UL rated and recognized. It shall provide individual connection points for remote controls, clean filter indicator and power connections. The primary and secondary control wiring fuses shall be incorporated into the terminal block as one unit.

Product Manual: Shall be provided with each electrical control box supplied. The product manual shall include a description of components with part numbers inclusive to the controller. It shall include a wiring schematic showing all internal circuitry as well as all field installed wiring connections to the controller.

Electrical Interference: To protect the apparatus and communications, designs that allow any possibility of electrical back-feed or induced current which may interfere with a central services communication or onboard vehicle computer logic or navigational equipment will not be accepted.

J. ELECTRICAL SYSTEM

Station Electric Supply Panel: The power circuit for the “Emergency Response Vehicle Exhaust Removal System” shall originate in a circuit breaker panel board of the appropriate size to handle the load. Fan circuit shall be supplied by a UL listed, HACR rated circuit breaker (HACR rating is specifically for motor type loads) of the same type as indicated by the manufacturer of the circuit breaker panel or a dual element time delay fuse for fuse style panels. The circuit shall be clearly

marked on an engraved ledger plate or in ink on the panel schedule as "Emergency Response Vehicle Exhaust Removal System".

OS-3 Automatic Controller: Built and supplied by a UL recognized and listed exhaust system manufacturer. Controller shall carry the UL - CUL listing label as an "Enclosed Industrial Control Panel". Individual components listed by UL shall not satisfy the above requirement. Manufacturer must undergo monthly inspections by UL to verify all requirements and standards are met as outlined by UL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications in 2.17 Electrical Controllers. The controller shall be mounted 6 feet (1829 mm) to the top of the cabinet AFF (above finished floor). A safety disconnecting means must be within sight of the controller for servicing and for safety reasons. If the supply panel is not within sight, a separate disconnecting means is required beside the controller (NEC code ref. 430-102 (a)). Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures. See attached Table 1-1 for proper Square D part number of safety disconnect switch.

Power Wiring Conduit: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (International Electrical Code). Conduit shall be supported with a conduit strap every 10 feet (3 m) and within 3 feet (914.4 mm) of each box or termination, (International Electrical Code and local modifiers.).

Power Wiring from Supply Panel to OS-3: THHN stranded copper wire consisting of a flame retardant, heat-resistant thermoplastic insulation with a nylon jacket for abrasion, gas, and oil resistance and rated up to 600 volts.

Low Voltage Control Wiring: Minimum of a 14/2 multi-conductor shielded cable (Anixter part number #2AS-1401POS or equivalent) to meet UL standards for the controller's low voltage field wiring. Termination procedure shall be as follows; the shielded cable shall be stripped back inside the control cabinet, the mylar foil shield and silver drain wire are to be twisted together and secured under the screw in the grounding lug inside the control cabinet. Terminations at each sensor must leave foil shielding and drain wire intact and at no point shall it come into contact with ground. There shall be only one connection to ground.

Power Wiring from OS-3 to Fan Motor: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (NEC code ref.348-10). Conduit shall be supported with a conduit strap every 10 feet (3048 mm) and within 3 feet 914.4 mm) of each box or termination (International Electrical Code and local modifiers.). Conduit shall extend through the outside wall through a hole of the proper size and terminate directly into the back of the safety disconnect with the appropriate connector and sealed with a silicon sealer or cement mortar. (Using fan model number select appropriate wire and conduit size from Table 1-1).

Fan Safety Disconnect: Square D (or equivalent), non-fusible, NEMA 3R rated for wet locations, mounted adjacent to the AMCA Certified blower. Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures. (Using fan model number select appropriate safety disconnect from attached Table 1-1).

Liquid Tight Flexible Metal Conduit: UL listed liquid tight flexible metallic conduit (Sealtite). Conduit will encase the load wires and ground wire from the safety disconnect switch to the blower motor. Conduit length not to exceed 4 feet (1219.2 mm) from disconnect to blower motor. The appropriate listed terminal fittings shall be used. (NEC code ref.351-7) (Using fan model select appropriate conduit size from attached Table 1-1).

Spark Resistant Blower: AMCA certified, designed and installed as a direct drive spark resistant blower (IMC code ref. 503.2) The motor shall meet current EPACT standards for energy savings. Fans utilizing steel housings and impellers will not be accepted.

Temperature Switch: One for each apparatus connected to the system. The temperature switch shall be of the snap disc type and adjustable from 90 degrees F (32 degrees C) to 130 degrees F (54 degrees C). It shall be mounted on the ductwork 2 inches (50.8 mm) above the pressure switch by drilling a 1-inch (25.4 mm) hole, sealing the switch with silicon sealant and securing with 2 tek screws. Electrical connection shall be made with terminals provided or solder less type such as Thomas & Betts part no. 14RB-2577 or equivalent.

Pressure Switch: One for each apparatus connected to the system. The pressure switch shall operate at a maximum of 24VAC, pre-calibrated at .18 in. of water column. Mounting shall be accomplished by drilling a 3/8 inch (9.5 mm) hole 3 inches (76.2 mm) above the riser bracket and to the left of the regulator and threading the switch into the duct. The electrical connections shall be made with a 0.020-inch (.5 mm) by 0.187-inch (4.8 mm) female quick disconnect terminals, such as Thomas & Betts part no. 14RBD-18277 or equivalent.

OS-3 Controller Component Sizing Chart									
Table 1-1									
PlymoVent Model No.	Motor Manuf.	HP Rating	Name Plate		Circuit Breaker	Wire Size THHN AWG	Length of Wire in Feet Start to Finish		NEC Table Amps
			Voltage	FLA			From	To	
67001	Leeson	1hp	115V	16A	30A	#14	0'	115'	16A
						#12	116'	184'	
			230V	8A	15A	#14	0'	183'	8A
						#12	184'	290'	
67003	Leeson	3hp	230V	17A	35A	#12	0'	215'	17A
67005	Leeson	5hp	230V	28A	60A	#18	0'	216'	28A
67007	Marathon	7.5hp	230V	40A	80A	#8	0'	133'	40A
						#6	134'	211'	
						#4	212'	336'	
67009	Marathon	10hp	230V	50A	90A	#6	0'	167'	50A
67012						#4	168'	266'	
67013						#3	267'	335'	
Three Phase									
67002	Leeson	1hp	208V	4.8A	15A	#14	0'	358'	4.8A
			230V	4.2A	15A	#14	0'	352'	4.2A
			460V	2.1A	15A	#14	0'	1409'	2.1A
67004	Leeson	3hp	208V	11A	20A	#12	0'	181'	11A
			230V	9.6A	20A	#12	0'	223'	9.6A
			460V	4.8A	15A	#14	0'	563'	4.8A
67006	Leeson	5hp	208V	17.5A	35A	#10	0'	187'	17.5A
						#8	188'	298'	
			230V	15.2A	30A	#10	0'	229'	15.2A
			460V	7.6A	15A	#14	0'	362'	7.6A
67008	Leeson	7.5hp	208V	25.3A	50A	#10	0'	145'	25.3A
						#8	146'	231'	
						#6	232'	366'	
						230V	22A	45A	#10
						#8	175'	278'	

			460V	11A	20A	#14	0'	275'	11A	
						#12	276'	437'		
67010	Leeson	10hp	208V	32.2A	60A	#8	0'	178'	32.2A	
67011						#6	179'	282'		
			230V	28A	60A	#8	0'	215'	28A	
						#6	216'	340'		
			460V	14A	20A	#12	0'	338'	14A	
67014	Leeson	15hp	208V	48.3A	90A	#6	0'	190'	48.3A	
						#4	191'	303'		
			230V	42A	80A	#6	0'	231'	42A	
						#4	232'	369'		
			460V	21A	40A	#10	0'	365'	21A	

Manufacturer assumes no liability for any electric installation; all local, city, and the National Electric Code must be followed. This chart was calculated for a maximum voltage drop of 3% and is to be used as a guideline.

K. AIR MOVING DEVICES

Centrifugal Fans: Direct drive centrifugal type, high pressure, single width, and single inlet as required or indicated. **Impeller Wheels:** Backward incline design for high static pressure performance, spark resistance and made of Aluminum. The impeller shall be dynamically and statically balanced and of the non-overloading type to provide maximum efficiency while achieving quiet, vibration-free operation. The fan housing shall be manufactured from aluminum AA-1050A material or equivalent with an aluminum, finish. The outlet configuration shall be top horizontal, bottom horizontal, or upblast. The housing shall be capable of field reconfiguration in the event the mounting position needs to be changed for unforeseen reasons.

Fan Motor and Bearing: All 1 horsepower (746 watts) to 15 horsepower (11190 watts) motors shall be totally enclosed fan cooled (TEFC) continuous duty rated. The motors shall be dual voltage where applicable. Motors built after October 27th, 1997 shall comply with the government mandated "Energy Policy and Conservation Act" (EPACT) as outlined by the Department of Energy. The bearings shall be self-aligned, ball bearing type permanently sealed and lubricated. The exhaust discharge outlet shall be in compliance with International Mechanical Code and ACGIH recommendations (min. of 36" above roofline). Air intakes, windows, cascade systems, prevailing currents, communication equipment and building aesthetics shall be considered in the final location of the fan.

1. Teflon Shaft Seal: The fan shaft shall be steel and rotate in a non-sparking TEFLON seal to prevent leakage and to prevent hot exhaust gases from coming into contact with the motor bearings.
2. Variable Speed Drive: The motor shall be compatible with a variable speed drive unit.

Performance: The delivered volume shall take into account all the static regain of vehicle engine exhaust (based on an airtight connection at the tailpipe), lengths of ductwork, elbows, branches, shut off, wyes, etc. which accumulate the static pressure at the field inlet. The manufacturer's provided fan(s) shall be performance guaranteed.

1. Fan Capacity: The Fan Capacity shall be sized as such as to deliver the required CFM at each hose drop to which the vehicle is attached.
 - a. The 4-inch (101.6 mm) hose system shall be designed to deliver a minimum of 500 CFM (2.9 M/Second) at a velocity of 5800 FPM (33.6 M/Second) at the hose and nozzle connection.

- b. The 5-inch (127 mm) hose system shall be designed to deliver a minimum of 750 CFM (4.4 M/Second) at a velocity of 5800 FPM (33.6 M/Second) at the hose and nozzle connection.
- c. The 6-inch (152.4 mm) system shall be designed to deliver a minimum of 1100 CFM (6.4 M/Second) at a velocity of 5800 FPM (33.6 M/Second) at the hose and nozzle connection.

Location: The preferable fan location shall be on the outside of the fire station as far away from any living quarters as possible so that firefighters would not be disturbed by the system activation. No blower fans shall be mounted inside the fire station.

L. DUCTWORK SYSTEM

- 1. Ductwork Type and Materials:
 - Interior Duct shall be galvanized spiral pipe construction.
 - All branch laterals shall be tapered body design with branch inlets at 45 degrees.
- A. Ductwork Sizing and Gauges: Round pipe construction, with the range of available sizes not to exceed 10 inches (254 mm) in diameter. Duct gauge shall depend on diameter and a minimum operating pressure of 8 inches water gauge (1990 Pa). Acceptable Gauge and Reinforcement Requirements: Inner duct diameter 4 inches (101.6 mm) through 11 inches (279.4 mm) diameter shall be 22-gauge standard pipe (International Mechanical Code).
- B. Ductwork Fittings: Round and have a wall thickness 2 gauges (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected (International Mechanical Code). Air Duct Branch Entrances: Factory fabricated fittings or factory fabricated duct /tap assemblies. Fittings: Constructed so that air streams converge at angles no greater than 45 degree (International Mechanical Code). All Seams: Continuous stitch welded and if necessary internally sealed to ensure air tightness. Turning elbows shall be stitch-welded and used for all diameters and pressures. They shall be fabricated of 20 gauge-galvanized steel and constructed as two-piece with continuous welded seam construction fittings similar to those provided by Lindab Inc. Tapered Body Fittings: Used wherever particular fallout is anticipated and where airflow is introduced to the transport duct manifold.
- C. Ductwork Design Velocities: Minimum of 3500 FPM (20.3 M/Second) to 4000 FPM (23.2 M/Second) transport velocity. Capture Velocity: 5500 FPM (31.9 M/Second) to 6000 FPM (34.8 M/Second) to extract 100 percent of the exhaust gases.
- D. External Ductwork: Sized for the exact inlet and outlet of the exhaust fan blower. An exhaust rain cap shall be supplied and manufactured in accordance with EPA standard for free draft rain cap requirements. Included as an integral part of this rain cap shall be a back draft damper to provide protection from rain and other inclement weather.
- E. Exhaust Penetrations: The core drilling shall be properly sized to reduce the diameter of the smallest opening size.

2.03 SLIDING BALANCER TRACK – SPECIFIC COMPONENTS

1. TRACK:

A one-piece continuous extruded aluminum track in a minimum length of 19 feet (5791.2 mm). Profile shall be of a Boxloc type profile, track height 3-1/8 inches (73.4 mm), track width 1-1/2 inches (38.1 mm), track thickness 1/8 inch (3.175 mm); aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Track: Extruded design that shall incorporate three separate and functioning channels. Channels: Includes the mounting channel, the trolley channel and the Boxloc channel. Mounting Compartment: Designed to accept the slider bars (which shall be provided with factory supplied vertical support legs and riser clamp duct connection) and to allow positioning along the full length of the slotted track-mounting channel. Mounting Channel: Also accommodate the compressed airlines for the purposes of safe storage and appearance. Trolley Channel: Allow the trolley/balancer/hose assembly to glide to the door threshold in a safe and effective manner. Boxloc Channel: Allow the whole track to remain rigid as it hangs from factory supplied leg supports and also shall provide an area to attach bolts for splicing additional tracks together for systems over 19 feet (5791.2 mm) long. The overall extruded track lengths shall be 19 foot standard and shall weigh no more than 35 pounds (15.88 KG). The track system shall be equipped with end stops that limit travel of flex hose as the vehicle exits the building. The end stop shall be fabricated of zinc plated steel in a U shape form with a rubber end stop on the impact end. It shall be attached by using a 1/4 inch (6.35 mm) molded locking bolt. The end stop shall be secured to the track with no less than (2) 1/4 inch (6.35 mm) bolts and locking nuts located on the underside of the track. For security, a 1/4 inch (6.35 mm) bolt shall be drilled through the ends of each track system to ensure that the trolley/balancer assembly(s) roll no further than the end of the track system.

2. DOUBLE TRACK JOINER PLATE

Joiner Plate: constructed from a minimum of 1/4 inch (6.35 mm) thick zinc-plated material, designed to connect two parallel tracks to make a double track system to accommodate an apparatus bay over 40 feet (12192 mm) in length. Joiner Plate: 10 inch (254 mm) by 8 inch (203.2 mm) flat zinc-plated steel and designed to attach the two tracks to a single factory supplied support leg. The steel plate shall have (6) 3/8 inch (9.5 mm) holes drilled 6-7/8 inches (174.6 mm) apart to accommodate the slider bar provided with factory support legs. Joiner Plate: Have two slider bars attached to the plate, located on the outside edges of the plate. These slider bars shall fit into the Boxloc track mounting channel for a simple and secure attachment of the plate to the Boxloc track. The center portion of the joiner plate shall provide attachment for the factory supplied support leg.

3. TRACK SPLICING ASSEMBLY

Track Splice: Manufactured of galvanized steel (ASTM A653/A653M) in two parts and utilized as a clamping device. This clamp shall accurately secure both tracks together in a fashion, which shall eliminate any possibility of obstructing the trolley assembly as it passes through this connection point of track system. Connecting length of splice shall be a minimum of 15-3/4 inches (400 mm) long and fabricated of 14 gauge material. Four (4) 1/4 inch (6.35 mm) bolts with lock nuts shall pass directly through internal partition of the

Boxloc track. The splicing sleeve shall fit externally around the outside dimension of extruded aluminum track profile.

4. RISER CLAMP ASSEMBLY

Riser Clamp: Fabricated as a one piece welded assembly, manufactured to create the transfer of the hard spiral pipe joined at the top and flexible duct connection at the bottom. A slider bar and associated hardware shall be provided with riser clamp assembly. Sizes of the riser clamp will range from 4 inches (101.6 mm) to 5 inches (127 mm) in diameter to match the output velocity of the vehicles that will park in that station.

5. TROLLEY/BALANCER ASSEMBLY

Trolley Assembly: Manufactured as a two piece galvanized steel assembly including bumper stops at each end. Fixed to the side of the trolley are solid steel pins, which shall be for load carrying bearings that are sealed and permanently lubricated. The load carrying bearings shall travel internally in track trolley channel. Two additional permanently lubricated trolley wheels shall be provided on bottom side of the track to reduce wobble of trolley as it conveys the hose assembly to the door threshold. Release Plate: Attached to the chassis of the trolley to smoothly energize the uncoupling release valve when the trolley-balancer assembly approaches the door threshold. System Balancer Assembly: Self-adjusting weight spring tension balancer with a lifting capacity of no less than 31 pounds (14 KG). The balancer shall have a minimum diameter stainless steel cable of .080 inch (2 mm), with a safety link connection.

2.04 STRAIGHT RAIL SPECIFIC COMPONENTS

A. RAIL MATERIAL

Rail Material: One-piece continuous extruded aluminum rail in a minimum length of 19 feet (5791.2 mm) in an effort to reduce the points of leakage due to seams or connections. The construction profile shall be of a round profile type, diameter of 6.5 inches (165.1 mm) with a rail thickness of 0.175 inch (4.5 mm). The bottom portion of the rail shall have a continuous slot to accept a rubber seal. Rail Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Aluminum Rail: Extruded as a one-piece design unit to maximize the structural integrity of the rail and to minimize joints. Extruded into the rail profile shall be all necessary mounting guides, which will allow for support of the rail mounting hardware and airline support cable. Mounting Channels: Provided continuously along both sides of the rail extrusion in order the proper positioning of all required mounting supports in accordance with codes. The rail shall allow the trolley/hose assembly to glide to the door threshold in a safe and effective manner. The extruded rail channel shall allow the whole rail to remain rigid and shall provide an area to attach bolts for splicing additional rails together for systems over 19 feet (5791.2 mm) long. The overall extruded rail lengths shall be 19 foot (5791.2 mm) standard. Rail System: Equipped with a hydraulic braking system that limits travel of flex hose as the vehicle exits the building. Hydraulic Brake: Incorporated into the end cap of the suction rail.

B. TOP MOUNTING SUSPENSION

Top Mounting Suspension: Designed to attach with 2 mounting cleats to the mounting slots that were extruded into the rail profile.

C. MECHANICAL BRAKE SYSTEM

Mechanical Brake System: Incorporated into the end cap of the suction rail profile. The mechanical brake system must incorporate a pair of composite shock “bumpers” capable of reducing the forward impact of 1 to 4 suction trolleys which may be installed now or in the future to the exhaust rail system. This mechanical shock system shall be secured to a steel end cap fabricated of 6.25 inch (158.8 mm) diameter steel tubing with a wall thickness of 0.156 inch (4 mm) welded to a 0.156 inch (4 mm) steel plate with formed 90 degree side rails for rigidity. The end cap shall have a removable circular end plate to facilitate an end feed duct connection and shall be a black powder coated finish. The mechanical shock shall be capable of reducing to a full stop the trolleys in less than 4 inch (101.6 mm), without physical damage to either the rail profile or trolley that it is stopping

D. RAIL SPLICING JOINT

Rail Splicing Joint: The splice joint shall be formed aluminum extrusion equal to the internal diameter of the suction rail profile. The splice shall have a wall thickness of no less than .190 inches (4.8 mm) in thickness and a length of no less than 8 inches (203.2 mm) from end to end. The rail splicing shall be safely secured by no less than 12- 3/8 inch (314.3 mm) by 1-½ inch (38.1 mm) bolts, nuts and lock washers. Each bolt shall pass through the exterior of the rail profile and splicing joint and be secured on the inside by a lock washer and nut. Self-tapping bolts or screws are not acceptable.

E. MIDDLE RAIL DUCT CONNECTION

Middle Rail Duct Connection: The rail duct connection shall be rectangular to an 8 inch diameter round transition fitting fabricated from 24 gauge galvanized steel (ASTM A653) with a double rubber U style lip seal. The rectangular slot shall be 19 inch (482.6 mm) long by 1-¾ inch (44.5 mm) high with a 3/8-inch (9.5 mm) external flange to slide into the rail profile.

F. TROLLEY ASSEMBLY

Trolley Assembly: Gantry type trolley with sealed bearing loaded wheels designed to roll inside the internal rail profile flange. The trolley chassis shall be galvanized steel (ASTM A653) epoxy coated with a black finish. The chassis shall be fitted with a tapered cone. Rubber Sealing Lips: Vulcanized Teflon strip covering 1-½ inch (38.1 mm) of the bottom edge of the sealing lip which shall minimize resistance between the cone and the rubber sealing lips. The exhaust cone transition shall be a tapered slot design which shall fit inside the suction rail profile. The tapered slot shall be equal or exceed in area the diameter of exhaust ventilation hose to which it is attached. Trolley Assembly: Equipped with rubber impact bumpers at both the front and rear of the trolley chassis to eliminate metal-to-metal contact which could damage the trolley assembly. There shall be a system balancer assembly provided to aid in the delivery of the hose to the exit door. Balancer Assembly: Self-adjusting weight spring tension balancer with a lifting capacity of no less than 31 pounds (31 KG). The balancer shall have a minimum diameter steel cable of .080 inch (2 mm) and have a safety link connection.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide surface/substrate preparation as required by the manufacturer's printed installation instructions. Do not proceed with installation is in proper condition to receive vehicle exhaust system installation.

3.03 INSTALLATION

- A. Install vehicle exhaust system in accord with manufacturer's written instructions, original design and referenced standards.

3.04 ADJUSTING

- A. Adjust vehicle exhaust system for proper operation. Replace any parts that prevent the system from operating properly.

3.05 CLEANING

- A. Remove all debris caused by installation of the vehicle exhaust system. Clean all exposed surfaces to as fabricated condition and appearance.

3.06 PROTECTION

- A. Provide protection of the completed installation until completion of the project. Repair any damage at no additional cost to Owner.

3.07 TRAINING

- A. Provide training to fire department personnel in the daily use and maintenance of the vehicle exhaust removal system that has been installed and specified herein. The fire department shall be notified at least 7 days prior to the date scheduled for the training course. Training shall be for all personnel involved with the operation of the exhaust removal system to include all shifts required to man the particular facility. The Training session shall be performed in person by a recognized representative of the manufacturer of the exhaust removal system, in addition a training video shall be provided to the fire department.
 1. Provide training to all shifts during their normal shift period.

3.08 WARRANTY

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

ETC Project Number-150302CPAG

- A. Provide a written warranty for a period of one (1) year from date of shipment for all components including fan, motor and controls.

END OF SECTION 233521

SECTION 16010 – BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

SECTION INCLUDES

- A. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

WORK INCLUDES

- A. Provide a complete and operable electrical system as indicated on the drawings and as specified in the project manual.
- B. Service shall be a 480/277V, 3 phase, 4 wire 60 Hertz.

REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

SUBMITTALS

- A. Submit under provisions of Division 1. See table at the end of this Section.
- B. Proposed Products List: Include Products specified in the following Sections:
 - 1. Section 16111 - Conduit & Accessories
 - 2. Section 16120 - Wire & Cable
 - 3. Section 16141 - Wiring Devices
 - 4. Section 16420 - Service Entrance
 - 5. Section 16450 - Secondary Grounding
 - 6. Section 16470 - Panelboards
 - 7. Section 16476 - Circuit Breaker
 - 8. Section 16510 - Lighting Fixtures
 - 9. Section 16721 - Fire Alarm and Smoke Detection System
- C. Submit shop drawings and product data grouped to include complete submittals of related Systems, Products, and accessories in a single submittal.
- D. Mark dimensions and values in units to match those specified.
- E. Submit shop drawing and product data at one time; multiple submittals will not be allowed.
- F. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

REGULATORY REQUIREMENTS

- A. Conform to International Building Code including Fire Protection Code, Mechanical Code, Plumbing Code, Gas Code, Energy Code and Electrical Codes plus local amendments.
- B. Obtain permits, and request inspections from authorities having jurisdiction. Extra work or materials resulting from lack of timely code enforcement inspections shall be performed under this Section without additional cost to the Owner.
- C. Electrical: Conform to NFPA 70 (NEC).

PROJECT/SITE CONDITIONS

- A. Engineering drawings are generally diagrammatic in nature. While the Engineer has made a concerted effort to arrange and layout equipment, piping and ductwork in a non-conflictive manner, the final responsibility of coordination of various trades and their work shall be the Contractors.
- B. The HVAC contractor shall have the primary responsibility of coordinating the work of this Section, all mechanical and plumbing work and work by Owner. Electrical Contractor shall assist HVAC contractor as necessary and shall prepare shop drawings showing any necessary rearrangement of Work to meet Project conditions; submit to engineer and HVAC contractor. Extra work or materials resulting from lack of coordination shall be performed under this Section without additional cost to the Owner.
- C. The Contractor and all subcontractors shall be responsible for identifying any and all discrepancies between the engineering and architectural drawings or with respect to any variance to Code requirements; bidders shall notify the Architect and Engineer prior to bidding. Any discrepancies identified after this time which result in additional work shall be performed under this Section without additional cost to the Owner.
- D. Contractor shall not proceed with the work affected until clarification has been made by the Architect or Engineer.

QUALITY ASSURANCE

- A. The use of manufacturer's names and catalog numbers on the drawings or in these specifications indicate a required level of product quality; not a requirement for a closed specification. Unless the words "NO SUBSTITUTES" are notated, then the contractor may propose a product of equal or greater quality provided the procedures of Division 1 are followed.

SUPPLY COORDINATION

- A. Motors & Starters: All starters shall be furnished and installed by Division 16 unless specifically stated otherwise. Motors shall be furnished by Division 16 unless the motor is an integral part of the mechanical equipment (i.e., factory mounted). Division 16 shall review Division 15 drawings to verify that all starters are provided for pumps, cooling towers, air handling units, and other mechanical equipment.
- B. Control devices shall be installed by the division that furnishes the device. Electrical devices installed by Division 15 shall be installed by properly licensed personnel only. Division 16 shall be responsible for providing all power circuits for control panels, etc.; locations of said circuits shall be coordinated between Division 15 and 16. Interlock contacts and remote starting devices shall be provided by Division 16; Division 15 shall be responsible for coordinating the number and type of said devices.
- C. Horsepower and/or electrical ratings of equipment indicated on the drawings shall not limit sizes of the electrically operated equipment or capacity of the electrical work. Before commencing electrical work, the contractor shall check all horsepower and/or electrical rating of each electrically operated equipment (regardless of who supplies and installs) to insure that feeders, starters, switches and other electrical devices are properly sized to provide adequate protection.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 16111 - CONDUIT & ACCESSORIES

PART 1 - GENERAL

WORK INCLUDED

- A. Rigid metal conduit and fittings.
- B. Intermediate metal conduit and fittings.
- C. Electrical metallic tubing and fittings.
- D. Liquid-tight flexible metal conduit and fittings.
- E. Boxes.

REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.
- C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- D. NFPA 70 - NEC

PART 2 - PRODUCTS

RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. PVC coated rigid steel in natatorium and pool equipment room; UL6
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.

ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

- A. EMT: ANSI C80.3 Galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression type.

LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Conduit: Flexible metal conduit with PVC jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

CONDUIT SUPPORTS

- A. Conduit Clamps, Straps, and Supports: Steel or malleable iron, PVC coated in natatorium and pool equipment room.
- B. Where conduit is not rigidly connected to the building structure provide seismic control.

OUTLET BOXES

- A. Boxes: NEMA 3X Listed as pool boxes comprised PVC coated galvanized steel, copper, brass, suitable plastic, or other approved corrosion-resistant material.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
- B. Manufacturers: Crouse-Hinds, Thomas & Betts, Appleton; substitutions under provisions of Division 1.

FLOOR BOXES:

- A. Floor Boxes: NEMA 3X Listed as pool boxes comprised PVC coated galvanized steel copper, brass, suitable plastic, or other approved corrosion-resistant material.
- B. Manufacturers: Calbond, Hubbell, Crouse-Hinds, Thomas & Betts, Appleton; substitutions under provisions of Division 1.

PULL AND JUNCTION BOXES

- A. Boxes: NEMA 3X Listed as pool boxes comprised copper, brass, suitable plastic, or other approved corrosion-resistant material.
- B. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- C. Provide Code size pull boxes, in accessible locations, where the number and degree of conduit bends exceed code limitations.
- D. Install pull boxes in feeders over 200'. Install boxes in branch circuits over 100'.
- E. Junction boxes shall be identified per following:

System	Color
Fire Alarm	Red
Communication	Blue

PVC - POLYVINYL CHLORIDE CONDUIT

- A. Conduit - PVC Schedule 40 UL listed for electrical service
- B. Fittings - Thread fittings on PVC connectors and adapters.

PART 3 - EXECUTION

CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduit for conductor type installed per NEC; 1/2 inch minimum size.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- H. Support conduit at a maximum of 10 feet on center or as allowed by NEC.

CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of four 90- degree bends between boxes.

- E. Use conduit bodies to make sharp changes in direction, as around beams.
- F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- I. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples. Use No. 10 AWG for runs longer than 100'.
- J. Where conduit penetrates fire-rated walls and floors, provide pipe sleeve two sizes larger than conduit; fill void around conduit with non-shrink grout and seal opening around conduit with UL listed fire rated sealant.
- K. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements. Offset boxes on opposite sides of sound partitions and fire walls by a minimum of 24" OC.
- L. Install electrical boxes to maintain headroom and to present neat mechanical appearance. Boxes located above lay-in ceilings shall be mounted to bottom of deck or structural members (as high as possible). Use flex steel conduit from box to fixtures.
- M. Install boxes to preserve fire resistance rating of partitions and other elements.
- N. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
- O. Support boxes independently of conduit.
- P. Use gang box where more than one device is mounted together. Do not use sectional box.
- Q. Use gang box with plaster ring for single device outlets.
- R. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- S. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- T. Set floor boxes level.
- U. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
 - 1. Interior Dry Locations: Use hinged enclosure.
 - 2. Other Locations: Use surface-mounted cast metal box.
- V. All pull and junction boxes shall be identified as to their contents. Identify circuit numbers on the cover by means of wide tip, black permanent marker.
- W. Polyvinyl Chloride Schedule (PVC) Installation:
 - 1. All conduits in ground level slabs, roof slabs and underground shall be PVC up to the point of transition to vertical to rise above grade. Transitions shall be made with standard or prefabricated rigid elbows and conduit. No PVC shall emerge from the ground of the concrete slab or encasement. PVC shall convert to galvanized rigid conduit prior to upturn/downturn with rigid elbows.
 - 2. All PVC conduits used in underground primary services, secondary services and feeder raceways shall be encased in a minimum 3" of concrete around all sides of each conduit. At the time of installation, while the concrete is still moist, a RED chalk dust shall be spread on the top of the concrete encasement the entire length of the raceway's run.
 - 3. All PVC conduits used in exterior underground branch circuits, fire alarms, controls, etc., shall be installed at 24" below the finished grade from the top of the conduit and shall be covered on the sides and top with a minimum of 2" of concrete. At the time of installation, while the concrete is still moist, a RED chalk dust shall be spread on the top of the concrete the entire length of the raceway's run.
 - 4. No exposed PVC conduit shall be allowed.
EXCEPTION: PVC conduit shall be used to enclose all service grounding conductors as required in the NEC. Exposed PVC conduit used in this application shall be supported securely within 18" of each cabinet, transformer, fitting, etc. and each 3 linear feet.
 - 5. Minimum size of PVC conduit shall be 3/4" in all applications. Maximum size of PVC conduit in 4 inch slabs shall be 1-1/4 inches and in 6 inch slabs shall be 2-1/2 inches.
 - 6. Use threaded fittings on all PVC connectors and adapters.
 - 7. All PVC conduit bends shall be made with standard ells or with an approved bender. No blow torch shall be used for bending.

8. All PVC underground service and feeder conduits shall be supported securely by industry-approved chairs each 5 linear feet. All galvanized rigid ells used at PVC-transitioned turn-ups shall be supported securely by industry-approved chairs. All industry-approved chairs shall be securely staked and tied to the trench's floor with a minimum 3/8" x 18" reinforcement steel rod and steel tie wire. No copper wire will be allowed.
 9. All PVC underground branch circuit, fire alarm, control, etc. conduits shall be supported within 18" of each turn-up and each 5 linear feet by a minimum 3/8" x 18" reinforcement steel rod stake and steel tie wire. No copper wire will be allowed.
 10. A grounding conductor shall be installed in each PVC conduit, sized in accordance with 1990 NEC Tables 250-94 and 250-95. A minimum #14 AWG copper grounding conductor shall be in each PVC conduit used to install control circuits such as fire alarm, and those not covered by the above NEC tables.
- X. Flexible Metal Conduit
1. Flexible metal conduit, maximum length of 24", shall be used for termination points at equipment that may possibly vibrate such as motors, HVAC equipment, etc.
 2. Flexible metal conduit, maximum length of 6', shall be used at junction boxes to connect lighting fixtures installed in suspended ceilings.
 3. Flexible metal conduit, maximum length of 3', may be concealed in walls.
 4. Minimum size of flexible metal conduit shall be 3/8" for lighting fixtures, and 1/2" for utilization equipment other than lighting fixtures. Minimum size for EMS flexible metal conduit systems shall be 1/2".
 5. Liquid tight flexible metal conduit shall be used in the following locations:
 - a. Flexible raceways exposed to intermittent or continuous moisture.
 - b. The termination of line and load feeders to all transformers.
 - c. The termination point at all HVAC pump motors.
 6. Flexible metal conduit shall be supported as in accordance with NEC.
- Y. Paint all visible conduit & boxes to match adjacent services in accordance with Section 09900.

CONDUIT INSTALLATION SCHEDULE

- A. Exposed Outdoor Locations: Rigid steel conduit.
- B. Wet Interior Locations (equipment connection): Rigid steel conduit, or liquid-tight flexible metal conduit.
- C. Concealed or Exposed Dry Interior Locations: Rigid steel or EMT.
- D. Underground - PVC

END OF SECTION

SECTION- 16120 WIRE & CABLE

PART 1 - GENERAL

WORK INCLUDED

- A. Building wire.
- B. Wiring connections and terminations.

REFERENCES

- A. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- B. NFPA 70 - NEC

PART 2 - PRODUCTS

BUILDING WIRE

- A. Thermoplastic-insulated Building Wire NEMA WC 5.
- B. Feeders and Branch Circuits Larger than 6 AWG: Copper, stranded conductor, 600 volt insulation, THHN or THHW.
- C. Feeders and Branch Circuits 6 AWG and Smaller. Copper conductor, 600 volt insulation, THHN or THHW, 6 and 8 AWG stranded conductor, smaller than 8 AWG, solid conductor.
- D. All wire shall be of the same manufacturer.

CONTROL WIRE

- A. Nylon Jacketed type MTW copper

IDENTIFICATION

- A. Wiring shall be color coded as follows.

PHASE	COLOR
A	BLACK
B	RED
N	WHITE
GRD	GREEN

MANUFACTURER

- A. American
- B. Diamond Wire.
- C. General Cable.
- D. Thomas & Betts
- E. Substitutions: Under provisions of Division 1.

PART 3 - EXECUTION

GENERAL WIRING METHODS

- A. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

- B. Splice only in junction or outlet boxes.
- C. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- D. Make Conductor lengths for parallel circuits equal.

WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricate for pulling 4 AWG and larger wires.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.

WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes and cable trays as allowed by NFPA 70.
- B. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller.
- C. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- D. Thoroughly clean wires before installing lugs and connectors.
- E. Make splices, taps, and terminations to carry full ampacity of conductors without perceptible temperature rise.
- F. Terminate spare conductors with electrical tape.

FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to manufacturer's recommended values.
- C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

WIRE INSTALLATION SCHEDULE

- A. Concealed and Exposed Interior Locations: Building wire in raceways.
- B. Above Accessible Ceilings: Building wire in raceways.
- C. Wet or Damp Interior Locations: Building wire in raceway.
- D. Exterior Locations: Building wire in raceways.
- E. Other wiring methods where permitted by NEC and AHJ.

END OF SECTION

SECTION 16141- WIRING DEVICES

PART 1 - GENERAL

SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Device plates and decorative box covers.

RELATED SECTIONS

- A. Section 16111 - Conduit & Accessories

REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. NFPA 70 - NEC

SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data. Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Manufacturer's Instructions:
 - 1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
 - 2. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.

REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell.
 - 2. Bryant.
 - 3. Thomas & Betts.
 - 4. Substitutions: Under provisions of Division 1.
- B. Description: NEMA WD 1, heavy-duty, AC only general-use snap switch.
- C. Device Body: Ivory (or color as designated by Architect) plastic with toggle handle.

- D. Voltage Rating: 120 volts, AC.
- E. Current Rating: 20 amperes.

RECEPTACLES

- A. Manufacturers.
 - 1. Hubbell.
 - 2. Bryant.
 - 3. Thomas & Betts.
 - 4. Leviton.
 - 5. Substitutions: Under provisions of Division 1.
- B. Description: NEMA WD 1; heavy duty specification grade, polarized grounding receptacle; rated 125V; 20 A.
- C. Configuration: NEMA WD 6; type as specified and indicated.
- D. Convenience Receptacle: Type 5-15.
- E. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements; Hubbell GF 8200 series.

WALL PLATES

- A. Decorative Cover Plate: Ivory (or color as designated by Architect) smooth plastic.
- B. Weatherproof Cover Plate: Gasketed cast metal with gasketed device cover shall be used in the natatorium exclusively.

COMMUNICATION OUTLETS

- A. Provided 4x4x4 junction box with blank face plate; provide 3/4 conduit with pull wire from box to 6 inches above accessible ceiling or accessible crawl spaces, bend conduit horizontal.

PART 3 - EXECUTION

EXAMINATION

- A. Verify outlet boxes are installed at proper height and that designate mounting height does not interfere with architectural trims.
- B. Verify wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify floor boxes are adjusted properly.
- D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- E. Verify openings in access floor are in proper locations.

PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes

INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install devices plumb and level
- C. Install switches with OFF position down.
- D. Install receptacles with grounding pole on bottom.
- E. Connect wiring device grounding terminal to outlet box with bonding jumper.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

- G. Connect wiring devices by wrapping conductor around screw terminal.
- H. Use jumbo size plates for outlets installed in masonry walls.
- I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- J. Engrave receptacle face with panel and circuit number which serve it.

INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 16010 to obtain mounting heights specified and indicated on Drawings.
- B. Install wall switches 48 inches above finished floor.
- C. Install convenience receptacle 16 inches above finished floor or 4 inches above cabinet backsplash unless indicated otherwise on the drawings. Contractor shall review Architectural drawing details for other mounting heights.
- D. Install telephone jacks 16 inches above finished floor unless indicated otherwise on the drawings.
- E. Install thermostats 48 inches above finished floor.

FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

END OF SECTION

SECTION 16420 - SERVICE ENTRANCE

PART 1 - GENERAL

WORK INCLUDED

- A. Arrangement with Utility Company for permanent electric service to meet Project requirements. All fees and charges associated with service shall be paid for by the Owner.

RELATED WORK

- A. Section 03300 - Concrete work.

SYSTEM DESCRIPTION

- A. System Voltage: 120/240 volts, SINGLE phase, three-wire, 60 Hertz.
- B. Provide rough-in for pad mounted service transformer in accordance with power company standards.

QUALITY ASSURANCE

- A. Install service entrance in accordance with utility Company's rules and regulations.

SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 1.
- B. Submit Utility Company prepared drawings.

PART 2 - PRODUCTS

METERING EQUIPMENT

- A. Meter: As required by local power company.
- B. Meter Base: Meet Power Company specifications.

PART 3 - EXECUTION

INSTALLATION

- A. Submit work order to Utility Company to obtain permanent electric service to the Project.

END OF SECTION

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

WORK INCLUDED

- A. Lighting and appliance branch circuit panelboards.

REFERENCES

- A. NEMA AB1 - Molded Case Circuit Breakers.
- B. NEMA PB1 - Panelboards.
- C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- D. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.

SUBMITTALS

- A. Submit shop drawings for equipment and component devices under provisions of Division 1.
- B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURES - PANELBOARDS

- A. General Electric
- B. Square-D
- C. ITE-Seimens
- D. Thomas & Betts
- E. Substitutions: Under provisions of Division 1.

BRANCH CIRCUIT PANELBOARDS

- A. Branch Circuit Panelboards: NEMA PBI, circuit breaker type. Type I, Class 1; UL Listed.
- B. Enclosure: NEMA PB 1; Type I.
- C. Provide flush cabinet front with concealed trim clamps, concealed hinge flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
- D. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards. Provide isolated ground bus where indicated.
- E. Minimum Integrated Short Circuit Rating: 14,000 amperes rms symmetrical for 208 volt panel boards unless indicated otherwise.
- F. Molded Case Circuit Breakers: NEMA AB1 bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

PART 3 - EXECUTION

INSTALLATION

- A. Install panelboards plumb, in conformance with NEMA PB 1.1
- B. Provide filler plates for unused spaces in panelboards.
- C. Provide typed circuit directory' for each branch circuit panelboard. Revise directory to reflect circuiting

changes required to balance phase loads.

FIELD QUALITY CONTROL

- A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 10 percent, rearrange circuits in the panelboard to balance the phase loads within 10 percent. Take care to maintain proper phasing for multi- wire branch circuits.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

SECTION 16476 - CIRCUIT BREAKERS

PART 1 - GENERAL

SECTION INCLUDES

- A. Molded case circuit breakers.

REFERENCES

- A. NEMA AB1 - Molded Case Circuit Breakers.

SUBMITTALS

- A. Submit product data under provisions of Division 1.
- B. Include circuit breaker and current limit ratings, trip current and let-through current curves, outline dimensions, and terminal lug sizes.

REGULATORY REQUIREMENTS

- A. Use circuit breakers listed by Underwriter's Laboratories, Inc., and suitable for specific application.

PART 2 - PRODUCTS

MANUFACTURERS

- A. Square-D
- B. General Electric
- C. Siemens
- D. Thomas & Betts
- E. Substitutions: Under provisions of Division 1.

MOLDED CASE CIRCUIT BREAKER

- A. Circuit Breaker: NEMA AB 1.
- B. Utilize breakers, listed and labeled for switching duty on lighting circuits.
- C. Utilize breakers listed and labeled as HACR for HVAC equipment.

CONFIGURATION

- A. Circuit breakers for panelboard use shall be bolted bus, molded plastic case, air circuit breaker type. Breakers shall have thermal-magnetic trip units and two and three pole breakers shall have a common trip bar so that the trippings of one pole will automatically trip all poles of each breaker. All breakers shall be trip-free and trip-indicating. All breaker contracts shall be quick-make, quick-break type.
- B. Field-Changeable Ampere Rating Circuit Breakers: NEMA AB I Provide circuit breakers with frame sizes 250 amperes and larger with changeable trip units.
- C. Current Limiting Circuit Breaker: Provide circuit breaker as scheduled with automatic- resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.
- D. Ground Fault Breakers: Provide where scheduled.

RATINGS

- A. Ratings. See Drawings

ACCESSORIES

- A. Provide accessories as scheduled or as required by operations; coordinate with HVAC controls contractor and fire alarm contractor.

PART 3 - EXECUTION

EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify field measurements are as shown on Drawings.
- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Beginning of installation means installer accepts conditions.

INSTALLATION

- A. Install enclosed circuit breakers where shown on Drawings, in accordance with manufacturer's instructions.

FIELD QUALITY CONTROL

- A. Inspect and test each circuit breaker to NEMA AB 1.
- B. Inspect visually and perform several mechanical ON-OFF operations on each circuit breaker.
- C. Verify circuit continuity on each pole in closed position.
- D. Determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB1 requirements.
- E. Include description of testing and results in test report.

END OF SECTION

SECTION 16510 - LIGHTING FIXTURES

PART 1 - GENERAL

WORK INCLUDED

- A. Interior luminaries and accessories
- B. Exterior luminaries and accessories.
- C. Lamps.
- D. Ballasts.
- E. Emergency Lighting Fixtures.

RELATED WORK

- A. Section 09900 - Painting.

REFERENCES

ANSI C82.1 - Specification for Fluorescent Lamp Ballasts
ANSI C82.4 - Specifications for High-Intensity-Discharge Lamp Ballasts (Multiple Supply Type
ANSI C78.377 - Specifications for LED Lighting
FS W-F-414 - Fixture, Lighting Fluorescent, Alternating- Current, Pendant Mounting.
NEMA LE 2 - H-I-D Lighting System Noise Criterion (LS-NC) Ratings
IES LM-79 & LM-80: Testing Methods for LED Lighting

SUBMITTALS

- A. Submit product data under provisions of Division 1.
- B. Include outline drawings, lamp and ballast data, support points, weights, and accessory information for each luminaire type.
- C. Submit manufacturer's installation instructions under provisions of Division 1.

DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 1.
- B. Store and protect products under provision of Division 1.

PART 2 - PRODUCTS

INTERIOR LUMINARIES AND ACCESSORIES

- A. See Lighting Schedule on Drawings; The fixtures and lamps listed represent minimum acceptable product quality and should not be taken as a closed spec.
- B. Recessed Incandescent Luminaries: Pre-wired type. Provide remodel style fixtures where access above ceiling is not available.
- C. Provide complete emergency and exit light system as indicated and as required by authorities having jurisdiction.
- D. HID Luminaries: Pre-wired with integral ballast. Provide remodel style fixtures where access above ceiling is not available
- E. Recessed fluorescent fixtures shall have factory installed 3/8" flexible metal conduit whip containing #14 AWG, minimum, conductors including green grounding conductor.
- F. Provide LED fixtures with integral or remote driver. Provide emergency backup batteries as scheduled.
- G. All natatorium fixtures shall be wet listed and made of corrosive resistant materials.

EXTERIOR LUMINARIES AND ACCESSORIES

- A. Enclosures: Complete with gaskets to form weatherproof assembly.
- B. Provide low temperature ballasts, with reliable starting to 0 degrees F

ACCEPTABLE MANUFACTURERS - LAMPS

- A. Phillips.
- B. GE.
- C. Substitutions: Under provisions of Division 1.

LAMPS

- A. Fluorescent Lamps: Cool white; energy saving type; all by same manufacturer.
- B. HID Lamps: Clear, suitable for all burning positions.
- C. LED lamps shall be provided with same color rendition rating regardless of schedule. Coordinate with Architect and Engineer during submittals.

ACCEPTABLE MANUFACTURERS - FLUORESCENT BALLASTS

- A. Advance.
- B. Magnetek.
- C. Dayton.
- D. Substitutions: Under provisions of Division 1.

FLUORESCENT BALLASTS

- A. Fluorescent Ballasts: ANSI C82. high power factor type.
- B. Nominal 430 ma Lamp Ballasts: Standard type.
- C. Fluorescent fixtures shall have T-8 high efficiency lamps, electronic, high frequency ballasts capable of operating 1, 2, 3 or 4 lamps. Ballasts shall be high power factor, reduced harmonic type. Each ballast shall be fused with a GLR3 fuse in a HLR fuse holder.
- D. Provide dimmable electronic ballast which drawings indicate dimmable circuits.

HID BALLASTS

- A. HID Ballast: ANSI C82.4; selected by luminaries' manufacturer.
- B. LS-NC Rating: NEMA LE 2; equal to or less than ratings listed in Table C-I.

LED LIGHT FIXTURES

- A. General:
 - 1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
 - 2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
 - 3. LED drivers shall include the following features unless otherwise indicated:
 - a. Minimum efficiency: 85% at full load.
 - b. Minimum Operating Ambient Temperature: -20° C. (-4° F.)
 - c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
 - d. Integral short circuit, open circuit, and overload protection.
 - e. Power Factor: ≥ 0.95.
 - f. Total Harmonic Distortion: ≤20%.
 - g. Comply with FCC 47 CFR Part 15.
 - 4. LED modules shall include the following features unless otherwise indicated:
 - a. Comply with IES LM-79 and LM-80 requirements.
 - b. Minimum CRI 80 and color temperature 3000° K unless otherwise specified in

- c. Minimum Rated Life: 50,000 hours per IES L70.
- d. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.
- B. LED Downlights:
 - 1. Housing, LED driver, and LED module shall be products of the same manufacturer.
- C. LED Troffers:
 - 1. LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.
 - 2. Housing, LED driver, and LED module shall be products of the same manufacturer.

PART 3 - EXECUTION

INSTALLATION

- A. Install lamps in luminaries and lampholders.
- B. Support surface-mounted luminaries from building structure only.
- C. Install recessed luminaries to permit removal from below where access from below is not possible.

RELAMPING

- A. Relamp luminaries which have failed lamps at completion of Work.

ADJUSTING AND CLEANING

- A. Align luminaries and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaries.
- B. Touch up luminaries finish at completion of work.
- C. Install emergency exit luminaries on separate non-switchable circuit(s) as required by Code.

END OF SECTION

SECTION 16721 - FIRE ALARM & SMOKE DETECTION SYSTEM

PART 1 GENERAL

SECTION INCLUDES

- A. Fire alarm and smoke detection Systems.

RELATED SECTIONS

- A. Section 15975 - Automatic Control System
- B. Section 16120 - Wire & Cable

REFERENCES

- A. NFPA 72 - National Fire Alarm Code
- B. NFPA 101 - Life Safety Code
- C. Americans with Disabilities Act

REGULATORY REQUIREMENTS

- A. System: UL and FM listed.
- B. Conform to requirements of NFPA 101.
- C. National Electrical Codes.
- D. Standard Fire Prevention Code.

SYSTEM DESCRIPTION

- A. Fire Alarm System: NFPA 72; automatic fire alarm system.; microprocessor based, intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not limited to, alarm initiating devices, alarm notification appliances, DACT Digital Alarm Communicator Transmitter connected to a Remote Supervising Station Monitoring service and field coming.
- B. System Supervision: Provide electrically supervised system, with supervised alarm initiating and alarm signaling circuits. Occurrence of single ground or open condition in initiating or signaling circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode.
- C. Alarm Sequence of Operation: See Drawings.
- D. When an "Alarm" condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
 - 1. The System Alarm LED shall flash and the FACP's local piezo electric signal shall sound.
 - 2. The LCD display in both the FACP and the Remote Annunciator Panel shall indicate all information associated with the "Alarm" condition, including the type of alarm point and its location within the protected premises.
 - 3. All system output programs assigned via control by event equations to activated by the particular point in alarm shall be executed, and the associated System Outputs (alarm indicating appliances and/or relays) shall be activated.
 - 4. The "Alarm" shall be reported via dedicated telephone lines to the Remote Supervising Station Monitoring Service, who shall be responsible for reporting the alarm to the Memphis Fire Department.
- E. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm initiating circuits have cleared.
- F. Trouble Sequence of Operation System trouble, including grounding or open circuit of supervised circuits, or power or system failure causes system to enter TROUBLE mode, including the following operations:
 - 1. Visual and audible trouble alarm by zone at control panel.
 - 2. Visual and audible trouble alarm at annunciator panel.

City of Paragould
Paragould Fire Station No.1
Paragould, Arkansas

- 3. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm, visual alarm is displayed until initiating trouble is cleared.
- G. Lamp Test: Manual LAMP TEST function causes alarm indication at each zone at fire alarm control panel and at annunciator panel.
- H. System shall provide Ground Fault detection for external wiring

QUALIFICATIONS

- A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five years documented experience.
- B. Installer: Company specializing in smoke detection and fire alarm systems and approved by the Owner's insurance company

SUBMITTAL OF EQUIPMENT, PLANS, DRAWINGS AND CERTIFICATION FOR APPROVAL

- A. For equipment and products other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance and quality of the specified equipment.
- B. All submittals shall include sufficient information to determine compliance with these specifications. They shall include the manufacturer's name, model numbers of all equipment, devices, appliances and components, ratings, power requirements, battery calculations, equipment layout, device with electronic address arrangement, appliance arrangement and circuits, wiring cut sheets, complete field wiring diagrams and conduit layouts. Show remote annunciator panel layout, configurations and terminations.
- C. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name including technical data sheets.
- D. Wiring diagrams and schematics shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment
- E. Provide a clear and concise description of the system's sequence of operation that gives, in detail, the information required to properly determine its compliance with these specifications and to operate the equipment and system.
- F. The contractor shall submit a certification from the major equipment manufacturer indicating that the proposed supplier of the fire alarm system's equipment is a duly, authorized representative of the manufacturer. Include names and addresses in the certification. The equipment supplier must maintain a local service shop and factory trained service personnel capable of troubleshooting and repair of any and all supplied equipment to an integrated circuit level.
- G. All products, plans and drawings shall be submitted by the Contractor to the Engineer and to local and state code enforcement and fire inspectors for comment and approval. Furnish all letters of comment and approval of the fire alarm system from the local and state inspectors to the Engineer for final approval prior to starting the installation of the system.

PROJECT RECORD DRAWINGS

- A. Submit documents under the provisions of Division 1.
- B. Submit all items as required by NFPA 72 including but not limited to:
 - 1. Owner's Manual
 - 2. Installation Instructions
 - 3. Record (as-built) drawings
 - 4. Record copy of site-specific software
 - 5. Certificate of compliance with NFPA 72
 - 6. Copy of all certificates of acceptance by AHJs.

OPERATION AND MAINTENANCE DATA

- A. Submit data under provisions of Division 1.
- B. Include operating instructions, and maintenance and repair procedures.
- C. Include manufacturer representative's letter stating that system is operational.

DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 1.
- B. Store and protect products under provisions of Division 1.

PART 2 - PRODUCTS

MANUFACTURERS

- A. Notifier, Simplex, Edwards.
- B. Substitution per Division 1.

FIRE ALARM AND SMOKE DETECTION CONTROL PANEL (FACP)

- A. Control Panel: Modular construction with wall-mounted enclosure; recessed in new walls and surface for existing walls or block walls; Notifier System 5000 or equal.
- B. Power Supply: Adequate to serve control panel modules, remote detectors, remote annunciators, door holders, relays, and alarm signaling devices. Include battery operated emergency power supply with capacity for operating system in standby mode for 24 hours.
- C. Detection Circuits: Supervised zone module with alarm and trouble indication.
- D. Signal Circuits: Supervised signal module, sufficient for signal devices connected to system.
- E. Remote Station Signal Transmitter: Electrically supervised, capable of transmitting alarm and trouble signals over telephone lines to remote station receiver.
- F. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts for each detection zone to provide accessory functions specified.
- G. Provide TROUBLE ACKNOWLEDGE, DRILL, and ALARM SILENCE switch.

INITIATING DEVICES

- A. Manual Station: Addressable surface mounted, single action manual station with break-glass rod.
- B. Ceiling Mounted Smoke Detector: NFPA 72 Class A Style 6a; photoelectric type with visual indication of detector actuation, suitable for mounting on 4 inch outlet box.
- C. Duct Mounted Smoke Detector: NFPA 72 Class A Style 6a; ionization type with auxiliary SPDT relay contact, key-operated NORMAL-RESET-TEST switch. Duct sampling tubes extending width of duct, and visual indication of detector actuation, in duct-mounted housing.
- D. Provide interface module for water flow, tamper & other sprinkler system contact devices. All sprinkler devices shall have a unique system address.
- E. Remote Test Switch Key-operated switch mounted on flush cover with lamp to indicate detector actuation.
- F. Addressable smoke detectors shall have their addresses on both the base and the head of the unit. Contractor shall write the address on the part that does not have the address physically in place with indelible marker.

SIGNALING DEVICES

- A. HORN/STROBE: NFPA 72 Class B Style X, ADA UL Listed. Install per NFPA 72 Guidelines.

ANNUNCIATOR

- A. Remote Annunciator: Provide supervised remote annunciator including audible and visual indication of fire alarm by zone, and audible and visual indication of system trouble. Install in recessed wall-mounted enclosure. It shall be non-functional in the resetting, silencing, etc. of the system. The remote annunciator shall have no exposed keypads, switches, etc. or shall be covered by secured plastic cover.

FIRE ALARM WIRE AND CABLE

- A. Fire Alarm Power Branch Circuits: Building wire as specified in Section 16120.
- B. Initiating and Signal Circuits: NEC listed copper wire.
- C. Provide plenum rated cable as necessary; review mechanical drawings.

PART 3 - EXECUTION

INSTALLATION

- A. Install system in accordance with NFPA 72 and manufacturer's instructions.
- B. Install manual station with operating handle 48 inches above floor. Install audible and visual signal devices 90 inches above floor. Meet ADA requirements.
- C. Use 14 AWG minimum size conductors for fire alarm detection and signal circuit conductors. Install wiring in conduit.
- D. Provide alarm signal to intercom system.
- F. Provide alarm signal for central station notification.
- G. Make conduit and wiring connections to sprinkler flow switches, sprinkler valve tamper switches, and duct smoke detectors if provided by others.
- H. Furnish and install a fire alarm directory' and detailed drawings of the building(s) and all levels, detailing the location of all initiating devices and individual addresses, indicating appliances, remote annunciator panel and the FACP. This directory and drawings shall be securely mounted to the wall at the FACP and remote annunciator panel in a metal frame with plexiglass cover. The directory shall include a schedule of the individual initiating devices addresses and their locations in numerical order.
- I. When the job is complete, record all of the systems wiring in AutoCad 2000 format. Submit the final records in As-built drawings with two sets of reproducible copies, one set of diskette files, and two complete sets of the fire alarm manual to the Owner. The As-built plans shall contain the locations and addresses of all devices, and shall indicate the types of smoke detectors installed. The photoelectric type shall be identified as (P) and the ionization type shall be identified as (IN).

FIELD QUALITY CONTROL

- A. A final acceptance test of 100% of the devices and appliances shall be the contractor to ensure that the system is fully functional and meets all required specifications, drawings and codes The Owner's representative or the local and state fire inspectors, the Contractor's representative and two factory trained technicians shall be present.
- B. Final acceptance by the Owner shall be given only after the local and state fire inspectors have fully approved of the system, copies of their approval in writing are presented to the Owner, all punch list items have been addressed and all As-built drawings, AutoCad diskettes, fire alarm manuals and sensitivity tests of all smoke detectors have been furnished to the Owner.

END OF SECTION

SECTION 26 32 13
ENGINE GENERATOR

PART 1 GENERAL

1.1 Summary

- A This section includes the following items from a single supplier:
 - 1. Engine Generator Set.
 - 2. Enclosure
 - 3. Related Accessories as specified

- B Related Requirements
 - 1. It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
 - 2. Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been omitted or have been taken exception to, and a complete description of all deviations.
 - 3. It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
 - 4. All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

1.2 Submittals

- A Action Submittals
 - 1. Product Data
 - a The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

- B Informational Submittal
 - 1. Certificates
 - a The generator set shall be listed to UL 2200 or submitted to an independent third party certification process to verify compliance as installed.

- C Closeout Submittal
 - 1. Maintenance Contracts
 - 2. Operation And Maintenance Data

3. Warranty Documentation
4. Record Documentation

1.3 Quality Assurance

A Regulatory Agency

1. The generator set shall conform to the requirements of the following codes and standards:
 - a CSA C22.2, No. 14-M91 Industrial Control Equipment.
 - b EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
 - c EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 - d IEC8528 part 4, Control Systems for Generator Sets.
 - e IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.
 - f IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
 - g NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
 - h NFPA 99, Essential Electrical Systems for Health Care Facilities.
 - i NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.
2. Qualifications
 - a The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
 - b The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.
3. Manufacturers
 - a The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
 - b The generator set described herein is a Kohler model 150REZGC, and it is with the price of this equipment that the contractor of this section shall enter with his proposal at bid time. If the contractor wishes to propose equivalent equipment by Caterpillar, it is to be submitted in a separate document at bid time. All additional costs associated with re-engineering and mechanical & electrical modifications to the installation will be at the contractor's expense. The contractor must also supply the details listed below with his equivalent proposal:
 - The associated credit for the equivalent equipment
 - Any deviations from the specifications in a line by line format
 - The weight & outline dimensions

Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications shall be allowed or included in the certification.

Warranty or Bond

B Manufacturer's Warranty

1. The generator set shall include a standard warranty covering one (1) year or 2000 hours, whichever occurs first, to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup.
2. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

PART 2 PRODUCTS

2.1 Equipment

A Equipment

1. The generator set shall be a Kohler model 150REZGC with a 4T13X alternator. It shall provide 134 kVA and 134 kW when operating at 120/240 volts single phase, 60 Hz. The generator set shall be capable of a 130°C Standby rating while operating in an ambient condition of less than or equal to 77 °F and a maximum elevation of 500 ft above sea level. The standby rating shall be available for the duration of the outage.

B Engine

1. The minimum 8.8 liter displacement engine shall deliver a minimum of 227 HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:
 - a. Electronic isochronous governor capable of 0.5% steady-state frequency regulation
 - b. 12-volt positive-engagement solenoid shift-starting motor
 - c. 70-ampere automatic battery charging alternator with a solid-state voltage regulation
 - d. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain
 - e. Dry-type replaceable air cleaner elements for normal applications
 - f. The engine shall be turbo charged and fueled by LP vapor fuel. LP liquid fuel.
 - g. The engine shall have a minimum of 8 cylinders and be liquid-cooled
2. The engine shall be EPA certified from the factory
3. The generator must accept rated load in one-step.

C Cooling System

1. The engine shall be liquid-cooled by a closed loop, unit mounted radiator rated to operate the generator set at full load at an ambient temperature of 50 degrees C (122 degrees F). The radiator fan and other rotating engine parts shall be guarded against

accidental contact.

D Standard Air Cleaner

1. The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

E Battery

1. Each genset requires a BCI group 31 batteries which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine cranking cycles. Each battery shall be rated according to SAE Standards J-537 with a minimum cold cranking amp of 630 amps and a minimum reserve capacity of 185 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery elements must be anchor-locked with full-frame grids and tight-packed commercial plates to resist the effects of vibration. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life. Removable cell covers shall be provided to allow for checking of electrolyte specific gravity.
2. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

F Housing

1. Sound Attenuated Enclosure
 - a The generator set shall be supplied with a Sound Attenuated Enclosure, providing a sound pressure of 73.5 dB(A) while the generator is operating at 100% load at 7 meters (23 feet) – free field – using acoustic insulation and acoustic-lined inlet hoods, constructed from a minimum of 0.125 inch thick formed heavy duty aluminum panels. The acoustic insulation used shall meet UL 94 HF1 flammability classification. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement. The enclosure shall use external vertical air inlet and outlet hoods with 90 degree angles to discharge air up and reduce noise. The enclosure shall have an integral rodent guard and skid end caps and shall have bracing to meet 241 kph (150 mph) wind loading.
 - b The enclosure components and skid shall be cleaned with a two-stage alkaline cleaning process to remove grease, grit, and grime from parts. Components shall then be subjected to a Zirconium-based conversion coating process to prepare the metal for electrocoat (e-coat) adhesion. All enclosure parts shall receive an 100% epoxy primer electrocoat (e-coat) with high-edge protection. Following the e-coat process, the parts shall be finish coated with powder baked paint for superior finish, durability, and appearance with a Power Armor™ industrial finish that provides heavy duty durability in harsh conditions, and is fade-, scratch- and corrosion-resistant.
 - c The enclosure must surpass a 3,000 hour salt spray corrosion test per ASTM B-1117.
 - d Enclosures will be finished in the manufacturer's standard color.
 - e The enclosures shall allow the generator set to operate at full load in an ambient temperature of 50°C with no additional derating of the electrical output of the generator set.
 - f Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set,

an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.

- g Doors shall be fitted with hinges, hardware, and the doors shall be removable.
- h Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.
- i A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.
- j The complete exhaust system shall be internal to the enclosure.
- k The critical silencer shall be fitted with a tailpipe and rain cap.

G Controller

1. APM402 Generator Set Controller
 - a. The generator set controller shall be a microprocessor based control system that will provide automatic starting, system monitoring, and protection. The controller system shall also provide local monitoring and remote monitoring. The control system shall be capable of PC based updating of all necessary parameters, firmware, and software.
 - b. The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.
2. Codes and Standards
 - a. The generator set controller shall meet NFPA 110 Level 1 requirements and shall include an integral alarm horn as required by NFPA.
 - b. The controller shall meet NFPA 99 and NEC requirements.
 - c. The controller shall be UL 508 listed.
3. Applicability
 - a. The controller shall be a standard offering in the manufacturer's controller product line.
 - b. The controller shall support 12-volt and 24volt starting systems.
 - c. The controller's environmental specification shall be: -40°C to 70°C operating temperature range and 5-95% humidity, non-condensing.
 - d. The controller shall mount on the generator or remotely within 40 feet with viewable access.
4. Controller Buttons, Display and Components
 - a. The generator set controller shall include the following features and functions:
 1. Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:
 - a. Run Mode: When in the run mode the generator set shall start as directed by the operator.
 - b. Off/Reset Mode: When in the Off/Reset mode the generator set shall stop, the reset shall reset all faults, allowing for the restarting of the generator set after a shutdown.
 - c. Auto Mode: When in Auto the mode the generator set shall be ready to accept a signal from a remote device.
 2. Emergency Stop Switch. The remote stop switch shall be red in color

- with a "mushroom" type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.
3. Push Button/Rotary Selector dial. This dial shall be used for selection of all Menus and sub-menus. Rotating the dial moves you through the menus, pushing the dial selects the menu and function/features in that menu. Pushing the button selects the feature/function and sub-menus.
 4. Digital Display. The digital display shall be alphanumeric, with 2 lines of data and approximately 24 characters. The display shall have back lighting for ease of operator use in high and low light conditions. The display shall display status of all faults and warnings. The display shall also display any engine faults. While the generator set is running, the display shall scroll all-important information across the screen for ease of operator use. The scroll can be stopped by pushing the rotary dial. The display shall fall asleep when the generator set is not running and will wake-up when the generator set starts or the rotary dial is depressed.
 5. Fault Light. The controller shall have an annunciator fault light that glows red for faults and yellow for warnings. These faults and warnings shall be displayed in the digital display. The fault light will also glow yellow when not in AUTO.
 6. Alarm Horn. The controller shall provide an alarm horn that sounds when any faults or warnings are present. The horn shall also sound when the controller is not in the AUTO mode.
 7. Alarm Silence/Lamp Test Button. When this button is depressed, it shall test all controller lamps. This button will also silence the alarm horn when the unit is not AUTO.
 8. USB Connection. The controller shall have a USB connection on the face of the controller. This connection shall allow for updating of all software and firmware. This port shall also allow for all servicing of generator set parameters, fault diagnostics and viewing of all controller information via use a laptop computer.
 9. Dedicated user inputs. The controller shall have dedicated inputs for remote emergency stop switch, remote 2-wire star for transfer switch and auxiliary shutdown.
 10. The controller shall have auto resettable circuit protection integral on the circuit board.
5. System Controller Monitoring and Status Features and Functions
- a. The generator controller shall display and monitor the following engine and alternator functions and allow adjustments of certain parameters at the controller:
 1. Overview menu
 - a. Active shutdowns and warnings shall be displayed if present and without the need of operator interface
 - b. Engine runtime with total hours
 - c. Average line to line voltage
 - d. Coolant temperature
 - e. Fuel level or pressure

- f. Oil pressure
 - g. Battery voltage
 - h. Software version
 - i. Frequency
 - j. Average current
 - 2. Engine metering menu.
 - a. Engine speed
 - b. Oil pressure
 - c. Coolant temperature
 - d. Battery voltage
 - 3. Generator metering menu.
 - a. Total power in VA
 - b. Total power in W
 - c. Rated power % used
 - d. Voltage L-L and L-N for all phases
 - e. Current L1, L2, L3
 - f. Frequency
 - 4. Generator set information.
 - a. Generator set model number
 - b. Generator set serial number
 - c. Controller set number
 - 5. Generator set run time.
 - a. Engine run time total hours
 - b. Engine loaded total hours
 - c. Number of engine starts
 - d. Total energy in kW
 - 6. Generator set system
 - a. System voltage
 - b. System frequency 50/60Hz
 - c. System phase, single/three phase
 - d. Power rating kW
 - e. Amperage rating
 - f. Power type standby/prime
 - g. Measurement units, metric/English units adjustable
 - h. Alarm silence, always or auto only
 - 7. Generator set calibration, the following are adjustable at the controller.
 - a. Voltage L-L and L-N all phases
 - b. Current L1, L2, L3
 - c. Reset all calibrations
 - 8. Voltage regulation, +/-0.5% regulation, the following is adjustable at the controller.
 - a. Voltage Adjustable +/- 10%
 - 9. Digital and Analog Inputs and outputs
 - a. Displays settings and status
 - 10. Event Log
 - a. Stores event history, up to 1000 events
6. Controller Engine control features and functions
- a. Automatic restart - the controller has automatic restart feature that initiates

- the start routine and re-crank after a failed start attempt.
- b. Cyclic cranking - the controller shall have programmable cyclic cranking
 - c. Engine starting aid - the controller shall have the capability of providing control for an optional engine starting aid.
 - d. The control system shall include time delays for engine start and cool down.
 - e. The control system shall interface with the engine ECM and display engine fault codes and warnings. The ECM shall also include sender failure monitoring to help distinguish between failed senders and actual failure conditions.
 - f. The controller shall monitor and display engine governor functions with include steady state and transient frequency monitoring
7. Controller Alternator control features and functions
- a. Integrated hybrid voltage regulator. The system shall have integral microprocessor based voltage regulator system that provides +/- 5% voltage regulation, no-load to full load with three phase sensing. The system is prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum +/- 10% adjustable of nominal voltage.
 - b. AC output voltage regulator adjustment. The system shall allow for adjustment of the integral voltage regulator with maximum of +/- 10% adjustment of the system voltage.
 - c. Alternator thermal overload protection. The system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
 - d. Power metering. The controller digitally displays power metering of kW and kVA.
8. Other control features and functions
- a. Event logging. The controller keeps a record of up to 1000 events, for warning and shutdown faults. This fault information becomes a stored record of systems events and can be reset.
 - b. Historical data logging. The controller total number of generator set successful start shall be recorded and displayed.
 - c. Programmable access. The control system shall include a USB port that gives service technicians the ability to provide software and firmware upgrades. The system shall also be capable of allowing setting of all critical parameters using the service software and a laptop computer. All parameters and setting should be capable to being stored on a laptop for future upgrades of printing for analysis.
9. Generator Set Warning, Shutdown Alarm and Status
- a. The generator set shall have alarms and status indication lamps that show non-automatic status and warning and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:
 1. Engine functions

- a. Critical high fuel level (alarm)
 - b. ECM communication loss (shutdown)
 - c. ECM diagnostics (alarm & shutdown)
 - d. Engine overspeed (shutdown)
 - e. Engine start aid active
 - f. Engine under speed (shutdown)
 - g. Fuel tank leak (alarm & shutdown)
 - h. High DC battery voltage (alarm)
 - i. High coolant temperature (alarm & shutdown)
 - j. High fuel level (alarm)
 - k. Low DC battery voltage (alarm)
 - l. Low coolant level (shutdown)
 - m. Low coolant temperature (alarm)
 - n. Low cranking voltage (alarm)
 - o. Low engine oil level (alarm & shutdown)
 - p. Low fuel level (alarm & shutdown)
 - q. Low fuel pressure (alarm)
 - r. Low oil pressure (alarm & shutdown)
 - s. No coolant temperature signal (shutdown)
 - t. No oil pressure signal (shutdown)
 - u. Overcrank (shutdown)
 - v. Speed sensor fault (alarm)
2. Generator functions
 - a. AC sensing loss over & under current (alarm & shutdown)
 - b. Alternator protection (shutdown)
 - c. Ground fault input (alarm)
 - d. kW overload (shutdown)
 - e. Locked rotor (shutdown)
 - f. Over-frequency (shutdown)
 - g. Over AC voltage (shutdown)
 - h. Under-frequency (shutdown)
 - i. Under AC voltage (shutdown)
 - j. Emergency stop (shutdown)
 3. Other General functions
 - a. Battery charger fault (alarm)
 - b. Common fault (shutdown)
 - c. Common warning (alarm)
 - d. Master switch not in auto (alarm)
 - e. Generator running
 - f. Input/Output fault (alarm)
 4. The generator set controller shall also be capable of meeting all necessary NFPA 110 level 1 requirements that include several of the above along with; EPS supplying load, Master switch "not in auto", and contacts for local and remote common alarm.
10. Communications
 - a. The controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards
 - b. Kohler proprietary RBUS communication shall be available.

- c. A RBUS shall be able to monitor and alter parameters, and start or stop a generator.
- d. The controller shall have the capability to communicate to a personal computer (IBM or compatible) and appropriate application software
- e. A variety of connections shall be available based on requirements:
 1. A single control connection to a PC via USB
 2. Internet connection via Ethernet
- f. Generator and transfer switch controls shall be equipped with communications modules capable of connecting to the same communication network.

H Generator Overcurrent and Fault Protection

1. The generator shall be provided with a factory installed, 80% rated line circuit breaker rated at 600.00 amperes that is UL489 listed. Line circuit breakers shall be sized for the rated ampacity of the loads served by the breaker per the NEC.
2. The circuit breaker(s) shall incorporate a electronic trip unit.
3. Load side lugs shall be provided from the factory. Load side breaker connections made at the factory shall be separated from field connections.
4. When GFI is required per the NEC, additional neutrals shall be factory installed, and the alarm indication shall be integrated with the other generator-set alarms.
5. Barriers to provide segregation of wiring from an emergency source to emergency loads from all other wiring and equipment, if required by the NEC, shall be provided.

I Alternator

1. The alternator shall be salient-pole, brushless, 2/3-pitch, with 4 bus bar provision for external connections, self-ventilated, with drip-proof construction and amortisseur rotor windings, and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a vacuum pressure impregnated, fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to 130°C Standby. The PMG based excitation system shall be of brushless construction controlled by a digital, three phase sensing, solid- state, voltage regulator. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.
2. The alternator shall have a maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
3. The generator shall be inherently capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.
4. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 440 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components

affecting total voltage dip, i.e., engine, alternator, voltage regulator, and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

J Vibration Isolation

1. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.2 Accessories

1. The generator set shall be supplied with a 6-ampere automatic float/equalize battery charger capable of charging both lead-acid and gel-cell type batteries, with the following features:
 - a. Automatic 3-stage float to equalization charge
 - b. 1% steady-state voltage regulation from no load to full load over 10% AC input line voltage variation
 - c. Indicator LED lamps for charge state indication (bulk charge/absorption/float)
 - d. Ambient temperature operating range: -40°C to 70°C
 - e. Potting for durability and waterproofing
 - f. Short-circuit and reverse polarity protection
 - g. UL 1236 listed
 - h. UL 2200 compliant
 - i. CSA certified
 - j. Ring terminals for battery connection.
2. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.
3. The generator set shall be furnished with rodent guards to prevent rodent intrusion and protect internal components.
4. The air cleaner restriction indicator shall indicate the need for maintenance of the air cleaners.
5. The generator shall be furnished with an externally mounted, recessed, emergency stop switch (break glass, pushbutton style) protected from accidental operation.
6. The generator set shall be provided with a run relay which shall provide a three-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The run relay dry contacts can be used for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)
7. The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows and includes the flex exhaust tube and the mounting hardware.
8. Supply flexible fuel lines to provide a flexible connection between the engine fuel fittings and the fuel supply tank piping and for the fuel return lines from the injector pump per engine manufacturer's recommendations. Flex line shall have a protective steel wire braid to protect the hose from abrasion.
9. Block Heater - The block heater shall be thermostatically controlled, 1,800 watt, 110-120 VAC - single phase, with isolating valves, to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.
10. Remote annunciator panel Single ATS – The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. Panel shall provide ATS source availability, contactor position, and loaded or unloaded test for one transfer switch. The panel shall have the capability to be either flush-mounted or surface-mounted. The annunciator shall meet UL508 requirements.

2.3 Source Quality Control

A. Non-Conforming Work

1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
 - a. **Design Prototype Tests.** Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:
 - i. Maximum power (kW)
 - ii. Maximum motor starting (kVA) at 35% instantaneous voltage dip.
 - iii. Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
 - iv. Governor speed regulation under steady-state and transient conditions.
 - v. Voltage regulation and generator transient response.
 - vi. Harmonic analysis, voltage waveform deviation, and telephone influence factor.
 - vii. Three-phase short circuit tests.
 - viii. Alternator cooling air flow.
 - ix. Torsional analysis to verify that the generator set is free of harmful torsional stresses.
 - x. Endurance testing.
 - b. **Final Production Tests.** Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
 - i. Single-step load pickup
 - ii. Safety shutdown device testing
 - iii. Rated Power @ 0.8 PF
 - iv. Maximum power
 - v. Upon request, a witness test, or a certified test record sent prior to shipment.
 - c. **Site Tests.** The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
 - i. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
 - ii. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
 - iii. Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.

- iv. Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.
- v. NFPA 110 Testing. The test shall consist of 2 hours of continuous operation at 100% load using a portable resistive load bank and 1.5 hours of building load. Furnish the portable load bank, all connecting cables, metering equipment, and other equipment or devices required to perform the on-site testing. During the test, readings shall be taken every 15 minutes showing % load, voltage, amps, oil pressure, water temperature, and battery charge.

END OF SECTION

SECTION 26 32 23
AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.1 Summary

- A This section includes the following items from a single supplier:
 - 1. Automatic transfer switch
 - 2. Related Accessories as specified

- B Related Requirements
 - 1. It is the intent of this specification to secure an automatic transfer switch that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
 - 2. Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been omitted or have been taken exception to, and a complete description of all deviations.
 - 3. It is the intent of this specification to secure an automatic transfer switch that has been tested during design verification, in production, and at the final job site. The automatic transfer switch will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
 - 4. All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

1.2 Submittals

- A Action Submittals
 - 1. Product Data
 - a The submittal shall include specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

- B Closeout Submittals
 - 1. Operation And Maintenance Data
 - 2. Warranty Documentation

1.3 Quality Assurance

A Regulatory Agency

1. The automatic transfer switch shall conform to the requirements of the following codes and standards:
 - a UL 1008 - Standard for Transfer Switch Equipment
 - b IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 - c NFPA 70 - National Electrical Code
 - d NFPA 99 - Essential Electrical Systems for Health Care Facilities
 - e NFPA 110 - Emergency and Standby Power Systems
 - f IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 - g NEMA Standard ICS 10-2005, Electromechanical AC Transfer Switch Equipment.
 - h EN61000-4-4 Fast Transient Immunity Severity Level 4
 - i EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)
 - j IEEE 472 (ANSI C37.90A) Ring Wave Test
 - k IEC Specifications for EMI/EMC Immunity (CISPR 11, IEC 1000-4-2, IEC 1000-4-3, IEC 1000-4-4, IEC 1000-4-5, IEC 1000-4-6, IEC 1000-4-8, IEC 1000-4-11)
 - l CSA C22.2 No. 178 certification
2. Qualifications
 - a The automatic transfer switch shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
 - b A manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year shall produce the automatic transfer switch.
3. Manufacturers
 - a The automatic transfer switch shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
 - b The manufacturer shall maintain a national service organization of employing personnel located throughout the contiguous United States. The Service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
 - c The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

1.4 Warranty or Bond

A Manufacturer's Warranty

1. The ATS shall include a standard warranty covering one (1) year to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup.

2. The ATS manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

PART 2 PRODUCTS

2.1 Equipment

A Equipment

1. Furnish and install an automatic transfer switches system(s) with 2-Pole/ 3-Wire, Solid Neutral, 1000 Amps, 240V/60Hz. Each automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

B Manufacturer

1. Automatic transfer switches shall be Kohler Specific Breaker Rated - Standard Transition KSS-AFTA-1000S. Any alternate shall be submitted for approval to the consulting engineer at least 10 days prior to bid date. Alternate bids shall include a line-by-line clarification of the specification marked with "D" for deviation; "E" for exception, and "C" for comply.

C Construction

1. The transfer switch shall be electrically operated and mechanically held with double throw construction, and operated by a momentarily energized solenoid-driven mechanism.
2. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
3. The switch shall be positively locked and unaffected by momentarily outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
4. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.
5. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 800 amperes and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
6. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
7. For two and three pole switches, where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

8. For four pole switches with a switching neutral, where neutral conductors must be switched as shown on the plans, the contactor shall be provided with fully rated switched neutral transfer contacts. Overlapping neutral contacts may be used as an alternative.

D Enclosure

1. The ATS shall be furnished in a NEMA 1 enclosure.
2. All standard door mounted switches and indicating LEDs shall be integrated into a flush-mounted, interface membrane or equivalent in the enclosure door for easy viewing & replacement. The panel shall be capable of having a manual locking feature to allow the user to lockout all membrane mounted control switches to prevent unauthorized tampering. This cover shall be mounted with hinges and have a latch that may be padlocked. The membrane panel shall be suitable for mounting by others when furnished on open type units.

2.2 Operation

A Controls

1. A four line, 20 character LCD display and dynamic 4 button keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and control through the communications interface port or USB. The following parameters shall only be adjustable via a password protected programming on the controller:
 - a Nominal line voltage and frequency
 - b Single or three phase sensing
 - c Operating parameter protection
 - d Transfer operating mode configuration (Standard transition, Programmed transition, or Closed transition)

B Voltage and Frequency

1. Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored. Voltage on both normal and emergency sources and frequency on the emergency sources shall be adjustable with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

a	Parameter	Dropout/Trip	Pickup/Reset
b	Under voltage	75 to 98%	85 to 100%
c	Over voltage	06 to 135%	95 to 100% of trip
d	Under frequency	95 to 99%	80 to 95%
e	Over frequency	01 to 115%	105 to 120%
f	Voltage unbalance	5 to 20%	3 to 18%
2. Repetitive accuracy of all settings shall be within $\pm 0.5\%$ over an operating temperature range of -20°C to 70°C .
3. An adjustable dropout time for transient voltage and frequency excursions shall be provided. The time delays shall be 0.1 to 9.9 seconds for voltage and .1 to 15 seconds for frequency.
4. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad, remotely via the communications interface port or USB.
5. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall

be indicated on the LCD; the service required LED and the annunciation through the communication protocol and dry contacts. In addition, the phase rotation sensing shall be capable of being disabled, if required.

6. The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition is a loss of phase and shall be considered a failed source.
7. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.

C Time Delays

1. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 12 or 24 VDC power supply.
2. A time delay shall be provided on transfer to the emergency source, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
3. A time delay shall be provided on re-transfer to normal. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
4. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
5. A time delay activated output signal shall also be provided to drive external relay(s) for selective load disconnect and reconnect control. The controller shall be capable of controlling a maximum of 9 individual output time delays to step loads on after a transfer occurs. Each output may be individually programmed for their own time delay of up to 60 minutes. Each sequence shall be independently programmed for transferring from normal to emergency and transferring from emergency to normal.
6. All time delays shall be adjustable in 1 second increments.
7. All time delays shall be adjustable by using the display and keypad, with a remote device connected to the communications interface port or USB.
8. Each time delay shall be identified and a dynamic countdown shall be shown on the display. Active time delays can be viewed with a remote device connected to the communications interface port or USB.

D Additional Features

1. The controller shall have 3 levels of security. Level 1 shall allow monitoring of settings and parameters only. The Level 1 shall be capable of restricted with the use of a lockable cover. Level 2 shall allow test functions to be performed and Level 3 shall allow setting of all parameters.
2. The display shall provide for the test functions, allowed through password security. The test function shall be load, no load or auto test. The auto test function shall request an elapsed time for test. At the completion of this time delay the test shall be automatically ended and a retransfer sequence shall commence. All loaded tests shall be immediately ended and retransfer shall occur if the emergency source fails and the normal source is acceptable.
3. A contact closure shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper

- output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
4. Auxiliary contacts shall be provided consisting of a minimum of two contacts, closed when the ATS is connected to the normal source and two contacts closed, when the ATS is connected to the emergency source.
 5. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
 6. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency sources (red), as determined by the voltage, frequency and phase rotation sensing trip and reset settings for each source.
 7. A membrane switch shall be provided on the membrane panel to test all indicating lights and display when pressed.
 8. Provide the ability to select "commit/no commit to transfer" to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
 9. Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which closes to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad, communications interface port or USB. A "not-in-auto" LED shall indicate anytime the controller is inhibiting transfer from occurring.
 10. An in-phase monitor shall be a standard feature in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The in-phase monitor shall be specifically designed for and be the product of the ATS manufacturer. The in-phase monitor shall be capable of being enabled or disabled from the user interface, communications interface port or USB.
 11. A time based load control feature shall be available to allow the prioritized addition and removal of loads based during transfer. This feature may be enabled for either or both sources. The user shall be able to control up to nine loads with independent timing sequences for pre and post transfer delays in either direction of transfer.
 12. The controller shall provide 2 inputs for external controls that can be programmed from the following values:
 - a Common fault, Remote test, Inhibit transfer, Low battery voltage, Peak shave, Time delay bypass, Load shed forced to OFF position (Programmed transition only)
 13. The controller shall provide two form "C" contact outputs rated for up to 12A @ 240VAC or 2A @ 480VAC that can be programmed from the following values:
 - a Aux switch open, Transfer switch aux contact fault, Alarm silenced, Alarm active, I/O communication loss, Contactor position, Exercise active, Test mode active, Fail to transfer, Fail to acquire standby source, Source available, Phase rotation error, Not in automatic mode, Common alarm, In phase monitor sync, Load bank control active, Load control active, Maintenance mode active, Non-emergency transfer, Fail to open/close, Loss of phase, Over/under voltage, Over/under frequency, Voltage unbalance, Start signal, Peak shave active, Preferred source supplying load, Standby source supplying load
 14. The controller shall be capable of expanding the number of inputs and outputs with additional modules.

15. Optional input/output modules shall be furnished which mount on the inside of the enclosure to facilitate ease of connections.
16. Engine Exerciser - The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to 21 different exercise routines based on a calendar mode. For each routine, the user shall be able to:
 - a Enable or disable the routine
 - b Enable or disable transfer of the load during routine.
 - c Set the start time, time of day, day of week, week of month (1st, 2nd, 3rd, 4th, alternate or every)
 - d Set the duration of the run.
 - e At the end of the specified loaded exercise duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. All loaded exercises shall be immediately ended and retransfer shall occur if the standby source fails. The next exercise period shall be displayed on the main screen with the type of exercise, time and date. The type of exercise and the time remaining shall be display when the exercise is active. It shall be possible of ending the exercise event with a single button push.
17. Date and time - The date shall automatically adjust for leap year and the time shall have the capability of automatically adjusting for daylight saving and standard times.
18. System Status - The controller shall have a default display the following on:
 - a System status
 - b Date, time and type of the next exercise event
 - c Average voltage of the preferred and standby sources
 - d Scrolling through the displays shall indicate the following:
 - i) Line to line and line to neutral voltages for both sources
 - ii) Frequency of each source
 - iii) Load current for each phase
 - iv) Single or three phase operation
 - v) Type of transition
 - vi) Preferred source
 - vii) Commit or no commit modes of operation
 - viii) Source/source mode
 - ix) In phase monitor enable/disable
 - x) Phase rotation
 - xi) Date and time
19. Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible.
20. Self-Diagnostics - The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
21. Communications Interface - The controller shall be capable of interfacing, through a standard communications with a network of transfer switches and generators. It shall be able to be connected via an RS-485 serial communication (up to 4000 ft. direct connect or multi-drop configuration). This module shall allow for seamless integration of existing or new communication transfer devices and generators.

22. The transfer switch shall also be able to interface to 3rd party applications using Modbus RTU open standard protocols utilizing Modbus register maps. Proprietary protocols shall not be acceptable.
23. The controller shall contain a USB port for use with a software diagnostic application available to factory authorized personnel for downloading the controller's parameters and settings; exercise event schedules; maintenance records and event history. The application can also adjust parameters on the controller.
24. Data Logging - The controller shall have the ability to log data and to maintain the last 2000 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory. The controller shall be able to display up to the last 99 events. The remaining events shall be accessible via the communications interface port or USB.
 - a Event Logging
 - i) Data, date and time indication of any event
 - b Statistical Data
 - i) Total number of transfers*
 - ii) Total number of fail to transfers*
 - iii) Total number of transfers due to preferred source failure*
 - iv) Total number of minutes of operation*
 - v) Total number of minutes in the standby source*
 - vi) Total number of minutes not in the preferred source*
 - vii) Normal to emergency transfer time
 - viii) Emergency to normal transfer time
 - ix) System start date
 - x) Last maintenance date
 - xi) * The statistical data shall be held in two registers. One register shall contain data since start up and the second register shall contain data from the last maintenance reset.
25. External DC Power Supply - An optional provision shall be available to connect up to two external 12/24 VDC power supply to allow the LCD and the door mounted control indicators to remain functional when both power sources are dead for extended periods of time. This module shall contain reverse battery connection indication and circuit protection.

2.3 Accessories

- A. Controller Disconnect Switch. A Logic disconnect switch shall be mounted inside the enclosure, and shall disconnect power to controller without disconnecting the load. The logic disconnect switch shall disconnect utility power to the controller during maintenance and service without disconnecting power to the load. The switch has two positions, auto and disconnect. The disconnect position shall disconnect the voltage sensing leads for the utility source (A, B, C, N). It is assumed that the user shall disable the generator by placing the controller in the OFF position.
- B. Surge Protection Device (SPD). A SPD shall be provided for protection of the normal source supply. The SPD shall be provided with replaceable cartridges to allow replacement of components without disconnecting the normal source supply. A 90dB audible alarm shall be provided as standard. A terminal block for remote contacts shall be provided. The SPD shall provide L-L, L-N, L-G, and N-G lines protection. LED status indicators shall be available on the

face of the device to indicate operational state. The SPD device shall be listed to UL 1449, Edition 3.

- C. Line to Neutral Monitoring. Line-to-neutral voltage monitoring shall allow the display of the AN, BN, and CN RMS voltages in the normal operation menus.

2.4 Source Quality Control

A Test and Inspection

1. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.
2. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

END OF SECTION