



S P E C I F I C A T I O N S

GATES COUNTY HIGH SCHOOL SCIENCE CLASSROOM ALTERATIONS

GATES COUNTY SCHOOLS

GATESVILLE, NORTH CAROLINA

P I N N A C L E A R C H I T E C T U R E , P . A .

PO BOX 187,
(630 TEAM ROAD, SUITE 200)
MATTHEWS, NC 28106-0187 (28105)

CIGAR FACTORY BUILDING
701 EAST BAY STREET, SUITE 302
CHARLESTON, SC 29403

**TABLE OF CONTENTS –
for
Gates County High School – Science Classroom Alterations
Gatesville, North Carolina**

Section	Description	Pages
<u>Division 00</u>		
00 01 10	Table of Contents	1-3
00 62 76.13	County Sales Use Tax	1-2
00 65 01	Contractor's Affidavit & Waiver of Lien	-1-
00 65 02	Subcontractor's Release & Waiver	-1-
00 65 03	Status of Liens Affidavit	-1-
00 65 04	General Guarantee	-1-
00 65 05	Roofing and Sheet Metal Guarantee	-1-
00 65 06	Watertightness Guarantee	-1-
00 65 07	Landscape Plants and/or Grass Guarantee	1-2
00 72 00	General Conditions of the Contract	1-6
00 73 00	Supplementary General Conditions of the Contract	1-14
<u>Division 01</u>		
01 10 00	Project Summary	-1-
01 21 00	Allowances	-1-
01 22 00	Unit Prices	1-2
01 25 00	Substitution Procedures	1-3
01 26 13	Request for Information	-1-
01 31 19	Project Meetings	1-2
01 32 16	Schedules and Reports	1-2
01 33 00	Shop Drawings and Submittals	1-3
01 50 00	Temporary Facilities	1-2
01 60 00	Product Requirements	1-2
01 70 00	Project Closeout	1-2
<u>Division 02</u>		
02 41 00	Demolition	1-4
02 41 19	Selective Demolition	1-3
<u>Division 03</u>		
03 00 00	Concrete Work	1-13
03 10 00	Concrete Forms and Accessories	1-3
03 20 00	Concrete Reinforcement	1-4
03 30 53	Concrete Finishes	1-4
<u>Division 05</u>		
05 41 00	Light Gauge Metal Framing	1-2
05 50 00	Miscellaneous Metals	1-5
05 50 50	Hollow Metal Entrances	1-2
<u>Division 06</u>		
06 05 73	Wood Treatment	-1-
06 10 00	Rough Carpentry	1-6
06 20 00	Finish Carpentry	1-2
06 41 00	Cabinetwork/Millwork	1-3

Division 07

07 90 00 Caulking & Sealants 1-2

Division 08

08 11 10 Metal Doors and Frames 1-3
08 14 00 Wood Doors 1-3
08 30 00 Specialty Doors & Shutters 1-2
08 41 13 Aluminum Windows & Storefronts 1-2
08 71 00 Finish Hardware 1-8
08 71 30 Weatherstripping -1-
08 80 00 Glass and Glazing 1-3

Division 09

09 21 00 Gypsum Drywall 1-3
09 51 00 Suspended Acoustical Ceiling 1-3
09 65 00 Resilient Flooring 1-3
09 90 00 Painting 1-8

Division 10

10 11 16.23 Markerboards & Tackboards -1-
10 14 00 Identifying Devices 1-2
10 44 13 Fire Extinguishers and Cabinets -1-

Division 12

12 21 13 Window Treatment (Horizontal Blinds) 1-4

Division 22

22 05 00 Plumbing General Provisions 1-16
22 05 01 Basic Materials and Methods 1-4
22 07 00 Insulation(Plumbing) 1-3
22 11 16 Domestic Water Supply Piping 1-2
22 13 00 Soil, Waste, Vent and Drain Piping 1-2
22 13 13 Acid Waste & Vent System 1-3
22 40 00 Plumbing Fixtures and Equipment 1-3

Division 23

23 05 00 Mechanical General Provisions 1-17
23 05 93 Testing, Adjusting and Balancing 1-2
23 07 00 Insulation (Mechanical) 1-4
23 20 00 HVAC Piping 1-2
23 30 00 Air Distribution 1-6
23 34 00 Fans 1-2
23 81 19 Vertical Self-Contained Heat Pump 1-5
23 81 26 Split System Air Conditioning Unit (Ductless) 1-2
23 81 43 Split System Heat Pump 1-2

Division 26

26 00 00 Electrical General Requirements 1-4
26 00 10 Electrical Testing 1-2
26 00 20 Equipment Connections -1-
26 04 10 Cable Tray -1-
26 05 19 Conductors 1-3

26 05 26	Grounding and Bonding	1-2
26 05 33	Raceways and Fittings	1-5
26 05 34	Outlet and Junction Boxes	1-2
26 22 00	Dry Type Transformers	1-2
26 24 13	Switchboards	1-3
26 24 16	Panelboards	1-4
26 27 26	Wiring Devices	1-2
26 27 30	Fastening and Supports	-1-
26 28 16	Disconnect Switches	-1-
26 32 13	Emergency Standby Power Generator System-Diesel	1-8
26 51 00	Lighting Fixtures	1-2
<u>Division 27</u>		
27 00 50	Intercom System	1-21
<u>Division 28</u>		
28 31 11	Addressable Analog Fire Alarm System	1-4

STATE OF NORTH CAROLINA
COUNTY SALES AND USE TAX REPORT
SUMMARY TOTALS AND CERTIFICATION

CONTRACTOR: _____

Page 1 of _____

PROJECT: _____

FOR PERIOD: _____

	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL ALL COUNTIES
CONTRACTOR							
SUBCONTRACTOR(S)*							
COUNTY TOTAL							

* Attach subcontractor(s) report(s)

** Must balance with Detail Sheet(s)

I certify that the above figures do not include any tax paid on supplies, tools and equipment which were used to perform this contract and only includes those building materials, supplies, fixtures and equipment which actually became a part of or annexed to the building or structure. I certify that, to the best of my knowledge, the information provided here is true, correct, and complete.

Sworn to and subscribed before me,

This the _____ day of _____, 20____

Signed

Notary Public

My Commission Expires: _____

Print or Type Name of Above

Seal

NOTE:

This certified statement may be subject to audit.

STATE OF NORTH CAROLINA SALES AND USE TAX REPORT DETAIL

CONTRACTOR: _____

Page 2 of

SUBCONTRACTOR _____

FOR PERIOD: _____

PROJECT: _____

PURCHASE DATE	VENDOR NAME	INVOICE NUMBER	TYPE OF PROPERTY	INVOICE TOTAL	COUNTY TAX PAID	COUNTY OF SALE *
				\$	\$	
				TOTAL:	\$	

* If this is an out-of-state vendor, the County of Sale should be the county to which the merchandise was shipped.

DIVISION 00

PA Form 1

AFFIDAVIT AND WAIVER OF LIEN
PRIME CONTRACTOR

STATE OF _____

COUNTY OF _____

Personally appeared before me, the undersigned Notary Public for said County and State
_____ (Name of Individual), _____
(Title) of _____ (Prime Contractor), who being duly sworn by me
states on oath that all product suppliers and Subcontractors, payrolls, sales tax, privilege tax or
license, old age benefits tax, state and federal unemployment insurance, and other liabilities
incurred in the performance of _____ (Type of Contract) Contract
for the construction of improvements at _____ (Name of Project),
have been paid in full and that the above named Prime Contractor waives any claims and
releases _____ (Owner) from any rights or claims (including lien
rights) for debts due and owing by virtue of the furnishing of any labor, products, and supplies
furnished for such improvements.

The above named Prime Contractor agrees to indemnify the Owner and save him harmless on
account of any loss he may sustain in reliance upon this Affidavit and Waiver of Lien including the
amount of any lien he may be compelled to pay all costs relating thereto and a reasonable
attorney's fee.

(Prime Contractor)

By: _____

Title: _____

Date: _____

Sworn to and subscribed before me

this _____ day of _____, 20____

Notary Public

My Commission Expires: _____

DIVISION 00

PA Form 2

**RELEASE AND WAIVER OF CLAIMS BY
SUBCONTRACTORS AND PRODUCT VENDORS**

STATE OF _____

COUNTY OF _____

Personally appeared before me the undersigned authority in and for said County and State
_____ (Name of Individual), _____

(Title) of _____ (Company), who, being duly sworn by me states

on oath that all bills for labor and products, sales tax, privilege tax or license, old age benefits
tax, state and federal unemployment insurance and other liabilities have been paid in full, or that
funds are in hand to discharge such liabilities when due, incurred in the performance of its
Subcontract for furnishing labor or products in the construction of improvement at

_____ (Name of Project), _____

(Location), upon receipt of check in the amount of \$ _____, the undersigned company
waives any claims and releases _____ (Owner) and

_____ (Contractor) from any rights or claims for debts due
and owing by virtue of the furnishing of any labor or products and any lien therefore.

By: _____

Title: _____

Date: _____

Sworn to and subscribed before me

this _____ day of _____, 20____

Notary Public

My Commission Expires: _____

DIVISION 00

PA Form 3

**CONTRACTOR'S AFFIDAVIT
AS TO STATUS OF LIENS**

STATE OF _____

COUNTY OF _____

Personally appeared before me, the undersigned Notary Public for said County and State,
_____ (Name of Individual),
_____ (Title) of _____ (Prime Contractor), who being duly sworn by me states on oath that to the best of his knowledge and belief, except as listed below, the Releases and Waivers of Claim attached hereto include all Subcontractors and all suppliers of labor, products, and equipment provided by all persons who may have liens against the property of _____ (Owner), located at _____ (Location of Project), arising out of the construction of improvements thereon.

Exceptions: (If none, write "NONE." Any exception listed shall be bonded by the Contractor to indemnify the Owner, and a copy of each such bond shall be attached hereto.)

- 1.
- 2.
- 3.

(Name of Company)

By: _____

Title: _____

Date: _____

Sworn to and subscribed before me

this _____ day of _____, 20____

Notary Public

My Commission Expires: _____

DIVISION 00

PA Form 4

Date _____
(Date Project Accepted by Owner)

GENERAL GUARANTEE

_____ (Name of Contractor) guarantees all products and workmanship incorporated in the _____ (Name of Project), _____ (Location), against defect due to faulty products or faulty workmanship or negligence for a period of (12) twelve months for the General Guarantee and a period of (24) twenty four months for incidental building watertightness not covered by specific Sections of the Project Manual as set forth in the General Conditions and the Supplementary Conditions or for such longer periods as may be designated by specific Sections of the Project Manual.

He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any and all work necessary to return the building to a watertight condition. He shall also, at his own expense, repair or replace any other damaged products, finishes, and furnishings, damaged as a result of this water penetration, to return the building to its original condition.

This guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage, damage caused by acts of God, or other casualty.

(Contractor)

By: _____

Title: _____

Date: _____

Sworn to and subscribed before me

this _____ day of _____, 20____

Notary Public

My Commission Expires: _____

DIVISION 00

PA Form 5

Date: _____
(Date Project Accepted by Owner)

ROOFING AND SHEET METAL GUARANTEE

Notwithstanding and in addition to the roofing products manufacturer's guarantee, _____ (Name of Roofing Contractor/Subcontractor) guarantees all products and workmanship incorporated in the _____ (Name of Project), _____ (Location), against defects due to faulty products, negligence, and poor and/or faulty workmanship for a period of 24 months as set forth in the General Conditions, Supplementary Conditions, Roofing Specification Section _____, and Sheet Metal Flashing and Trim Specification Section _____.

Notwithstanding and in addition to the roofing products manufacturer's guarantee, blisters, buckles, curled edges, fish mouths, splits, wrinkles, damaged insulation, damaged vapor retarder loose flashings, deteriorating flashings, deteriorating flashing caulking, etc., shall be considered as evidence of poor and/or faulty workmanship and products and shall be repaired when discovered during the annual roof inspections of this guarantee. This guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage and damage caused by acts of God or other casualty.

As a condition of this guarantee, the Contractor and the Roofing Contractor/Subcontractor agree to make 2 annual roofing system inspections, in the presence of the Owner, prior to the expiration of the 2-year guarantee period.

The Owner will call for the date and time for the annual inspections at the end of the first year and at the end of the second year.

He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any and all work necessary to return the building to a watertight condition. He shall also, at his own expense, repair or replace any other damaged products, finishes, and furnishings, damaged as a result of this water penetration, to return the building to its original condition.

(Roofing Contractor/Subcontractor)

By: _____

Title: _____

Date: _____

Sworn to and subscribed before me

this ____ day of _____, 20____

Notary Public

My Commission Expires: _____

(Contractor)

By: _____

Title: _____

Date: _____

Sworn to and subscribed before me

this ____ day of _____, 20____

Notary Public

My Commission Expires: _____

DIVISION 00

SECTION 00 65 06: WATERTIGHTNESS GUARANTEE

PA Form 6

Date _____
(Date Project Accepted by Owner)

WATERTIGHTNESS GUARANTEE

(Does *not* include **Roofing and Sheet Metal Guarantee** if applicable to Project)

_____ (Name of Subcontractor/Manufacturer) guarantees all products and workmanship incorporated in the _____ (Name of Project), _____ (Location), against defect due to faulty products or faulty workmanship or negligence for a period of (60) sixty months for watertightness guarantee covering work in Section _____ as set forth in the General Conditions and Supplementary Conditions or for such longer periods as may be designated by specific Sections or of the Supplemental Sheets of these Specifications.

He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any and all work necessary to return the building to a watertight condition. He shall also, at his own expense, repair or replace any other damaged products, finishes, and furnishings, damaged as a result of this water penetration, to return the building to its original condition.

This guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage, damage caused by acts of God or other casualty.

(Subcontractor of Manufacturer)

By: _____

Title: _____

Date: _____

(Contractor)

By: _____

Title: _____

Date: _____

Check the following as applicable:

☐ Subcontractor ☐ Manufacturer

Sworn to and subscribed before me

this _____ day of _____, 20____

Notary Public

My Commission Expires: _____

Sworn to and subscribed before me

this _____ day of _____, 20____

Notary Public

My Commission Expires: _____

DIVISION 00

SECTION 00 65 07: LANDSCAPE PLANTS AND/OR GRASS GUARANTEE

PA Form 7

Date _____
(Date Project Accepted by Owner)

LANDSCAPE PLANTS AND/OR GRASS GUARANTEE

_____ (Name of Contractor) guarantees all products and workmanship incorporated in the _____ (Name of Project), _____ (Location), against defect due to faulty products or faulty workmanship or negligence for a period of (1) one 12 month cycle which will include (1) one full growing season for plants and (1) one full year for grass for the general guarantee for plants and/or permanent grass furnished and planted for this Project as is required by the specific Sections of the Specifications.

He shall, immediately upon notification by the Owner of an apparent defect in the condition of any plant and/or grass area, determine the extent and degree of the defect and, at his own expense, do any and all work necessary, including furnishing and planting new plants and/or grass, to correct the defect. He shall also, at his own expense, repair or replace any other damaged work, finishes, and other construction damage as a result of any defect to return the landscaping to its original finished condition.

All plants shall be guaranteed to live through (1) one full growing season, March 1 to October 31. If plants are planted after March 30, the growing season guarantee shall start on March 1 of the next year. If plants are found to be dead, dying, or of poor appearance at any time during this period, they shall be removed and replaced with new plants at no additional cost. Any plant that dies, or is in an unhealthy condition prior to acceptance, shall be replanted and this replacement shall not be considered as a guarantee replacement. All replacements shall be made with plants of the same kind, in the same manner as specified for original planting, at no additional cost. All plants including replacement plants, that have been found to be dead, dying, or of poor appearance shall be immediately removed and the Owner notified. Replacement of trees and large shrubs shall be made at the beginning of the next planting season and shall be guaranteed for its full growing season. Replacement of small shrubs and ground covers shall be made within 30 days following the inspection that determined the required replacement. The Owner shall be

notified prior to all replacement work. The Contractor shall guarantee for (1) one full year a live and vigorous stand of permanent grass at the time of acceptance of the work consisting of:

- (A) 80 percent minimum live coverage for seeded grass with no bare spots greater than 3 square feet spaced no closer than 10', the total of which shall not exceed 20 percent of the grassed area, or
- (B) 3 live sprigs each square foot for sprigged grass, or
- (C) 100 percent live coverage for sodded grass, as applicable.

This guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage, damage caused by acts of God, or other casualty.

(Landscape Contractor/Subcontractor)

By: _____

Title: _____

Date: _____

(Contractor)

By: _____

Title: _____

Date: _____

Sworn to and subscribed before me

this ____ day of _____, 20____

My Commission Expires: _____

Sworn to and subscribed before me

this ____ day of _____, 20 ____

My Commission Expires: _____

DIVISION 00

SECTION 00 72 00: GENERAL CONDITIONS OF THE CONTRACT

A. DEFINITIONS

1. The Contract Documents consist of the Construction Agreement, Instructions to Bidders, General Conditions of the Contract, the Contract Documents and the accepted proposal.
2. The AIA® Document A201™-2007 General Conditions will be considered a part of these Contract Documents. A copy of AIA® Document A201™-2007 is herein attached or if not attached may be obtained by writing AIA Headquarters, 1735 New York Avenue, Washington, DC 20006-5292 or may be examined at the Architects office.
3. The Owner and the Contractor are those mentioned as such in the Construction Agreement.
4. The Architect is:

**Pinnacle Architecture, P.A.
PO Box 187, (630 Team Road, Suite 200)
Matthews, North Carolina, 28106 (28105)
Telephone: 704/847-9851 FAX: 704/847-9853**
5. The term "Work" of the Contractor or any of his Subcontractors includes labor, materials or both.

B. CORRELATION AND INTENT OF THE DOCUMENTS

1. The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. The intention of the documents is to include all labor, materials, equipment, and transportation necessary for the proper execution of the work. It is not intended, however, that materials or work not covered by or properly inferable from the heading, branch, class or trade of the specifications shall be supplied unless distinctly so noted on the drawings. Materials or work described in words which so applied have a well-known technical meaning or trade meaning shall be held to refer to such recognized standards.
2. The Specifications are intended to be typical and complete with only the applicable items of material used. However, the items of material as required by the drawings are not limited to those noted in the specifications.
3. Bidders are required to carefully examine SECTION 00 91 13: SUPPLEMENTAL SHEETS. Note all deletions, additions and corrections made to the specifications.
4. Manufacturer's names and brands are mentioned in the sections of the Specifications, which follow in order to establish the type, quality, and dimensions for any one product. For items specified "or equal", the Contractor may use a product or brand other than that specified, but must submit to the Architect the data and/or samples of the proposed products and brands to be used, along with

samples of the product specified for comparison. If considered to be an equal to that specified in the opinion of the Architect, it will be approved in writing. No substitutions will be permitted without the written approval of the Architect.

5. All "or equal" approvals shall be obtained before bidding. Such approvals during construction will be extremely difficult to obtain.
6. Where dimensions are given on the drawings, said dimensions are to be followed in preference to measurements obtained by scale. Where no dimension is given, Architect is to be contacted for interpretation.

C. THE ARCHITECT'S STATUS

1. The Architect is the interpreter of the Contract Documents. The Architect is the agent of the Owner, only to the extent provided for in the Contract Documents, and when, in special instances, he is authorized by the Owner to so act; and in such instances, he shall, upon request, show the Contractor written authority.

D. PRIME CONTRACTORS

1. All Prime Contractors and their sub-contractors shall cooperate in the execution of the work and shall plan their work in such manner as to avoid conflicting schedules or delay of the work.
2. If any part of a Prime Contractor's work depends upon the work of another contractor, defects which may affect that work shall be reported to the Architect in order that prompt inspection may be made and the defects corrected. Commencement of work by a Contractor where such condition exists will constitute acceptance of the other contractor's work as being satisfactory in all respects to receive the work commenced, except as to defects which may develop. The Architect shall be the judge as to quality of work and shall settle all disputes on the matter between contractors.
3. Any mechanical, electrical or plumbing work such as sleeves, inserts, chases, etc. which is located in the work of the General Contractor shall be built in by the General Contractor under the competent supervision of a qualified representative of such mechanical and/or electrical contractor. The responsibility for the exact location of such items shall be that of the mechanical, electrical, or plumbing contractor.
4. Each Contractor or Subcontractor shall leave all such chases, holes, or openings straight, true, and of the proper size in his own work as may be necessary for the proper installation of another Subcontractor's work, consulting with the Subcontractor concerned regarding proper location and size of same. No excessive cutting will be permitted nor shall any piers or other structural members be cut without the consent of the Architect. After such work has been installed, he shall carefully fit around, close up, repair, patch and point up same as directed, to the entire satisfaction of the Architect. All this work shall be done with the proper tools and by careful workmen of the particular trade to which such work belongs, and shall be done without any extra charge to the Owner.

E. SEPARATE CONTRACTS

1. The Owner reserves the right to let other contracts in connection with the work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs.

F. PROJECT EXPEDITER

1. It shall be the responsibility of the General Contractor to schedule the work of all prime contractors; to maintain a progress schedule for all prime contractors for this project; and to notify the designer of any changes in the progress schedule. He shall be responsible for providing adequate notice to all prime contractors to insure efficient continuity of all phases of the project work. The General Contractor will be "Project Expediter."
2. Designation as "Project Expediter" entails an additional project control responsibility and does not alter in any way the responsibilities of the other Prime Contractors.
3. Each other Prime Contractor is held responsible for keeping the "Project Expediter" fully informed as to his work progress, including immediate notification of any work progress changes.
4. It will be the responsibility of each Prime Contractor to initiate and maintain such programs as may be necessary to comply with Section 107 of the Contract Work Hours and Safety Standards Act (86. Stat. 96; 40 U.S.C. 327) commonly known as the Construction Safety Act, as published in Volume 36, Number 75 of the Federal Register dated April 17, 1971, or as amended.

G. CONSTRUCTION SUPERINTENDENT

1. Each Contractor shall keep a thoroughly competent Superintendent on the work during its progress. If observed to be inattentive to the requirements set forth in these documents and/or the work in progress the superintendent may be removed from the project at request of the Architect.

H. PERMITS AND/OR LICENSES

1. The Contractor shall pay for any building permits necessary in connection with the work unless otherwise indicated. The Contractor (each prime contractor) shall obtain and prepare all necessary paperwork. The Contractor(s) shall file for and obtain the permits.

I. DRAWINGS FOR JOB USE

1. All complete sets of plans and specifications used in bidding the project shall be issued to the successful Contractor. These shall be picked up and signed for at the office of the Architect. Any additional set requested shall be furnished at reproduction and postage costs. Upon completion of the work, and before final acceptance, all sets of drawings and specifications must be returned to the office of the Architect who will issue a receipt for same.

J. OWNERSHIP OF DRAWINGS

1. All drawings, specifications, and copies furnished by the Architect are his property. They are not to be used on other work, and with the exception of the signed contract set, are to be returned to him on request at the completion of the work.
2. The Owner shall, upon full payment of all compensation due to the Architect obtain the rights and privileges to use the drawings and specifications prepared under this agreement. For such consideration, the Owner assumes the responsibility and liability for all damages, direct and indirect, for the future use of the documents. In addition, the Owner shall defend, indemnify and hold the Architect harmless from any and all costs, obligations or liability arising from law suits or threatened law suits by any person, firm or corporation arising from the future use of the documents, including payment of the Architect's defense cost and legal fees. The Owner acknowledges that the documents are site specific and shall not use the drawings and specifications for execution of any project, including renovations and additions, other than that for which it was originally developed, nor shall the Owner give, bequeath or sell the drawings or specifications to others under any circumstances, except by agreement in writing with the appropriate compensation to the Architect. The Architect may retain copies of the original documents and has full rights to reuse their content and reserves the right to remove his title block and seal from any reproducible copies provided the Owner.

K. EXTRA AND/OR ADDITIONAL WORK CHANGES

1. The Contractor shall not make any changes or do any extra or additional work, or both, without the prior written approval of the Architect.

L. ASSIGNMENT OF CONTRACT

1. Neither this contract nor any monies due, or to become due there under, may be assigned by the Contractor without the prior written approval of the Architect.

M. SUB-CONTRACTING

1. No part of this Contract shall be sublet without the prior written approval of the Architect.

N. MEASUREMENTS

1. Before ordering any materials or doing any work, each Subcontractor shall verify all measurements at the building and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of differences between the actual dimensions and the measurements indicated on the drawings.

O. COMMENCEMENT AND COMPLETION OF THE WORK

1. The Contractor shall commence work under his contract as soon as practicable, shall expedite the work to the best of his ability and shall fully complete same within as short a time as conditions affecting the work will permit.

- P. LIQUIDATED DAMAGES FOR FAILURE TO FURNISH SECURITY FOR AND EXECUTE CONTRACT
1. If the successful bidder fails to provide security for and execute the Contract as provided herein and in the general conditions within ten (10) days after notice of acceptance of his proposal, the bid check for bidder's bond submitted with his bid shall be forfeited to the Owner as liquidated damages.
- Q. USE OF PROPOSAL FORM
1. All proposals shall be made on the form issued with the other documents and signed in longhand. All blank spaces in the form shall be filled out. All spaces left blank will be read zero (0) or no change.
- R. LICENSE
1. All bidders must be registered and licensed to do general contracting in the state in which the building is to be erected. All Subcontractors must be licensed Contractors.
- S. INSURANCE CONTRACTOR'S COVERAGE
1. The Contractor shall not commence work under this Contract until all insurance required under SECTION 00 73 00: Supplementary General Conditions of the Contract - Article 11 hereof has been obtained, and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his subcontract until all similar insurance required of the Subcontractor has been so obtained and approved.
- T. MAINTENANCE AND GUARANTEE
1. The contractor shall warrant and provide a performance bond to assure the Owner's interests as follows:
 - a. The Contractor shall bind all of the Subcontractors with him in warranties hereinafter required. Their performance bond shall remain in force for a period of one year from the date of acceptance of the work covered by this Contract as a guarantee that the Contractor will, at his own expense, repair or replace and make good all defects of material or workmanship, in connection with this contract, which may develop during the period of warranty.
 - b. In addition to the performance bond, the Contractor shall guarantee all built-up and single membrane roofing and flashing for a period of two (2) years after a certificate of occupancy is acquired. Shingle roofs and single membrane roofs will be factory warranted for a period of not less than twenty (20) years.
 - c. If, at any time during the warranty period, defects of materials or workmanship, from any cause whatsoever, shall develop or become evident through inspection, the Contractor shall, at his own expense, replace or repair the parts affected. If the Owner shall deem it necessary and so order, such repairs or replacements shall be commenced within 48 hours after the serving of notice, and shall be completed without delay.

Should the Contractor, after due notice, refuse or neglect to make good the defects as notified, then the Owner is empowered to proceed to make good all such defects by whatsoever means they see fit. In such instances, all the actual expenses incurred thereby for remedying such defects shall be billed to and paid for by the Contractor, or in case of his default, his surety shall become liable for and pay for all such expenses.

- d. The Contractor further guarantees the entire equipment, fixtures, piping, apparatus, etc., as installed and connected under his contract to perform all of the duties specified or expected under the condition notes without failure, defects, etc., for a period of one year after the date of acceptance by the Owner. Where no definite performance of equipment is specified, the equipment as installed and connected shall be guaranteed by the Contractor to equal the best and most efficient performance of the equipment as specified by name or performance.

U. SIGN:

- 1. Refer to detailed drawing of project identification sign contained in SECTION 01 58 13: Project Sign. If not shown herein, the Architect will issue a drawing of same. All projects will have a construction sign identifying the project, the Architects and all Prime Contractors. Location of sign will be by Architect at pre-construction. Project sign must be in place before first pay request will be considered.

DIVISION 00

SECTION 00 73 00: SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT

00 73 00.01: GENERAL

1. General Conditions of the Contract for Construction, American Institute of Architects Document A201™ dated 2007 will be considered part of these specifications. These Supplementary General Conditions contain changes and additions to the AIA® General Conditions, Document A201™-2007. Where any portion of an AIA General Conditions Article is modified or voided in part by the Supplementary Conditions the unaltered provisions shall remain in effect. A copy of the AIA® General Conditions, Document A201™-2007 may be examined at the Architect's office.
2. All references in Articles 4.1.4, 4.3.2, 4.3.4, 4.4.4, 4.5, 8.3.1, 10.1.2, 11.3.9 and 11.3.10 to arbitration in accordance with the construction arbitration rules of the American Arbitration Association shall be deleted. It is the specific intent that where interpretations of the Architect, given in writing as final, remain, in dispute by either the Owner or the Contractor and said disputes cannot be amicably resolved by the parties, final settlement will be made by the courts having jurisdiction.

ARTICLE 1 – GENERAL PROVISIONS:

1.1 BASIC DEFINITIONS: Add the following:

1.1.6 Specification Terms:

"Or Approved Equal" and "Equal To": Shall mean products by manufacturers other than those specified in the Project Manual and Addenda which the Contractor may submit for substitution and prove to be equal to those specified in the Project Manual and Addenda and on the drawings and which may be incorporated in the work after review and concurrence by the Architect and acceptance by the Owner.

"Provide": Shall mean furnish and install complete, in place, and ready for use.

"Indicated" and "Shown": Shall mean as detailed, scheduled, or called for in the Contract Documents.

"Latest Edition": Shall mean the current printed document issued up to thirty (30) calendar days prior to date of receipt of bids.

"Quality": Shall mean the meticulous attention to the detail of installation and workmanship necessary to the assemblage of products in the highest grade of excellence by skilled craftsmen of the trade.

"Prime Contractor": These documents are written to encompass "multi prime" bidding. Where "Prime Contractor" appears (in a single prime bidding scenario) read as "General Contractor".

1.1.9 Divisions of Responsibility:

The following responsibilities are in addition to those called for in the General Conditions and in these Supplementary Conditions.

The Architect is responsible for general overall design and not for product design, product fabrication, and construction.

The Contractor is responsible for overall construction and safety.

The Subcontractor is responsible to the Contractor for the proper construction of and proper design when called for, the work under his Subcontract.

The manufacturer is responsible to the Subcontractor and the Contractor for product design and product fabrication.

The Owner is responsible for proper maintenance and proper usage after completion and acceptance of the Project.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS:

1.2.3 Add the following:

All work shall conform to Contract Documents. No change there from shall be made without a review by Architect. Where only part of the work is indicated, similar parts shall be considered repetition. Where any detail is shown and the components therefore are fully described, similar details shall be construed to require equal products and construction.

1.2.4 Add the following:

Such separations shall not operate to make the Architect an arbiter to establish limits of work between Subcontractors or between Contractor and Subcontractor. The General Contractor is the "Project Expeditor" and will operate and be responsible in that capacity.

Add the following:

1.2.5 Should drawings disagree in themselves or with specifications, the better quality or greater quantity of work or material shall be furnished, unless otherwise ordered in writing.

1.2.7 Contractor will understand that work herein described shall be completed in every detail. Contractor will be held to provide labor and material necessary for entire completion of work intended to be described, and shall not avail him of any manifestly unintentional error or omission, should same exist.

1.2.8 Preference shall be given to calculated dimensions on drawings rather than measurements by scale. Contractor shall report any error or inconsistency noted in dimensions to the Architect before commencing work.

1.2.9 In such cases where the nature of the work requires clarification by the Architect, such clarification shall be furnished with reasonable promptness by means of written

instructions or detail drawings, or both. Clarifications and drawings shall be consistent with the intent of documents and become a part thereof.

ARTICLE 2 - OWNER

2.1 GENERAL: Add the following:

2.1.3 The Owner, when referred to throughout the Contract Documents, shall be as listed in Advertisement for Bids and/or Instructions for Bidders contained herein.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER:

2.2.6 Add the following:

The Owner reserves the right to have his authorized representative and agents inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.

ARTICLE 3 - CONTRACTOR

3.1 GENERAL:

3.1.1 Add the following:

Only one (1) Contractor is recognized as a party to the Contract and the term "Contractor" refers to the Contractor who signed the Contract. When the Owner executes separate Contracts, the term "Prime Contractor" is used to distinguish these from the Subcontractor.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR:

3.2.1 Omit in its entirety and add the following:

The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to Subparagraph 2.2.2 and shall at once report to the Architect errors, inconsistencies or omissions discovered.

If Contractor fails to give such notice and, knowingly, proceeds with incorrect work, he shall correct any such errors, inconsistencies or omissions at no additional cost. Should the Specifications and Drawings fail to particularly describe the product or kind of goods to be used in any place, then it shall be the duty of the Contractor to make inquiry of the Architect for what is best suited. The product that would normally be used in this place to produce first quality finished work shall be considered a part of the Contract.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES:

3.3.5 Add the following:

The Contractor has the responsibility to insure that all product suppliers, and Subcontractors, their agents and employees, adhere to the Contract Documents and that they order products on time. The Contractor shall coordinate his work with that of all others on the Project including for deliveries, storage, installations, and construction

utilities. The Contractor shall be responsible for the space requirements, locations, and routing of his equipment. In areas and locations where the proper and most effective space requirements, locations, and routing cannot be made as indicated, the Contractor shall meet with all others involved, before installation, to plan the most effective and efficient method of overall installation. A general example is equipment above corridor ceilings where ductwork, piping, conduit, lights, etc., will be installed. A thorough coordinated plan shall be used to install the equipment to furnish proper clearances, radii of turns, locations, pipe slopes, supporting appurtenances, and access where required.

3.4 LABOR AND MATERIALS: Add the following:

3.4.4 All materials and labor shall be in strict accordance with all governing rules and regulations of the State and any and all local rules, laws, or ordinances governing or otherwise appertaining thereto. All contractors are required to comply with Public Law 91- 54, "Federal Construction Safety Act of 1969", and Public Law 91- 596, "Occupational Safety and Health Act of 1970" with amendments through January 1, 2004, or its latest revision.

3.5 WARRANTY: Add the following:

3.5.1 All warranties shall include labor and products and shall be signed by the manufacturer or subcontractor, as the case may be, and countersigned by the Contractor. All warranties shall be addressed to the Owner and delivered to the Architect upon completion of the project and before or with the submission of request for final payment.

3.5.2 Except where a longer guarantee time is specifically called for in the Specification Sections, the general guarantee shall be for twelve (12) months. Material, equipment, and labor replaced during the warranty period will be guaranteed for twelve (12) months after the replacement of same. The Contractor shall make good such defective materials, equipment or workmanship within the stipulated guarantee period without cost to the Owner.

3.5.3 The Contractor signing a Contract with the Owner shall issue to the Owner a "General Guarantee," PA Form 4, for all work under his Contract. It shall cover incidental building watertightness not covered by specific Sections of these Specifications. It shall not include the individual specific guarantees for watertightness and roofing and sheet metal.

3.5.4 The Contractor signing a Contract with the Owner shall issue to the Owner a "Watertightness Guarantee," PA Form 6, for each Section of these Specifications covering such that is under his Contract. Submit a separate guarantee for each Section requiring a guarantee for watertightness. This guarantee shall not include the guarantee for roofing and sheet metal.

3.5.5 The Contractor signing a Contract with the Owner shall issue to the Owner a "Roofing and Sheet Metal Guarantee," PA Form 5, which is in addition to that to be issued by manufacturers of products.

The Contractor signing a Contract with the Owner shall issue to the Owner a "Landscape Plants and/or Grass Guarantee," PA Form 7.

3.5.6 The Contractor signing a Contract with the Owner shall obtain and forward to the Owner any and all guarantee issued by the manufacturers specifically for certain products and

systems covered under his Contract. In the event the manufacturer does not have a suitable "preprinted warranty form" to fully cover the guarantee requirements as set forth in the Specification Section, he shall produce a warranty form patterned after those contained hereinafter which shall fully document the guarantee as set forth in the Specification Section.

3.5.7 Warranties shall become effective on a date established by the Architect. This date generally shall be the date of Final Acceptance of the Total Project, or shall be at Substantial Completion should it become expedient for the Owner to accept portions of the work prior to total completion of the Total Project.

3.5.8 In the case of Substantial Completion, separate warranties shall be issued for those specific portions of the Total Project which were accepted and shall be dated the date the specific portion was accepted. As additional work is accepted, separate warranties for those specific portions of the work shall be issued and properly dated. Substantial Completion Reviews and Acceptance will be considered when the progress of the Project conforms to Paragraph 8.1.3.

3.5.9 Substantial Completion Acceptance shall in no way become the basis for Application for Final Payment nor shall it become a means by which the Contractor and his Subcontractors, Sub-Subcontractors, product suppliers, etc., may sue to obtain early acceptance and warranty dates.

3.5.10 In the event that the Architect considers it impractical, because of unsuitable test conditions, or some other factors, to execute simultaneous final acceptance of all equipment, portions of the installation may be certified by the Architect for final acceptance when that portion of the system is complete and ready for operation as called for in Paragraph 9.8.

3.5.11 The Contractor shall guarantee for a period of TWENTY-FOUR (24) MONTHS that the building shall be watertight and leak proof at every point and every area, except where leaks can be attributed to damage to the building by external forces beyond his control. He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any work necessary to make the building watertight. He shall also at his own expense, repair or replace any other damaged material, finishes, and furnishings, damaged as a result of this water penetration to return the building to its original accepted condition.

3.5.12 If, for any reason, the Contractor cannot guarantee any part of his work using products or construction methods which have been specified, or shown, he shall notify the Architect in writing before contracts are signed, giving reasons, together with the names of products and data on substitutions he can guarantee.

Should the Contractor fail to so notify the Architect prior to the Signing of Contracts, he will be held to have agreed to guarantee all work specified or shown.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES:

3.10.1 Delete in its entirety and insert the following:

General Contractor, or Project Expediter, (see SECTION 00 72 00 GENERAL CONDITIONS of the CONTRACT) shall prepare a Progress Schedule as follows:

A proposed Progress Schedule shall be prepared covering all work on the Project and shall be submitted to the Architect for review within twenty (20) consecutive calendar days after the Notice to Proceed. Every Prime Subcontractor or every other Prime Contractor, as the case may be on the Project, shall submit to the preparer of the overall Progress Schedule, his Progress Schedule for the proper preparation of the overall Progress Schedule for the entire Project. Every Prime Subcontractor or every other Prime Contractor, as the case on the Project, shall cooperate with the preparer of the overall Progress Schedule, in the preparation of this document so that the work of all will be coordinated.

The Progress Schedule shall be in a bar chart form similar to the example bound hereinafter. The bar chart shall show the date when the operation of each Specification Section is to begin and is to be completed and its total dollar value percent to be completed each month. Each Progress Schedule, after the first submission, shall incorporate a progress barometer indicating the planned percent and actual percent of the total work completed by that Contractor as of the Progress Schedule date. The Progress Schedule shall be brought up-to-date each month showing actual progress in time and dollar value through that month and shall be submitted each month with the Application for Payment excluding the Application for Final Payment.

If any Contractor or Subcontractor at any time knows or has reason to believe that the delivery of any product or the shortage of qualified labor or delays caused by others or the occurrence of any other difficulty may cause a delay in carrying out the Progress Schedule, the Contractor i.e. "Project Expediter" shall notify the Architect in writing within three (3) days.

3.10.2 Delete in its entirety and insert the following:

The purpose of the Progress Schedule and monthly updates as hereinbefore described, or as may be otherwise submitted and approved, shall be to furnish the Owner and Architect with information to indicate that the Contractor has planned the Project in sufficient detail for the Contractor to insure that its construction can be accomplished within the stipulated time frame. The dollar value estimates to be included on the schedule are to assist the Owner in his cash flow planning so that funds will be readily available to pay Contractor Applications for Payment. Monthly updates are to furnish the Owner with current status of any changes required in the original schedule which will assist the Owner in scheduling delivery and installation of any products, furnishings, etc., necessary for the operation of the facility for its intended purpose.

The responsibility for construction planning and the effective efficient implementation of such, or the converse, to meet the Contract completion date, or authorized appropriate extensions thereof, are the total responsibility of the Contractor i.e. Project Expediter and such responsibility shall not transfer to the Owner/Architect. Review of the original Progress Schedule and subsequent modifications thereto, by the Owner and/or the Architect, shall be limited to the general purposes set out above. Such approval shall not operate to imply the agreement of the Owner/Architect to the Contractor's planned procedures, coordination, critical path scheduling, etc., as being appropriate or reasonable.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:

3.12.4 Add the following:

All shop drawings, product data, and samples shall be submitted to the Architect, through the Contractor, for review within thirty (30) calendar days after the Notice to Proceed. Samples and product data required for substitutions shall be submitted with the request for substitution. Shop drawings will **not** be considered for review on substituted products that have not been submitted as called for in SECTION 00 21 13: INSTRUCTIONS FOR BIDDERS, SECTION 00 72 00 – GENERAL CONDITIONS and SECTION 01 33 00: SHOP DRAWINGS AND SUBMITTALS or which have not been completely checked, approved, and stamped by the Contractor, Subcontractor, and Fabricator. Shop drawings shall be prepared showing the specific locations and installation requirements of the Project.

Samples shall be in triplicate, one (1) to be retained by the Architect and two (2) to be returned to the Contractor, one (1) of which is to be placed on file in the field office for comparison to the products delivered. Where full-size samples are required and specified to be installed on the Project, only one (1) sample will be required.

For each shop drawing required for the initial submission, submit four (4) copies not exceeding 24" x 36" in size. After Architect reviews, three (3) copies will be returned to the Contractor who may reproduce his required number of copies before returning the reviewed copy to the Fabricator. Should printed product data be required with the submission, one (1) copy will be retained by the Architect and the remainder submitted will be returned to the Contractor. When corrections are necessary and a resubmittal is not requested, one (1) copy of corrected "field use" drawings will be forwarded to the Architect for file purposes.

After the Electrical, Plumbing, Heating, Ventilating and Air Conditioning submittals have received a favorable review the Contractor shall submit to the Architect for the Owner three (3) copies of complete operating and maintenance manuals as called for in DIVISIONS 22, 23, 26 AND 28. Three (3) copies of similar manuals shall also be submitted for other than those in DIVISIONS 22, 23, 26 AND 28. These manuals, bound in a hard binder and indexed, shall be submitted not later than sixty (60) calendar days before occupancy and shall be received before final Certificate for Payment is issued.

The Architect's review of shop drawings, product data, or samples shall not relieve the Contractor of his responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Architect in writing of such deviation at the time of submission and the Architect has given consideration to the specific deviation, nor shall the Architect's review relieve the Contractor from his responsibility for errors or omissions in the shop drawings, product data, or samples.

3.12.7 Add the following:

The Contractor shall make all corrections required after review by the Architect and shall resubmit the required number of corrected copies of shop drawings, new product data, or new samples in accordance with the Architect's review stamp. When corrections are necessary and a resubmittal is not requested, three (3) copies of corrected "field use" drawings will be forwarded to the Architect for file purposes. The Contractor shall direct specific attention in writing or on resubmitted shop drawings, product data, and samples

as to revisions other than the corrections requested by the Architect on previous submittals.

3.12.8 Add the following:

No portion of the work requiring submission of a shop drawing, product data, or sample shall be commenced until the submittal has been reviewed and approved by the Architect.

ARTICLE 4 - ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

4.2.6 Add the following:

Any instructions which the Architect may issue the Contractor shall be adjudged an interpretation of the Contract requirements and not an act of supervision. The Architect has no authority, nor accepts any responsibility, either direct or implied, to direct and/or superintend the work.

ARTICLE 5 - SUBCONTRACTORS

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

5.2.1 Add the following:

"As soon as practical" as stated above will be within fourteen (14) consecutive calendar days after the Construction Agreement. The list of Subcontractors and Craftsmen shall be enumerated in accordance with the Sections of these Specifications. Those listed on the Bid Form shall also be included.

5.3 SUBCONTRACTURAL RELATIONS: Add the following:

5.3.2 The Owner or Architect will not undertake to settle any differences between the Contractor and his Subcontractors or between Subcontractors.

ARTICLE 6 – CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY: Add the following:

6.2.7 Each Contractor agrees to coordinate his work with each other separate Contractor within the total time frame established by the preparer of the overall Progress Schedule i.e. Project Expediter and made a part of the agreement. This time frame shall be as called for in 3.10 PROGRESS SCHEDULE which requires the participation and agreement of all Contractors in its preparation and acceptance. Should any Contractor or combination of Contractors allege, that another Contractor or combination of Contractors have caused a delay in his Contractor their Contract, then the Contractor or combination of Contractors causing the delay shall indemnify and hold harmless the Owner and the Architect from any cause of action, resulting from the alleged delay or delays and the responsible Contractor or combination of Contractors shall bear all costs and expenses, including all attorneys' fees and court costs, which the Owner and/or Architect may have incurred in the resolution of such claim or claims.

ARTICLE 7 – CHANGES IN THE WORK

7.2 CHANGE ORDERS:

7.2.1 Add the following:

All Change Orders shall be approved by the Owner and Architect BEFORE the Contractor begins the work covered by the Change Order.

ARTICLE 8 - TIME

8.2 PROGRESS AND COMPLETION: Add the following:

8.2.4 The work will not be considered suitable for Substantial Completion Review until all Project systems are operational as designed; all designated or required governmental inspections and certifications have been made and posted, designated instruction of Owner's personnel in the operation of systems has been completed, and all final finishes are in place. In general, the only remaining work shall be minor in nature, such that the Owner could occupy the building on the following date and the completion of the work by the Contractor would not materially interfere or hamper the Owner's normal business operation. As a further condition of Substantial Completion Acceptance, the Contractor shall certify that all remaining work will be completed within thirty (30) consecutive calendar days following the date of Substantial Completion, and the failure to do so shall automatically reinstitute the provisions for damages due the Owner as contained elsewhere in the Agreement or as provided by law or such period of time as may be required by the Contractor to fully complete the work whether the Owner has occupied the work or not.

Exceptions to the above conditions for acceptance of designated portions of the Project, or other conditions of whatever kind, may be instituted by and in the sole discretion of the Owner, subject to concurrence of the Contractor; or, unless otherwise provided for elsewhere in the Agreement. The Owner may not reasonably withhold acceptance of the Total Project after Certification of Completion by the Architect.

8.3 DELAYS AND EXTENSIONS OF TIME:

8.3.2 Add the following:

Requests for extensions of construction time due to adverse weather conditions shall include U.S. Weather Bureau Climatological Reports for the months involved plus a report indicating the average precipitation, temperature, etc., for the past ten (10) years from the nearest reporting station. The 10-year average will determine the number of adverse weather days which the Contractor would normally expect to encounter. Extensions of time may be requested for any month of construction for days lost due to adverse weather in excess of the expected lost time.

8.3.4 Add the following:

Extension of time shall be Contractor's sole remedy for delay unless the same shall have been caused by acts constituting intentional interference by the Owner with Contractor's performance of the work and where and to the extent that such acts continue after Contractor's notice to Owner of such interference. Owner's exercise of any of its rights

under ARTICLE 7 CHANGES IN THE WORK regardless of the extent or number of suspensions of the work, or requirement of correction or re-execution of any defective work, shall not under any circumstances be construed as intentional interference with the Contractor's performance of the work.

ARTICLE 9 –PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES:

9.2.1 Add the following:

The schedule of values shall be listed in numerical order of the Sections of the Specifications, and shall include: Description of the item, quantities, and the labor, product and total Contact amount for each item. This schedule of values shall be dated and signed by the Contractor.

General and Plumbing; Heating, Ventilating, and Air Conditioning; and Electrical Contracts or Subcontracts, as the case may be, shall be broken down in accordance with the Table of Contents.

9.3 APPLICATIONS FOR PAYMENT: Add the following:

Each month the Owner will make a progress payment to the Contractor based on the Contractor's approved estimate and Application for Payment for work performed under this Contract during the preceding calendar month. Application for Payment shall list products and labor separately. The Owner will retain five (5) percent of the amount of each estimate and Application for Payment until final completion and acceptance of all work covered by this Contract.

A final payment including retained amounts and authorized additions and deductions will be made upon full completion and acceptance of all work covered by this Contract.

APPLICATION FOR PAYMENT WILL NOT BE APPROVED WITHOUT AN UPDATED PROGRESS SCHEDULE.

APPLICATION FOR FINAL PAYMENT WILL NOT BE APPROVED WITHOUT CONTRACT COMPLETION REQUIREMENTS IN PARAGRAPH 16.2.

9.3.1 Add the following:

The application shall be on AIA® Documents G702™ and G703™. The Contractor shall include on each monthly Application for Payment, AIA® Documents G702™ and G703™, the following statement if surety is required for the Project:

"We certify that the Surety for this Project has been duly notified of the amount of this request." Unless exception to pay is made by the Surety to the Architect within four (4) calendar days following the date of request, it will be assumed that the Surety concurs in the payment of this application. American Institute of Architects Documents G702™ and G703™ may generally be obtained at office supply firms or directly from The American Institute of Architects, 1735 New York Avenue, N.W., Washington, DC 20006.

9.3.2 Add the following:

When Application for Payment includes products stored off the Project Site or stored on the Project Site but not incorporated in the Project, for which no previous payment has been requested, a complete description of such product shall be attached to the application. Suitable storage which is off the Project Site shall be bonded warehouse with the stored products properly tagged and identifiable for the Project. The Owner's written approval shall be obtained before the use of an off-site storage is made.

9.5 DECISIONS TO WITHHOLD CERTIFICATION:

9.5.2 Add the following:

Any money withheld due to any of the preceding causes constitutes a waiver of the Contractor's right to interest as stipulated in Paragraph 13.6.

ARTICLE 11 – INSURANCE AND BONDS:

11.1 CONTRACTOR'S LIABILITY INSURANCE:

11.1.1 Add the following:

Certificate of Insurance shall be on an AIA® Document G715™.

11.1.2 Add the following:

Without limiting any of the other obligations or liabilities of the Contractor, the Contractor shall purchase and maintain minimum insurance coverage as follows.

The Contractor shall include a waiver of subrogation to Owner and Architect, which applies to all insurance policies.

The Contractor shall purchase and maintain insurance coverage on his tools, equipment, and machinery and shall waive subrogation to Owner and Architect for damage thereto.

The amounts of the Contractor's Liability Insurance shall be written for not less than the following, or greater if required by law:

a. WORKMEN'S COMPENSATION:

- 1) Statutory
- 2) Employers Liability: \$100,000/500,000/100,000

b. COMPREHENSIVE GENERAL LIABILITY:

- 1) Bodily Injury & Property Damage including Contractual Liability Coverage:
\$500,000 each occurrence/1,000,000 aggregate

c. COMPREHENSIVE AUTOMOBILE LIABILITY:

- 1) Bodily Injury & Property Damage: \$500,000

d. PREMISES LIABILITY COVERAGE:

1) Duration of the project.

\$500,000 each occurrence/1,000,000 aggregate

11.1.3 Change first sentence to read:

Certificates of Insurance shall be attached to each copy of the Agreement by the Contractor before they are returned to the Architect for the Owner's signature, and Certificates shall be addressed to the Owner in care of the Architect.

Add the following:

11.1.4 Contractors Installation Floater: Contractor and all Subcontractors are required to furnish evidence of insurance on materials that are intended for use on the Project that will become part of the building but are not stored within limits of the construction site.

11.3 PROPERTY INSURANCE:

11.3.1.1 Change the last sentence concerning other perils to read:

"Policy shall include coverage for all risks and all perils."

11.3.1.2 Delete in its entirety and insert the following:

The Contractor shall be financially responsible for the deductible of any and all claims against the Owner's property insurance.

11.3.1.3 & 11.3.1.4 Delete both in their entirety.

11.3.2 Change the first sentence to read:

The Owner shall purchase and maintain boiler, pressure vessel, and machinery insurance after testing and issuance of an inspection certificate by the governing agency: this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insured's.

11.4 PERFORMANCE BOND AND PAYMENT BOND:

11.4.1 Delete in its entirety and insert the following:

The Contractor shall furnish bonds in a surety company authorized to do business in project state in amount of 100% of contract. Cost shall be included in proposal. Bonds shall not only guarantee faithful performance of contract, but shall further guarantee payment of all bills for labor and materials when said bills are due. Performance Bond and Labor and Material Payment are to be executed on latest AIA® Forms.

11.4.3 Add the following:

A Performance Bond and a Labor and Material Payment Bond are required. The Contractor shall obtain a Performance Bond and Labor and Material Payment Bond,

acceptable to the Owner in a surety company authorized to do business in the state in which the Project is constructed for the full amount of the Contract Sum. The bond shall guarantee the Contractor's faithful performance of the Contract and the payment of all obligations arising there under. The bond shall remain in force until (1) the building has been completed and accepted by the Owner, (2) the provisions of all guarantees required by these Contract Documents have been fulfilled, and the time limitation for all guarantees has expired, or (3) until the time for the filing of all mechanics' lien has expired, whichever is longer, after which it shall become void. The Contractor shall pay all charges in connection with this bond as a part of the Contract. One executed copy of the bond shall be attached to each copy of the Contract before they are returned to the Architect for the Owner's signature.

11.4.4 This bond shall be written on AIA® Document A312™, latest edition. Copies of AIA® Document A312™ may be obtained from the local office supply or stationery store or maybe ordered from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C. 20006. A current Power-of-Attorney shall be attached to this bond. It shall be the Contractor's sole responsibility to abide by and conform to this section.

11.4.5 Add the following:

Contractor's Default: If the Contractor defaults, the Contractor or his Surety, if Surety is required, shall reimburse the Owner for any additional architectural fees for additional services made necessary because of the Contractor's default.

The following are additions to the 2007 Edition of the AIA® GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION A201™.

ARTICLE 16 - COMPLETION:

16.1 FINAL REVIEW AND ACCEPTANCE:

16.1.1 At the completion of the Project, two (2) reviews will be performed by the Architect to establish acceptance of the work.

The terminology of these reviews shall be:

PRELIMINARY REVIEW - will establish check list of items to be corrected and completed before the Final Review.

FINAL REVIEW - will determine whether items on the check list have been corrected and completed, and whether the Project can be accepted by the Owner.

16.1.2 On a date approximately fourteen (14) calendar days before the Time of Completion as set forth on the Owner-Contractor Agreement, or on an amended date agreed to by the Contractor and the Architect and approved by the Owner, a Preliminary Review will be held and a check list of items will be prepared for correction and completion before the Final Review.

16.1.3 At the Time of Completion as set forth in the Owner-Contractor Agreement, a Final Review will be held to determine completion for acceptance of the Project. If, after review by the Architect, all work appears to comply with the requirements of the Agreement, final payment will be made in accordance with the Agreement.

16.1.4 In the event all items of the Preliminary Review Check List have not been corrected or completed by the Contractor on the date of Final Review, except items for which an extension of time had been agreed upon, the Contractor shall be deemed to have neglected to prosecute the work properly, and subsequent reviews required by the Architect to substantiate final completion will be deemed an extra service to the Owner. For this extra service, the Architect will be reimbursed by the Owner in the amount of \$200.00 each day or fraction thereof, per person, required to expeditiously review the major Divisions of the work in the total Project (General; Electrical; Heating, Ventilating, and Air Conditioning, Plumbing; etc.), for each subsequent review required.

Due to the Contractor's failure to complete the work as required, this reimbursement will be deducted from the funds due the Contractor by the Owner under terms of their Agreement. In addition to the above, the provisions of Paragraph 2.4 may be invoked by the Owner.

In lieu of the invocation of the provisions of Paragraph 2.4, the Owner may request the Architect to provide an Architectural Representative to more closely review the residual completion activities of the Contractor. For this service, the Architect will be reimbursed in the amount of \$200.00 each day for each day or fraction thereof that the Owner considers it necessary for the Architectural Representative to visit the Project site. This reimbursement to the Architect will be deducted from funds due to Contractor by the Owner under the terms of their Contract. This reimbursement will be in addition to any liquidated damages that may become due the Owner, and shall be considered as compensation to the Owner for extra architectural services made necessary by the Contractor's failure to complete the work as scheduled.

16.2 CONTRACT COMPLETION REQUIREMENTS:

16.2.1 The final payment of retained amount due the Contractor on account of the Contract shall not become due until the Contractor has furnished to the Owner, through the Architect, completion documents as enumerated below:

1. Guarantees as set forth in Paragraph 3.5, including other Guarantees required by specific Sections of the Specifications, four (4) copies each.
2. Shop drawings, product data, operating and maintenance manuals as set forth in Paragraph 3.12.4.
3. Affidavit and Waiver of Lien Prime Contractor (PA Form 1), four (4) copies.
4. Release and Waiver of Claims by Subcontractors and Product Vendors (PA Form 2), four (4) copies.
5. Contractor's Affidavit as to Status of Liens (PA Form 3), four (4) copies.
6. Consent of Surety Company to Final Payment (Document G707™), four (4) copies.

In addition to the above, all other submissions and certifications required by other Articles and Sections of the Specifications shall be in the hands of the Architect before approval of final payment.

DIVISION 01

SECTION 01 10 00: PROJECT SUMMARY

**Gates County High School –Science Classroom Alterations
88 US-158
Gatesville, North Carolina**

01 10 00.01: GENERAL

A. SCOPE

1. This project consists of the renovation of the science classroom. Please refer to plan set.

B. BIDDING

1. Bidding will be by invitation and/or by pre-approved licensed Contractors by the Owner through the Architect. Contractor should have five (5) years of construction experience with at least three (3) similar projects to his credit (with favorable recommendations). Contractor must submit AIA Qualification Form A305 to the Architect before applying for Construction Bid Documents.
2. All Contractors must visit the site and by submitting a bid has satisfied himself that he understands the scope of the work.
3. The bidding is "turn key" and includes all permitting, equipment, scaffolding and clean up (disposing) to present a complete project ready to use by the Owner.

C. LOCATION

1. The Project is located at 88 US-158, Gatesville, NC 27938

01 10 00.02: DRAWINGS

A. SCHEDULE OF DRAWINGS:

1. The following drawing sheets amplify/illustrate and compliment these specifications and together will be considered as one document.

General Construction:

Sheets G1.0 thru G2.0	- General
Sheets A1.1 thru A2.0	- Architectural Drawings
Sheets P100 thru P500	- Plumbing Drawings
Sheets M102 thru M307	- Mechanical Drawings
Sheets E200 thru E300	- Electrical Drawings

DIVISION 01

SECTION 01 21 00: ALLOWANCES

**Gates County High School –Renovations and Additions
88 US-158
Gatesville, North Carolina**

01 21 00.01: GENERAL

A. REQUIREMENTS INCLUDED

1. Designate in the Construction Schedule the delivery and installation dates for Materials covered by allowance.
2. Designate in the Schedule of Values quantities of materials covered by allowance.

B. SCOPE

1. The following cash allowance shall be included in the Contract Price. If the Actual cost is more than or less than the allowance, the Contract Price will be adjusted up or down accordingly when the actual cost is determined. Adjustments in the Contract Price will be made by Change Order. The amount below includes the net cost of materials and shipping charges to the Project Site.
2. The Contractor's overhead and profit shall be included in the Contract Price, but Not in the allowance. Any taxes shall be included in the Contract Price, but not in the allowance. The cost of labor for installation shall be included in the Contract Price, but not in the allowance. The contractor shall submit to the Architect/ Engineer for approval all bills for materials under Cash Allowances.
3. Where applicable, the Architect/Engineer will make the selections of materials Covered by the allowance.

C. SCHEDULE OF ALLOWANCES

- | | | |
|----|-----------------|-----------------------|
| 1. | Finish Hardware | \$ 1,500.00/door leaf |
|----|-----------------|-----------------------|

DIVISION 01

SECTION 01 22 00: UNIT PRICES

**Gates County High School—Science Classroom Alterations
88 US-158
Gatesville, North Carolina**

01 22 00.01: GENERAL

A. SCOPE

1. The Contractor shall state on his Proposal the amounts to be added to the Base Bid for each of the unit prices specified herein. Each unit price shall cover all costs, by trades, required for that particular part of the work completed, in place and ready for use by the Owner. All Bonds, insurance, overhead and profit, etc. to be included per unit specified.
2. A unit price unaddressed will be considered as "no change" in contract price.
3. The Owner reserves the right to issue a change order for any quantity of any unit at any time during the course of contract and amend the Contract accordingly. Price will be figured by simply multiplying unit price by quantity necessary.
4. Unit prices will also be used to deduct materials from the Contract including base bid and alternates. Amount of deduction will be quantity by cost per unit.
5. All unit prices including any unit price not specifically mentioned herein shall be in accordance with all sections of specifications governing those items - including SECTIONS 00 21 13, 00 72 00, 00 73 00 and 00 91 13.

01 22 00.02: UNIT PRICES

- A. CERAMIC/PORCELAIN TILE (per square foot)
Per SECTION 09 30 13
- B. SUSPENDED ACOUSTICAL CEILING (per square foot)
Per SECTION 09 51 00
- C. RESILIENT FLOORING (VCT) (per square foot)
Per SECTION 09 65 00
- D. CARPET TILES (per square foot)
Per SECTION 09 68 13
- E. PAINTING (per square foot)
Per SECTION 09 90 00
- F. DIRT EXCAVATION (per cubic yard)
Per SECTION 31 20 00

G. COMPACTED FILL (per cubic yard)

Per SECTION 31 23 00

H. ROCK EXCAVATION, MASS ROCK DRILLING AND BLASTING (per cubic yard)

Per SECTION 31 20 00, 31 23 16.26

I. ROCK EXCAVATION, TRENCH ROCK DRILLING AND BLASTING (per cubic yard)

Per SECTION 31 20 00, 31 23 16.26

J. FORMED POURED IN PLACE REINFORCED CONCRETE (per cubic yard)

Per SECTIONS 31 23 16.26, 31 22 19, 31 31 16, 32 13 00, 03 10 00, 03 20 00, 03 30 00, and any other pertinent Sections of these specifications. Concrete work may include sidewalks, floor slabs, roof decks, grade beams, columns, etc.

DIVISION 01

SECTION 01 25 00: SUBSTITUTION PROCEDURES

01 25 00.01: GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
2. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."
3. Standards: Refer to Section "Definitions and Standards" for applicability of industry standards to products specified.
4. Procedural requirements governing the Contractor's selection of products and product options are included under Section "Materials and Equipment."

C. DEFINITIONS

1. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.
2. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:
 - a. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - b. Revisions to Contract Documents requested by the Owner or **PINNACLE ARCHITECTURE, P.A.**
 - c. Specified options of products and construction methods included in Contract Documents.
 - d. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

D. SUBMITTALS

1. Substitution Request Submittal: Requests for substitution will be considered if received within thirty (30) days after commencement of the Work. Requests received more than thirty (30) days after commencement of the Work may be considered or rejected at the discretion of **PINNACLE ARCHITECTURE, P.A.**
 - a. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.
 - b. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - 1) Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
 - 2) A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
 - 3) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.
 - 4) A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - 5) Cost information, including a proposal of the net change, if any in the Contract Sum.
 - 6) Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
 - c. **PINNACLE ARCHITECTURE, P.A.**'s Action: Within one week of receipt of the request for substitution, **PINNACLE ARCHITECTURE, P.A.** will request additional information or documentation necessary for evaluation of the request. Within two (2) weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, **PINNACLE ARCHITECTURE, P.A.** will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of a Change Order.

01 25 00.02: PRODUCTS

A. SUBSTITUTIONS

1. Conditions: The Contractor's substitution request will be received and considered by **PINNACLE ARCHITECTURE, P.A.** when one or more of the following conditions are satisfied, as determined by **PINNACLE ARCHITECTURE, P.A.**; otherwise requests will be returned without action except to record noncompliance with these requirements.
 - a. Extensive revisions to Contract Documents are not required.
 - b. Proposed changes are in keeping with the general intent of Contract Documents.
 - c. The request is timely, fully documented and properly submitted.
 - d. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
 - e. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
 - f. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 - g. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to **PINNACLE ARCHITECTURE, P.A.** for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
 - h. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
 - i. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
 - j. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.
2. The Contractor's submittal and **PINNACLE ARCHITECTURE, P.A.**'s acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

DIVISION 01

SECTION 01 26 13: REQUEST FOR INFORMATION

Date: _____

**Gates County High School –Science Classroom Alterations
88 US-158
Gatesville, North Carolina**

To: Pinnacle Architecture, P.A.
P.O. Box 187 (630 Team Rd. Ste 200)
Matthews, NC 28106 (28105)
shannon@pinnaclearchitecture.net
melissa@pinnaclearchitecture.net
Fax: 704-847-9853

RFI Number: _____

In reference to the above listed project, we are hereby requesting a clarification, determination and/or information concerning the following:

Section Number: _____ Drawing Number: _____

Requested By: _____ Date of Request: _____

Title: _____ Date Reply Required: _____

Company: _____

In reply to your request, be advised: _____

Reply By: _____

Date of Reply: _____

Title: _____

Date Reply Returned: _____

DIVISION 01

SECTION 01 31 19: PROJECT MEETINGS

01 31 19.01: GENERAL

A. RELATED DOCUMENTS

1. The work of this section shall be included as a part of the Contract Documents of each Contractor on this Project. Where such work applies to only one Contractor, it shall be defined as to which Contractor the work belongs.

B. SUMMARY

1. Each Contractor or awardee shall be required to have present at each of the following project meetings a representative acceptable to the Architect. The designated representative shall have sufficient authority and knowledge to make decisions for the Contractor he is representing on matters affecting this Project.
2. A Contractor or representative unable to attend a specified meeting shall have an acceptable alternate representative designated or shall notify the Architect not less than seven (7) days prior to date of meeting.
3. Pre-Construction Meeting:
 - a. The purpose of this meeting is to review submittals that will be required by the Contractors and to review the project procedures that are to be followed during the progress of construction.
 - b. Advance written notice of the Pre-Construction Conference date, time, and place will be sent to the various successful Bidders by the Architect. Each Prime Contractor shall require his principal subcontractors to attend.
 - c. Minimum agenda shall be as follows:
 - 1) Discussion of construction.
 - 2) Critical work sequencing.
 - 3) Designation of responsible personnel.
 - 4) Processing of field decisions and change orders.
 - 5) Distribution of Contract Documents.
 - 6) Submittal of shop drawings, product data and samples.
 - 7) Procedures for maintaining record documents.
 - 8) Use of premises:
 - a) Office and storage areas.
 - b) Owner's requirements.
 - 9) Major equipment deliveries and priorities.
 - 10) Safety and first-aid procedures.
 - 11) Security procedures.
 - 12) Housekeeping procedures.
 - 13) Review of code compliance requirements (with code officials present and available for questions).

4. Progress Meetings:

- a. Progress meetings will be established on an as needed basis, (by the Architect Construction Administration Representative), to review the progress of construction, possible delays, problems, and projected construction activity. Attendance at the progress meeting is required by all Contractors on site, as well as by Contractors preparing to move on site.
 - 1) Notice of said meetings will originate in the office of the General Contractor.
 - 2) Each Contractor shall require his principal subcontractors to attend.
 - 3) These meetings shall be attended by Contractors with work in progress or with work about to commence. The progress and schedule of each involved Contractor shall be coordinated at this meeting. The representatives of the Contractor present shall have the authority to change the Contractor's work schedule or authorize work with the consent of the Contractor. If the Contractor fails to attend this meeting, it shall be his responsibility to obtain the information discussed at the meeting. Meeting notes and the most current schedule will be in the office of the General Contractor.
 - 4) Minimum agenda shall be as follows:
 - a) Review work progress since last meeting.
 - b) Note field observations, problems, and decisions.
 - c) Identify problems which impede planned progress.
 - d) Review off-site fabrication problems.
 - e) Develop corrective measure and procedures to regain planned schedule.
 - f) Revise construction schedule as indicated.
 - g) Plan progress during next work period.
 - h) Review submittal schedules, expedite as required to maintain schedule.
 - i) Maintaining of quality and work standards.
 - j) Review changes proposed by Owner for effect on construction schedule and effect on completion schedule.
 - k) Complete other current business.

5. Contractors shall review and comply with required pre-installation conferences outlined in the Contract Documents. (See individual specification sections.)

DIVISION 01

SECTION 01 32 16: SCHEDULES AND REPORTS

01 32 16.01: GENERAL

A. SCOPE

1. The Contractor shall submit to the Architect such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed under this contract.

B. CONSTRUCTION SCHEDULE

1. Within ten (10) days after execution and delivery of the contract, the Contractor shall deliver to the Architect an estimated construction progress schedule in a form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the contract documents and the anticipated amount of each monthly payment that will become due to the Contractor in accordance with the progress schedule.

C. SCHEDULE OF VALUES

1. Within ten (10) days after execution and delivery of the contract, the Contractor shall furnish a detailed schedule of values giving a complete breakdown of the contract price. The values scheduled will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

D. MATERIALS LIST

1. Within ten (10) days after execution and delivery of the contract, the Contractor shall submit, for approval and record, complete lists or schedules of all materials suppliers, and of all proposed construction materials and equipment.
2. Brand names where used in the technical specifications, are intended to denote the standard of quality required for the particular material or product. The term equal or equivalent, when used in connection with brand names, shall be interpreted to mean a material or product that is similar and equal in type, quality, size, capacity, composition, finish, color and other applicable characteristics to the material or product specified by trade name, and that, in the opinion of the Architect, is suitable for the same use and capable of performing the same function as the material or product specified.
3. Each Contractor shall obtain approval from the Architect for use of materials not mentioned as standard. Such approvals must be obtained as soon after contract award as possible and before any materials are ordered. Applications for approvals shall be made by the Contractor and not the Subcontractor or material suppliers. When this list is approved, no substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted, it will be assumed that the Contractor will supply materials specified and the Contractor shall be held to this requirement.

E. LIST OF SUBCONTRACTORS

1. Within ten (10) days after execution and delivery of the contract, the Contractor shall submit, for approval and record, the names of the Subcontractors proposed for each of the principal parts of the work. The Architect, after due investigation, will notify the Contractor or any reasonable objection to any such proposed Subcontractor.

F. RECORD DRAWINGS

1. The Contractor shall maintain notes of any changes or modifications. Upon completion of project, the Contractor shall note such changes on plans and deliver the plans to the Architect, with final certificates. Final payment will not be made by the Owner until these drawings are in the hands of the Owner.

G. REPORTS, RECORDS AND DATA

1. The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

DIVISION 01

SECTION 01 33 00: SHOP DRAWINGS AND SUBMITTALS

01 33 00.01: GENERAL

A. SCOPE

1. The reviewing of shop drawings and submittals is to be regarded as assisting the Contractor, and in reviewing same, the Architect does not relieve the Contractor from the responsibility for errors or omissions which may exist even though in accordance with the approved drawings. Should errors or omissions be discovered at a later date, they must be made good by the contractor, irrespective of any approval of the Architect. Manufacturer's or fabricator's shop drawings shall be submitted to the General Contractor and before the General Contractor, or his Subcontractors, submits shop drawings to the Architect for approval, he shall:
 - a. Submit shop drawings, product data and samples where called for by these specifications.
 - b. Shop, erection and setting drawings, certificates, catalog cuts, and schedules required for work of various trades, shall be checked before submission, as hereinafter specified, by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. All submittals must be stamped and signed by the Contractor certifying to such check and must be accompanied by a letter of transmittal signed by Contractor.
 - c. When requested by the Architect, the Contractor shall submit shop drawings, erection or setting drawings, and schedules of various items of work, whether or not such drawings or schedules are specifically mentioned in the technical sections of the specifications.
 - d. No items shall be fabricated, nor any portion thereof shipped to site prior to approval of applicable shop drawings.
 - e. The Contractor is responsible for any delay caused by his failure to observe these requirements, and the time for the completion of his contract will not be extended because of such delays.

01 33 00.02: SUBMISSION PROCEDURE

A. IN ORDER THAT THE ARCHITECT MAY EXPEDITE THE APPROVAL AND RETURN OF THE SHOP DRAWINGS, ALL MUST BE SUBMITTED AS FOLLOWS:

1. Shop drawings of materials shown on coded sections, details, etc., must bear the same section and code identification as noted on the Architectural drawings.
2. For each drawing/document required, submit four (4) copies not exceeding 24" x 36" in size.
3. Each drawing shall have marked thereon proper descriptive title, manufacturer's project and sheet number, name of project for which submitted and exact location where material covered by such drawings is to be used.

4. A space 5" x 5" shall be reserved on each drawing to accommodate Architectural stamp.
5. Each submittal must be properly stamped, dated and signed by the Contractor verifying that same has been completely checked for accuracy, completeness and compliance with contract requirements.
6. The submittals will be reviewed by the Architect and returned to the General Contractor for corrections. Any delays resulting from compliance with this directive shall be the responsibility of the Contractor. Regardless of corrections made to such drawings by the Architect, the Contractor will nevertheless be responsible for the accuracy of such drawings and their conformance to the Plans and Specifications unless he gives notice in writing of any deviations at the time such drawings are furnished.
7. Shop drawings are reviewed by the Architect for compliance with the design concept of the project and compliance with the information given in the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences, and procedures of construction; and for coordination of the work of all trades. The Architect's review of a specific item does not indicate approval of an assembly of which the item is a component.
8. Drawings returned to the Contractor with the Architect's "No Exception Taken", "Make Corrections Noted" or "Exceptions Indicated" stamp need not be resubmitted for approval, however any notes or corrections indicated by the Architect on the "Make Corrections Noted" or "Exceptions Indicated" copies of shop drawings shall be complied with in the selections, fabrications, and installation. Corrected copies of "Make Corrections Noted" or "Exceptions Indicated" shop drawings shall be furnished for record when requested.
9. If submittals are stamped "Revise and Resubmit" or "Rejected - See Remarks", the corrections shall be made and new documents shall be submitted to the Architect for approval.
10. Each Contractor shall maintain, in readable condition at his job office, one complete set of working drawings and specifications of his work including all shop drawings bearing the appropriate Architect's stamp. Such drawings and specifications shall be available for use by the Architect.

B. CERTIFICATES SCHEDULES AND CATALOG CUTS (MANUFACTURER'S DATA)

1. Certificates, schedules and catalog cuts shall be submitted in quadruplicate (4). When catalog cuts are submitted, the specific item to be considered shall be identified as specified above. Items that are not so identified will be returned to the Contractor without action.

C. SAMPLES

1. Samples shall be submitted as called for in the technical sections of these specifications. Each sample shall be identified with descriptive title, manufacturer's name, name of project for which submitted, and location where material is to be used.
2. Samples shall be in triplicate (3), one (1) to be retained by the Architect and two (2) to be returned to the Subcontractor, one (1) of which is to be placed on file in the field office for comparison to the products delivered. Where full-size samples are required and specified to be installed on the Project, only one (1) sample will be required.

DIVISION 01

SECTION 01 50 00: TEMPORARY FACILITIES

01 50 00.01: GENERAL

A. SCOPE

1. Provide all temporary structures and utilities required for proper execution of the work including, but not limited to, those items specified herein.

01 50 00.02: TEMPORARY FACILITIES

A. TEMPORARY STRUCTURES

1. The General Contractor shall erect a temporary field office, complete with lights, telephone (installed at the Contractor's expense) and heat (in cold weather.)
2. Each contractor shall provide all necessary storage sheds, shanties, etc. of adequate size, for his own use. All temporary structures shall be built in a sound waterproof manner and shall remain on the premises until their removal is directed by the Architect.

B. TEMPORARY TOILETS

1. The General Contractor shall provide toilet facilities for all employees, as required by local ordinances, for complete adequate sanitary arrangements. These facilities shall be kept neat and clean at all times and shall be available to other contractors at all times.

C. TEMPORARY UTILITIES

1. The General Contractor shall provide water required by all trades for building purposes.
2. The General Contractor shall negotiate with the local electric utility for all necessary power requirements for construction purposes on the basis of applicable construction power rate schedules. Any expenses in securing electrical service and cost of the electrical energy usages for construction purposes shall be borne by the Contractor. Other contractors who have special electrical needs will make satisfactory arrangements with the General Contractor for same. In the event that special power requirements are necessary during the construction stages, the Contractor shall be responsible for the provisions thereof, with full co-operation and coordination of the Architect and other contractor(s) involved in order to meet the requirements of the approved plans and specifications. The Contractor's responsibility for electric service ceases upon the issuance of the "Certificate of Occupancy" or acceptance by Owner. At this time, notice should be given the local electric utility for Contractor's construction service "disconnect" and Owner's service "connect".

3. The General Contractor shall provide necessary heat as required before the building is closed or as directed by the Architect. The Contractor shall close all exterior openings, and keep same closed, until permanent enclosures are in place and while the building is being heated. Temporary heat shall be kept in operation as required, or as directed by the Architect. Other contractors with special needs will make arrangements with the General Contractor for same, but in no case will the General Contractor be relieved of the above requirement.
4. If the building's permanent mechanical systems are used for temporary heating or cooling during construction, the General Contractor shall pay for the fuel consumed. Under such circumstances the Contractor must provide temporary filters for all air handling equipment.
5. If the Contractor elects to use the mechanical systems for his own purposes (comfort, dry-out building, etc.) the Architect, or his engineer representative, shall conduct an inspection of the system prior to its being started. The Manufacturer's guarantee period begins from the day the equipment is started. The General Contractor will be responsible for the additional guarantee period needed to total 12 months to the Owner following the date of Substantial Completion.
6. If the Owner elects to use the mechanical systems for his own purposes (install lockers, equipment, etc.) prior to the date of Substantial Completion, then the Owner's 12-month guarantee period will begin on the day he begins using the facility. The Architect is to be notified and an inspection made prior to starting the mechanical systems.
7. The contractor shall, at all times, keep the premises free from accumulation of waste material or rubbish caused by his work or employees, and, at the completion of his work, he shall remove all debris and all his tools, scaffolding, and surplus material from the premises.
8. Do all shoring and build all barricades and temporary partitions necessary to protect the public and present property from all damage, danger and weather.

DIVISION 01

SECTION 01 60 00: PRODUCT REQUIREMENTS

01 60 00.01: GENERAL

A. SUMMARY

1. Work included:
 - a. Protect products scheduled for use in the work.
 - b. Product options and substitutions.
 - c. Each Subcontractor is responsible for receipt, storage, protection and on-site movement of their products and equipment.
2. Related work:
 - a. Section 01 33 00: Submittal Procedures (shop drawings, product data and samples).
 - b. Additional procedures may be prescribed in other Sections of these Specifications.

B. MANUFACTURERS RECOMMENDATIONS

1. Comply with manufacturers' recommendations on product handling, storage and protection.

C. PACKAGING

1. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

D. STORAGE

1. Generally, elevate all materials from the ground.
2. Store all products likely to be stolen in a locked area.
3. Store all products susceptible to weathering, mold, decay, ultra violet or other form of deterioration, in a protected and humidity controlled environment.

E. PROTECTION

1. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.
2. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.
3. Maintain furnished surfaces cleaned, unmarred and suitably protected until accepted by the Owner.

F. REPAIRS AND REPLACEMENTS

1. In the event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.
2. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

G. PRODUCT OPTIONS AND SUBSTITUTIONS

1. Various components in these Specifications are part of assemblies used to conform to requirements of Fire and Life Safety, A.D.A., State Energy Code, IBC and other similar regulations. These assemblies may or may not involve proprietary products. Substitution of one component of an assembly could invalidate the approval of the assembly and must, therefore, be carefully considered.
2. The following products do not require further approval except for interface within the Work:
 - a. Products specified by reference to standard specifications such as ASTM and similar standards.
 - b. Products specified by manufacturer's name and catalog model number.
 - c. Do not substitute materials, equipment or methods unless such substitution has been specifically approved by the Architect.
3. "Or equal":
 - a. Where the phrase "or equal", or "or equal as approved by the Architect", occurs in the Contract Documents, do not assume that the materials, equipment or methods will be approved as equal unless the item has been specifically so approved for this Work by the Architect.
4. Substitutions:
 - a. The Contract is based on the standards of quality established in the Contract Documents. Substitutions will be considered only when requested at time of bidding and when substantiated by the submittal of required data.
 - b. Substitution requests made prior to bidding will require an Addendum to notify all bidders of allowable alterations.
 - 1) No substitution requests will be accepted within ten (10) working days of the bid date.
5. Review authority:
 - a. Unless directed otherwise, all submittals shall be made according to Section 01 22 00.

DIVISION 01

SECTION 01 70 00: PROJECT CLOSEOUT

01 70 00.01: GENERAL

A. SCOPE

1. The Contractor shall supply all documents and provide all labor and materials required to comply with all items of the project closeout procedure as specified herein. **Do not provide the original Closeout Binders to the Owner until the Architect has reviewed and approved.**

01 70 00.02: PROCEDURE

A. SUBSTANTIAL COMPLETION

1. The Contractor shall notify the Architect of substantial completion of the project and shall prepare a list of items remaining to be completed.
2. Within seven (7) days of notification by the Contractor, the Architect shall conduct an inspection to determine whether or not substantial completion has been achieved.
3. If the Architect finds the project to be substantially complete, he shall prepare a Certificate of Substantial Completion and a list of items the Contractor must complete or correct before final payment will be made.

B. FINAL COMPLETION

1. Upon completion and/or correction of the items noted by the Architect, the Contractor shall email one (1) copy of each of the following documents to the Architect for review. **NOTE:** Please list each by Sections as per Table of Contents and highlight the Guarantee/Warranty information.
 - a. Final Application and Certificate for Payment
 - b. Contractor's Affidavit & Waiver of Lien (PA Form 00 65 01)
 - c. Subcontractor's, Supplier/Vendor's Release & Waiver (PA Form 00 65 02). Must receive from **each** Sub, supplier and/or vendor.
 - d. Status of Liens Affidavit (Form PA 00 65 03)
 - e. Contractor's General Guarantee (Form PA 00 65 04)
 - f. Roofing and Sheet Metal Guarantee (Form PA 00 65 05) – if applicable
 - g. Watertightness Guarantee (Form 00 65 06) - if applicable
 - h. Landscape Plants and/or Grass Guarantee (Form 00 65 07) - if applicable
 - i. Operation and Service Manuals – One (1) copy (refer to NOTE under B.1.).
 - j. Guarantee and Warranties per Specification Documents, with the required information highlighted, (refer to NOTE under B. 1.)
 - k. Copy of the Original Record Drawings with any changes or modifications marked (As-Builts). If no changes were made, then note on Cover Sheet: "NO MODIFICATIONS WERE MADE TO THE CONSTRUCTION DOCUMENTS" Date, and sign. Original As-builts will be given to the Owner.

2. When the Architect determines that all items of work have been completed in Agreement with the Contract Documents, and all Closeout Documents have been reviewed and approved, he will issue the Final Certificate of Payment for the Owner's action. Per the Construction Documents; provide to the Owner in hardback binders;
 - a. Four (4) hard copies of all items list above (B.1.a.-j.)
 - b. One (1) Original hard copy of (B.1.j.), shall be provided to the Owner.

NOTE: You can verify the quantities required with the Owner.

END OF SECTION

DIVISION 02

SECTION 02 41 00: DEMOLITION

02 41 00.01: GENERAL

A. RELATED DOCUMENTS

1. The Contract Documents and provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 01, General Requirements, are included as part of this Section as though bound herein.

B. SUMMARY

1. Selective demolition work requires removal and offsite disposal of existing building elements.
2. Refer to the Documents for particular whole or partial elements requiring demolition and the extent of each.

C. SUBMITTALS

1. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to the Architect for review prior to commencement of Work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control.
2. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
3. Coordinate with Owner's continuing occupation of portions of existing building, with Owner's partial occupancy of completed new addition.

D. SCOPE OF WORK INCLUDED

1. The Contractor shall furnish all tools, labor, and materials as required to complete all demolition as herein specified.
2. Obtain and pay for all permits as required for the execution of the Work, in this Section.
3. Notify all corporations, companies, individuals or local authorities owning conduits, wires, or pipes running to the property. Arrange for the removal of all wires running to and on the property. Cap all pipes and sewers, in accordance with all Local Governing Codes and Ordinances.
4. The work shall be demolished down to and including footings, where required.
5. Dust chutes shall be erected and used for removal of material, rubbish and debris.
6. All rubbish and debris shall be constantly sprinkled to lay the dust.

7. Remove all buildings, fences, walls, all tanks or other underground equipment, all paving, etc., as indicated.
8. Unless otherwise noted, all demolished materials shall become the property of the Demolition Contractor.

E. JOB CONDITIONS

1. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished. Conditions existing at time of commencement of Contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
2. Partial Demolition and Removal: Items indicated to be removed but having salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
3. Storage or sale of removed items on site will not be permitted.
4. All materials, rubbish, and debris shall be promptly removed from the building and from the premises. Accumulation of same will not be permitted.

F. PROTECTIVE MEASURES

1. Provide temporary barricades and other forms of protection as required to protect the public and the Owner's personnel from injury due to selective demolition work.
 - a. Provide protective measures as required to provide free and safe passage of the public and the Owner's personnel to and from occupied portions of building.
 - b. All abatement of hazardous materials will be the responsibility of the Demolition Contractor.
 - c. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
 - d. Protect from damage, when and as directed, existing finish work that is to remain in place and becomes exposed during demolition operations.
 - e. Construct temporary insulated solid dust proof partitions when required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dust proof doors if required.
 - f. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure of interior areas of existing building.
 - g. Protect improvements on adjoining properties as well as those on the Owner's property.
 - h. Restore improvements damaged by this Work to their original condition, as acceptable to the Owner or other parties or authorities having jurisdiction.
 - i. Protect and maintain all conduits, drains, sewers, pipes, and wires that are to remain on the property.

- j. Provide, erect, and maintain all lights, barricades, warning signs, and guards as necessary for the protection of streets, sidewalks, alleys, adjacent buildings and adjoining properties.
 - k. Remove project protection measures at completion of Work.
2. Use of explosives will not be permitted.
3. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Coordinate with the Owner.
- a. Do not interrupt existing utilities serving occupied or used facilities, except when approved by the Owner.
 - b. Environmental Controls: Use temporary enclosures, and other suitable methods to limit dispersed dust and noise to lowest practical levels.
 - c. Traffic: Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
 - d. Coordinate with Mechanical and Electrical Work prior to start and during demolition operations.

02 41 00.02: PRODUCTS

No work in this section.

02 41 00.03: EXECUTION

A. PREPARATION

- 1. Cover and protect furniture, equipment, and fixtures to remain (or to be removed by Owner) from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.
- 2. Erect and maintain dust proof partitions and closures as required in preventing the spread of dust or fumes to occupied portions of the building.
- 3. Provide weatherproof closures for exterior openings resulting from demolition work.
- 4. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.
- 5. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.

B. DEMOLITION

- 1. Perform selective demolitions work in a systematic manner. Use such methods as required to complete Work indicated on Drawings in accordance with Demolition Schedule and governing regulations.

2. This work shall be executed in an orderly and careful manner, with due consideration for neighbors and the public. Sidewalk, streets, and alley shall be kept clean and swept daily.
3. Demolish foundation walls to a depth of not less than 12 inches below existing ground surface.
4. Demolish and remove below-grade wood or metal construction.
5. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel, or sand, free of trash, debris, stones over 6 inch diameter, roots, and other organic matter.
6. Note: If unanticipated, mechanical, electrical, or structural elements which conflict with intended function or design are encountered, investigate and assess both nature and extent of the conflict. Submit report to the Architect in written, accurate detail. Pending receipt of directive from the Architect, rearrange selective Demolition Schedule as necessary to continue overall job progress without delay.
7. Any Contractor, Subcontractor, or Vendor who discovers asbestos or asbestos products during the construction or removal of existing construction on this project will advise the General Contractor and Architect immediately. The General Contractor will stop all construction until a certified Asbestos Removal Contractor removes the offensive material and advises the General Contractor, Owner, and Architect in writing that construction may be resumed.

C. DISPOSAL OF DEMOLISHED MATERIALS

1. Remove debris, rubbish, and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site.
2. Burning of removed materials is not permitted on project site.

D. CLEAN-UP AND REPAIR

1. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
2. Repair demolition performed in excess of that required. Return structures and surfaces to remain, back to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

E. INSURANCE

1. The General Contractor, Demolition Contractor, or any other person or persons contracting to do the demolition must maintain such insurance as will protect him and the Owner from all claims under Workman's Compensation Act and from all claims for damage or personal injury, including death, which may arise from operations under this contract, whether such operations be by himself or by any Subcontractor or anyone directly or indirectly employed by either of them. Certificates of Insurance shall be filed with the Owner and shall be subject to his approval for adequacy of protection.

DIVISION 02

SECTION 02 41 19: SELECTIVE DEMOLITION

02 41 19.01: GENERAL

A. RELATED DOCUMENTS

1. The Drawings and provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 01, General Requirements, are included as part of this Section as though bound herein.

B. SUMMARY

1. Selective demolition work requires removal and offsite disposal of existing building elements.
2. Refer to the Drawings for particular whole or partial elements requiring demolition and the extent of each.

C. SUBMITTALS

1. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to the Architect for review prior to commencement of Work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control.
2. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
3. Coordinate with Owner's continuing occupation of portions of existing building, with Owner's partial occupancy of completed new addition.

D. JOB CONDITIONS

1. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished. Conditions existing at time of commencement of Contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
2. Partial Demolition and Removal: Items indicated to be removed but having salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
3. Storage or sale of removed items on site will not be permitted.
4. Protections: Provide temporary barricades and other forms of protection as required to protect the public and the Owner's personnel from injury due to selective demolition work.

- a. Provide protective measures as required to provide free and safe passage of the public and the Owner's personnel to and from occupied portions of building.
 - b. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
 - c. Protect from damage, when and as directed, existing finish work that is to remain in place and becomes exposed during demolition operations.
 - d. Construct temporary insulated solid dust proof partitions when required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dust proof doors if required.
 - e. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure of interior areas of existing building.
 - f. Protect improvements on adjoining properties as well as those on the Owner's property.
 - g. Restore improvements damage by this Work to their original condition, as acceptable to the Owner or other parties or authorities having jurisdiction.
 - h. Remove protections at completion of Work.
5. Use of explosives will not be permitted.
6. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Coordinate with the Owner.
- a. Do not interrupt existing utilities serving occupied or used facilities, except when approved by the Owner.
 - b. Environmental Controls: Use temporary enclosures, and other suitable methods to limit dispersed dust and noise to lowest practical levels.
 - c. Traffic: Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
 - d. Coordinate with Mechanical and Electrical Work prior to start and during demolition operations.

02 41 19.02: PRODUCTS

No work in this Section

02 41 19.03: EXECUTION

A. PREPARATION

- 1. Cover and protect furniture, equipment, and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.
- 2. Erect and maintain dust proof partitions and closures as required in preventing the spread of dust or fumes to occupied portions of the building.

3. Provide weatherproof closures for exterior openings resulting from demolition work.
4. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.
5. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.

B. DEMOLITION

1. Perform selective demolitions work in a systematic manner. Use such methods as required to complete Work indicated on Drawings in accordance with Demolition Schedule and governing regulations.
2. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power driven masonry saw or hand tools.
3. Demolish foundation walls to a depth of not less than 12 inches below existing ground surface.
4. Demolish and remove below-grade wood or metal construction.
5. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel, or sand, free of trash, debris, stones over 6 inch diameter, roots, and other organic matter.
6. Note: If unanticipated, mechanical, electrical, or structural elements which conflict with intended function or design are encountered, investigate and assess both nature and extent of the conflict. Submit report to the Architect in written, accurate detail. Pending receipt of directive from the Architect, rearrange selective Demolition Schedule as necessary to continue overall job progress without delay.

C. DISPOSAL OF DEMOLISHED MATERIALS

1. Remove debris, rubbish, and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site.
2. Burning of removed materials is not permitted on project site.

D. CLEAN-UP AND REPAIR

1. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
2. Repair demolition performed in excess of that required. Return structures and surfaces to remain, back to the condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

DIVISION 03

SECTION 03 00 00: CONCRETE WORK

03 00 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, materials, equipment, appliances, forming, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, the applicable drawings, and latest issue of the ACI standards 318.
2. The work required under this section consists of all concrete work and related items necessary to complete the work indicated on drawings and described in the specifications.

B. SUBSTITUTIONS

1. The materials or products herein and indicated on drawings by trade names, manufacturer's name or catalogue number shall be provided as specified. Substitutions will not be permitted, except as approved in writing by the Architect.

C. COMPLIANCE WITH STANDARD AND INDUSTRY SPECIFICATIONS

1. Any material or operation specified by reference to the published specifications of a manufacturer. The American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), the Portland Cement Association, the Concrete Reinforcing Steel Institute, the local Building Code, or other published standard, shall comply with the requirements of the current specification or standard listed. In case of a conflict between this referenced specification and the project specifications, the project specifications shall govern. (In case of conflicts between the referenced specifications, or standards, the one having the most stringent requirements shall govern.)

D. SUBMITTALS

1. Submit design mix in quadruplicate.
2. Submit (in quadruplicate) copies of reports of tests performed by an independent testing laboratory on specimen cylinders cast from concrete complying with the proposed design mix.
3. Submit (in quadruplicate) description of type and source of materials used for design mix.

E. WEATHER CONDITIONS

1. Concrete when deposited shall have a temperature not below 50° F. and not above 90° F. In freezing weather, suitable means shall be provided for maintaining the concrete at a temperature not lower than 70° F. for three days or 50° F. for five days after placing. Cooling of the concrete to outside temperature shall not be at a rate faster than one degree each hour for the first day and two degrees each hour thereafter until the outside temperature is reached. The methods of heating the materials and protecting the concrete shall be approved by the Architect. The maximum temperature of concrete produced with heated aggregates, heated water, or both, shall not exceed 90° F. at any time during its production or transportation.

2. COLD-WEATHER CONCRETE

- a. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near freezing weather. No frozen materials, or materials containing ice, shall be used.
- b. All concrete materials and all reinforcement, forms, fillers, and ground with which concrete is to come into contact shall be free from frost.
- c. Whenever the temperature of the surrounding air is below 40° F, all concrete placed in the forms shall have a temperature of between 70° F and 80° F., and adequate means shall be provided for maintaining temperature of not less than 70° F. for three days, or 50° F. for five days, or for as much more time as is necessary to insure proper curing of the concrete.
- d. Salt, anti-freeze admixtures, or other chemicals for the prevention of freezing shall not be used.
- e. Housing, covering, or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heat is discontinued.

3. HOT-WEATHER CONCRETE

- a. Provide adequate methods of lowering temperature of concrete ingredients so that the temperature of concrete when placed does not exceed 90° F.
 - b. When the weather is such as to raise concrete temperature, as placed, consistently above 80° F., MasterPozzoloth retarder shall be used.
 - c. Subgrade and forms shall be sprinkled with water before placing of concrete. All excess water shall be removed before concrete is placed.
 - d. Curing shall start as soon as practicable to prevent evaporation of water, and forms shall be kept wet. Flat work shall be protected from dry winds and direct sun.
4. Admixtures intended to accelerate the hardening of the concrete or to produce higher than normal strength at early period will not be permitted unless specified or the prior approval is obtained from the Architect.
 5. Records shall be kept by the Contractor to show the date of placements, the mix used and the air temperature at the time of concreting for the various portions of the work. These records shall be available to Architect when required and/or requested, as required by ACI-318.

F. PROTECTING AND CURING

1. Protect concrete against frost and rapid drying and keep moist for at least six days after placing. During this period, concrete shall be maintained above 70° F. for at least three days or above 50° F. for at least five days. Concrete from which forms are removed within six days after pouring should be sprayed during the curing period as frequently as drying conditions may require. Cover cement finishes with mats, waterproof paper or other approved membrane within 24 hours after finishing and maintain in good condition until the installation of permanent floor covering or until directed. Covering shall be of a type that will not stain or discolor finished concrete surfaces. At Contractor's option, floors may be coated with a sealing and curing compound; the compound used must meet the Architect's approval.

03 00 00.02: PRODUCTS

A. CEMENT

1. Cement shall be standard Portland Cement of American manufacturer, conforming to ASTM C150, Type I. Only one brand of commercial Portland Cement shall be used in the exposed concrete of the structure. Cement reclaimed by cleaning bags or from leaking containers shall not be used.
2. Mill tests shall be furnished on each car of Portland Cement used, or laboratory tests on marked bin from which cement is shipped, and shall be conducted in accordance with the recommendations of the American Society for Testing and Materials.
3. Cost of tests shall be borne by the Contractor. Test reports in duplicate, stating whether the material meets requirements of the ASTM Specification, shall be sent to the Architect.

B. CONCRETE AGGREGATE

1. Fine aggregate shall be sand having clean, hard, durable, uncoated grains and free from deleterious substances and shall conform to ASTM C33. Lightweight aggregates shall conform to ASTM C330.
2. Coarse aggregate for standard-weight concrete shall be crushed stone, gravel or other approved inert material having clean, hard, durable, uncoated particles conforming to ASTM C33. The maximum size of coarse aggregate shall be in accordance with ACI 318, Paragraph 3.3.3.
3. Abrasive aggregate shall be composed of 60 to 75% aluminum oxide or silicon carbide abrasive, bonded by a vitreous ceramic material. The structure of aggregate shall be hard, homogeneous, non-glazing, rust-proof and unaffected by freezing, moisture or cleaning compounds. Aggregate shall be graded to sizes as hereinafter specified; fine 1/32 to 1/4 inch size, or coarse, 1/4 to 1/2 inch sizes.

C. WATER

1. Water used in mixing concrete shall be clean and free from deleterious amounts of acids, alkali, or organic materials.

D. EXPANSION JOINT MATERIAL

1. Expansion joint material shall be asphalt-impregnated fiber strips, 1/2" thick, unless otherwise shown or noted on the drawings, and shall be Sealtight by W. R. Meadows, Inc., or equal.

E. ADMIXTURES

1. MasterPozzolith, a Master Builders brand, as manufactured by BASF Admixtures, Inc., Cleveland, Ohio, or approved equal, shall be used in all concrete, unless otherwise noted on the drawings, except column footings and wall footings. Admixtures shall be used in accordance with BASF Admixture, Inc. data sheets found at www.basf-admixture.com. Air entraining admixture shall comply with ASTM C260.
2. MasterAir VR 10, a Master Builders brand of BASF Admixtures, Inc., or equal, shall be used with MasterPozzolith to produce specified amount of entrained air. Air entrainment of 5% +/- 1% shall be used with all concrete exposed to the weather.
3. No admixture shall contain calcium chloride.

F. STRENGTH REQUIREMENTS

1. The locations and strengths to be used under this contract shall be indicated on Structural Drawings.

G. MIX DESIGNS

1. Concrete shall be Plant Ready-Mixed.
2. Ready-mixed concrete design may be based on producer's previously developed design mixes (complying with admixture requirements herein and proposed materials) when they have been approved by the Architect on basis of submittal requirements hereinafter outlined.
3. Concrete mix design prepared for this project shall be prepared by testing laboratory employed by Contractor, based on materials to be used on the project. Proportions of ingredients shall be selected to produce an average strength at least 1200 psi greater than the required strength unless the provisions of Paragraph 4.3 of ACI 318-89 are met.

H. MIX TESTS

1. Tests shall be performed to verify mixes of all strengths of concrete and to test aggregates.
2. Contractor shall submit samples, in adequate quantities, for each mix verification of all concrete materials to be used on the project to the designated testing laboratory.
3. The designated testing laboratory shall make strength tests from trial batches, in the laboratory, using materials and mix designs proposed for use by the Contractor. Six test cylinders shall be made for each trial batch. Three shall be broken at seven days, and three at twenty-eight days.

4. Verification tests of concrete mixes to be deemed satisfactory shall exceed specified strengths in accordance with ACI 318-89, Section 4.3.2.
5. If verification tests fall below these limits, either the material samples shall be changed and resubmitted or the proposed mix design shall be removed and resubmitted for testing.
6. Compression test specimens made to verify the mixes shall be made in accordance with ASTM C192; aggregates shall be tested in accordance with ASTM C33 and C330, and all compression test specimens shall be tested in accordance with ASTM C39.

I. PLANT MIXING

1. Working stresses for the design of this structure are based on the specific minimum 28-day compressive strength of the concrete. Proportions shall be in compliance with approved design mix for each strength of concrete.
2. Proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into corners and angles of forms and around reinforcement with method of placing employed on the work, but without permitting materials to segregate or excess free water to collect on the surface.
3. Concrete shall be homogeneous; and, when hardened, shall be the strength, resistance to deterioration, durability, and resistance to abrasion, water-tightness, appearance, and other properties required in the Contract Documents.
4. All concrete materials shall be measured by weight.
5. Provide necessary equipment to accurately determine and control amount of materials entering the concrete mix. Individual ingredients shall be weighed separately on each batch. Accuracy of all weighing devices shall be such that successive quantities can be measured to within one percent of the desired amount.
6. Completely discharge contents of the mixer before each new batch is loaded. Use of re-tempered concrete is forbidden.
7. A separate water metering device (not truck tank) shall be used for measuring water added to the original batch.
8. Use of wash water as a portion of the mixing water is forbidden. Wash water added to empty drums after discharging shall be dumped before a new batch is received.
9. Centrally mixed concrete shall be mixed for the length of time specified herein, not "shrink-mixed".
10. Mixing drums shall be watertight.
11. Concrete shall be discharged within one hour from the time concrete is mixed, if centrally mixed, or from time the original water was added, if transit-mixed.

12. Producer shall furnish delivery ticket with each load of concrete delivered under this Specification. Delivery ticket shall show clearly the class and strength of concrete, size of coarse aggregate, the slump ordered, and the date and time of departure from the batching plant. Delivery tickets shall conform to requirements of ASTM C94-69.

J. CONVEYING EQUIPMENT

1. If concrete is to be transported more than 50 feet in carts or buggies, the carts or buggies shall be equipped with pneumatic tires.
2. Equipment for chuting or other methods of conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at delivery and without separation or degradation of materials.

K. CONTROL JOINT

1. Key-Loc® Joints as manufactured by Form-A-Key Products, Louisville, Kentucky, 40214. Provide galvanized steel stakes at a maximum of 2'-0" on centers. Saw cut control joints will not be permitted.

03 00 00.03: EXECUTION

A. SAFETY FACTOR

1. Initial design mix shall have safety factor equal to 1,200 psi. After 30 consecutive tests, design mixes may be adjusted in accordance with ACI 318-83 Section 4.3.

B. TESTING LABORATORY'S DUTIES

1. All concrete testing shall be performed by a laboratory meeting the requirements of ASTM E-329, Standard Recommended Practice for Testing Agencies for Concrete as Used in Construction. Accreditation as a Class I or II laboratory by BACTL will suffice as evidence of the laboratory meeting these ASTM requirements. The following duties will be performed by the testing laboratory approved by the Architect.
2. Make, store, transport, cure and test compression specimens made during placing of concrete. Compression test specimens shall show all pertinent data, such as strength of concrete, exact location of pour, truck number for ready-mixed concrete, date on which specimen was broken, age of specimen, compression strength of specimen and slump test results of pour from which the specimen was made.

C. TESTS

1. No less than 6 cylinders shall be made for each test. Test shall be made and cylinders tested as follows:
 - a. One test for each class of concrete for each day's pour.
 - b. One test for each 50 yards of concrete.
 - c. One test for each 5,000 sq. ft. of pour.
 - d. Two cylinders tested at 7 days for information.
 - e. Two cylinders tested at 28 days for acceptance.
 - f. Two cylinders in reserve.
2. Reports should be filed with the Architect through the Contractor.

D. EVALUATION AND ACCEPTANCE OF CONCRETE

1. Evaluation of compression test results shall be in accordance with ACI 301-84 Chapter 17, and ACI 318-89 Section 4.7.
2. Neither the results of laboratory verification tests nor any provision in the Contract Documents shall relieve the Contractor of the obligation to furnish concrete of the class and strength specified.

E. INSPECTION OF WORK BEFORE POURING

1. Inspect work to receive poured concrete for deficiencies to be corrected.
2. Do not place concrete on earth until the fill or excavation has been prepared as set forth under applicable sections of the Specifications for that work.
3. Before any concrete is placed in forms, all pipes or sleeves, openings or embedded items shall be in place and shall have received any tests specified for them. All anchor bolts for columns shall be set in place using an instrument and template to the required lines and grade unless otherwise shown.
4. Do not place concrete in forms until all foreign matter has been removed from forms and the reinforcing steel is in proper condition for placement of concrete.
5. Remove hardened, or partially hardened, concrete of forms or reinforcement before placing concrete.

F. CONVEYING

1. Concrete shall be conveyed from mixer to place of final deposit by methods which will prevent separation or loss of the material.
2. Runway supports shall not bear upon reinforcing steel or fresh concrete.
3. All conveying equipment shall be thoroughly cleaned before a run of concrete is begun and at frequent intervals during placing of concrete.
4. All rejected concrete shall be hauled away from the site, and disposed of at Contractor's expense.

G. CONSTRUCTION JOINTS AND EXPANSION JOINTS

1. Early in the construction program, the Contractor shall preview with the Architect the construction joints he proposes to use and which are not indicated on the drawings. Contractor shall not use any construction joints which are not approved by the Architect. In all cases construction joint shall occur at sections of minimum shear.
2. Construction joints shall be formed as indicated on the drawings, or as approved or directed by the Architect. Dowels and keys shall be used where indicated or required.
3. The rate and method of placing concrete and the arrangement of construction joint bulkheads shall be such that the concrete between construction joints shall be placed in a continuous operation.

4. Joints in reinforced slabs, joists, beams and girders shall be perpendicular to the axis or surface of the member jointed and at the center of the span. If an intersecting member occurs at that point, the joint shall be located at a point of minimum shear.
5. Construction joints in walls, columns, or piers shall be at the bottom of connecting beam.
6. Construction joints in walls, columns or piers shall be at the bottom of connecting beam or girder. Whenever it is necessary to stop a day's work, or for any reason, such stops shall be located at center of slabs and of beams or as directed by the Architect. (Construction and other joints in concrete walls below grade shall have a Continuous water stop as shown and/or noted placed full length in each joint. Seal laps and joints of water stops tight.)
7. A temporary wood bulkhead shall be erected so that the jointing will follow a vertical plane at right angles with the direction of the main reinforcement. To this bulkhead, fasten a wood strip 2" thick and of width equal to one-third the depth of the concrete slab to form a tongue and grooved joint.
8. Before concreting is resumed, the surfaces of previously placed concrete shall be roughened, cleaned, wetted and slushed with grout immediately before additional concrete is placed. Grout shall be one-part Portland Cement and two parts sand.

H. PLACING

1. Deposit concrete as nearly as practicable in its final position to avoid segregation due to re-handling or flowing. Do not deposit concrete on work that has partially hardened or been contaminated by foreign material, and do not use re-tempered concrete. In no case shall concrete be used when the elapsed time after addition of water and cement to batch exceeds one hour.
2. Concrete shall not be dropped more than four feet. For greater distances of drop, concrete shall be handled with metal chutes or tremie pipes.
3. Once concreting has started, it shall be carried on as a continuous operation until placing of the plane or section is completed. The top surface shall be finished to a true plane. When construction joints are necessary, they shall be made in accordance with Article 3.6 above.
4. All concrete shall be thoroughly compacted by suitable means during the operation of placing, and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms. When vibration is used, it shall be applied directly to the concrete. Vibration shall be applied at the point of deposit and in the area of freshly placed concrete. It shall be of sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures but shall not be long enough to cause segregation of the mix. To secure even and dense surfaces, free from aggregate pockets or honeycomb, vibration shall be supplemented by hand spading in the corners and angles of forms and along form surfaces while the concrete is plastic under the vibratory action. Caution must be exercised when using vibrators and hand spades to prevent any injury to the inside face of the forms or any movement of the reinforcement.

5. Concrete slabs shall be placed in a continuous operation, within limits as specified hereinafter until the placing of the section is completed. Concrete shall be thoroughly worked around all embedded items and into corners. Concrete floor slabs shall be placed in checkerboard pattern; pour limits shall not exceed one bay in width by four bays in length. Refer to SECTION 5 herein.

I. FINISHES FOR CONCRETE WORK

1. The following finishes shall be provided for poured-in-place concrete work:
 - a. Concealed Work..... As formed
 - b. Exposed Work Rubbed
 - c. Exterior Walks, Stairs, and Paved Areas..... (not to pond water)
 - d. Floor Slabs to receive Resilient Tile and Carpet..... Steel Troweled
 - e. Floor Slabs to receive Ceramic or Quarry Tile..... Wood Float
2. Rubbed Finish: Remove all fins and projections, rub surfaces to a smooth, even texture with Carborundum stone and water immediately after stripping of forms. Do not use a grout wash.
3. Light Broom Finish: Wearing surfaces of exterior concrete walks, aprons, ramps and steps shall be given a light broom or brush finish and shall be non-slippery. Exterior steps should slope as not to pond water.
4. Steel Troweled Finish: Concrete floor slabs scheduled to receive resilient flooring shall be machine rubbed and ground with abrasive stones where necessary to provide a smooth concrete surface, free of ridges, projections and depressions, so that finish floors will be free of irregularities and highlights.
5. Wood Float Finish: Tamp and screed with straight edge concrete floor slabs to receive ceramic tile and give a uniform, smooth, wood float finish, free of exposed aggregate, and left ready for the installation of ceramic or quarry tile.

J. PROTECTION

1. Protect freshly placed concrete from damage or injury due to water, falling objects, persons or anything that may mar or injure finish surface of concrete.

K. DOCUMENTS TO BE KEPT AT THE PROJECT JOB SITE OFFICE

1. Maintain one copy of ACI 301: make available to the Architect and others related to concrete work; do not allow to be removed from the project office.

L. STOPPING WORK

1. Where work is stopped before completion of the mass, the concrete shall be left with a clean, rough surface without cavities or loose stone. All surfaces shall be approximately vertical, or horizontal, unless otherwise specified or directed on the plans. When placing fresh concrete upon the surface of brushes where necessary: all dirt brushed off, and the surface of the old concrete thoroughly wet and broomed with a thin wash of cement grout mixed one part cement and one part sand. All exposed surfaces of concrete shall be kept thoroughly moist by drenching once each day or more often for two weeks after being deposited, or unit covered with fresh

concrete, and all exposed finished surfaces of concrete shall, in addition, be covered with coarse burlap, wet sawdust or sand, or other satisfactory covering for at least three (3) days.

M. CONSTRUCTION OF FORMS

1. Construction forms to slopes, lines and dimensions shown, plumb and straight and sufficiently tight to prevent leakage; securely brace and shore forms to prevent displacement to safely support construction loads. Provide access openings for cleaning and inspecting forms and reinforcing prior to depositing concrete. Do not coat forms with material that will stain or cause injury to exposed concrete surfaces or to plaster applied direct to concrete. Keep wood forms wet as necessary to prevent shrinkage. (Forms for exposed, concrete beams, girders, columns and pilasters shall provide for a 1" flat bevel on external corners). Construct forms for beams, girders and lintels so that sides may be removed without disturbing bottom of form or its support.
2. Where soil conditions will permit excavation to accurate sizes without bracing, side forms for footings may be omitted and the sides of excavation lined with waterproof paper, or .006 inch thick polyethylene film.

N. INSERTS AND FASTENING DEVICES FOR OTHER WORK

1. Provide for installation of inserts, conduit, pipe sleeves, drains, hangers, metal ties, shelf angle supports, anchors, bolts, angle guards, stair nosings, dowels, thimbles, anchor slots, metal reglets, nailing strips, blocking, grounds and other fastening devices required for attachment of other work. Properly located in cooperation with other trades and secure in position before concrete is poured. (Where openings are left in concrete for the passage of ducts, the openings shall be made slightly larger than the duct size. Where boxes are required for floor type door closers, they shall be accurately located and where required the base slab shall be cut out to receive the boxes prior to placing the cement floor topping). Do not install sleeves in any concrete beam, joist or column except after approval of the Architect.
2. Sufficient time between erection of forms and placing of concrete shall be given to the various trades to permit the proper installation of their work. See drawings and other sections of the specifications for extent, location and details of items to be embedded or placed in concrete.
3. All sleeves, chases, inserts, hangers, etc., which are provided and placed in the forms by the various trades shall be maintained in position and protected until the concreting is completed. (Hangers where required shall be anchored to the main reinforcing bars.)

O. MASONRY ANCHORS

1. Provide and install dovetail slots and anchors for anchorage of all masonry to concrete work. Place slots 24" on centers vertically and anchors 16" on centers horizontally.
 - a. Where concrete walls or beams more than 16 inches high are faced with masonry veneer, place slots vertically and space 24 inches apart.
 - b. Where concrete columns are faced with masonry or where a masonry partition or masonry wall abuts such a column, provide one continuous

vertical anchor slot in each side of column as required to receive anchors for the facing or abutting masonry.

- c. Where shown on drawings to receive anchors for stone or precast facings.
- d. Where concrete building or retaining walls are veneered with masonry or stone, place slots vertically and spaced 24 inches on centers over entire wall.
- e. Cast-in concrete anchors and welding plates will be shown on drawings.

P. FORM TIES

- 1. Form ties used for exposed concrete surfaces shall be of type approved by Architect. They shall have a minimum working strength when fully assembled of at least 3,000 pounds. Ties shall be adjustable in length as to permit complete tightening of forms and of such type as to leave no metal closer than 1-1/2" to the surface. They shall not be fitted with any lugs, cones, washers or other device to act as a spreader within the forms, or, for any other purpose which will leave a hole or depression larger than 7/8" in diameter or a depression back of the exposed surface of the concrete. Wire ties will not be permitted.
- 2. Ties that are to be pulled from the walls shall be coated with cup grease or other approved material to facilitate removal.
- 3. Tie rods that are to be entirely removed from the walls shall be loosened 24 hours after the concrete is poured. All but a sufficient number of ties to hold the forms in place may be removed at that time.

Q. REMOVAL OF FORMS

- 1. Forms shall be removed in accordance with the requirements of the ACI Building Code Requirements for Reinforced Concrete No. 318, Chapter 5-local building code, without damage to concrete and in a manner to insure the complete safety of the structure. Leave shoring in place until concrete member will safely support its own weight plus any live loads that may be placed upon it.
- 2. Upon removal of forms, the Architect shall be notified by the Contractor in order that an Inspection of the newly stripped surfaces may be made prior to patching.
- 3. Freshly stripped surfaces shall not be pointed up or touched up in any manner before having been inspected by the Architect.

R. PATCHING FORMED SURFACES OF EXPOSED CONCRETE

- 1. After the forms have been removed, all concrete surfaces shall be inspected and any pour joints, voids, stone pockets or other defective areas permitted by the Architect to be patched, and all tie holes, shall be patched before the concrete is thoroughly dry. Defective areas shall be chipped away to a depth of not less than one inch with the edges perpendicular to the surface. The area to be patched and a space at least six inches wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. Do not fill or patch construction joints or surfaces to receive metallic waterproofing, unless specifically authorized by the Architect. Do not patch any concrete in freezing water.
- 2. A grout of equal parts of Portland Cement and sand with sufficient water to produce a brushing consistency shall then be well brushed into the surface, followed immediately by the patching mortar. The patch shall be made of the same material

and of the same proportions as used for the concrete except that the coarse aggregate shall be omitted. The amount of mixing water shall be as little as consistent with the requirements of handling and placing. The mortar shall be re-tempered without the addition of water by allowing it to stand for a period of one hour during which time it shall be mixed with a trowel to prevent setting.

3. The mortar shall be thoroughly compacted into place and screeded off so as to leave the patch slightly higher than the surrounding surface. It shall then be left undisturbed for a period of one to two hours to permit initial shrinkage before being finally finished. The patch shall be finished in such manner as to match the adjoining surface. Tie holes left by withdrawal of rods or the holes left by removal of ends of ties shall be filled solid with mortar after being thoroughly wetted. For holes passing entirely through the wall, a plunger-type grease gun or other device shall be used to force the mortar.
4. Unexposed formed surfaces of concrete shall be patched as directed by the Architect.
5. At the option of the Contractor, the bonding of the patching mortar to the acceptable concrete after necessary cutting and removal of porous or otherwise unacceptable concrete is completed may be done by the use of an approved bonding agent applied in accordance with the printed instructions of the manufacturer. Filling and finishing of the patch shall be completed as herein before specified.

S. TYPE OF FORMS AND EXPOSED FINISHES: (Other than floors)

1. Smooth Finish:
 - a. Smooth finish shall be used for all exterior vertical and overhead concrete surfaces that will be exposed as finished work. Obtain by using steel forms or by lining forms with 3/16 inch thick tempered pressed wood or 1/4" thick plywood. Sheets shall be as large as possible with smooth even edges and installed with close joints. Joint marks and fins shall be ground off and surfaces left smooth, dense and free from honeycombing, prominent grain markings and bulges or depressions more than 1/8" in four feet. Surfaces shall then be patched as hereinafter specified, leaving the surface finish uniformly smooth and washed clean. (Preliminary approval of sample panels at least 48 inches square will be required at project site).
2. Rubbed Finish:
 - a. Apply rubbed finish on all exposed interior concrete surfaces. Fins and other projections shall be carefully removed; offsets leveled, and damaged places repaired. Surfaces shall then be rubbed with cement or abrasive bricks and water. Do not use mortar or grout in the rubbing process. Remove form marks and similar blemishes and leave the surface finish uniformly smooth and clean.
3. Rough Finish:
 - a. Rough concrete finish shall be used for all other concrete for which no other finish is indicated or specified. Obtain by using clean, straight lumber, plywood, or metal forms. Concrete having a rough finish shall have honeycombing and minor defects patched.

T. FLOOR SLABS ON EARTH

1. Concrete floor slabs on earth shall be placed over a well compacted subgrade. Over subgrade, place a porous fill consisting of clean washed gravel graded from (1-inch to 2-1/2 inch) - (3/4 inch to 1-1/2 inch) size; thickness of porous fill shall be 4 inches unless otherwise shown. Roll or tamp fill until thoroughly compacted.

U. CONCRETE FLOOR AND SLAB FINISHES

1. General
 - a. Concrete finishes for floors and other slabs shall be of type specified for the various locations. Where specific type of finish is not indicated or specified, provide a standard integral monolithic finish for slabs where a separate topping is not required, and provide a standard topping finish for slabs where a delayed separate topping finish is required.
 - b. Slabs under quarry tile, ceramic tile, terrazzo, etc., shall be screeded to grade and left in rough condition to receive finish material.
 - c. Sidewalks, exterior landings and ramps shall be floated to grade and left in perfect condition. Use edger at sides and joints.
 - d. All other slabs unless otherwise specified shall receive smooth steel trowel finish.

V. WALKWAYS, CURBS, WALLS, STEPS, ETC

1. Where shown, all shall be as shown and/or noted on the drawings. Place construction joints 20 feet on centers and dummy joints 4 feet on centers. Place expansion joints against all walls and as shown and/or noted. Check drawings for items covered in this part of the specifications. In general, and unless otherwise shown, walkways, curbs, walls, etc., shall be 6" above the drive surfaces. Where shown, place weeps in walls. Exposed corners of walkways, curbs, walls, etc., shall be finished with edging tools with slight radius.

W. CLEANING FINISHED EXPOSED CONCRETE SURFACES

1. In the event that efflorescence, stains, oil, grease, or any unsightly accumulation of foreign materials are visible on the exposed exterior and interior surfaces of finished concrete, the Architect may require remedial action to remove these blemishes.

DIVISION 03

SECTION 03 10 00: CONCRETE FORMS AND ACCESSORIES

03 10 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete all concrete formwork as required by the drawings and specified herein.

B. INDUSTRY STANDARDS

1. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used):
 - a. American Concrete Institute (ACI).
 - b. The American Society for Testing and Materials (ASTM).
 - c. U.S. Product Standards (PS).

03 10 00.02: PRODUCTS

A. EARTH FORMS FOR TRENCH EXCAVATION

1. Where trench excavation is used and walls of excavation are neatly cut in good soil, side forms may be omitted for footings.

B. FORM MATERIAL

1. Plywood: Formwork for all concrete, unless otherwise specified, shall not be less than 5/8", 5-ply Douglas fir plywood especially processed to resist moisture and conforming to Plywood Class I, B-B-Ext-DFPA of U.S. Product Standard PS 1-66, as made by a member of the American Plywood Association.

C. ACCESSORIES

1. Form ties where concrete is unexposed shall be standard crimped snap ties. Form ties where concrete is exposed as finish shall be form clamps used with smooth tie rods. Form ties where concrete is exposed as finish shall be form clamps used with smooth tie rods. Form ties shall be as manufactured by Meadow Steel Products Company, Gateway Erectors, Inc. or Universal Form Clamp Company.
2. Corner formers shall be plastic with 1/2" radius equal to "Green Streak" corner formers, manufactured by Greenstreak Group, Inc., St. Louis, MO. 1-800-325-9504, B.F. Goodrich Company or Vinylex Corporation.
3. Form releasing agent shall be non-staining "Form Oil" as manufactured by Texaco, Sinclair or Georgia Carolina Company.

03 10 00.03: EXECUTION

A. FORM CONSTRUCTION

1. Forms shall conform to shape, lines, and dimensions of members indicated, and shall be substantial and sufficiently tight to prevent leakage of grout. Forms shall be properly braced or tied together so as to maintain position and shape. Construct forms so that they can be removed readily without hammering or prying against the concrete. Forms for exposed concrete shall be carefully made and accurately placed to obtain correct shape and lines.
2. Contractor shall be fully responsible for adequacy of form in its entirety. Forms shall support loads they will be required to sustain and shall maintain their dimensional and surface correctness to produce members required by drawings.
3. Box out for slots, chases, recesses, or other openings as shown on drawings or as needed for the work of any other trades.
4. Build bulkheads with keys in walls, footings and slabs where it is necessary to stop pouring of concrete. See Section 3C for construction joints.
5. Box out for all temporary openings and build forms to seal them up as required.
6. All formwork shall be constructed in accordance with ACI 347.

B. REUSED FORMS

1. Reused forms shall be thoroughly cleaned of dirt, debris, concrete, and foreign matter. Forms shall not be reused if they have developed defects which would affect their tightness and strength. Used forms shall not be used for architectural concrete.

C. WOOD FORMS

1. Wood forms shall be made of plywood. Joints shall be butted tight on solid bearings. Arrangements of panels shall be orderly and symmetrical, and use of small pieces shall be avoided. Forms shall be chamfered for external corners of concrete which will be exposed in finished work.

D. APPLICATION OF FORM COATING

1. Immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form of releasing agent specified, applied in compliance with the manufacturer's instructions.

E. GUARANTEE

1. Form Release Coatings: Submit a written guarantee signed by the coating manufacturer that the coating will not stain the concrete, will not impair the natural bonding character of paints, plasters, or their concrete coatings, will not damage the surface texture of the concrete, nor impair the strength of the concrete.

F. REMOVAL OF FORMS

1. Contractor shall assume full responsibility for removal of formwork. Forms shall be removed in accordance with the requirements of ACI 318 without damage to concrete, and in such manner as to insure complete safety of structure.
2. Under ordinary weather conditions, wall forms and other vertical forms for concrete which do not span between definite supports may be removed after two days.

DIVISION 03

SECTION 03 20 00: CONCRETE REINFORCEMENT

03 20 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete all concrete reinforcement as indicated on the drawings and specified herein.

B. INDUSTRY STANDARDS

1. Some products and execution are specified in the Section by reference to published specifications or standards of the following (with respective abbreviations used):

- a. American Concrete Institute (ACI).
- b. The American Society for Testing and Materials (ASTM).

2. The current edition of the following standard references shall apply to the work of this Section:

ASTM A82	Specification for Cold Drawn Steel Wire for Concrete Reinforcement.
ASTM A185	Specification for Welded Steel Wire Fabric for Concrete Reinforcement.
ASTM A615	Specification for Deformed Billet Steel Bars for Concrete Reinforcement.
ACI 315	Manual of Standard Practice for Detailing Reinforced Concrete Structures.
ACI 318	Building Code Requirements for Reinforced Concrete.
AWS D1.4	Structural Welding Code. Reinforcing Steel.

C. SUBMITTALS

1. Submit for approval shop drawings showing placing plans, bending details, and bar lists. All details and notes appearing on the Contract Drawings, and giving information for the placing of reinforcing steel, shall be shown also on the shop drawings. Shop drawings will not be approved without such information, and be of the same general form, as those on the contract drawings. Wall reinforcing shall be shown in elevation. Location and arrangement of accessories shall be clearly indicated. Only shop drawings completely checked by stamped, signed and dated by Contractor will be considered by the Architect.
2. Mill tests of reinforcing steel shall be submitted for each 15 tons, or less, shipped to the job site. Tests shall be conducted in conformance with ASTM A615, and methods prescribed therein. Cost of tests shall be borne by Contractor. Three (3) copies of each test report shall be submitted to the Architect.

D. STORAGE OF MATERIALS

1. Reinforcing steel delivered to the job, and not immediately placed in forms, shall be protected from mud, excessive rust producing conditions, oil, grease, or distortion.

E. INSPECTION OF STEEL PLACEMENT

1. The Architect shall have 24 hours notice and the opportunity to inspect and pass upon the placement of reinforcing steel before each concrete pour. Such inspections are in the nature of assisting the Contractor to minimize errors, and in no case will they operate to relieve the Contractor of this responsibility to provide the materials and workmanship required by the Contract Documents.

03 20 00.02: PRODUCTS

A. REINFORCING BARS

1. Metal reinforcement shall be deformed type bars conforming to ASTM A615 Grade 60. Reinforcement shall be manufactured from new billet steel of American manufacture, and shall conform to ASTM A615. All reinforcing shall be clean and free from loose rust, scale or other coatings that will reduce bond.

B. WELDED WIRE FABRIC

1. Welded wire fabric, or cold-drawn wire for concrete reinforcement shall conform to the requirements of ASTM A185 or ASTM A82, respectively. Size and gauge shall be as indicated on drawings with a minimum of 6 x 6 - W1.4xW1.4.
2. Lap sides and ends a minimum of 6". As concrete is deposited, carefully lift the mesh to the position indicated or noted on the drawings. Use steel mesh around steel to be fireproofed so it is 3/4" to 1" from flat surface of column or beam flanges. All to be as ASTM A-A 185-61T.

C. SHOP FABRICATION

1. Reinforcing steel shall be fabricated to shapes and dimensions indicated on the drawings and in compliance with applicable provisions of ACI 315 and ACI 318. Bars shall be bent cold in the Shop, and no bars shall be bent in the field.

03 20 00.03: EXECUTION

A. PLACEMENT AND ANCHORAGE

1. Space metal chairs, spacers and hangers in accordance with ACI 315 and ACI 318.
2. Metal reinforcement, at the time concrete is placed, shall be free from mud, oil, grease, rust, scale or other coatings that will destroy or reduce bond. Bars with kinks or bends not shown on the plans shall not be used.

- a. Metal reinforcement shall be placed in the exact position as shown on the plans and held securely during the placing of the concrete. In general, all reinforcement shall be placed and securely wired at each intersection with not less than 16 gauge annealed wire or approved clips and blocked before placing concrete in any section. All abrupt bends shall be avoided except where one member is bent around another. All reinforcing shall be securely blocked away from the forms by means of approved devices. Brick or clay tile may be used to support reinforcement in footings on ground. All metal supports used for this purpose adjacent to forms are to be galvanized, or as noted in other parts of this specification.
 - b. No concrete shall be deposited until the Architect has inspected the placing of the reinforcement and given permission to place concrete. All concrete placed in violation of this provision shall be rejected and removed. Reinforcement must not be displaced from its correct position during or before the placing of concrete.
 - c. There will be absolutely no changes, rearrangement nor deviation from the drawings. Indifference and carelessness will not be tolerated and any workman, foreman, or superintendent displaying that attitude will be immediately removed from the job.
3. Steel reinforcement dowels for successive work (walls, columns, and similar items) shall be wired in the correct position before placing concrete. The "sticking" of dowels into concrete after placement will not be permitted.
 4. Masonry Reinforcement: All masonry walls shall be reinforced with flush masonry reinforcing. Masonry metal reinforcing material shall be used every alternate course, beginning with the first course. Width of reinforcement to be 2" less the thickness of wall as shown on the drawings. Corner starter units shall be used on all corners. Partition "T" shall be used every alternate course, at all intersections of interior bearing and non-bearing partitions. Metal reinforcing shall be installed in at least two consecutive courses above and below all wall openings, with reinforcement extending a minimum of 32" beyond opening on each side. Finish shall be hot dipped galvanized after fabrication. All masonry metal reinforcing for bearing walls (8" and 12") shall be "Heavy Duty". That for non-bearing walls (4") shall be "Standard".

B. CONCRETE COVER

1. Metal reinforcement shall be protected by concrete cover. Where not otherwise shown on drawings, the thickness of concrete over reinforcement shall be as follows:
 - a. Walls 2" clear to surface exposed to weather;
1-1/2" clear to interior surfaces.
 - b. Slabs 1" clear to top and bottom.
 - c. Footings 3" clear to sides and bottom.
 - d. Beams 1-1/2" clear to stirrups.

C. SPLICING

1. Splicing of reinforcement not shown on drawings, or as specified in this paragraph, shall not be done except in specific instances previously approved by the Architect. Splices shall not be made at point of maximum stress and shall provide sufficient lap to transfer stress between bars by bond. Minimum lap of all bars shall be 30 diameters, or as indicated on the drawings. All splices shall be in accordance with ACI 315.

DIVISION 03

SECTION 03 30 53: CONCRETE FINISHES

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

03 30 53.01: GENERAL

A. DESCRIPTION OF WORK

1. Work shall consist of providing specified finishes to all Cast-In-Place concrete shown on the Drawings.
2. All structural concrete work shall be done in accordance with the applicable sections of ACI 301, Specifications for Structural Concrete for Buildings.

B. SUBMITTALS

1. Submit, in accordance with General Conditions, Manufacturer's printed instructions for application of all products specified.

03 30 53.02: PRODUCTS

A. MATERIALS

1. Fine Aggregate:
 - a. ASTM C 33-71a, Fine aggregate, Natural sand.
2. Portland Cement:
 - a. ASTM C 150-72, Type I, gray.
3. Water:
 - a. Potable, free of chemicals affecting set of the cement.
4. Bonding Agent:
 - a. Equal to INTRALOK by WR Meadows.
5. Curing Compound and Sealer:
 - a. Equal to KUREZ DR VOX by The Euclid Chemical Company or 1100-CLEAR by WR Meadows.
6. Epoxy Bonding Compound:
 - a. 100% solids, 100% reactive, suitable for use on dry or damp surfaces. One of following: "Euco Epoxy #452 by The Euclid Chemical Company or "Sikadur Hi-Mod" by Sika Chemical Corporation.

03 30 53.03: EXECUTION

A. CONDITION OF SURFACES

1. Surfaces to receive bonding grout containing the bonding admixture shall be structurally sound and clean of any material which reduces bonding.

B. PATCHING CONCRETE

1. Any concrete which is not formed as shown on the Drawings, or for any reason is out of alignment or level, or shows a defective surface, or shows defects which reduce the structural adequacy of a member or members, shall be considered as not conforming to the intent of these Specifications. Defective concrete work shall be removed from the project by the Contractor at his expense, unless the Architect grants permission to patch the defective area. Permission to patch any such areas shall not be considered a waiver of the Architect's right to require complete removal of the defective work if the patching does not, in his opinion, satisfactorily restore the quality and appearance of the surface, or if patching does not restore the structural adequacy for the member or members.
2. After removing forms, inspect all concrete surfaces. Patch any poor joints, voids, honeycomb, stone pockets, or other defective areas permitted by the Architect to be patched, and all tie holes. Where necessary, chip away defective areas to a depth of not less than 1", with the edges perpendicular to the surface. The areas to be patched and a space at least 6" wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. A grout of equal parts Portland cement and sand with a 50/50 mixture of the bonding admixture and water to produce a consistency of thick paint and shall then be well brushed into the surface, followed immediately by the patching mortar. The patching mortar shall be made of the same material (and of approximately the same proportions) as used for the concrete, except that the coarse aggregate shall be omitted. The mortar shall not be richer than 1 part cement to 3 parts sand. The amount of mixing water shall be as little as is consistent with the requirements of handling and placing. The mortar shall be re-tempered without the addition of water by allowing it to stand for a period of one (1) hour, during which time it shall be mixed occasionally to prevent setting.
3. Compact mortar thoroughly into place, and screed off so as to leave the patch slightly higher than the surrounding surface. Leave patch undisturbed for a period of 1 to 2 hours to permit initial shrinkage before final finishing. Finish patch in such a manner as to match adjoining surface. On exposed surface where unlined forms have been used, obtain the final finish by striking off the surface with a straight-edge spanning the patch, and held parallel to the direction of the form marks. All patches shall be cured in accordance with curing requirements for the surface in which the patch occurs. Keep patch moist for not less than three (3) days after installation.
4. Tie holes left by the withdrawal of rods, or the holes left by the removal of ends of ties shall be filled solidly with mortar after first being wet thoroughly. For holes passing entirely through a wall, a plunger-type grout gun shall be used to force the mortar through the wall, starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside; and when the hole is completely filled, the

excess mortar shall be struck off with the cloth flush with the surface. Holes not passing entirely through the walls shall be filled with a small tool that will permit packing the hole solidly with mortar. Any excess mortar at the surface of the wall shall be struck off flush with a cloth.

5. All structural repairs shall be made with prior approval of the Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar.

C. FINISHES ON FORMED SURFACES

1. Upon completion of patching, surfaces of concrete shall be finished as follows:

a. Grout and Rubber Float Finish:

- 1) All exterior and interior concrete surfaces which will not be covered by other construction and which will be visible, shall receive a grout and rubber float finish.
- 2) Remove all fins and projections. Rub surface lightly with dry, coarse silicon carbide stone, with concrete dry. Use no water at this stage. Cure concrete for three more days.
- 3) Following cure, fog down surface until thoroughly saturated (2 to 6 hours). Apply grout consisting of 1 part Portland cement and 1-1/2 parts of fine sand with a 50/50 mixture of the bonding admixture and water to produce a consistency of thick paint. Apply grout uniformly with a brush, completely filling all air bubbles and holes.
- 4) Scour thoroughly with 80 grit silicon carbide stone or cork float. Do not add more water. After making surface uniform in color and texture, let stand until grout becomes tacky. Remove excess grout with rubber float. No tool marks shall be visible.
- 5) Cure for 48 hours with continuously wet burlap, or by continuous dampening with fog spray.

b. Common Finish:

- 1) Common finish shall be produced by filling smoothly all tie holes, honeycomb, and other depressions, knocking off and evening up burrs and form marks.
- 2) Common finish shall be confined to concrete surfaces which will be covered by other construction and which will not be visible.

D. UNFINISHED STRUCTURAL SLABS

1. Surfaces intended to receive cement setting bed or fill for other materials shall be screeded to true plane, and scraped free of laitance or scum immediately thereafter; and shall be roughened mechanically for bond as soon as they will bear the weight of workmen.
2. Surfaces to receive fill or cement setting beds shall be scrubbed thoroughly before placing fill or cement setting beds, and shall then have neat cement grout broomed onto the surface a short distance ahead of the fill.

E. MONOLITHIC CEMENT FINISH

1. Apply steel trowel finish to the surface of concrete floor slabs as follows: Place, consolidate, strike off and level concrete slab to proper elevation. After the concrete has stiffened sufficiently to permit the operation, and water sheen has disappeared, the surface shall be floated at least twice to a uniform sandy texture.
2. Trowel Finish: After floating, the surface shall then be troweled at least twice to a smooth dense finish and to an FL tolerance. Differences in elevation, between two points, shall not exceed 1/4" in 10 ft., Class B. In addition, floor surface shall not vary more than +/1 1/2" from the elevation noted on the drawings anywhere on the floor surface. Perform final troweling after concrete has hardened so that no mortar accumulates on the trowel and a ringing sound is produced as the trowel is drawn over the surface. No floating screeds allowed.
3. Concrete Grinding: (Contractor's Option) Contractor shall have the option of floating concrete slabs as specified above and grinding concrete floor to tolerance as described above. Contractor shall submit grinding equipment and methods to the Architect for approval prior to grinding. Grinding shall be done prior to stud placement.
4. Patching and Leveling of Concrete Floors: Slabs not meeting required tolerances shall be patched and leveled at no additional cost to the Owner.

F. CURING

1. Interior slabs with resilient tile, carpet, or left exposed, and all exterior slabs, sidewalks, curbs, etc. shall be cured with the specified clear curing and sealing compound.
2. Other interior slabs shall be cured with the specified dissipating resin type curing compound.
3. Curing compounds must be applied immediately after final finishing.
4. All formed vertical surfaces shall be cured with the specified curing/hardening compound when the forms are removed prior to the completion of the required curing period. Compound should be applied immediately after form removal; application shall be even to assure uniform appearance.

DIVISION 05

SECTION 05 41 00: LIGHT GAUGE METAL FRAMING

05 41 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to install all steel stud framing and metal furring as detailed on the drawings and specified herein.

B. CO-ORDINATION

1. Verify and supplement dimensions and conditions shown on the drawings with field measurements as required.
2. Coordinate all work with related trades so as to cause no delay to any part of the work on the project.

C. SUBMITTALS

1. Submit shop drawings of all items and framing details to the Architect for approval. Materials shall not be fabricated or delivered to the site before the approved shop drawings have been returned to the Contractor.

05 41 00.02: PRODUCTS

A. SYSTEM COMPONENTS

1. With each type of steel framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, bracing, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete steel framing system.

B. GAUGE

1. Unless otherwise shown or indicated, non-load bearing studs shall be designed to withstand L/600 wind loading and/or in accordance with all local governing codes (minimum gauge of 18). Load bearing conditions shall be designed to withstand loads and deflection per all governing codes (minimum gauge of 16). Provide sealed shop drawings with all applicable loads indicated.

C. MATERIALS

1. Fabricate metal framing components of structural quality steel with a minimum yield point of 40,000 psi for studs, and 33,000 psi for runners in accordance with ASTM A 446.
2. Screws shall be as recommended by the manufacturer.
3. Provide galvanized finish to metal framing components complying with ASTM A 525 with a G60 coating.

4. Manufacturer's standard structural steel studs of size, shape, and gauge indicated, with a minimum flange of 1-5/8" and a flange return lip of 1/2".
5. Manufacturers: Provide "C" shaped, steel studs as manufactured by United States Gypsum, Milcor, Dale Industries or approved equal.

D. ACCESSORIES

1. Provide all galvanized tie wire, sheet metal screws, and other accessories and fasteners required for a complete installation.

05 41 00.03: EXECUTION

A. INSTALLATION

1. All steel stud framing shall be adequately secured, braced and tied to provide a firm base for the gypsum board panels as indicated. The installation shall be made by skilled workmen in strict accordance with the approved shop drawings.

DIVISION 05

SECTION 05 50 00: MISCELLANEOUS METALS

05 50 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, materials, equipment, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions and the applicable drawings.

B. WORK INCLUDED

1. The General Contractor shall furnish and install the following items of miscellaneous steel and iron, which shall include, but is not limited to, the following:
 - a. Framing for roof openings.
 - b. Supports for roof drains and drain lines as approved by the Architect.
 - c. Proper and adequate supports for pipe and ducts.
 - d. Proper and adequate supports for roof supported air handling units.
 - e. Steel angle bracing members when shown and/or required.
 - f. Angle and anchors for securing wood plates, etc.
 - g. Welding plates anchored and cast into concrete for securing joists and other structure.
 - h. Ladders and anchors. Note: Provide ladder to serve roof. Ladder will be in storage or mechanical area.
 - i. Catch basin, frames and covers.
 - j. Trench drains, frames and covers.
 - k. Heavy steel grilles and anchors.
 - l. Anchors for veneering, when shown and/or required.
 - m. Steel pipe handrails for stairs and ramps.
 - n. Steel lintels, weld plates, clip angles, etc.
 - o. Anchors, etc. required for veneering masonry as noted. All loose angles and anchors required for securing marble, granite, limestone, pre-cast, etc. All anchors, etc. that cast into concrete shall be built into masonry.
 - p. Galvanized aluminum and/or stainless steel items.

C. COORDINATION

1. Field measurements must be taken as necessary to verify and supplement dimensions and conditions shown on drawings.
2. Supply built-in items in ample time for incorporation in work. Items, anchors, inserts, etc., for miscellaneous metal items, that are required to be built into other work shall be furnished and placed in ample time for incorporation into work and so as to cause no delay to any part of work on project.

D. SUBMITTALS

1. Submit shop drawings of all items to the Architect for approval. Materials shall not be fabricated or delivered to the site before the approved Shop Drawings have been returned to the Contractor. Only Shop Drawings completely checked by the Fabricator and the Contractor will be considered.

05 50 00.02: PRODUCTS

A. STOCK ITEMS

1. Stock commercial materials, products, pattern and fabrication methods meeting requirements of this specification and conforming to details and designs indicated will be acceptable. See drawings for location, size and details not covered in this specification.

B. MATERIALS

1. Steel for structural members shall conform to ASTM A-36.
2. Aluminum shall be proper alloy for intended use.
3. Galvanized iron and steel shall conform to ASTM A385-62 and ASTM A123-69. Pre-treat galvanized pipe with conversion coating: FT TT-C-490, Type III.
4. Stair rails shall be fabricated of 1-1/4" I.D. and 2" I.D. pipe as detailed on the drawings. Use steel pipe on the interior and galvanized steel on the exterior. Wall brackets are to be the same material as the rail and support the rail with 1-1/2" clear to the wall.
5. Metal door louvers for wood doors shall be Titus Model T-800 or equal. Furnish louvers in baked enamel finish over bonderizing and prime coat. Color of enamel will be selected by the Architect from manufacturer's standard colors. Louvers shall be of sizes indicated on the Door Schedule.
6. Vertical ladder to the roof hatch shall be fabricated as detailed on drawings.
7. Stair nosings shall be Wooster Type 150 curb bar, Aluminum. (Except on Charlotte-Mecklenburg Schools where there will be no metal nosings on exterior concrete steps).
8. Provide loose steel angles and plate lintels for openings in masonry walls as indicated on drawings and required by field conditions. Minimum bearings at each end of lintels shall be 8 inches unless otherwise noted on drawings.
9. Miscellaneous items such as weld plates; clip angles; etc., not specifically mentioned hereinafter, shall be furnished and installed under this section in accordance with details on drawings and general requirements specified herein.
10. The carpet edge strip will be equal to Pemko Number 282A extruded aluminum.

C. FABRICATION

1. Form steel, iron and other materials to shape and size required by drawings, with all angles sharp and true and with surfaces well finished, smooth and with well defined lines and arises. Punching and shearing shall be properly and neatly done. Permanent connections shall be riveted, bolted, or welded as required. All exposed welds shall be ground smooth and flush. Joints shall be milled to produce a neat, close fit. Necessary rebates, lugs, and brackets shall be provided as required for neat and substantial assembly of work.
2. Welding shall be performed by operators who are currently qualified by tests (within the past 12 months) as prescribed in "Standard Qualification Procedure" of the American Welding Society to perform the type welding required for the project using a qualified welding procedure.
3. Fillet, butt, continuous and intermittent welds shall be made in accordance with the best standard practices. Surfaces to be welded shall first be cleaned of loose scale, rusts, oil, paint or other foreign matters. Welds shall show uniform section, reasonable smoothness and weld metal, feather edges without overlaps and with a minimum of craters, porosity, and clinkers. Visual inspection of edges and ends of fillets and butt joint welds shall indicate a good fusion with and penetration of base metals. Precaution shall be taken to minimize stresses and distortions due to heat.
4. Miscellaneous metal items shall be shop fabricated insofar as practical and, except where otherwise required, shall be fabricated, assembled, and installed or erected in accordance with applicable requirements and details of "Architectural Metal Handbook", latest edition, of the National Association of Ornamental Metal Manufacturers.
5. All rivets shall be countersunk or flush type especially produced for prison work. Unless otherwise noted or required, rivets shall be 3/8" in diameter and shall be accurately spaced from 4" to 6" on center, and shall be well driven to completely fill holes. Rivet holes shall be punched and reamed as necessary not to exceed 1/16" more in diameter than the rivet used and to insure proper matching of holes. Rivets shall not be staggered. Loose rivets or rivets with imperfect heads or those not having firm bearings in metal shall be replaced with good rivets.

D. SHOP PAINTING

1. All steel and iron which is to be field painted shall be thoroughly cleaned of all dirt, grease, loose scale, rust, or other foreign material and shall be given one coat of manufacturer's standard primer unless otherwise specified or noted on the drawings.

05 50 00.03: EXECUTION

A. INSTALLATION

1. Miscellaneous metal items shall be installed or erected in a secure, workmanlike manner and where applicable in strict accordance with manufacturer's instructions. All items, upon completion, shall be plumb, true and level or installed at required angles.

2. Aluminum and other finished metals shall be thoroughly protected from damage during construction. Any scratches, dents or other damaged areas in such surfaces shall be rubbed, ground and polished as necessary to completely remove such defects and damaged areas.
3. Aluminum surfaces shall be coated or otherwise isolated as necessary to protect metal from damage by contact with concrete, masonry, steel, plaster or other materials that will corrode or damage aluminum. Such protection shall conform to aluminum manufacturer's instructions.
4. All field welds shall be buffed and brushed to remove all loose material and given a drenching coat of rust inhibiting paint and finished as specified herein.
5. Where anchored plates as shown and noted - lags and expansion shields will not be acceptable. Anchors to plates in concrete walls will be welded to the reinforcing.
6. All work must be executed in a neat, substantial and workmanlike manner and to the entire satisfaction of the Architect. All materials shall be new and of the best quality.
7. Miscellaneous Lintels and Shelf Angles:
 - a. Provide miscellaneous lintels and shelf angles as indicated or required.
 - b. Verify lintels and shelf angles design and placement with the Architect where not shown on the drawings.
 - c. Lintels shall have 8" bearings at each end unless shown otherwise.
 - d. In masonry veneer or solid masonry walls, provide lintels over all openings in walls.
 - e. Weld, bolt, or rivet members together where so indicated, to form complete assembly.
8. Furnish all bolts, nuts, anchor bolts, plates, anchors, ties, clamps, hanger, nails, spikes, screws, straps, toggle and expansion bolts, and other items of rough hardware of sufficient size and number to tie together the various parts of the building and secure all of its parts in place. Such miscellaneous items typically shall be of same material as they contact.
9. Vertical ladders shall be 24" wide (unless shown and noted otherwise), fabricated with 3/8" x 2-1/2" hot-rolled steel rails and 5/8" round steel rungs extending through the rails with connection welds. Space rungs 12" o.c. Anchor ladders at bottoms and tops and at intermediate points not over 6'0" apart, with brackets. Brackets shall be of same size as side rails and of such length as to hold ladder 7" away from walls.
10. Provide steel pipe handrails as detailed. Unless otherwise shown, provide 1-1/2" O.D., standard weight, carbon steel pipe complying with ASTM A 53.
11. Join posts, rails and corners by welded joints made by fitting post to top rail and intermediate rail to post, with radiused corners, groove welding joints, and grinding smooth. Butt railing splices and reinforce by a tight fitting interior sleeve not less than 6" long.

12. Adjust railings prior to securing in place to insure proper matching at butting joints and correct alignment throughout their length. Space posts not more than 8 feet on centers. Plumb posts in each direction. Secure posts and rail ends to building construction as follows.
13. Anchor posts in concrete by means of pipe sleeves set and anchored into the concrete. Provide sleeves of galvanized, standard weight, steel pipe, not less than 6" long, and having an inside diameter not less than 1/2" greater than the outside diameter of the inserted pipe post. Provide steel plate closure secured to the bottom of the sleeve and of width and length not less than 1" greater than the outside diameter of the sleeve. After the posts have been inserted into the sleeves, fill the annular space between post and sleeve solid with molten lead or sulphur or a quick setting hydraulic cement. Cover anchorage joint with a round steel flange welded to the post.

DIVISION 05

SECTION 05 50 50: HOLLOW METAL ENTRANCES, ETC.

05 50 50.01: GENERAL

A. SCOPE

The work covered by this section of the specifications consists of furnishing all labor, materials, equipment, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, and the applicable drawings. Glass and glazing is under Section 08 of these specifications.

05 50 50.02: MATERIALS

A. MATERIAL

1. See drawings for manufacturer, type, etc. Unless shown or otherwise noted, all hollow metal at entrances shall be sixteen (16) gage steel.

B. PAINT

1. All to receive a factory coat of Bakelite Paint, ovenbake.

C. ACCESSORIES

1. While the doors are a part of the hollow metal entrances, all jambs and heads must include all plates, etc., required for hinges, closers, etc., in accordance with the hardware schedule. Type of closers and hinges will be noted on the door schedule.
2. Install sixteen (16) gage continuous steel fins at head, jambs, and sills if shown and/or noted on the drawings.

D. SHOP DRAWINGS

1. These must show all construction, anchoring, sections, trim, etc.

E. MANUFACTURERS

1. Custom Hollow Metal as manufactured by:
 - a. Pioneer Industries
 - b. Bymoco Metal Products
 - c. Overly Manufacturing Co.
 - d. Philipp Manufacturing Co.

2. Stock Hollow Metal as manufactured by:
 - a. Steelcraft
 - b. Ceco Corporation
 - c. Fenestra
 - d. Curries
3. Any manufacturer other than those noted above will be submitted to the Architect for approval before the bid date.

05 50 50.03: EXECUTION

A. WORKMANSHIP

1. All work shall be performed in a workmanlike manner by experienced mechanics. Upon completion, all shall be cleaned and left in perfect order. All parts required shall be furnished and installed.

B. ANCHORING

1. Provide all bracing and anchoring as shown, noted and/or required.

C. HARDWARE

1. All finish hardware shall be furnished to the general contractor under the hardware allowance. All shall be installed as per the manufacturer's instructions and the hardware schedule.

D. CAULK

1. Caulk interior and exterior perimeters of all hollow metal entrances.

E. THRESHOLDS

1. All thresholds for Hollow Metal Doors as shown and/or noted will be furnished by the hardware supplier.

F. GENERAL NOTE

1. When aluminum doors fit into hollow metal frames or hollow metal entrance constructions, all finish hardware to be used in these openings shall be furnished to the proper manufacturer by the hardware supplier under the hardware allowance. The responsibility for coordination shall rest with the hardware supplier only so far as hardware is concerned. Sizes, clearances, etc., shall be handled between the two manufacturers.

DIVISION 06

SECTION 06 05 73: WOOD TREATMENT

06 05 73.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the preservative treatment of wood items specified in other sections of these Specifications.

06 05 73.02: PRODUCTS

A. MATERIALS

1. Preservative for application by immersion, flood coat, spray or brush treatment shall be equal to "Woodlife® is Inside™" as manufactured by KOP-COAT Wood Protection Products. Preservative shall meet or exceed all requirements of the Minimum Standards of the National Woodwork Manufacturer's Association.
2. Preservative for pressure treatment shall be a water-repellent (paintable) solution of not less than 5% pentachlorophenol dissolved in mineral spirits.
3. Chemical for fire-retardant treatment of framing lumber and plywood shall be FirePRO® as manufactured by Koppers Performance Chemicals, Pittsburgh, PA, Dricon® FRT-by Arch Wood Protection, or equal.

06 05 73.03: EXECUTION

A. PRESSURE PRESERVATIVE TREATMENT

1. Framing lumber, nailers, furring, grounds, blocking, etc. in contact with concrete floors or exterior walls shall be pressure preservative treated. Minimum retention of preservative shall be 0.3 pounds per cubic foot of wood.

B. FIRE-RETARDANT TREATMENT

1. Interior wood framing members and plywood panels shall be pressure impregnated with fire-retardant chemicals in accordance with the recommendations of the manufacturer to provide a flame spread, fuel contributed and smoke developed U.L. label certifying this classification. Wood supplied shall be suitable for finishing with paint or varnish.

C. CERTIFICATES

1. The General Contractor shall furnish certificates signed by Contractor and treating plants stating that treated lumber and millwork delivered to site comply with specified treatment requirements. Certificate shall contain name and address of Contractor, project location, quantity of lumber and date or dates of shipments, name of chemical used, retention in pounds per cubic foot of lumber treated and drying of lumber after treatment and before shipping.

DIVISION 06

SECTION 06 10 00: ROUGH CARPENTRY

06 10 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, equipment, materials, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein in strict accordance with this section of the specifications, the general conditions, and the applicable drawings.
2. Work consists of all temporary enclosures, supports, grounds, all rough carpentry work, door bucks, nailers, plates, blocking, framing for cabinets, framing around all roof openings, furring, etc., as shown or noted on the drawings or as required to complete all finish work in a satisfactory manner. All of this work shall be properly installed and anchored as shown or required in a strong and substantial manner.
3. All nails, screws, bolts, anchors and other rough hardware for proper installation of rough carpentry shall be provided.
4. Items not specifically mentioned herein shall conform to details on the drawings and with specifications for other similar items.

B. COORDINATION

1. Coordinate the location and installation of framing and furring members with the installation of finishes specified to be furnished under other sections of these specifications.

C. ACTION SUBMITTALS

1. Product Data: For each type of process and factory-fabricated product.
 - a. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - b. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

06 10 00.02: PRODUCTS

A. WOOD PRODUCTS, GENERAL

1. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If not grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

- a. Factory mark each piece of lumber with grade stamp of grading agency.
 - b. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - c. Provide dressed lumber, S45, unless otherwise indicated.
2. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
3. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - a. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. WOOD PRESERVATIVE-TREATED LUMBER

1. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with the ground, use Category UC3b for exterior construction not in contact with the ground, and use Category UC4a for items in contact with the ground. All wood framing members of any type within 4 feet of floor, all wood nailers on concrete floor, all nailers used to apply or hold in place roof insulation, gravel stops and scuppers, or where conditions of moisture or high humidity prevail, shall be pressure preservative treated in accordance with SECTION 06 05 73 - WOOD TREATMENT.
 - a. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
4. Application: Treat items indicated on Drawings, and the following:
 - a. Wood cants, nailers, curbs equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
 - c. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - d. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - e. Wood floor plates that are installed over concrete slabs-on-grade.

C. DIMENSION LUMBER FRAMING

1. Non-Load-Bearing Interior Partitions: Construction or No. 2
 - a. Application: Interior partitions not indicated as load-bearing.
 - b. Species:
 - 1) Mixed southern pine; SPIB.
2. No. 2 grade.
 - a. Application: Framing other than interior partitions not indicated as load-bearing.
 - b. Species:
 - 1) Southern pine; SPIB.
3. Framing Other Than Non-Load-Bearing Interior Partitions: Any species and grade with a modulus of elasticity of at least 1,500,000 psi and an extreme fiber stress in bending of at least 1,000 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.
 - a. Application: Framing other than interior partitions not indicated as load-bearing.
4. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain and wane.
 - a. Application: exposed
 - b. Species and Grade: Indicated above for load-bearing construction of same type.

D. ENGINEERED WOOD PRODUCTS

1. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
 - a. Extreme Fiber Stress in Bending, Edgewise: 2600 psi for 12-inch nominal-depth members.
 - b. Modulus of Elasticity, Edgewise: 1,900,000 psi

E. MISCELLANEOUS LUMBER

1. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - a. Blocking
 - b. Nailers.
 - c. Rooftop equipment bases and support curbs.
 - d. Cants.
 - e. Furring
 - f. Grounds.
2. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.
3. For concealed boards, provide lumber with 19 percent maximum moisture content and of the following species and grades:
 - a. Mixed southern pine; No. 2 grade; SPIB

F. FASTENERS

1. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - a. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
2. Power-Driven Fasteners: NES NER-272.
3. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. METAL FRAMING ANCHORS

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Simpson Strong-Tie Co., Inc.
 - b. USP Structural Connectors
 - c. Phoenix Metal Products, Inc.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
3. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - a. Use for interior locations unless otherwise indicated.

4. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - a. Use for wood-preserved-treated lumber and where indicated.

06 10 00.03: EXECUTION

A. INSTALLATION, GENERAL

1. Set rough carpentry to required levels and lines, with members plumb, true to line, cut and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking and similar supports to comply with requirements for attaching other construction.
2. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
3. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
4. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
5. Do not splice structural members between supports unless otherwise indicated.
6. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
7. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - a. NES NER-272 for power-driven fasteners.
 - b. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - c. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential code for One- and Two-Family Dwellings.

B. WORKMANSHIP

1. All framing shall be erected in a careful and workmanlike manner and shall be in accordance with the details. Where there are no specific details for framing, same shall be erected in accordance with the best practice. Framing shall be cut square on bearing, closely fitted, accurately set to required lines and levels, properly braced and rigidly secured in place.
2. All wood grounds, blocking, furring and nailers shall be of size and shape required for securing gypsum wallboard, wood trim or other work or equipment in place.

C. DELIVERY, STORAGE AND HANDLING

1. Immediately upon delivery to job site, place materials in an area protected from the weather. If despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
2. Store materials in a minimum of 6 inches above ground on a framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
3. Do not store seasoned materials in wet or damp portions of the building.
4. Protect fire-retardant materials against high humidity and moisture during storage and erection.
5. Protect sheet materials from broken corners and damaged surfaces, while unloading.
6. Any material rendered unfit for use shall be removed from the site.

DIVISION 06

SECTION 06 20 00: FINISH CARPENTRY

06 20 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications shall consist of furnishing all labor, materials, equipment, scaffolding, appliances, etc., in connection with the complete installation, ready for use, of the items specified herein in strict accordance with this section of the specifications, the general conditions, and the applicable drawings. This Contractor must furnish and properly erect in a true and workmanlike manner, with the necessary and proper nails and screws, all finishing materials as noted on the drawings as being furnished by the Contractor. All shall be left in perfect and acceptable condition.

B. SUBMITTALS

1. Before proceeding with finish carpentry work, submit shop drawings for all items, identified with quality, grade, type of finish and species of wood. Show items in related and dimensional position with sections either full size or 3 inches equal 1 foot scale.

06 20 00.02: PRODUCTS

A. WOOD

1. All lumber shall be Association grade marked; (or in lieu thereof, a certificate from an approved laboratory certifying that lumber meets requirements of applicable lumber associations for the species and grades specified shall be submitted to the Architect.)
2. Framing lumber, blocking, etc., except as otherwise specified, shall be spruce.
3. Chipboard shall not be furnished or installed under any condition.
4. Plywood not otherwise specified shall be A-D INT-APA.
5. Wood shelving shall be solid stock "B" or Better western pine or softwood pine with solid stock "B" or Better pine edges.
6. Woodwork and trim not otherwise specified or indicated on drawings shall be "B" or Better western pine or fir. Trim for aluminum windows shall be treated with wood preservative.
7. Items not specifically referred to herein shall conform to details on drawings and to specifications for other similar items.
8. Wood shall be sound, thoroughly seasoned, well manufactured and free of warp that cannot be corrected in process of bridging or nailing. Woodwork shall be dressed on all sides.

9. Wood stairs shall have 3/4" thick "B" or Better kiln dried pine riser and 1 1/8" thick kiln dried Grade I red oak treads unless otherwise noted/detailed.

06 20 00.03: EXECUTION

A. CONDITION OF SURFACES

1. Examine all grounds, stripping and blocking used to secure finish carpentry. Do not begin installation until all defects are corrected.

B. INSTALLATION

1. All items shall be erected plumb, level and true to line; shall be properly braced; and shall be securely anchored in place. Shim as necessary with concealed shims.
2. Accurately scribe and closely fit all face plates, filler strips and trim strips to irregularities of adjacent surfaces.
3. Wood trim shall be of sizes and designs shown and shall be installed at locations indicated. Joints shall be coped or mitered, as required, and tightly fitted.

DIVISION 06

SECTION 06 41 00: CABINETWORK/MILLWORK

06 41 00.01: GENERAL

A. SCOPE

1. Furnish and install all cabinets and shelf units as indicated, detailed, specified and as listed on the drawings and illustrated in these specifications and/or drawings.

B. SHOP DRAWINGS

1. Shop Drawings shall be submitted for approval before proceeding with fabrication. They shall show all dimensions, thickness, construction and sizes of all members, as well as the manner of assembling the various members which make up the different items. Field measurements shall be taken where necessary to coordinate the work. Plastic laminate joints shall be shown and care shall be used to align the joints and to place the joints in line with the panels.

C. COORDINATION WITH OTHER TRADES

1. This contractor shall coordinate his work with that of all other trades and make all provisions in his work to receive the work of such trades.

D. DEFINITIONS

1. Exposed: shall mean all exterior surfaces including exterior surfaces of portable cabinetwork which might be against a wall, etc., during periods of non-use.
2. Concealed: shall mean any surface subject to view such as inside of drawers, inside of cabinets including backs of doors or sliding panels, dividers, shelves and tops, bottoms and sides of cabinet interiors.
3. Unexposed: shall mean all surfaces and parts permanently kept from view.

06 41 00.02: PRODUCTS

A. SHOP-BUILT CABINETS/MILLWORK

1. Cabinet configurations shall be as shown on the plans. Units shall be furnished complete with all accessories as shown per the illustrations (shelves, trays, etc.). Any additional illustrations may be on the drawings or in the specifications, either in this section or in the SUPPLEMENTAL SHEETS SECTION.
2. Sinks in countertops will be furnished by the Plumbing Contractor and installed as shown.
3. Shop built cabinets, counters, shelving units, etc. as indicated and detailed on the drawings shall be fabricated to comply with Section 400 - Architectural Cabinets of the Architectural Woodwork Institute Quality Standards, Edition 1 2009, and as amplified by the following:

- a. All edge grain of exposed and concealed plywood shall be hardwood banded tongue and groove to match face veneers and solid woods.
- b. Exposed doors, drawer fronts, and exposed ends shall be select red oak plywood with solid hardwood edges as listed above, except as otherwise noted on the drawings.
- c. Plastic laminate shall be Formica, Nevamar, or WilsonArt. Color and pattern to be selected by the Architect. It shall be installed with adhesive in strict accordance with the manufacturer's specifications.
- d. Bottoms of drawers, concealed sides and backs shall be 1/2" furniture grade plywood.
- e. Hardware:
 - 1) Drawer and door pulls - Stanley No. 4484, Chrome finish.
 - 2) Door hinges - Blume Concealed, Self-Closing 170 Degree opening: #91A6530 or Hafele 5 Point, self-closing 270 Degree opening: #343.11.727.
 - 3) Drawer slides - K & V No. 8500 heavy duty full extension with full ball bearing roller guides.
 - 4) Adjustable shelf brackets - K & V No. 255NP with 256NP.
 - 5) Coat Hook - Ives No. 405.
 - 6) All others by prior approval only.

B. PREFABRICATED SCIENTIFIC/MILLWORK

1. The numbered and/or illustrated cabinets will be equal to units supplied by CampbellRhea or Kewaunee as scheduled. Finishes shall be Kewaunee's Stock "Golden Oak", or CampbellRhea Heritage Oak with standard stain, sealer, and top coats. Submit samples to the Architect for selection and approval.
2. Countertops on pieces scheduled from Kewaunee/CampbellRhea will be molded epoxy resin, "KEMRESIN" or "TRESPA" resistance to chemical spills. Edges are self-banded in manufacturer's standard finish thickness. Submit color samples to the Architect for selection and approval.
3. See drawings for schedule and/or illustration(s).
4. All others by prior approval only.

06 41 00.03: EXECUTION

A. INSTALLATION

1. Install all casework in accordance with approved shop drawings and the manufacturer's recommendations. All components shall be fully assembled, installed, and securely fastened in place, plumb and level, in complete working order.
2. All field conditions, dimensions, etc. are to be verified by the Contractor for proper installation of the cabinets. Where the plans show "wall to wall" installation, filler panels will be provided as required. The filler panels will match the cabinet finish. The Casework Contractor will coordinate all utility connections with other contractors.

B. CUTTING HOLES

1. No holes shall be cut in any of the cabinetwork for electrical outlets, switches, etc., without the Architect's approval. If any holes are cut without the Architect's approval, the complete item shall be replaced at no additional cost.
2. All cutting of countertops, cabinets, etc. will be by the Casework Contractor. Coordinate with other Contractors. Installation of sinks in countertops will be by the Plumbing Contractor.

C. CLEANING

1. All work shall be left clean and protected until final acceptance.

06 41 00.04: GUARANTEE

A. GUARANTEE

1. All materials and workmanship shall be guaranteed by sub-contractor for a period of 2 years after acceptance of the work.

DIVISION 07

SECTION 07 90 00: CAULKING AND SEALANTS

07 90 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete all caulking and pointing shown on the drawings and specified herein.

B. WORK INCLUDED

1. On the exterior, caulk wall control joints, around all frames in walls, all other locations shown on drawings and/or specified, and as required to assure weather-tight construction.
2. On the interior, caulk and point as necessary at locations shown on drawings and/or specified.
3. Where items are specified to be bedded in caulking compound during installation or erection, caulking is specified to be furnished and applied with such items in accordance with the requirements of this section.

C. SUBMITTALS

1. Submit written notification of the brand name and manufacturer of each material proposed for use. Obtain approval of materials prior to placing orders. Provide location for each proposed material and use.

07 90 00.02: PRODUCTS

A. INTERIOR CAULKING COMPOUND

1. All interior caulking shall be done with a gun grade DAP Flexiseal one-part Polysulfide Sealant or equal Thiokol Sealant meeting Federal Specifications TT-S-230.

B. EXTERIOR CAULKING COMPOUND

1. All exterior caulking shall be done with Dow Corning 795 Building Sealant or equal. Compound shall be color to match adjacent work. Material shall be delivered to site in manufacturer's original sealed packages.

C. JOINT BACKING MATERIAL

1. Joint backing material, where required, shall be non-staining resilient polyurethane or polyethylene foam rod type. A bond breaker must be used between the filler and the sealant and will be 25% oversized to the joint to permit the sealant bead to be in compression.

D. MASONRY JOINT SEALS

1. Joint seals shall be specially compounded styrene-butadiene rubber molded into the shape shown on the drawings.

07 90 00.03: EXECUTION

A. APPLICATION

1. Joint and spaces to be caulked shall be clean, dry and free of loose materials. Joints more than 1/2 inch deep and all joints where suitable backstop has not been provided shall be packed with joint backing material to within 1/2 inch of surface before applying caulking. In place material will be no thicker than 3/8" and no thinner than 8".
2. Apply caulking primer to all surfaces in contact with caulking compound in strict accordance with instructions of manufacturer of caulking compound.
3. Apply caulking compound with gun having proper size and type nozzle; use sufficient pressure to fill all voids and joints solid. Remove excess caulking and leave surfaces neat and clean. Upon completion caulking shall have a smooth even finish. All caulked joints shall be weather-tight and watertight.

DIVISION 08

SECTION 08 11 10: METAL DOORS AND FRAMES

08 11 10.01: GENERAL

A. SCOPE

1. Furnish all labor, material and equipment necessary to complete the fabrication and installation of all Hollow Metal Doors and Frames.

B. SUBMITTALS

2. Shop drawings shall be submitted for approval on all metal doors and frames. A schedule showing location of doors and frames shall be submitted with the shop drawings. Drawings shall indicate elevations of each door and frame type; details of construction; size, shape and thickness of materials; methods, details and thickness of reinforcing; method of assembling sections; provisions for receiving hardware, glazing, finishes; and type and locations of frame anchors.

08 11 10.02: PRODUCTS

A. METAL DOORS

1. Hollow metal doors shall be flush, sized as shown on the drawings, 1-3/4" thick. The face sheets shall be of 16 gage A60 or G60 Galvanized and bonderized steel sheets. There shall be no exposed cracks or visible seams either on the surface faces or the vertical edges of the doors. The top edge of the door shall not be channeled or hold water. Tops shall be flush and closed with no holes. Bottom shall have inverted channel to allow field adjustment if necessary at a later date. Tops and bottoms of door shall be not less than 16 gage channels. Welds on 2" centers shall occur around the perimeter of the door using the projection welding method. Sound and heat retardation shall be secured by permanently bonding a nominal one pound density pre-cured rigid polystyrene foam core to the panels. Reinforce doors where closers will attach. Doors shall be painted at factory with one coat baked-on prime paint.

B. HOLLOW METAL FRAMES

1. Frames will be fabricated of cold rolled furniture steel, free of scale, pitting and other surface defects. Frames shall be 14 gage A60 or G60 Galvanized at exterior openings; 16 gage cold rolled at interior openings. Frames will be shaped and sized as shown on the drawings. All frames shall have mitered and welded corners. Frames shall not be drilled to receive silencers. Silencers are adhesive type to be furnished by hardware supplier. Mullions and transom bars shall be tubular construction to match adjoining door frames as shown on the drawings with all joints at heads and jambs mitered and face welded; intersecting mullions and heads and jambs mitered and face welded; intersecting mullions and heads or transom bars and jambs shall be butt welded on face. All welds are to be ground smooth. Provide a removable spreader bar welded to the bottom of all door frames for rigidity during transit and handling only. These shipping bars shall be

removed prior to installation. Provide 16 gage drywall frames where indicated. Provide frames for view windows as indicated and detailed on the drawings. All Hollow Metal Frame anchors to be concealed type anchors -no exposed screw anchors will be permitted. Reinforce frames where closers will attach. Frames shall be painted with one coat baked-on prime paint.

2. Frame anchors at jambs shall be permanently attached to frame and designed to match the wall system they are joining. Yoke and Strap type at masonry walls. Anchors will be of not less than 18 gage steel using not less than 3 anchors per jamb for openings 7 feet or less in height. Provide 16 gage floor anchors at the bottom of all door jambs. All Hollow Metal Frame anchors to be concealed type anchors -no exposed screw anchors will be permitted.
3. Provide labeled frames where scheduled. Frames shall be constructed as necessary to conform to requirements of Underwriters' Laboratories, Inc., for label designation indicated. Door frames shall be Underwriters' label.
4. All frames are to be set with bottom of frames on finish floor level. Anchor to base concrete slab by means of adjustable floor anchors. It is to be noted that the finish above the concrete floor slab will be as follows (unless otherwise shown and/or noted).

Vinyl Composition Tile	1/8"
Carpet	5/8"
Ceramic Tile (mud set)	1-1/2"
Ceramic Tile (thin set)	1/2"
Terrazzo	1-1/2"
Terrazzo Tile	1/8"-3/16"

C. SHOP FINISH

1. Steel surfaces of all doors and frames shall be thoroughly cleaned; exposed surfaces shall be filled and ground smooth. All items not otherwise specified shall be bonderized and shall be given one coat of prime paint.

D. PREPARATION FOR FINISH HARDWARE

1. Finish hardware for all items in this section is specified to be furnished and installed under the FINISH HARDWARE Section. All items specified under this section shall be mortised, reinforced, drilled and tapped at factory to receive finish hardware as scheduled.
2. Doors shall be mortised, reinforced, drilled and tapped to receive specified mortise hardware and reinforced only for specified surface hardware. Drilling and tapping for surface hardware shall be done in the field. Continuous hinge reinforcements shall be continuous full height 12 gage channel welded to the face skin(s). Reinforcements for other surface and mortise hardware shall be 14 gage except closer reinforcements shall be 12 gage.
3. When aluminum doors fit into hollow metal frames or hollow metal entrance construction, all finish hardware to be used in these openings shall be furnished to the proper manufacturer by the hardware supplier under the hardware allowance.

The responsibility for coordination shall rest with the hardware supplier only so far as hardware is concerned. Sizes, clearances, etc., shall be handled between the two manufacturers.

E. DELIVERY AND STORAGE

1. Doors and frames shall arrive at the job site marked to agree with the shop drawings. Store material under cover on wood runners or floors in an upright position and in a manner that will prevent rust and damage.

08 11 10.03: EXECUTION

A. INSTALLATION

1. Frames shall be installed according to S.D.I. recommendations. Frames shall be installed plumb, straight, true, rigidly secured in place and properly braced with temporary spreaders. Frames shall be anchored to concrete floors with expansion bolts or by power-actuated bolts using two bolts per jamb. Temporary spreaders shall not be removed until frames are set and anchored. Contractor shall check all frames for plumbness and correct positioning before anchoring frames to masonry walls and partitions. Frames shall be filled solid at masonry walls with grout as the wall is laid. Provide space for caulking.
2. All doors shall be set true and plumb, with sufficient clearance for free operation not to exceed 1/3 inch at jambs and heads, 1/4 inch at meeting edges of pairs of doors and 3/4 inch at bottom. Strike side of doors shall be so designed to provide proper operating clearance. Finish hardware will be attached prior to any glazing work.

Manufacturers:

- a. All manufacturers shall be a member of S.D.I. (Steel Door Institute).
- b. The following manufacturers are acceptable, providing they meet the required specifications as indicated in this section:
 - 1) Ceco
 - 2) Curries
 - 3) Pioneer
 - 4) Steelcraft

DIVISION 08

SECTION 08 14 00: WOOD DOORS

08 14 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor and materials in connection with the complete installation, ready for use, of the wood doors in strict accordance with this section of the specifications, the general conditions, and the applicable drawings.

08 14 00.02: PRODUCTS

A. MATERIALS

1. All doors are to be manufactured by Algoma Hardwoods, Weyerhaeuser or Eggers Industries. See Door schedule for style, size, finish, etc.
2. Unless otherwise noted, all wood doors are to be solid core and a written certificate so stating shall be signed by a legally qualified representative of the manufacturer and furnished to the Architect.
3. All wood doors shall be guaranteed for the life of installation, against any defects which shall make them unsuitable for use for which they are intended. Any warp in excess of 1/8" in 8' shall be considered a defect under the terms of this guarantee. The guarantee shall provide a replacement as originally furnished. Manufacturer shall inspect the installation of doors prior to issuance of the guarantee, and shall note on the guarantee form that no provisions of the guarantee have been voided or nullified in the installation or manufacture of doors. Guarantee shall be furnished promptly upon completion of the installation of doors.
4. Lights and louvers (where shown and noted): Provide openings where shown and/or scheduled for lights or louvers in accordance with manufacturer's standard details (or as detailed on the drawings), louvers and beads to be of same species and color as face veneer.
 - a. Glass - doors shall be job glazed with 1/4" glass as noted. Bed glass in best quality exterior type elastic glazing compound. Nail wood beads tight both sides and with brads, set and fill with matching wood putty.
 - b. To avoid weakening the door, at least 5" of solid door must remain between the cutouts, between door edges and cutouts, or between cutouts and hardware mortises.
5. Door manufacturer shall deliver all doors to the job site packed in heavy cardboard cartons, marked to agree with the approved shop drawings.
6. Store under cover on wood runners or floors in a manner that will prevent damage.

B. SUBMITTALS

1. Submit shop drawings for approval on all wood doors. Submit schedule showing locations of doors with the shop drawings. Indicate elevations of doors, details of construction, size, thickness of material, method of assembling, and finishes.
2. Samples of all types of finishes and doors specified shall be submitted for approval at the time of the submission of shop drawings, and shall clearly show all pertinent construction features.
3. Submit three (3) samples of each of lightest and darkest range of color tones proposed for project, for Architect's approval.
4. Door color or quality not matching approved samples will be rejected.

C. DOORS

1. Face veneers shall be Premium "A" grade plain sliced red oak unless otherwise noted in the SUPPLEMENTAL SECTIONS.
2. Face Veneers shall be standard thickness, thoroughly dried, tapeless spliced with Type II adhesive, per CS 35 as revised, laid at right angles to crossbanding. Belt and sand polish. Species shall be stain grade, clear birch unless otherwise shown and noted on the drawings. Pairs, side panels and transoms shall be side and/or end matched. Single doors and all multiple panels will be center balance match.
3. Crossbands shall be Birch or Maple, 1/16" thick, tapeless, spliced, no voids.
4. Core shall be one piece slab, 3 ply particle board, density 25# per cu. ft. or greater, bonded to stiles and rails with Type II adhesive, using high frequency method.
5. Vertical stiles shall be one piece of 3/4" thick hardwood of same species as face veneers, color selected to match faces, and an inner stile of 3/4" hardwood laminated to outer stile to provide minimum thickness (total) after trimming of 1-3/8". Top and bottom rails shall be of same construction, but of any hardwood with a density greater than .350. Where mortise closers or other similar devices occur, blocking shall be provided so that all screws fasten into hardwood for their complete length.
6. All adhesives employed in assembly of door shall be Type II, per CS 35-61.
7. All wood door veneers shall match in grain color, with center balance match.
8. Pairs of doors will be matching veneers (each door will be center balance match, book match flitch.)

D. PRE-FINISH AND MACHINE WORK

1. All interior wood doors shall be completely machined and prefinished by door manufacturer, to accommodate all hardware requiring cutting of door, except hardware applied by surface application. Doors shall be beveled on two vertical edges, mortised for hinges, locks, closers, and trimmed to required sizes, to provide a properly operating door. Transoms and doors shall be rabbeted as required.

2. All plates or other protective devices shall be applied by the door manufacturer, with suitable adhesives, as noted. Bond shall be guaranteed same as doors.
3. Contractor shall provide door manufacturer with all necessary information, including metal buck shop drawings, hardware schedule, floor plans, templates, and samples of hardware required to properly machine doors, same to be in possession of door manufacturer at least 120 days prior to required delivery date of doors. Door manufacturer shall be responsible for properly coordinating information received by him so that doors are properly machined, glazed, and ready to hang.
4. All doors shall be finished by door manufacturer on both faces and four edges using a conversion varnish system, an additional coat of urethane for protection of finish, tone and sheen shall be selected by the Architect from door manufacturer's options. All wood beads shall be finished to match door faces. Finish color: Clear.

E. WOOD FIRE DOORS (Where Specified):

Underwriters Laboratories labeled fire doors, good covered, composite type doors shall be supplied in accordance with the required ratings listed in the Door Schedule. Such doors shall match interior doors in appearance as to face veneers and finish, and be prefit to net sizes. Factory machining shall be limited to only those functions permitted by Underwriters Laboratories.

1. Specify: 1-1/2 Hour Class "B" Fire Door.
Where scheduled Underwriters Laboratories approved factory primed steel vision panels of UL listed sizes shall be installed by door manufacturer. These vision panels will be glazed with 1/4" wire glass bedded in suitable glazing material.
2. Core Construction: Type 1 above.
Mineral composition of calcium silicate with normal density 2 lbs. per cubic foot. Core shall be jointed together with T & G Joints in accordance with Underwriters Laboratories, Inc., Procedures Manual. Core to be smoothly sanded prior to application of crossbands and face veneer. Core shall be glued to edge banding with Type II adhesive.
3. Crossbands: 1-1/2 Hour door --1/16" minimum of non-combustible material extending the full width of the door.
4. Exposed Edge Bands:
Must be Maple lumber treated to refusal with Class "A" fireproofing agent.

08 14 00.03: INSTALLATION

- A. Set all doors true and plumb, with sufficient clearance for free operation not to exceed 1/8 inch at jambs and heads, 3/16 inch at meeting edges of pairs of doors and 3/4 inch at bottom. Lock edges of doors shall be so designed to provide proper operating clearance. Attach finish hardware prior to any glazing work.

DIVISION 08

SECTION 08 30 00: SPECIALTY DOORS, ROLLING GRILLE AND SHUTTERS

08 30 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the fabrication and installation of the roll-up doors, overhead doors and ceiling access doors where shown and/or noted on the drawings and specified herein.

B. SUBMITTALS

1. Submit shop drawings and manufacturer's technical data to the Architect for approval. Obtain approvals before placing order.

08 30 00.02: PRODUCTS

A. OVERHEAD DOOR

1. Exterior: The overhead door shall be constructed of flush (both sides) steel insulated panels. Panels shall be 16-gauge zinc coated steel and chemically treated for paint adherence. Stiles shall be 16 gauge or heavier steel. The door shall be the 416 Series or 600 Series as manufactured by the Overhead Door Company or approved equal as shown in the drawings. This door shall be motorized with motor wired to 120v circuit. Atlas and Cookson are approved equal.
2. Interior: The overhead door shall be similar to the Cookson Company type FCM-Motor (belt drive) operated service door w/ aluminum finish. Weather-stripping is not needed. The Overhead Door Company and Atlas Door are approved equal.
3. The overhead door will be for face of wall mount and will be motorized operated.
4. Finish will be paint as per SECTION 09 90 00: PAINTING.

B. ROLLING GRILLE

1. The rolling grille shall be equal to Cookson Visionaire® ESG10 Rolling Grille. The rolling grille curtain shall be constructed of 5/16" solid aluminum rods at 2" on center with vertical chains of eyeletted aluminum spaced at 9" apart. This rolling grille will be motorized. Finish to be selected by Architect.

C. ROLL-UP COUNTER DOOR

1. The roll-up counter door shall be constructed with stainless steel (type F-138) flat crown slats with pitch of 1-3/8". Frame shall be 16-gauge primed steel with 14-gauge stainless steel sill. The door shall be equal to model FCB4 (push up) as manufactured by the Overhead Door Company.
2. Frame finish for frame will be paint as per SECTION 09 90 00: PAINTING.

D. ACCESS DOOR

1. Access door shall be Inryco/Milcor Aluminum Ceiling Access Door Model No. CF-2 or approved equal.
2. Door shall be flush-mounted in ceiling where indicated and shall be 30" x 36" and downward swinging.
3. Finish shall be painted as per SECTION 09 90 00: PAINTING.

E. SECURITY

1. All specialty doors will be lockable, keyed to Owner's requirements.

F. DELIVERY AND STORAGE

1. Deliver special doors and shutters to the job site crated and protected by heavy cardboard, market to agree with the approved shop drawings. Store under cover on wood runners or floors in a manner that will prevent damage.

08 30 00.03: EXECUTION

A. INSTALLATION

1. Hang rolling door, overhead door and shutter true, plumb and in strict accordance with the manufacturer's installation instructions.
2. Install access door in strict accordance with manufacturer's instructions.

B. GUARANTEE

1. Roll-up shutter, rolling door, overhead door and access door shall be warranted against defective workmanship and materials for one year from date of acceptance.

DIVISION 08

SECTION 08 41 13: ALUMINUM WINDOWS AND STOREFRONTS

08 41 13.01: GENERAL

A. SCOPE

1. This Contractor shall furnish all labor and materials to complete fabrication, installation, weatherproofing and other work incidental to or required for completion of all windows, storefront and curtain wall shown on the drawings, scheduled, or herein specified.
 - a. Aluminum windows, mullions, door frames, etc. as indicated and detailed on the drawings.
 - b. Aluminum sills as indicated.
 - c. Glass and glazing is specified in SECTION 08 80 00: GLASS AND GLAZING. Caulking is specified in SECTION 07 90 00: CAULKING AND SEALANTS.
 - d. Refer to SECTION 00 21 13, Items 20, 21, and 22 for "or approved equal".

B. SHOP DRAWINGS

1. Submit shop drawings showing complete fabrication and installation details in accordance with requirements of SHOP DRAWINGS SECTION 01 33 00 of Division 01.

08 41 13.02: PRODUCTS

A. ALUMINUM WINDOWS

1. Aluminum Windows shall be Kawneer 8225TL Series thermally-broken fixed, projected and casement out-swing (escape) units and/or Kawneer 5500 Series thermally-broken fixed, projected and casement out-swing (escape) units as scheduled and detailed on the drawing. Horizontal sliding and fixed windows shall be equal to TRACO, TR-6800 and TR-7100, hurricane resistance. EFCO, Winco and YKK are approved equivalent. Refer to SECTION 00 21 13, Items 20, 21 and 22.
2. Aluminum storefront shall be Kawneer Trifab™ VG 601/601T, hurricane resistance Series or equal. Framing as shown on the drawings. Provide door frames as indicated. All must be approved by the Architect.
3. The curtain wall shall be equal to Kawneer 1600 Wall System™2 Curtain Wall for structural silicone glazing, hurricane resistance and 1" Low-e insulated glass as detailed on the drawings.
4. Extrusions shall be 6063-T5 alloy. The finish shall be anodized. Color selected by Architect. The thermal barrier shall consist of a two-part, chemically curing, high density polyurethane. Fasteners, where exposed, shall be aluminum. Perimeter anchors may be aluminum or steel. If steel is used it shall be properly isolated from the aluminum. Glazing gaskets shall be elastomeric extrusions.

5. All hardware shall be compatible with aluminum and shall be in accordance with the manufacturer's recommendations.
6. All windows are to be glazed with 1" Low-e insulating glass as specified in SECTION 08 80 00.

B. ALUMINUM SILLS

1. The aluminum sills as indicated and detailed shall be equal to Style AA, Section #54684 with SA 100 Anchor Clips as manufactured by J. G. Braun a division of The Wagner Companies, Milwaukee, WI. The sills shall be clear anodized to match windows.

08 41 13.03: INSTALLATION

A. INSTALLATION

1. Windows, storefronts and curtain wall shall be installed and adjusted by experienced workmen in accordance with manufacturer's instructions and approved shop drawings and shall be anchored securely.

B. PROTECTION AND CLEANING

1. After installation, both interior and exterior of metal surfaces of windows and sills shall be cleaned of all mortar, paint and other contaminants. After being cleaned, all work shall be protected against damage, until it is accepted by the General Contractor to maintain protection and provide final cleaning.

DIVISION 08

SECTION 08 71 00: FINISH HARDWARE

08 71 00.01: GENERAL

A. QUALITY ASSURANCE

1. Acceptable Designs: Specified products and their manufacturers establish acceptable design, material, type, grade, size, function, and finish of hardware items required. Do not substitute other products, except with Architect's acceptance.
2. Manufacturer: Obtain each kind of hardware [latch and locksets, hinges, closers] from only one manufacturer, although several may be indicated as offering products complying with the manufacturer's requirements.
3. Supplier: The hardware supplier shall be a full member of the Society of Architectural Hardware Consultants and shall be available during normal working hours during the course of the project for hardware consultation to the Owner, Architect, and Contractor.

B. SUBMITTALS

1. Product Data: Submit in accordance with the requirements of Section 01 30 00. Include installation and maintenance instructions for operating parts and finish. Transmit copy of applicable data to Installer.
2. Certificates: Any hardware that is furnished other than that scheduled on the drawings shall have manufacturer's certificates certifying that the hardware meets this specification submitting the hardware shop drawings.
3. Hardware Schedule: Submit final hardware schedule in the manner and format indicated below. Hardware schedules are intended for coordination of work.
 - a. Organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening, including:
 - 1) Type, style, function, size and finish of each hardware item.
 - 2) Name and manufacturer of each item.
 - 3) Fastenings and other pertinent information.
 - 4) Location of hardware cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - 5) Explanation of all abbreviations, symbols, code, etc. contained in schedule.
 - 6) Mounting locations for hardware.
 - 7) Door and frame sizes and materials.
 - b. Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work [e.g. hollow metal frames], which is critical in the project construction schedule.

- c. Include product data, samples, shop drawings of other work affected by builder's hardware, and other information essential to the coordinated review of hardware schedule.
 - d. Templates: Furnish for the installation of all hardware and to the manufacturer of related equipment for his preparation of that equipment for all hardware that must be attached thereto. Templates shall also be furnished to the manufacturer of wood doors for use on all wood doors that are factory fitting and factory machined for hardware.
- 4. Keying Schedule: Submit separate detail schedule indicating clearly how the Owner's final instruction on keying of locks has been fulfilled. Prior to submittal blank key schedule to be completed by maintenance personnel.
 - 5. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of builders hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.

C. JOB CONDITIONS

- 1. Coordinate hardware with other work. Tag each item or package separately with identification related to the final hardware schedule. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security, and similar requirements indicated as necessary for proper installation and function. Deliver individually packaged hardware items at the proper times to the proper location [shop or project site] for installation.
- 2. Packing and Marking: Package each item of hardware separately in individual containers, complete with necessary screws, keys, instructions and installation templates for spotting mortising tools. Mark each container with item's number corresponding to number shown on hardware supplier's schedule and properly tag each cylinder's key.
- 3. Provide secure lock-up for hardware delivered to the project but not the installed. Control the handling and installation of hardware items, which are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, both before and after installation.
- 4. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work to confirm that adequate provisions are made for the proper installation of hardware.
- 5. Inspection of Hardware and Installation: The hardware supplier shall visit the project when the hardware is delivered and check it before it is installed. He shall visit the project again after all the hardware has been installed and shall notify the Architect if there is any hardware that has not been installed correctly. Contractor and supplier shall furnish Architect with written certification to this effect. After the hardware is installed, the hardware supplier shall meet with the Owner or his representative and explain the functions, uses, and maintenance of all types of hardware installed. The Contractor shall turn over to the owner, after completion of the work, all tools, wrenches and templates that come packaged with the hardware for the Owner's use in servicing the hardware. The hardware supplier

shall adjust the door closers for proper operation with particular attention being given to final operation of the air conditioning, heating and ventilating system.

08 71 00.02: PRODUCTS

A. PRODUCTS

1. Acceptable Manufacturers:

- a. Hinges: Bommer, McKinney, Stanley
- b. Continuous Gear Hinges: ABH, Select, Zero
- c. Cylinders: Best, Corbin Russwin, Schlage
- d. Door Closers: RYOBI, LCN, Norton
- e. Locks, Latches: Best, Corbin Russwin, Schlage
- f. Silencers, Stops & Flush Bolts: Baldwin, Ives, Rockwood
- g. Kick Plates, & Misc.: Baldwin, Ives, Rockwood
- h. Weatherstrip: National Guard, Pemko, Zero
- i. Push/Pulls: Baldwin, Ives, Rockwood
- j. Exit Devices: Precision, Sargent, Von Duprin
- k. Thresholds: National Guard, Pemko, Zero
- l. Overhead Stops/Holders: ABH, Glynn-Johnson, Rixson
- m. Electronics: RCI, Locknetics, Best
- n. Auto Operators: Hunter, Beasam, LCN

B. MATERIALS, FABRICATION AND FINISHES

1. General:

- a. Manufacturer's Name Plate: Do not use products which have manufacturer's name or trade name displayed in a visible location except in conjunction with required UL labels.
- b. Unless otherwise noted, exposed hardware items shall receive satin stainless steel finish.
- c. Furnish screws of type as required for substrates indicated with each hardware item. Finish exposed screws to match the hardware finish or, if exposed in surfaces of other work, to match the finishes of such other work as closely as possible.
- d. Unless otherwise noted, provide concealed fasteners for hardware units that are exposed when door is closed. Where fasteners must remain exposed when door is closed. Where fasteners must remain exposed, provide vandal resistant fasteners.
- e. Finish shall be as scheduled. Dull Chrome [US26D], Dull Stainless Steel [US32D] Aluminum Lacquer [AL], Extruded Aluminum [Alum] and Prime Coat [USP] as listed.
- f. Tools for maintenance: Furnish a complete set of specialized tools as needed for Owner's continued adjustment, maintenance and removal and replacement of builder's hardware.
- g. Hardware Operation: Force required to activate door hardware shall be not greater than 5 lbf.
- h. Door Opening Force: Maximum force for pushing or pulling open a door shall comply with this paragraph. For hinged doors the force shall be applied

perpendicular to the door at the door opener or 30 inches from the hinged side whichever is farther from the hinge.

- 1) Exterior hinged doors shall not exceed 8.5 lbf. Slight increases in opening force shall be allowed where 8.5 lbf. is insufficient to compensate for air pressure differentials.
- 2) Interior hinged doors shall not exceed 5.0 lbf.
- 3) Fire doors shall be adjusted to meet the minimum opening force permitted by governing fire safety standards.

2. Hinges

- a. Provide template-produced hinges complying with ANSI A156.1.
- b. Provide stainless steel pins, non-removable type for exterior doors and non-rising types for interior doors. Pins shall have flat button ends finished to match hinge leaves.
- c. Hinges shall be full-mortised, 4½" x 4½" unless otherwise noted; five knuckle ball bearing type, heavy duty rated.

3. Lock Cylinders and Keying:

- a. Metals: Construct lock cylinder parts from brass/bronze, stainless steel, or nickel silver.
- b. Equip locks with manufacturer's construction master key feature that permits voiding of construction keys without cylinder removal.
- c. Comply with the Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
- d. Key Material: Provide keys of nickel silver only.
- e. Key Quantity: Furnish three keys for each lock and four keys for each master key, four Grand Master Keys, four Great Grand Master Keys.
- f. Permanently inscribe each key with number or lock that identifies cylinder Manufacturer's key symbol.
- g. Keying: Establish a new Grand Master key System as directed by the Architect and/or Owner. Furnish four (4) Grand Master keys, four (4) Master keys, three (3) keys per lock.
- h. Key Cabinet: Furnish a key cabinet of sufficient size to accommodate this work plus 50%. Lund, Key Control and Telkee are acceptable.

4. Locks and Latches:

- a. Strikes: Except as otherwise indicated or specified, provide manufacturer's standard wrought box strike for each latch or lock bolt with curved lip extended to protect frame, finished to match hardware set.
- b. Handles and knobs: Provide manufacturer's lever handle set complete with stem, roses and trim unless otherwise noted.
- c. Lock throw: Provide 1/2" minimum throw on doors.

5. Exit Devices: Exit devices shall be as scheduled with no substitutes accepted. Exit devices shall comply with ANSI Standard 156.3 Grade 1 modified as follows:
 - a. The devices shall be "touchpad" type with touchpad which shall extend a minimum of 1/2 of the door width.
 - b. Devices should have a 1/4" gap between the face of the door and the touch bar unit eliminating the need for shims or cutting away the glass moulding.
 - c. Lock stile chassis shall be cast bronze. Stamped steel units will not be accepted. All device latch bolts shall be extruded bronze and where used in vertical rod devices shall be deadlocking type.
 - d. Device strikes shall be investment cast stainless steel.
 - e. Device end cap shall be all metal and secured with bracket that completely inserts into device housing.
 - f. All outside device trim shall be cast or forged brass full escutcheon. Lever trim shall be "vandal resistant" with substantial resistance to rotation when locked.
 - g. All vertical rod devices shall be concealed and have "latch retraction" hold back.
 - h. Devices must be convertible from one function to another simply by exchanging back plate assembly in lock stile case and selecting proper outside trim.
 - i. Device shall be secured to the door with sex bolts and through bolting at both ends.
 - j. All devices shall be UL approved for all types and functions indicated in the Hardware Schedule.
 - k. Devices shall have published three-year warranty.
 - l. All exit devices shall be by the same manufacturer.
 - m. Mullions shall be "keyed removable" type with only a key required for take down. No key or tools shall be required to reinstall. Mullions shall be by the same manufacturer as the exit devices.
6. Closers: Shall be as scheduled.
 - a. Closer shall be non-handed and adjustable.
 - b. Closer shall have R14 high silicone aluminum alloy cylinder body with 1 1/2" steel piston.
 - c. Closer shall have ten year warranty.
 - d. Closer shall have all season fluid to eliminate seasonal adjustment.
 - e. All closers mounted parallel arm shall have EDA or CS arms.
7. Overhead Stops/Holders: Shall be as scheduled - No Sub.
 - a. Units shall have metal/plated end plugs.
 - b. Units mounting screws shall be designed so that they go through housing and end plug.
 - c. Units shall have metal slide.
 - d. All stops shall be by same manufacturer.

8. Silencers, Stops & Flush Bolts: Shall be as scheduled.
 - a. Silencers: Provide plug-type [not adhered type] silencers in all metal door frames unless continuous bumper-type weather-stripping is shown or specified. Provide 3 silencer units in door frames.
 - b. All Stops [wall and floor] shall be by the same manufacturer.
 - c. Flush bolts shall have 3/4" throw with 2" vertical adjustment. Shall have override feature and stainless steel cams and rubplates. All flush bolts shall be by the same manufacturer.
9. Door Stripping and Seals: Unless otherwise indicated, provide full-length weather-stripping at each edge of every exterior swing door leaf. All weather-stripping to be by same manufacturer.
10. Thresholds: Extruded aluminum, smooth commercial mill finish, grooved tread, 4" minimum tread by full door width. Thickness of threshold shall be 0.5" at primary tread surfaces, 0.1875" for secondary tread surfaces, and 0.125" for concealed flanges and legs.
11. Kick Plates, Mop Plates and Armor Plates: .050 material sized as follows:

Kick Plates: 8 x 2 LDW
Mop Plates: 4 x 2 LDW
Armor Plates: 16 x 2 LDW

C. SCHEDULE OF HARDWARE

1. See Hardware Schedule attached to this section (if applicable).

08 71 00.03: EXECUTION

A. INSTALLATION

1. General: Properly tag, index, and file all keys until turned over to the Owner. Apply hardware in accordance with templates and manufacturer's instructions; mortise and fit accurately; apply securely and adjust carefully.
 - a. Mount hardware units at heights recommended in "Recommended Locations for Builders Hardware" by DHI, except where shown otherwise on drawings.
 - b. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate.
 - c. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
 - d. Exercise care not to injure work when applying hardware. Review shop drawings and Contract Drawings for proper location. Cover door hardware with a heavy cloth until painting is completed. At completion of the work, examine doors and hardware, adjust as required and leave hardware in proper working order, free from defects.

- e. At all times be responsible for the distribution of keys for hardware installed during construction, and cause all keys to be returned prior to final completion of the building
2. Preparation:
- a. Do not install finish hardware until the wet trades have been fully completed.
 - b. Supplier shall mark each item of hardware for location. Protect markings until each item is installed. If any item of hardware is delivered to the Project not properly marked, return it to the supplier for marking before attempting to install it.
 - c. Install and make necessary adjustments for proper working order. Hardware damaged by improper adjustments or abuse will be rejected.
 - d. Provide clean, properly sized, and accurately placed mortises and drilled holes for all mortise and surface mounted finish hardware. Use appropriate jigs, templates, and power mortising equipment for the installation of all mortised hardware items.
 - e. Metal frames to receive hardware items shall be drilled and tapped accurately.
 - f. Removal for Painting:
 - 1) Before painters finish is applied, remove all finish hardware except prime-coated items.
 - 2) After final paint and finish coats are dry, permanently replace and adjust finish hardware for proper operation.
3. Thresholds:
- a. Cut and fit threshold to profile door frames, with mitered corners and hairline joints. Screw thresholds to substrate with No. 10 or larger bronze or stainless steel screws.
 - b. Set thresholds in a bed of either butyl/rubber sealant or polyisobutylene mastic sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or blockweeps. Remove excess sealant.
4. Weather-strip: Accurately install weather-strip to the door or frames where scheduled using proper type flush fasteners spaced not over 18" o.c. Installed work shall make continuous contact with the abutting surfaces and shall function for use intended. Adjust seals as required.
5. Mounting Heights: Shall be as follows, measured from finished floor except for top hinge which is measured from door top:
- a. Bottom hinge: 10-3/8" [hinge center].
 - b. Top hinge: 9-3/4" [hinge center].
 - c. Intermediate hinges: Equally spaced between top and bottom hinges.
 - d. Locks and latches: 38" [operating spindle].
 - e. Pulls, pull and push plates: 42" [center].

B. ADJUST AND CLEAN

1. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubricant recommended by manufacturer [graphite-type if no other recommended]. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
2. Upon completion of the work and before final acceptance demonstrate that all hardware is in satisfactory working order, that all keys fit in their respective locks and upon acceptance of the work, tag and deliver all keys to the Owner.
3. Final Adjustment: Wherever the hardware installation is made more than one month prior to acceptance or occupancy of a space or area; return to the work during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
4. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finish during the final adjustment of hardware.

DIVISION 08

SECTION 08 71 30: WEATHERSTRIPPING

08 71 30.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the weatherstripping of all exterior doors.
2. Weatherstripping for aluminum and glass doors will be furnished by the door manufacturer.

08 71 30.02: PRODUCTS

A. WEATHERSTRIPPING

1. Fasten weatherstripping to doors with brass-plated sheet metal screws.

B. DELIVERY AND STORAGE

1. All items shall arrive at the job site packed and marked for easy reference. Store material under cover in a manner that will prevent theft or damage.

08 71 30.03: EXECUTION

A. INSTALLATION

1. Install all items level, square, in proper alignment and in proper relationship to all adjoining work. Set all thresholds in a full bed of caulking; anchor with 1/4" machine screws and expansion or lead shields. At points where aluminum comes in contact with steel, prime the steel first with asphalt paint before attaching aluminum members.

DIVISION 08

SECTION 08 80 00: GLASS AND GLAZING

08 80 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials, appliances and equipment necessary for completion of all glazing work, including all supplementary parts necessary for a complete installation, as shown on the drawings, herein specified, or both, as follows:
 - a. Glazing of windows.
 - b. Glazing of doors and partitions.
 - c. Glazing of storefronts and curtainwalls.
 - d. Plate glass mirrors except mirrors over lavatories (See SECTION 10 28 13.13).
2. Shop drawings required.

B. WORK NOT INCLUDED

1. If in the opinion of the glass manufacturer there will be the probability of glass breakage due to the following possible causes, the Architect shall be notified in writing before bid date:
 - a. Thermal shock.
 - b. Shade and/or shadow on glass.
 - c. Sunshine on glass.
 - d. Glass directly exposed to interior heating and/or cooling.
 - e. Area between drapes and/or curtains and glass.
 - f. Installation details.
 - g. Sealants.
 - h. Vibration from truck and street traffic.
 - i. Any other condition or situation that could cause breakage other than abuse, vandalism and/or natural disaster.

C. INSTALLATION

1. Prior to glazing, all dirt, film, protective coatings, moisture, etc. shall be removed from glazing surfaces and glass; and glazing surfaces shall be treated as recommended by manufacturer of glazing material.
2. Except as otherwise specified or required, glazing clearances shall conform to the requirements specified herein. Glass shall be set to float free of all contact with sash or frame but shall be cut to size that will assure lap on all edges; glass clearances at perimeter on all four sides shall be not less than the thickness of glass to be installed. There shall be no metal to glass contact.
3. The sizes of glass indicated on the drawings are approximate only and the actual sizes required shall be determined by measuring the frames to receive the glass. Labels shall not be removed until final approval by the Architect.

4. All operable sash shall be glazed in closed position, and sash shall not be handled or operated until glazing compound has set.
5. After installation, glass shall be protected as necessary during all subsequent construction operations. Any glass which is chipped, cracked or scratched shall be replaced.
6. Upon completion of construction, all glass shall be cleaned to crystal clarity using a mild soap and water or other cleaning agents which will cause no damage to glass or adjacent surfaces.

08 80 00.02: GLAZING MATERIALS

A. GENERAL

1. Glazing compound shall not be altered with any other sealer or solvent, nor combined or cut with any material without approval of manufacturer.
2. All glass shall be factory labeled on each pane, and labels shall remain on glass until final cleaning. Manufacturer's label shall show strength, grade, thickness, type and quality of glass.

B. MATERIALS & LOCATION

1. All glass shall be similar and equal to the products of PPG Industries, Saint-Gobain or The NSG Group. Trade names listed herein denote grade, type and quality of materials required.
 - a. Glass for aluminum storefronts and curtainwalls will be 1" Low-e insulating glass with air space to suit thickness of glass specified. Glass adjacent to doors and within 18" of the floor in storefront and curtain walls shall be 1/4" Tuf-flex clear tempered float glass. Glass for aluminum-clad windows shall be 5/8" overall thickness.
 - b. Glass for aluminum windows shall be two panes of 1/8" Low-e double strength clear float glass. The glass for the insulated sections in the storefront and curtain wall shall be two panes of 1/4" clear float glass except as specified below.
 - c. Glass for glazed exterior doors will be 1/4" Tuf-Flex clear tempered float glass.
 - d. Glass for interior partitions will be as shown on the drawings:
 - 1) Glass adjacent to doors and floors to be 1/4" Tuf-flex tempered float glass.
 - 2) Other glass to be 7/32" clear float glass.
 - e. Glass for interior doors shall be D.S.B. unless otherwise noted.
 - f. Mirrors specified in SECTION 10 28 13.13.

08 80 00.03: INSTALLATION

- A. Glass shall be centered in openings using setting blocks and centered shims as required, and centered position shall be maintained throughout glazing operations.
 - 1. Windows glazing beads shall have a minimum wall thickness of .050" and shall be the interlocking type requiring no screws. Glazing shall be accomplished using continuous extruded Poly-vinyl gaskets and requiring no mastic or glazing compounds.
 - 2. Glazing of windows, doors, sidelight, etc. shall be accomplished neatly.
 - 3. Adequate protection shall be provided during fabrications, shipment, site storage and erection, to prevent damage of finished work.
 - 4. The mirrors shall be securely attached to the wall with concealed fastener, edge clips and cement.

DIVISION 09

SECTION 09 21 00: GYPSUM DRYWALL

09 21 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all plant, labor, materials, appliances, equipment, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, and the applicable drawings.

09 21 00.02: PRODUCTS

A. MATERIALS

1. Gypsum drywall shall be 1/2" and/or 5/8" thick, 48" wide tapered edge fire code wallboard in lengths as required. Certain areas may require Type X drywall (acceptable manufacturers are Georgia Pacific, American Gypsum and USG), refer to wall types on drawings. Provide casing beads where required. Use moisture resistant panels for exterior and in wet locations. Gold Bond or equal MR Board on interior and Soffit Board on exterior.
2. Screw Fasteners shall be 1-1/8" self-drilling cadmium-plated screws for wallboard application to metal studs.
3. Nail fasteners (where approved by Architect) shall be located 3/8" minimum to 1/2" maximum from edges and ends of wallboard at 8" o.c. on walls. The nails shall be driven home with the heads slightly below the surface of the board in a dimple formed by the driving tool. Improperly driven nails shall be removed.
4. Joint system shall consist of a perforated fiber tape and joint compound as recommended by the wallboard manufacturer. The system shall conform to ASTM C474 and C475 and Federal Specification SS-J-570A, Type III for combined joint compound and tape.
5. All gypsum drywall materials and accessories shall be the products of a single nationally recognized and reputable manufacturer.
6. Corner beads shall be galvanized steel 1" x 1".
7. Casing beads and trim shall be galvanized steel.
8. All exposed gypsum corners shall have vinyl corner guards – equal to Thinline model CG-2157 by AFCO, length 8'-0" from the finish floor. Note: "wing walls" will have corner guards on the most exposed corner(s).

B. DELIVERY AND STORAGE

1. All material shall be delivered to the job site in original unopened bundles or cartons bearing the manufacturer's label. Store material under roof, elevated above floor. Gypsum wallboard shall remain dry at all times.

09 21 00.03: EXECUTION

A. INSTALLATION:

1. Gypsum drywall will be installed in well ventilated, totally enclosed areas, with temperatures uniformly maintained within the range of 55° F to 70° F. Maintain temperature until building is occupied.
2. Gypsum wallboard shall be applied at right angles to framing members. Boards of maximum practical length shall be used so that an absolute minimum number of end joints occur. Boards shall be brought into contact with each other but shall not be forced into place. Wallboard joints at opening shall be located so that no end joint will align with edge of opening. End joints shall be staggered and joints on opposite sides of a partition shall not fall on the same stud. The application shall be in strict accordance with the specifications of the wallboard manufacturer. Keep a copy of the manufacturer's specifications on the job site during this operation.
3. Wallboard shall be cut neatly to fit around all outlets and switch boxes. The final work shall be plane with no dimples or arises. All walls shall be plumb, true and secure.
4. Joint compound and perforated tape shall be used on all face joints and internal angles formed by the intersections of walls. Final application of joint compound will be sanded smooth. Apply compound in three coats, sanding between coats.
5. Provide metal trim, corner beads, and control joints as shown on the drawings and/or as required, in single lengths. At least two coats of joint compound shall be applied over beads and each coat feathered out approximately 9" on both sides onto panel faces.
6. Joint Treatment:
 - a. Prefill: Fill open spaces between boards of 1/4" or more with taping compound. Allow to harden prior to application of taping coat.
 - b. Taping:
 - 1) Apply a thin uniform layer of compound to joints and angles to be reinforced. Provide sufficient compound under tape, approximately 1/64" to 1/32" for proper bond. Immediately apply tape, center over joint and seat into the compound. Apply skim coat immediately following tape embedment.
 - 2) Fold tape and embed in angles to provide a true angle.
 - 3) Allow to harden prior to application of fill coat.

c. Filling coat:

- 1) Apply compound over taping skim coat.
- 2) Fill board taper flush with the surface.
- 3) On non-tapered joints, apply compound over the tape and feather out at least 4" on either side of the joint.
- 4) Do not apply filling coat to interior angles.
- 5) Allow to dry thoroughly prior to application of finish coat.

d. Finishing:

- 1) Apply compound evenly over and extending slightly beyond the fill coat on all joints.
- 2) Feather to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface.
- 3) Apply compound at taped angles to provide a true angle.

7. Fastener Depressions:

Apply a minimum of three coats of compound, allowing each coat to dry or harden prior to application of the following coat. Leave finish level with the plane of the surface.

8. Metal Accessories:

- a. Apply a minimum of three coats of compound, allowing each coat to dry or harden prior to application of the following coat.
- b. Feather out from the ground to the plane of the surface, each coat slightly beyond the preceding coat.

9. Sanding:

- a. Sand where necessary between coats and following the final application of compound to provide a flat, smooth surface ready for decoration.

10. Fire/Smokestop Walls:

- a. All rated fire walls and smokestop walls shall be permanently identified. Each rated wall shall be identified by a sign or stenciling, no further than 12'-0" o.c. above the finished ceiling. The wording should read: "1 hr. (2 hr., 3 hr., 4 hr.) rated fire/smoke wall; protect all openings and penetrations".

DIVISION 09

SECTION 09 51 00: SUSPENDED ACOUSTICAL CEILING

09 51 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the acoustical panel ceiling system as indicated on the drawings, called for on the Room Finish Schedule and specified herein.

B. SUBMITTALS

1. Submit brand name and manufacturer of all items proposed for use. Obtain approval by the Architect before placing orders.
2. Submit shop drawings and manufacturer's technical data showing layout indication and installation details.
3. Submit a 12" x 12" sample of the acoustical panel proposed for use.

C. COORDINATION

1. Coordinate all work under this section with other trades to expedite the progress of the project. Provide special framing around recessed items as required.
2. Contractor shall familiarize himself with work by the Mechanical and Electrical Contractors so as to achieve first class results.

09 51 00.02: PRODUCTS

A. MANUFACTURER

1. All materials included in the acoustical panel ceiling system shall be the products of a single nationally recognized and reputable manufacturer, such as Armstrong, CertainTeed, USG or equal.
2. Products mentioned by name in this specification are intended to denote design and finish required.

B. SYSTEM DESCRIPTION

1. Acoustical panel ceiling system shall be mineral-fiberboard, lay-in type. Suspension system shall be hung directly from the structure above. The ceiling used shall be compatible with the floor-ceiling assembly required in each area.

C. SUSPENSION MATERIALS

1. Hanger wires shall be pre-straightened, galvanized steel wire.

2. Exposed grid framing shall have a baked white satin enamel finish unless otherwise noted (refer to drawings).
3. Provide hold-down clips on rated ceiling, matching wall moldings, caps and all other accessories required.

D. ACOUSTICAL CEILING TILES

1. Acoustical panels shall be 24" x 24" x 5/8" mineral-fiber-School Zone fine fissured, FireGuard, HumiGuard, or equal lay-in units with tegular edges, non-directional pattern, compatible with the UL Design Number indicated on the plans. Refer to the Architectural Reflected Ceiling plans. Armstrong (basis of design), CertainTeed Ceilings, USG.

E. CEILING ACCESS: DOOR

1. Access door shall be Inryco/Milcor Aluminum Ceiling Access Door Model No. CF-2 or approved equal. Door shall be flush-mounted in ceiling where indicated and shall be 30" x 36" and downward swinging. Key Lockable.
2. Finish shall be painted as per SECTION 09 90 00 – PAINTING and will match ceiling color.

F. DELIVERY, STORAGE AND HANDLING

1. Deliver material in its original, unopened, protective packaging with manufacturer's labels indicating brand name, pattern, size, thickness and fire rating, legible and intact.
2. Store materials in original protective packaging to prevent soiling, physical damage or wetting. Store cartons open at each end to stabilize moisture content and temperature.
3. Do not begin installation until sufficient materials to complete a room are received.

09 51 00.03: EXECUTION

A. CONDITION OF SURFACE

1. Examine surface scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of work.
2. Access provisions (i.e. doors, panels) will be installed before beginning installation.

B. ENVIROMENTAL REQUIREMENTS

1. Complete installation of dampening materials before beginning work.

2. Maintain a uniform humidity of 65% - 75% and temperature in the range of 55° F to 70° F in area where acoustical materials are to be installed, 25 hours before, during, and 25 hours after installation.

C. INSTALLATION

1. Securely attach hangers to structural members above at 48" o.c. each and within 6" of the ends of main runner runs. Provide power driven hanger inserts where ceilings are suspended below structural concrete slabs. Provide additional hanger wires at each corner of recessed light fixtures. Coordinate installation of hanger wires with fire ceiling contractor.
2. Level and secure angle molding to walls and columns as required, using finished angle corner plates at all exterior corners. Erect metal tees in pattern indicated on approved shop drawings. Install main runners at 48" o.c. and cross tees as required, with ends supported by wall molding.
3. Install panels on flanges or inverted tees with panels fitting neatly against abutting surfaces. Field cutting shall be done in a neat and inconspicuous manner with exposed edges sharp and unfrayed.
4. Provide tile for fireproofing over lighting fixtures and assemble fireproofing in accordance with U.L. Design specified.

D. TOLERANCE

1. Suspension system components, hangers and fastening devices supporting light fixtures, ceiling grilles and ceiling panels shall have a mixture deflection of 1/360 of the span and shall be level to within 1/8" in each room.

E. CLEANING

1. Clean soiled or discolored unit surfaces after installation. Touch up scratches, abrasions, voids, and other defects in painted surfaces. Remove and replace damaged or improperly installed units.

F. GUARANTEE

1. Defects in materials and workmanship that occur within one year from date of substantial completion of the project shall be corrected as directed by the Architect. Such defects shall include: noticeable warping, shrinking or sagging or acoustical peeling, and scaling of paint on painted work; rusting of suspension system members.

G. MAINTENANCE MATERIAL

1. Furnish extra materials equal to 1% of each type of acoustical material supplied.

DIVISION 09

SECTION 09 65 00: RESILIENT FLOORING

09 65 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the installation of all vinyl composition tile, synthetic flooring, rubber base, rubber treads and nosings where indicated on the drawings and Room Finish Schedule and as specified herein and the applicable drawings.

B. SAMPLES

1. Provide Architect with adequate samples of each product for selection of pattern, texture, quality and color. Also provide 4 copies of manufacturer's literature which describes products' qualities, installation recommendations and procedures, maintenance requirements and warranties.

09 65 00.02: PRODUCTS

A. VINYL COMPOSITION TILE

1. Vinyl Composition flooring shall conform to ASTM 1066, CLASS 2, ASTM 1700 and SS-T-312B(1), Type IV as made by a nationally recognized and reputable manufacturer. Tile shall be 12" x 12" x 1/8" with patterns and colors to match the existing project. Submit actual samples proposed for the project to the Architect, per submittal section within these specifications. Manufacturers: Armstrong, Azrock and Mannington.

B. RUBBER TREADS AND NOSINGS

1. Rubber treads and nosings shall be two-piece tread/riser safety design system to match existing. Submit actual samples proposed for the project to the architect, per submittal section within these specifications.

C. RUBBER BASE

1. Rubber base shall be 4" or 6" high, factory-molded, cove style with pre-molded corners, to match the existing. Submit actual samples proposed for the project to the architect, per submittal section within these specifications. Manufacturers: Johnsonite, Inc., Roppe, Allstate and Nora.

D. ADHESIVE

1. Adhesive for flooring and base shall be waterproof-type as recommended by the manufacturer.

E. DELIVERY AND STORAGE

1. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand names, colors and patterns, and quality designations legible and intact. Do not open containers or remove markings until materials are inspected and accepted.
2. Store and protect accepted materials in accordance with manufacturer's directions and recommendations. Unless otherwise directed, store materials in original containers at not less than 70° F. for not less than 24 hours immediately before installation

09 65 00.03: EXECUTION

A. PREPARATION

1. Examine substrate for excessive moisture content and unevenness which would prevent execution and quality of resilient flooring as specified. Do not proceed with installation of resilient flooring until defects have been corrected except where correction is indicated in this Section.
2. Maintain temperature in space to receive tile between 70° F. and 90° F. for not less than 24 hours before and 48 hours after installation; maintain minimum temperature of 55° F. thereafter.
3. Remove dirt, oil, grease, or other foreign matter from surfaces to receive floor covering materials. Fill cracks less than 1/16 inch wide and depression less than 1/8 inch deep with crack filler. Prime surfaces other than wood if recommended by flooring manufacturer.

B. INSTALLATION

1. Lay flooring symmetrically about center line of rooms or spaces as indicated on the drawings with tile against all walls not less than 6 inches wide. Install only as much adhesive as can be covered in a single day; spread adhesive evenly in a fan-like pattern using the proper tools. Lay tiles straight and neat with tight straight joints; roll with heavy roller as installation progresses. Cut tile to fit accurately at joining with other materials. Install polished aluminum edging strips where the edge of tile is exposed and where tile abuts other floor finishes. Install strips to the floor with screws spaced 12 inches apart; anchor screws to concrete using plastic expansion shields. Pattern shall be straight; not alternating.
2. Install base around perimeter of room or space and at cabinet toe spaces where detailed on plans. Unroll base material and cut into accurate lengths as desired or as required for minimum number of joints. Match edges at all seams or double cut adjoining lengths. Install with tight butt joints with no joint widths greater than 1/64 inch.
3. Base corners will be manufactured type - field cut will not be acceptable.

4. Rubber treads and nosings will cover entire treads and nosing shall fit sloped face as detailed. Blisters, warps and irregularities will not be accepted.

C. FINISHING AND CLEANING

1. Upon completion of the installation of floor covering, adjacent work, and after materials have set, clean surfaces with a neutral cleaner as recommended by the manufacturer for the type of floor covering material installed.
2. After cleaning, the floor tile shall be properly protected until acceptance by a covering of heavy paper, and by board walks in all areas where damage to the floor may occur because of subsequent building operations.

D. MAINTENANCE MATERIALS

1. Furnish three (3) copies of manufacturer's maintenance methods and procedures. Provide instructional session with Owner's representatives.
2. Furnish additional floor covering materials for maintenance and replacement at the rate of one (1) carton for each 1500 sq. ft. Furnish materials of each size, color, pattern and type of material included in the work.

E. GUARANTEE

1. The Contractor shall replace all loose and broken tile, treads, nosings and/or rubber base, at no cost to the Owner, for a period of one year after completion and acceptance of the project.

DIVISION 09

SECTION 09 90 00: PAINTING

09 90 00.01: GENERAL

A. SCOPE

1. The following specifications cover the complete painting and finishing of all surfaces, interior and exterior, except as otherwise specified. The painting contractor shall, as part of this contract, furnish all materials, labor, tools, scaffolds, and other appliances required to properly execute and complete the work according to the plans and specifications.
2. The painting contractor shall examine the specifications for the various other trades and shall thoroughly familiarize himself with all their provisions regarding their painting. All surfaces that are left unfinished by the requirements of other specifications shall be painted or finished as a part of this contract. Copper, chromium plate, stainless steel, aluminum and Monel metal shall not be painted or finished, unless otherwise specified. If the surface to be finished cannot be put in proper condition for finishing by customary preparation methods, the painting contractor shall notify the general contractor or Architect in writing or thereby assume responsibility for and correct any unsatisfactory finish resulting.

B. WORK INCLUDED

1. Exterior painting shall include, but not be limited to:
 - a. All metal doors (including overhead doors) and frames.
 - b. All exposed structural steel, steel joist, metal deck and other ferrous metal work.
 - c. Exposed louvers and grilles.
 - d. Gypsum board soffits.
 - e. All gutters, downspouts, fascia, metal panels, copings, gravel stops, etc... unless prefinished.
 - f. Steel stairs and handrails.
 - g. Concrete columns or exposed deck.
 - h. All metal louvers except factory finished.
2. Interior painting shall include, but not be limited to:
 - a. All exposed concrete block walls and partitions.
 - b. All gypsum wallboard walls and exposed ceilings.
 - c. All metal doors (including overhead doors) and frames.
 - d. All wood doors and trim which are not prefinished.
 - e. All exposed structural steel, steel joist, metal deck and other ferrous metal work.
 - f. All exposed Mechanical ductwork, piping and conduit.
 - g. Wood shelving and cabinets which are not prefinished.
 - h. All other exposed woodwork not specifically mentioned.
 - i. Steel handrails.
 - j. Concrete columns.
 - k. All exposed roof or floor deck, etc.
 - l. All exposed conduit, raceway, etc.

C. SUBMITTALS

1. Submit brand name and manufacturer of all products proposed for use. Obtain Architect's approval of all products prior to placing orders.

09 90 00.02: PRODUCTS

A. MANUFACTURER

1. All paint and related material applied in the field shall be the products of PPG Industries, Inc., Sherwin Williams, Benjamin Moore or Pratt & Lambert.
2. Colors shall be selected by the Architect and approved by the owner. Final finishes will match the selected samples.

B. MATERIALS

1. Ready mixed paint or paints colored by the manufacturer's authorized agents prior to delivery to the job site shall be used for all painting. Enamels and exterior paints shall be non-yellowing, and exterior paints shall be non-chalking.
2. All shellac shall be white, composed of pure gum. Only when absolutely necessary shall shellac be thinned and then only with pure denatured alcohol.
3. All paint for exterior work shall either contain a mildewcide in the paint formula or shall have an approved mildewcide additive mixed into the paint at the jobsite in strict accordance with the paint manufacturer's recommendations.
4. Putty shall be commercial grade of putty composed of linseed oil, and whiting.
5. Wood fillers shall be select paste fillers to match color of the stain to be used, not tinted with stain on the job.
6. Stains shall be as manufactured or furnished by manufacturer of finishing materials. Stains shall be compatible with surface receiving it, and with other finishing materials being applied.
7. Turpentine shall be pure gum spirits of turpentine, conforming to ASTM Specification A13-51.
8. Mineral spirits shall conform to ASTM Specification D13-51.

C. DELIVERY AND STORAGE

1. A room on the premises shall be assigned to the painting contractor for the storage of his tools and materials. The floor shall be properly protected with drop cloths or building paper. Paint shall be mixed in suitable containers and necessary precautions shall be taken to prevent fire. All oily rags and waste must be removed from the building every night and proper precautions taken to avoid the danger of fire.

2. All materials used on the work shall be the brand and quality specified and shall be delivered in the original containers with the seals unbroken and labels intact. No claim by the painting contractor as to the unsuitability or unavailability of any material specified, or his unwillingness to use same or his inability to produce first class with same, will be entertained unless such claims are made in writing and submitted with his bid. All materials shall be used only as specified by the manufacturer's direction label on the container. If required, panels for finish and color shall be prepared in advance with the specified materials, and for the approval of the Architect.

09 90 00.03: EXECUTION

A. SCHEDULE OF PAINTING

1. PPG Paint materials and numbers used as basis of design to indicate quality. Paint other than that specified by the Architect may be used only after written permission of the Architect is obtained.
2. A color schedule prepared by the Architect and representative of the paint manufacturer will be issued to the general contractor designating colors, finishes, etc., for all painted surfaces and areas. Any painted surface that is not in accordance with the color schedule shall be repainted.
3. Finishes: See room finish schedule for painted areas and paint colors. The painting contractor is to note that these specifications specify quality and type of paint; whereas, the paint numbers on the finish schedule identify color and not necessarily quality or type. These are typical specifications for the painting of various surfaces. The absence of a formal color schedule will not relieve the contractor from any responsibility to paint all surfaces and materials listed herein. This job may not require or include all the types of paint specified, nor is it limited to the following types:
 - a. Exterior
 - 1) Metals:
 - a) Non-Ferrous: Receives no paint
 - b) Ferrous:
 - i) Galvanized:
1 coat: PPG 90-712 Pitt Tech DTM Acrylic Metal Primer Finish.
2 coats: PPG Paints 7-282 Seven Line Industrial Gloss Alkyd Enamel.
 - 2) Stucco:
1 coat: PPG 4-603 Perma Crete Acrylic Alkali Resistant Primer.
2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Eggshell Finish.
 - 3) Brick: (When noted on drawings as receiving paint)
1 coat: PPG 4-603 Perma Crete Acrylic Alkali Resistant Primer.

- 2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Eggshell Finish.
- 4) Block: (When noted on drawings as receiving paint)
 - 1 coat: PPG 6-7 Speedhide Int./Ext. Latex Masonry Block Filler.
 - 2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Semi-Gloss Finish.
- 5) Woodwork:
 - 1 coat: PPG 6-609 Speedhide Exterior Latex Wood Primer
 - 2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Semi-Gloss Finish.
- 6) Concrete: When paint is specified, apply proper primer and 2 coats of Sonneborn Desoto Super Colorcoat VOC. Applied in strict accordance with the label instructions.
- 7) Gypsum Board Soffits:
 - 2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Eggshell Finish.
- b. Interior:
 - 1) Metals:
 - a) Non-Ferrous: Receives no paint
 - b) Ferrous, Steel, Ornamental Iron and Steel:
 - 1 coat: PPG 6-208 Speedhide Alkyd Rust Inhibitive Steel Primer.
 - 2 coats: PPG 6-1110XI Speedhide Alkyd Semi-Gloss Enamel.
 - 2) Plaster:
 - a) Flat Vinyl Finish:
 - 1 coat: PPG 17-921 Seal Grip 100% Acrylic Universal Primer.
 - 2 coats: PPG 6-70 Speedhide Interior Flat Latex Wall Paint.
 - b) Eggshell Alkyd Oil Finish:
 - 1 coat: 100% Acrylic Universal Primer/Sealer
 - 2 coats: Interior Eggshell Alkyd Oil Enamel.
 - 3) Concrete Block:
 - 1 coat: Interior/Exterior Masonry Latex Block Filler.
 - 2 coats: Interior Waterborne Acrylic Semi-Gloss Enamel.
 - 4) Concrete Block and Concrete Columns - Epoxy Finish:
 - 1 coat: Interior/Exterior Masonry Latex Block Filler.
 - *Note: In moisture prone areas fill with Cementitious Waterproofing Block Filler.
 - 2 coats: High Build Semi-Gloss Polyamide Epoxy Coating.
 - 5) Gypsum Board Walls & Ceilings:
 - 1 coat: Interior Acrylic Latex Primer Sealer.
 - 2 coats: Interior Acrylic Latex Eggshell Wall Paint.

- 6) Wood (Stained) Cabinets and Doors:
 - 1coat: Interior Oil Based Wood Stain.
 - 1coat: Interior Gloss Polyurethane Varnish, thinned to a 9:1 ratio with mineral spirits
 - 2 coats: Interior Gloss Polyurethane Varnish
- 7) Wood (Painted):
 - 1 coat: Interior Alkyd Enamel Undercoater.
 - 2 coats: Interior Alkyd Oil Semi-Gloss Enamel.
- c. Asphalt and Concrete Paving: Parking lines, etc., as shown on the site plan to be painted using equal grade and type white paint used by the State Highway Department for the road lane markings. Submit verification of quality for Architects approval.
- d. Interior-Trim-Specifications: Alkyd Semi-Gloss Enamel.
- e. Wood (Doors, Door Trim, Window Trim, Baseboards):
 - 1) First Coat: Interior Alkyd Enamel Undercoater.
 - 2) Second Coat: Interior Alkyd Oil Semi-Gloss Enamel
- f. Metal (Doors, Door Trim, Window Trim, Baseboards):
 - 1) Unprimed Ferrous Metals:
 - a) First Coat: PPG 6-208 Speedhide Int./Ext Rust Inhibitive Steel Primer.
 - b) Second Coat: Interior Alkyd Oil Semi-Gloss Enamel.
 - c) Third Coat: Interior Alkyd Oil Semi-Gloss Enamel
 - 2) Primed Ferrous Metals:
 - *Note: Spot damaged areas with recommended primer.
 - a) First Coat: Interior Alkyd Oil Semi-Gloss Enamel.
 - b) Second Coat: Interior Alkyd Oil Semi-Gloss Enamel.

B. PREPARATION OF SURFACES

- 1. All work shall be done in a workmanlike manner by skilled mechanics. All material shall be evenly spread and smoothly flowed on without sags or runs, and all coats shall be thoroughly dry before applying the succeeding coats. Enamel or varnish finish applied to wood or metal shall be sanded between coats with fine sandpaper to produce an even smooth finish. No exterior painting shall be done in rainy, damp, or frosty weather, or until the surface is thoroughly dry. No interior painting or finishing shall be permitted until the building has thoroughly dried out by natural or artificial heat.
- 2. All exterior and interior trim shall be back-primed before installation. Tops of all upper sashes and bottoms of all lower sashes shall be finished the same as balance of the exterior sash and tops, bottoms and edges of doors shall be finished the same as the balance of the doors after they are fitted and/or installed by the carpenter. All closets and the interior of all cabinets shall be finished the same as noted.

3. All surfaces to be painted shall be free of loose dirt, dust and grease. Knots, sap streaks and pitch areas shall be scraped or burned, then coated with shellac before priming coat is applied. Mildew shall be removed by washing thoroughly with a solution of tri-sodium phosphate (six ounces to a gallon of water). The surface shall be rinsed well with water.
4. All necessary puttying of nail holes, cracks, etc., shall be done after the first coat is dry. On metal surfaces, weld-spatter, burrs on cut edges, and sharp points various kinds shall be removed. New or unfinished wood shall be sanded as required. Cracks and countersunk nail holes shall be puttied with white putty after priming coat is dry. Paste wood filler, applied on open grain wood, when "set" shall be wiped across the grain of the wood, then with the grain to secure a clean surface.
5. Iron and steel arriving on the job with a shop prime coat applied shall be carefully sanded and all bare spots re-primed. Where rust or scale is present, it shall be wire brushed, or sand papered clean before painting. Shop coats of paint that become marred shall be cleaned and touched up with a similar primer. All field welds and bolts shall be spot primed.
6. All copper surfaces shall be wiped with one of the acceptable solvents to remove oil and grease. It shall be sanded lightly to remove deposits of verdigris (green corrosion products).
7. All galvanized metal surfaces shall be wiped with one of the acceptable solvents to remove oil and grease. The white deposit on weathered galvanized metal shall be removed with soap and water and rinsed well with fresh water and chemically treated with a compound designed for this purpose in accordance with manufacturer's directions for use before applying the first coat of paint.
8. All masonry materials shall be allowed to dry completely (usually 30 to 60 days) before painting. If painting when "green" or damp, the active alkali in these surfaces may "burn" the vehicle and color of succeeding coats of conventional paint. Cracks and crevices of interior plaster and masonry shall be filled with surface filler and sanded smooth, for exterior masonry surfaces, a Portland cement-lime mortar shall be used. Glaze from a hard-troweled surface shall be removed by etching with muriatic acid (5%-1% solution with water). After etching, the surface shall be flushed with water and allowed to dry. All cracks, gouges, nail holes and other imperfections on composition boards shall be filled with synkoloid spackling paste. Patched areas and points shall be sanded.
9. Any existing wall surfaces, doors, trim, etc... which are damaged in the construction process, shall be repainted.

C. APPLICATION

1. Perform painting only under approved conditions of adequate ventilation. Provide adequate protection against toxic fumes, and adequate safeguards against fire and explosion.
2. The commencing of work, or the absence of notification in writing to the contrary, shall be construed as acceptance by the Painting Subcontractor of the surfaces to

be finished as satisfactory to receive the finishes, and to produce the results required.

3. All paint work, unless otherwise called for, shall be brush work and shall be first class in every respect, free from brush marks, runs and sags.
4. All millwork items shall be back-primed under this section before installation of items. Items specified to be finished natural or stained shall be back-primed with white shellac, and all other items shall be back-primed with enamel undercoat.
5. The priming coat on all surfaces shall be tinted to the approximate shade of the final coat and touched up before applying the second and third coats to produce an even finish. The Contractor will secure color schedules before priming. All coats shall be thoroughly dry before applying succeeding coats.
6. Pastewood filler, applied on open grain wood, when "set" shall be wiped across the grain to secure a clean finish. All wood work to be finished with enamel shall be sanded smooth and the surface cleaned before proceeding with the application of the first coat. Enamel applied to wood shall be sanded between coats with fine sandpaper to produce an even, smooth finish. All interior wood trim shall be back-primed before installation.
7. The tops, bottoms and edges of all doors, to be painted or stained, shall be finished to match the surface of the doors after the hardware has been attached. Any door found unpainted upon the completion of the painting work will be taken down and painted.
8. All closets and the interior of all cabinets are to be finished the same as adjoining rooms, unless otherwise specified or directed. All other surfaces shall be finished the same as nearest or adjoining surfaces unless otherwise shown on the drawings.
9. No material will be applied over a damp surface. Exterior work shall not be performed during dusty, rainy, or frosty weather. A temperature of 70 degrees F. or more shall be maintained when enamel is being applied and 50 degrees F. or more during other interior painting. Exterior painting will be performed when the air temperature is 50 degrees F. or higher in drying weather.
10. Access doors or panels, electric panelboard covers, pipes, ducts and raceways shall be painted the same color as adjacent surfaces. All piping exposed in finishing areas shall be painted as required for interior ferrous metal. Where galvanized pipe occurs, paint galvanized surface as specified.
11. Hardware and accessories, fixtures, and similar items placed prior to painting shall be removed or protected during painting and replaced on completion of painting.
12. All work shall be complete. When color, stain, dirt, or undercoats show through the final coat of paint, the work shall be covered by additional coats until the paint is of uniform color and appearance and coverage is complete to the satisfaction of the Owner's representative.

D. PROTECTION AND CLEAN-UP

1. The Contractor shall not only protect the painting work at all times, but shall also protect all adjacent work and materials by suitable coverings or other methods during progress of the work. Upon completion of the painting all paint spots shall be removed. All rubbish and accumulated materials of any nature shall be removed from the job site leaving the work in a clean, orderly and acceptable condition.
2. Extras: No payment in addition to the amount agreed upon in his contract shall be paid to the painting contractor unless authorized in writing by the Architect.

DIVISION 10

SECTION 10 11 16.23: MARKERBOARDS AND TACKBOARDS

10 11 16.23.01: GENERAL

A. SCOPE

1. Furnish and install all markerboards, tackboards and accessories, complete as indicated on the drawings and specified herein.

B. WORK INCLUDED

1. Work under this section includes all markerboards/tackboards mounted on walls.

C. SUBMITTALS

1. Submit shop drawings showing complete fabrication and installation details in accordance with requirements of SHOP DRAWINGS Section of DIVISION 01.

10 11 16.23.02: PRODUCTS

A. MARKERBOARDS

1. Markerboards shall be equal to AARCO Products, Platinum Visual System, or Claridge Products (face sheet minimum 26 ga. with hardboard stabilizer and aluminum foil backing) 4'-0" high; trim shall be clear anodized aluminum with 1" map/tack rail. Colors shall be selected by the Architect. Provide 2 Flag Holders and 8 Map/Paper Clips per room with Markerboard. Grades K-6: Set bottom of board 24-32 inches from floor. Grades 7 & above: Set bottom of board 30-36 inches from floor. Verify installation height with Architect before beginning work.

B. TACKBOARDS

1. Tackboards shall be equal to AARCO Products, Platinum Visual System, or Claridge Products, 4'-0" high with aluminum slip-on trim with 1" map rail and fiberboard backing. Colors shall be selected by the Architect. Set bottom of board as indicated on the drawings. Provide special sizes as indicated on the drawings.

10 11 16.23.03: EXECUTION

A. INSTALLATION

1. All work in this division shall be done by skilled mechanics in strict accordance with approved shop drawings and manufacturer's instructions. After installation, markerboard and tackboard surfaces shall be thoroughly cleaned and left in perfect condition.

DIVISION 10

SECTION 10 14 00: IDENTIFYING DEVICES

10 14 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to fabricate and install all items of the identifying devices as indicated on the drawings and specified herein.

B. SUBMITTALS

1. Shop drawings shall be submitted to and approved by the Architect before fabrication of any items to be furnished by the General Contractor.

10 14 00.02: PRODUCTS

A. MATERIALS

1. Room number/title signs shall be laminated plastic with engraved copy equal to Best System HC-300. Unless otherwise noted, letters and numbers shall be upper and lower case Helvetica. Colors will be selected by the Architect.
2. Building Title: Unless otherwise noted, letters shall be cast aluminum with baked enamel finish. Letter style shall be Times Roman, unless otherwise noted. Any questions about style will be verified with the Architect. Color to be selected by the Architect. The letters shall be 12" high and shall be furnished as indicated on the drawings.
3. Contractor to verify State and Local Building Codes for applicable Handicap signage for elevators, restrooms, etc. Manufacturer shall conform to Americans with Disabilities Act (ADA) requirement. ADA requirements shall supersede technical specifications in the Section.

10 14 00.03: EXECUTION

A. PLASTIC NUMBER/TITLE SIGNS

The exact titles, numbers, and symbols will be supplied to the Contractor in sufficient time to allow for fabrication and installation prior to occupancy. If fewer signs than indicated in these specifications are required, the cost difference will be returned to the Owner as a credit.

1. Signs shall be mounted with double sided foam tape.
2. All rooms where construction occurs will be identified unless existing identification exists.

B. PROJECT PLAQUE

1. General Contractor shall supply and install a project plaque. The plaque shall be cast bronze 24" x 18" (or 18" x 24") with beveled edge, concealed mounting, raised letters, and standard background finish. Plaque shall include Project name, Owner, School Board Members, School Superintendent, Date, Architect, and General Contractor. Letter size, style, background finish and colors to be selected by Architect.

C. BUILDING TITLE

1. Cast aluminum letters shall be installed in accordance with manufacturer's installation instructions.

DIVISION 10

SECTION 10 44 13: FIRE EXTINGUISHERS AND CABINETS

10 44 13.01: GENERAL

A. SCOPE

1. Furnish and install fire extinguishers and fire extinguisher cabinets as indicated on the drawings and specified herein.

B. SUBMITTALS

1. Submit shop drawings in accordance with SECTION 01 33 00: SHOP DRAWINGS.

10 44 13.02: PRODUCTS

A. CABINETS

1. The fire extinguisher cabinets indicated on the drawings shall be similar to J. L. Industries - Academy, Larsen's or equal. The extinguishers for these cabinets will be furnished by the General Contractor.
2. Quantity – Seven (7).

10 44 13.03: EXECUTION

A. INSTALLATION

1. Install fire extinguisher cabinets in strict accordance with the manufacturer's instructions. Bottom of the cabinets shall be set 48" above the floor.
2. Local Fire Marshal will advise as to exact location of cabinets. If more cabinets are required by the Fire Marshal than are shown, Owner will furnish and General Contractor will install additional cabinets.

DIVISION 12

SECTION 12 21 13: WINDOW TREATMENT (HORIZONTAL BLINDS)

12 21 13.01: GENERAL

A. SCOPE

1. Furnish and install blinds in accordance with specifications, drawings, and contract documents.
2. Related work specified elsewhere.

B. QUALITY ASSURANCE

1. Installer's qualifications:
 - a. The installer shall be a firm approved by manufacturer.
 - b. The installer shall be qualified to install the product specified, as demonstrated by prior experience.

C. SUBMITTALS

1. Product information: Submit product literature and installation instructions.
2. Shop drawings: Indicate field-measured dimensions of opening which are to receive blinds, details on mounting surface and sill conditions, and details of corners and conditions between adjacent blinds.
3. Color samples: Submit a sample of each type and color of material specified.

D. DELIVERY, STORAGE, AND HANDLING

1. Packing and Shipping:
 - a. Materials shall be delivered to the Project in original unopened packaging with labels intact.
2. Storage:
 - a. Materials shall be stored in a clean area, which is free of corrosive fumes, dust, and away from construction activities.
 - b. Materials shall be stacked horizontally using plastic or wood shims such that drainage and ventilation are provided for, and such that water cannot accumulate in, about or upon the containers.
 - c. Stacks shall be covered with tarpaulins or plastic such that ventilation is provided for, and such that contaminants are prevented from contacting surfaces.

E. PROJECT/SITE CONDITIONS (BEFORE PRODUCT INSTALLATION BEGINS)

1. Roof must be tight, windows and frames installed and glazed, and interior doors hung.
2. Wet work including concrete, masonry, plaster, stucco, terrazzo, Sheetrock, spackling, and taping (including sanding) shall be complete and dry.
3. Ceilings, window pockets, electrical, and mechanical work above the product shall be complete.
4. Electrical power (110 volt AC) shall be available for installer's tools within 500 ft. of product installation areas.

F. WARRANTY

1. Lifetime warranty: Levolor Home Fashions shall repair or replace for the life of the blind, at its option, without charge, any part found defective in workmanship or material as long as the blind remains in the same window for which it was purchased.

12 21 13.02: PRODUCTS

A. MANUFACTURER AND PRODUCT DESCRIPTION

1. Acceptable products: Monaco DustGuard 1" (25mm) blind manufactured by Levolor Home Fashions. Lightlines Blinds manufactured by Hunter Douglas.
2. Materials:
 - a. Headrail shall be of .025" thick Tomized steel, "U" shaped, 1" high x 1-9/16" wide with flanged edges at top, and coated with baked-on finish. All hardware shall be enclosed in the metal headrail.
 - b. Guardian Tilter mechanism shall be of a not less than .042" thick Tomized steel housing with a self-lubricating nylon, automatically disengaging worm and gear mechanism to provide maximum closure, eliminate overdrive, and prevent strain or damage to blind.
 - c. Tilt Wand shall be transparent with a round fluted cross section approximately 5/16" in diameter with 8 grooves for nonslip grip.
 - d. Cord Lock shall be .031" thick Tomized steel and shall be securely attached to headrail. It shall be a crashproof type with sufficient sensitivity to lock slats at desired height upon release of cords.
 - e. Drum and cradle shall be provided for each ladder.
 - 1) Drums shall be engineering polymer providing secure attachment for both ladder ends.
 - 2) Cradles shall be of .025" thick Tomized steel having two holes with rolled edges to guide cords through bottom of headrail without abrasion. They shall provide bearing support for the tilt rod, thus preventing the weight of the blind from being transferred to the tilter. Cradles shall center drums over ladder openings.

- f. Tilt Rod shall be U-shaped, with a circular radius of approximately .125" designed to achieve minimum torsional deflection.
- g. End Braces shall be of at least .025" thick Tomized steel with reinforcing ribs and field adjustable tabs. End braces shall incorporate a field adjustable tab to insure secure installation, center blind in window, and prevent lateral movement.
- h. Installation Brackets shall be of a least .042" thick Tomized steel with baked-on finish to match headrail. The brackets shall incorporate a rivet-hinged safety locking front cover to permit removal of headrail without lateral movement. Mounting holes shall be located to accommodate overhead, side, or face mounting.
- i. Intermediate Brackets shall be supplied as required.
- j. Ladders (slat supports) shall be braided polyester yarn-dyed to Levolor color standard. The two vertical components shall be .076" x .038" designed for maximum flexibility combined with minimum stretch and tensile strength of not less than 50 lbs. per cable. Horizontal components (rungs) shall consist of not less than two cables inter-braided with the vertical components. Ladder shall support the slats without visible distortion. Distance between slats shall not exceed 21.5mm (nominally 14.2 slats per vertical foot). Distance between ladders shall not exceed 23" for blinds up to 80" long. For blinds over 80" long, distance between ladders shall not be greater than 22". Distance between end ladder and end of slat shall not exceed 7".
- k. Slats shall be of 5000 series magnesium aluminum alloy only, which includes recycled aluminum materials. Aluminum alloy shall be tempered to optimize tensile and yield strength for superior slat strength, resiliency, and corrosion resistance. Slats shall be nominally 1" wide and .0055"+/- .0003 (prior to coating); after coating, the thickness of the slats shall be nominally .0060". Slats shall have a coating thickness of .8 mil to 1.5 mil. Slats shall perform to 500 hours of 100% relative humidity testing, 300 hours of 5% salt spray solution at 95 degree F testing, and 250 hours of accelerated weathering testing without blistering, fading, corroding, or adhesive failure. Slat thickness and ladder support distances shall prevent visible sag or bow after continued use indoors. Bottom rail shall be of .031" thick Tomized steel formed after coating and shall be provided with color compatible molded plastic ladder and end caps having integral protrusions designed to prevent bottom bar from marring window sill and/or mullions. End caps shall provide hold-down capability designed to prevent bottom bar sway on doors or in windy exposures.
- l. Lift Cord shall be braided of high strength, 1.4mm diameter polyester fiber with a high tenacity polyester core, 34 picks per inch, 16 carrier smooth braids, and shall be flexible, have minimum stretch, maximum abrasion resistance characteristics, and a minimum breaking strength of 130 lbs. Cord shall be of sufficient length equalized to properly control raising and lowering of blind and spaced not over 46" between cords.
- m. Color of blind shall be selected from over 50 Levolor standard solid colors or standard metallic slat finishes and complementary standard accessory finishes. DustGuard feature is not available on all colors.

n. Options shall include:

- 1) Cutouts
- 2) Extension Plates
- 3) Fixed Height Lift Cord
- 4) Hold Down Brackets
- 5) Invisible Installation Brackets
- 6) Multiple Blinds on One Headrail
- 7) Pivot Plate
- 8) Pocket Brackets
- 9) Projection Brackets
- 10) Restrictive Cam Tilter
- 11) Ring Pull
- 12) Telescopic or Non-Telescopic Tilter Pole
- 13) Top-Lok Cord Lock
- 14) Universal Ring Tilter
- 15) Valance

12 21 13.03: EXECUTION

A. INSPECTION

1. Window treatment subcontractor shall be responsible for inspection of site, field measurements, and approval of mounting surfaces and installation conditions.
2. Subcontractor shall verify that site is free of conditions that interfere with blind installation and operation, and shall begin installation only when any unsatisfactory conditions have been rectified.

B. INSTALLATION

1. Installation shall comply with manufacturer specifications, standards, and procedures.
2. Provide support brackets as per manufacturer installation instructions.
3. See installation instructions packaged with blinds for more installation details.
4. Provide adequate clearance to permit unencumbered operation of blind and hardware.
5. Demonstrate blinds to be in uniform and smooth working order.

C. CLEANING

1. Clean soiled blinds with a mild soap solution only. Do not use cleaning methods involving heat, bleach, abrasives, or solvents. Do not use window cleaner or cloths with paper content.
2. Ensure proper drying following cleaning by providing adequate ventilation.

DIVISION 22

SECTION 22 05 00: PLUMBING GENERAL PROVISIONS

22 05 00.01 GENERAL

A. SCOPE

1. Applicable requirements of the General Conditions, Supplementary General Conditions, and Special Conditions bound at the front of these specifications shall govern work under this heading.
2. The Contractor shall coordinate the work and equipment of this Division with the work and equipment specified elsewhere in order to assure a complete and satisfactory installation. Work such as excavation, backfill, concrete, flashing, wiring, etc., which is required by the work of this section shall be performed in accordance with the requirements of the applicable section of the specifications.
3. It is the intention of these specifications and drawings to call for finished work, tested and ready for operation. Whenever the word "provide" is used, it shall mean "furnish and install complete and ready for use".
4. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.
5. This Contractor is referred to the General and Special Conditions of the Contract which shall form a part and be included in this section of the specification and shall be binding on this Contractor.
6. Some items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items or equipment as indicated on the drawings, and as required for complete systems.

B. DEFINITION

1. The word "Contractor" as used in this section of the specification refers to the Plumbing Contractor unless specifically noted otherwise. The word "provide" means furnish, fabricated, complete, install, erect, including labor and incidental materials necessary to complete in place and ready for operation or use the item referred to or described herein and/or shown or referred to on the Contract Drawings.

C. CONTRACTOR'S QUALIFICATIONS

1. It is assumed that the Contractor has had sufficient general knowledge and experience to anticipate the needs of a construction of this nature. The Contractor shall furnish all items required to complete the construction in accordance with reasonable interpretation of the intent of the Drawings and Specifications. Any minor items required by code, law or regulations shall be provided whether or not specified or specifically shown where it is a part of a major item of equipment, or of the control system specified or shown on the plans.

22 05 00.02 PRODUCTS

A. MATERIALS AND WORKMANSHIP

1. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Architect shall be furnished.
2. The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers and labor required to unload, transfer, erect, connect-up, adjust, start, operate and test each system.
3. Unless otherwise specifically indicated on the plans or specifications, all equipment and material shall be installed with the approval of the Architect in accordance with the recommendations of the manufacturer. This shall include the performance of such tests as the manufacturer recommends.
4. All work must be done by first-class and experienced mechanics properly supervised and it is understood that the Architect has the right to stop any work that is not being properly done and has the right to demand that any workman deemed incompetent by the Architect be removed from the job and a competent workman substituted therefore.

B. EQUIPMENT APPLICATION AND PERFORMANCE

1. The Contractor and/or Equipment Supplier shall be responsible to see that equipment supplied is correct for the intended application and will perform within the limits of capacity, noise, life expectancy, pressure drop and space limitations intended for that equipment as shown on the plans or described in the specifications. The shop drawings shall show the capacity and operating characteristics of the equipment.

C. EQUIPMENT DEVIATIONS

1. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical, or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted for approval by the Architect.
2. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

D. MOTORS

1. Motors shall be built in accordance with the latest standards of NEMA and as specified. Motors shall be tested in accordance with standards of A.S.A. C40 and conform thereto for installation resistance and dielectric strength. Each motor shall be provided with conduit terminal box, adequate starting and protective equipment as specified or required. The capacity shall be sufficient to operate associated driven devices under all conditions of operation and load and without overload, and at least shall be the horsepower indicated or specified. Each motor shall be selected for quiet operation.

E. FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

1. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all equipment, piping, pumps, tanks, and for all other equipment furnished under this contract, and shall submit drawings to the Architect for approval before purchase, fabrication or construction of same.
2. For all equipment where foundations are indicated, furnish and install concrete pads minimum 4 inches thick or as shown. All pads shall be extended six (6) inches beyond machine base in all directions with top edge chamfered. Insert six (6) inch long, 1/2" round steel dowel rods at 12" on center into floors to anchor pads. Shop drawings for all foundations and pads shall be submitted to the Architect for approval before same are constructed.
3. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent and surrounding flooring material.
4. All equipment, unless otherwise shown, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect, not strong enough shall be replaced as directed.

F. DIELECTRIC CONNECTIONS

1. Dielectric connections shall be used at any points within the piping systems where dissimilar metals meet. Careful attention shall be given to support brackets and hangers to select proper materials to avoid dissimilar metal contact at these points.

G. DRAINS AND VENTS

1. In addition to the drains and vents indicated on the plans and piping details, the Contractor shall install additional drains and vents as required to remove all water and air from the piping systems.

H. MOTOR STARTERS AND DISCONNECTS

1. Individual motor controllers complete with auxiliary contacts, control transformers, push buttons, selector switches and remote push button stations not specifically specified to be furnished with the equipment shall be provided under this section. Motor controllers shall comply with NEMA Standards and be complete with proper size heaters and auxiliary contacts and shall be in NEMA enclosures as required. Unless otherwise noted, push button stations shall be oil-tight heavy duty type.

Controllers shall be manual, magnetic, or combination type with disconnect switch or circuit breaker as indicated on the drawings or where required by the NEC. Controllers shall include motor over current protection in each phase conductor. Each motor controller shall be provided with phenolic nameplate, black with 1/4" high letters and white border, indicating equipment served, attached using counter sunk screws.

2. The Electrical Contractor shall furnish and install all disconnecting switches unless otherwise indicated or specified. Where disconnecting switches are indicated to be furnished under this Section, they shall be General Electric, Type TH in NEMA 1 enclosures, with voltage and amperage rating appropriate to the application. Unless otherwise noted, fuses shall be Buss "Fusetrons", or approved equal. Unfused motor disconnecting switches shall be Type TH in NEMA 1 or 4 applicable enclosures. Similar and equivalent equipment as manufactured by I.T.E., Square D, or Westinghouse is equally acceptable. Switches used as service switches shall bear such U.L. Label and nameplate on switch shall so indicate.

I. PAINTING

1. Paint material shall be selected from the products listed below and, insofar as practical, products of only one manufacturer shall be used. Contractor shall submit to the Architect the listed manufacturer he proposes to use in the work. Should the Contractor desire to use products of a manufacturer not listed below, or products made by a listed manufacturer but not scheduled herein, Contractor shall submit complete technical information on the proposed products to the Architect for approval. Only products approved by the Architect shall be used.

a. Rust Inhibitive Primer:

- 1) Devoe: Bar-Ox Quick Dry Metal Primer, Red.
- 2) Duron: Deluxe Red Primer.
- 3) Glidden: Rustmaster Tank and Structure Primer.
- 4) Pittsburgh: Inhibitive Red Primer.

b. Galvanized Metal Primer:

- 1) Devoe: Mirrolac Galvanized Metal Primer.
- 2) Duron: Duron Deluxe Galvanized Metal Primer
- 3) Glidden: Rustmaster Galvanized Iron Metal Primer.
- 4) Pittsburgh: Speedhigh Galvanized Steel Primer.

22 05 00.3 EXECUTION

A. DUTIES OF CONTRACTOR

1. Contractor shall furnish and install all materials called for in these Specifications and accompanying drawings, and must furnish the apparatus complete in every respect. Anything called for in the specifications and not shown on the drawings or shown on the drawings and not called for in the specifications must be furnished by the Contractor.
2. Contractor is responsible for familiarizing himself with the details of the construction

of the building. Work under these specifications installed improperly or which requires changing due to improper reading or interpretation of building plans shall be corrected and changed as directed by the Architect without additional cost to the Owner.

3. The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with installation.
4. The plans are diagrammatic and are not intended to show each and every fitting, valve, pipe, pipe hanger, or a complete detail of all the work to be done; but are for the purpose of illustrating the type of system, showing pipe sizes, etc., and special conditions considered necessary for the experienced mechanic to take off his materials and lay out his work. This Contractor shall be responsible for taking such measurements as may be necessary at the job and adapting his work to local conditions.
5. Conditions sometimes occur which require certain changes in drawings and specifications. In the event that such changes in drawings and specifications are necessary, the same are to be made by the Contractor without expense to the Owner, providing such changes do not require furnishing more materials, or performing more labor than the true intent of the drawings and specifications demands. It is understood that while the drawings are to be followed as closely as circumstances will permit, the Contractor is held responsible for the installation of the system according to the true intent and meaning of the drawings. Anything not entirely clear in the drawings and specification will be fully explained if application is made to the Architect. Should, however, conditions arise where in the judgment of the Contractor certain changes will be advisable, the Contractor will communicate with the Architect and secure his approval of these changes before going ahead with the work.
6. The right to make any responsible change in location of apparatus, equipment, routing of piping up to the time of roughing in, is reserved by the Architect without involving any additional expense to the Owner.
7. It shall be the duty of prospective Contractors to visit the job site and familiarize themselves with job conditions. No extras will be allowed because of additional work necessitated by, or changes in plans required because of evident job conditions, that are not indicated on the drawings.
8. Contractor shall determine the schedule of work as lay down by the General Contractor and must schedule his work to maintain the building construction schedule so as not to interfere with or hold up any other Contractors.
9. Contractor shall leave the premises in a clean and orderly manner upon completion of the work, and shall remove from the premises all debris that has accumulated during the progress of the work.

B. CODES, RULES, PERMITS AND FEES

1. The Contractor shall give all necessary notices, obtain all permits and pay all sales taxes, fees and other costs, including utility connections or extensions, in connection

with his work; file all necessary plans prepare all documents and obtain all necessary approvals of all authorities having jurisdiction. Obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment of the work.

2. The Contractor shall include in his work, without extra cost to the Owner, any labor, materials, service, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.
3. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, and with the requirements of all governmental departments having jurisdiction.
4. All materials and equipment for the electrical portion of the mechanical system shall bear the approval label, and shall be listed by the Underwriters' Laboratories, Inc.
5. All work shall be done in accordance with the North Carolina State Building Code, and requirements of governmental agencies having jurisdiction.

C. COOPERATION WITH OTHER TRADES

1. This Contractor shall give full cooperation to other trades and shall furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.
2. Where the work of the Contractor will be installed in close proximity to, or may interfere with the work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Architect, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than $3/8" = 1'-0"$, clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordination with other trades, or so as to cause any interference with work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.
3. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. RECORD DRAWINGS

1. The Contractor shall furnish drawings showing dimensioned location and depths of all exterior piping and structures, and shall indicate any and all changes in location of piping, equipment or valves from that shown on the Contract Drawings. The drawings shall consist of clean, legible prints of the Contract Drawings, available from the Architect on which the Contractor shall mark all notes, dimensions, sizes and information required.

E. SURVEYS AND MEASUREMENTS

1. This Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and

levels. Verify all measurements at the site and check the correctness of same as related to the work.

2. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Architect through the General Contractor, and shall not proceed with his work until he has received instructions from the Architect.

F. SAFETY REQUIREMENTS

1. All systems shall be installed so as to be safe operating and all moving parts shall be covered where subject to human contact. All rough edges of equipment and materials shall be made smooth.
2. All safety controls shall be checked under the supervision of the Architect's representative and eight (8) copies of test data showing setting and performance of safety controls shall be submitted to the Architect. All pressure vessels shall be ASME stamped and shall have stamped relief valves. Water heaters shall be provided with ASME stamped T & P relief valve.

G. SHOP DRAWINGS

1. Contractor shall submit within ten (10) days after award of contract eight (8) copies of a complete list of all manufacturers to be used on the job. No substitutions will be allowed after this date except in extenuating circumstances as determined by the Architect.
2. Submission of a manufacturer's name or equipment number on this list shall not be considered as equipment approved by the Architect.
3. The Contractor shall submit for approval eight (8) sets of detailed shop drawings of all equipment and all material required to complete the project, and no materials or equipment may be delivered to the job site or installed until the Contractor has in his possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Contractor shall furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than eight (8) copies.
4. Prior to delivery of any material to the job site, and sufficiently in advance of requirements to allow the Architect ample time for checking, submit for approval detailed, dimensioned drawings or cuts, showing construction, size, arrangement, operating clearances, performance, characteristics and capacity. Each item of equipment proposed shall be standard catalog product of an established manufacturer and of equal quality, finish, performance, and durability to that specified.
5. Samples, drawings, specifications, catalogs, submitted for approval, shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article number of specification governing, Contractor's Name and Name of Job.
6. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet,

etc. of item submitted shall be clearly marked. Data of a general nature will not be accepted. Data shall include eight (8) copies of computation sheets indicating how unit capacity was determined where ratings are at other than standard conditions. No payment for any equipment or labor will be allowed until all major pieces of equipment specified have been submitted to the Architect for approval.

7. The submittal of shop drawings shall be with the Contractor stamp affixed; this shall assure the Engineer that they are being submitted in accordance with Sub-Paragraph 4.13.4 in AIA Document A201 and/or Paragraph 6.26, in NSPE Document 1910-8. This stamp indicates that the Contractor, by approving and submitting shop drawings, represents that he has determined and verified all field measurements and quantities, field construction criteria, material, catalog material, and similar data that he has reviewed and coordinated information in the shop drawings with the requirements of the work and the Contract Documents. It, also, indicates that any deviation from the Contract Documents has been shown on the submittal and clearly defines the deviations from the specifications.
8. Approval rendered on shop drawings shall not be considered as a guarantee of quantities, measurements, or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail: said approval does not in any way relieve the Contractor from his responsibilities or necessity of furnishing material or performing work as required by the contract drawings and specifications.
9. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of Contract time, and no claim for extension by reason of default will be allowed.
10. All shop drawings and submittals are to be in the office of the Architect within 30 days after the Contracts have been awarded. Contractor shall be financially responsible for any price increase of shop drawing items from the time these drawings are issued until they are returned to the Contractor for purchase of items.
11. Contractor shall keep on the job at all times copies of all approved shop drawings.

H. OBSERVATION

1. The project will be observed periodically as construction progresses. The Contractor will be responsible for notifying the Architect at least 72 hours in advance when any work to be covered up is ready for inspection. No work will be covered up until after observation has been completed on such items as piping and insulation, etc.

I. ACCESSIBILITY

1. Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with the General Contractor and all other Contractors whose work is in the same space, and shall advise the General Contractor of his requirements. Such spaces and clearances shall; however, be kept to the minimum size required.
2. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited

to valves, traps, cleanouts, motors, controllers, switch-gear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility and any change shall be submitted for approval.

3. The Contractor shall provide the General Contractor with exact locations of access panels for each concealed valve or other device requiring service. Access panels shall be provided and installed by the General Contractor and as specified in the Architectural sections of the specifications. Locations of these panels shall be submitted in sufficient time to be installed in the normal course of work.

J. CONCEALED PIPE

1. In general, all pipes in finished spaces shall be run concealed in floors, walls, partitions and above ceilings.
2. Concealment of pipe and covering of same shall not be done until authorized by the Architect, after proper tests have been made. This applies to all interior work and exterior work.

K. CUTTING AND PATCHING

1. This Contractor shall provide all cutting and patching necessary to install the work specified in this section.
2. No structural members shall be cut without the approval of the Architect and all such cutting shall be done in a manner directed by him.
3. This Contractor shall arrange for proper openings in building to admit his equipment. If it becomes necessary to cut any portion of building to admit his equipment, portions cut must be restored to their former condition by this Contractor through agreeable arrangement with the General Contractor.
4. The General Contractor will provide all openings or chases in masonry or concrete; however, it is this Contractor's responsibility to advise exact dimensions, shape and locations of openings required in sufficient time for the General Contractor to make the necessary provisions. This Contractor shall be responsible for correct size and location of each opening for his equipment even though these openings are provided by the General Contractor.

L. SLEEVES AND PLATES

1. This Contractor shall provide and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching required where sleeves and inserts were not installed, or where incorrectly located. This Contractor shall do all drilling required for the installation of his hangers.
2. Sleeves shall be provided for all mechanical piping passing through concrete floor slabs and concrete, masonry, tile and gypsum wall construction. Sleeves shall not be provided for piping running imbedded in concrete or in insulating concrete slabs on grade.
3. Where sleeves are placed in exterior walls below grade, the space between the pipe

or conduit and the sleeves shall be packed with oakum and lead and made completely watertight.

4. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:
 - a. Terminate sleeves flush with walls, partitions and ceiling.
 - b. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor or as shown on the plans.
 - c. In all areas where pipes are exposed, extend sleeves 1/4 inch above finished floor, except in rooms having floor drains, where sleeves shall be extended 3/4 inches above floor.
5. Sleeves shall be constructed of schedule 40 black steel pipe unless otherwise indicated on the drawings. Sleeves through concrete beams shall be constructed as indicated on the drawings.
6. Fasten sleeves securely in floor, walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.
7. Where piping penetrates fire rated floors or walls, penetrations shall be sealed with a U.L. approved fire stopping system. System shall be as manufactured and detailed by 3M Company or approved equal.
8. Escutcheon plates shall be provided for all exposed pipes and all exposed conduit passing through walls, floors and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe or conduit. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

M. UTILITIES

1. This Contractor shall bear the cost of utilities required to perform the work under this Contract. Where services such as electricity, hoist, etc. are provided by the General Contractor, he shall be responsible directly to the General Contractor for his portion of the utilities as may be agreed upon.

N. SCAFFOLDING, RIGGING, HOISTING

1. This Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

O. EXCAVATING AND BACKFILLING

1. Each trade shall perform all excavation and backfill required for the installation of its work.

2. Particular care shall be taken not to disturb or damage work of other Contractors.
3. Mass excavation to approximate levels will be carried out under a section of the architectural specifications. The Contractor shall, however, do all trench and pit excavation and backfilling required for work under this section of the specifications, inside and outside the building, including repairing of finished surfaces and all required shoring, bracing, pumping and all protection for safety of persons and property. State and OSHA Safety Codes shall be strictly observed. In addition, it shall be the responsibility of the Contractor to check the indicated elevations of the utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Architect shall be notified of such conditions and a redesign shall be made before excavations are commenced. It is also the responsibility of the Contractor to make the excavations at the minimum required depths in order to avoid undercutting the footings.
4. No backfilling shall be done until work involved has been tested and approved by the Architect.
5. Contractor shall schedule excavation work so as not to unduly interfere with work of other trades on the job. Contractor shall be responsible for establishing all lines and grades required for proper location of his work.
6. When rock is encountered in excavation, it shall be paid for as outlined under the architectural section of these specifications.
7. In backfilling pipe trenches, approved fill shall first be compacted firmly and evenly on both sides of pipe in 6" layers to a depth of 12" over the top of the pipe. Remainder of trench shall be backfilled to established grade in 6" layers. Compact between each layer with a high-frequency vibrator tamper such as Dart Soil Compactor (as manufactured by Dart Manufacturing Company, Denver, Colorado). Fill shall be compacted to density specified under Earth Work Section of specifications for specified area through which trench passes. Compact fill to 95% maximum density at optimum moisture content all other areas. Earth bearing pressure as indicated shall be verified by a testing laboratory, which following the criteria specified for foundation wall trench, etc. in the Earth Work Section of the specifications. The reports shall be forwarded to the Architect for approval unless otherwise specified, the cost will be borne by this contractor, before any work is performed. If the earth bearing pressure is less than that required, the Contractor shall not begin additional work until notified by the Architect to do so. A copy of the report shall be forwarded to the Architect in triplicate.
8. Excess earth shall be distributed on premises as directed by the Architect.
9. Where ditches occur outside the building, the surface shall be finished to match existing surfaces. Any existing work or work of other trades which is damaged or disturbed shall be repaired or replaced, and left in good order.

P. ELECTRICAL CONNECTIONS

1. The Electrical Contractor shall furnish and install all wiring except interlock wiring. The Electrical Contractor shall receive from Contractor and mount all individually mounted motor starters and provide all power wiring to the motor terminals unless otherwise indicated. The Electrical Contractor will provide branch circuit protection

and disconnects unless otherwise indicated or specified. The Mechanical Contractor shall provide all other control and protective devices, and perform all control and interlock wiring required for the operation of the equipment. Power wiring, from nearest panel, for control components (dampers, panels, etc.) shall be provided by the Mechanical Contractor unless specifically called for by Division 26.

2. After all circuits are energized and complete, the Electrical Contractor shall be responsible for all power wiring, and all control wiring shall be the responsibility of this Contractor. Motors and equipment shall be provided for current characteristics as shown on the drawings.
3. It shall be the responsibility of this Contractor to check with the Electrical Contractor on service outlets provided for this Contractor, to determine that the switches and wiring provided are of adequate size to meet Code requirements for this Contractor's equipment. Any discrepancy shall be brought to the attention of the Architect before work is installed. Otherwise, any cost for changes shall be at the expense of this Contractor, and in any case electrical cost increase due to equipment substitution of different electrical characteristics shall be this Contractor's expense.

Q. PIPE WORK

1. All pipe work shown on the drawings and/or specifications or implied herein and required for a complete and operating system shall be done by experienced mechanics in a neat and workmanlike manner and subject to the approval of the Architect.
2. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required and it shall be the responsibility of the Contractor to furnish and install all materials and equipment required for the operating systems.
3. The piping shall be installed as shown on the plans with strict conformity to the sizes listed and due provisions for expansion and contraction.
4. Unless otherwise noted on the plans, all piping shall be installed inside the insulated envelope of the building.

R. PROTECTION

1. The Contractor shall protect all work and material from damage, and shall be liable for all damage during construction.
2. The Contractor shall be responsible for work and equipment until all construction is finally inspected, tested and accepted. He shall protect work against theft, injury or damage; and shall carefully store material and equipment received on site which is not immediately installed. He shall close open ends of work including pipe or equipment with temporary covers or plugs during storage and construction to prevent entry of obstructing materials or dust and debris.
3. Provide a protective covering of not less than 0.004" thick vinyl sheeting (or a similar approved material) to be used in covering all items of equipment, immediately after the equipment has been set in place, (or if in a place of storage within the building under construction) to prevent the accumulation of dirt, sand, cement, plaster, paint

or other foreign materials from collecting on the equipment and/or fouling working parts.

S. CLEANING

1. Clean from all exposed insulation and metal surfaces grease, debris or other foreign material.
2. Chrome plated fittings, fixtures, piping and trim shall be polished upon completion.

T. VALVE, TAGS AND SCHEDULE

1. Each valve shall be provided with an engraved black finish, phenolic tag indicating service and number. Tag lettering shall be at least 1/4" high etched white letters and beveled white trim. Tags to be attached using brass chains.
2. The Contractor shall submit eight (8) copies of charts indicating valve number, location, service, "normal" position, manufacturer, size and model number to the Architect for approval.
3. Prior to final inspection an approved copy of each chart shall be framed by the Contractor in a metal frame with glass front and installed in the Equipment Room.

U. EQUIPMENT SERVICEABILITY

1. All equipment shall be serviceable. All equipment shall be installed so that it can be removed. All equipment in or connected to piping systems shall have valves to isolate this equipment from the piping system. This includes, but not necessarily limited to control valves, water heaters, sensors, switches, pumps, traps and strainers. Unions (screwed or flanged) shall be provided so that all equipment is removable.
2. Equipment installed in walls, ceilings or floors shall be accessible for service or removal without cutting walls, etc.
3. Equipment requiring periodic service shall be installed to allow clearance for service and have removable panels, access doors, etc. through which the service is to be performed.

V. ACCEPTANCE OF EQUIPMENT

1. In the event that the Architect considers it impractical, because of unsuitable test conditions, or some other factors, to execute simultaneous final acceptance of all equipment portions of the installation may be certified by the Architect for final acceptance when that portion of the system is complete and ready for operation.
2. Contractor shall make all necessary tests, trial operation balancing and balance tests, etc., as may be required as directed by the engineer to prove that all work under these plans and specification is in complete serviceable condition and will function as intended.
3. Upon completion of all work the system shall be tested to determine if any excess noise or vibration is apparent during operation of the system. If any such objections

are detected in the system or noisy equipment found, the Contractor shall be responsible for correcting same. Equipment shall be wiped clean with all traces of oil, dust, dirt and paint spots removed.

W. GUARANTEE

1. The Contractor shall guarantee the complete mechanical system against defect due to faulty materials, faulty workmanship or failure due to negligence of the Contractor. This guarantee will exclude normal wear and tear, maintenance lubrication, replacement of expendable components, or abuse. The guarantee period shall begin on the date of the final acceptance and shall continue for a period of 12 months during which time the Contractor shall make good such defective workmanship and materials and any damage resulting there from, within a reasonable time of notice given by the Owner.

X. OPERATING AND MAINTENANCE INSTRUCTIONS

1. Submit 3 sets of complete operating and maintenance instructions.
2. Bind each set in plain black vinyl-covered, hard back, 3-ring binder. Individual paper shall be Boorum and Pease Reinforced Ring Book Sheet, No. S-212-101 or equivalent.
3. Organize material in the following format:
 - a. Section I:
 - 1) Name of Project
 - 2) Address
 - 3) Owner's Name
 - 4) General Contractor's Name and Address
 - 5) Plumbing Contractor's Name and Address
 - 6) Warranty Dates
 - b. Section II:
 - 1) Major Equipment List (name, manufacturer, serial no., H.P. and voltage) (include all equipment with motors)
 - 2) Routine Maintenance Instructions in Step-by-Step form
 - 3) Valve Schedules
 - c. Section III:
 - 1) Operating and Maintenance Instructions by Manufacturer
 - 2) Shop Drawings (Major Requirement)

Y. PAINTING

1. Painting shall be performed as detailed in Division 9.
2. All surfaces to receive paint shall be dry and clean.
3. Before priming, all surfaces shall be thoroughly cleaned of all dirt, oil, grease, rust,

scale and other foreign matter. Cleaning shall be done with sandpaper, steel scraper, or wire brush where appropriate and necessary. Metallic surfaces which have been soldered shall be cleaned with benzol and all other metal surfaces washed with benzine.

4. Mixing shall be in galvanized iron pans. Paint shall be mixed in full compliance with manufacturer's directions. Thinning shall be done only in full compliance with manufacturer's directions.
5. Workmanship shall be highest quality, free from brush marks, laps, streaks, sags, unfinished patches, or other blemishes. Edges where paint joins other material or colors shall be sharp and clean without overlapping. Paint shall be brushed or sprayed on in strict compliance with manufacturer's directions and shall work evenly and be allowed to dry at least 48 hours before subsequent coating. Paint shall not be applied in damp or rainy weather or until surface has thoroughly dried. Contractor shall furnish and lay drop-cloths in all areas where painting is done as necessary to protect work of other trades. Varnish and enamel shall not be applied when temperature in the area is less than 60 degrees Fahrenheit nor paint when under 50 degrees Fahrenheit. Prior to final acceptance, Contractor shall touch up or restore any damaged finish. All insulation materials shall be provided with a paint suitable jacket.
6. The following materials and equipment require painting as noted:
 - a. All concealed piping, sheet metal, hangers and accessories except galvanized sheet metal or piping:
 - 1) One coat rust-inhibitive primer except where exterior insulation is provided.
 - b. All exposed, exterior and interior, piping, sheet metal, hangers and accessories, except galvanized sheet metal or piping:
 - 1) One coat rust-inhibitive primer except where exterior insulation is provided.
 - c. All concealed galvanized sheet metal, piping and accessories.
 - 1) One coat galvanized metal primer on threaded portions of piping and any damaged galvanized surfaces.
 - d. All exposed, exterior and interior galvanized sheet metal, piping and accessories.
 - 1) One coat galvanized metal primer except where exterior insulation is provided.
 - e. All exposed, exterior and interior, insulation equipment.
 - 1) Two coats exterior glass enamel over paint suitable insulation jacket.
7. All piping in Equipment Rooms shall be painted (color shown below) and identified by stenciling with letters minimum 1/2" high in a contrasting color. Piping outside

Equipment Rooms shall be stenciled. Stenciling shall occur at each change of direction and every 20 feet. Arrows should be placed adjacent to letters signifying direction of flow.

- a. Standard piping color codes:
 - 1) Hot Water - Dark Yellow (Gold)
 - 2) Cold Water - Dark Green
 - 3) Drains - Natural with Walls
 - 4) Electrical - Natural with Walls

DIVISION 22

SECTION 22 05 01: BASIC MATERIALS AND METHODS (PLUMBING)

22 05 01.01 GENERAL

A. DESCRIPTION

1. The provisions of Section 22 05 00 apply to all the work in this Section.
2. This section of specifications and related drawings describe requirements pertaining to basic materials and methods.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.
2. Certified capacity ratings.
3. Installation instructions.
4. Operating and Maintenance Instructions.

22 05 01.02 PRODUCTS

A. PIPE SPECIALTIES

1. Pipe specialty equipment shall be provided on all piping on all piping system as specified or as required by code.
2. Provide dielectric unions on the inlet and outlet connection to water heaters storage tanks and at all places where dissimilar metals join in piping and plumbing systems. Use dielectric unions as manufactured by Watts Regulator Inc., Zurn/Wilkins, Victaulic or equal.
3. Vacuum breaker shall be provided on each hose outlet. This includes hose bibbs, service sinks, wall hydrants, etc.
4. A system of pulsation absorbers shall be provided. The system shall be selected in accordance with PDI Standard W-201. Absorbers shall be by JOSAM, ZURN, SMITH or approved equal.
5. Valves and Accessories:
 - a. Provide valves as indicated and required as scheduled below. Figure numbers are provided to indicate type and quality. Insofar as possible, all valves shall be by a single manufacturer as specified or approved equal.

<u>MANUFACTURER</u>	<u>GATES 125#</u>	<u>GLOBES 150#</u>	<u>CHECK 125#</u>
NIBCO	T134	T235-Y	T413-B

CRANE	428-UB	7	37
STOCKHAM	B-105	B-22	B-319

6. SOLDER ENDS, SCREWED BONNET GATES, UNION BONNET GLOBES, (Globes with Teflon disc):

<u>MANUFACTURER</u>	<u>GATES 125#</u>	<u>GLOBES 150#</u>	<u>CHECK 125#</u>
NIBCO	S111	S235-Y	S413-B
CRANE	428-UB	-	1342
STOCKHAM	B-109	B-24	B-309

7. Hose end gate valves, 3/4 - 2" shall be JENKINS NO. 372, CRANE 451, POWELL 503 or approved equal.
8. Wall hydrants shall be cast brass non-freeze, heavy duty with polished chrome face, brass operating parts, adjustment locknut, renewable nylon seat, 3/4" standard hose outlet, locking cover.
9. Ball valves shall be Cast Red Bronze with Two Piece Body, full port. When installed in insulated piping furnish Extended Tee Handle. All isolation valves installed above ceilings shall be ball valves.

B. HANGERS AND SUPPORTS

1. Pipe supports shall be provided for all piping. Pipe support components shall conform to accepted standards.
- a. Hangers shall adequately support the piping system. On horizontal, hangers shall be located near or at changes in piping direction and concentrated loads. They shall provide vertical adjustment to maintain pitch required for proper drainage. They shall allow for expansion and contraction of the piping.

- 1) Horizontal lines of copper tubing shall be supported as below:

<u>Nominal Tubing Size</u>	<u>Rod Diameter</u>	<u>Maximum Spacing</u>
Up to 1 inch	3/8 inch	6 feet
1-1/4" and 1-1/2"	3/8 inch	8 feet
2 inches	3/8 inch	9 feet
2-1/2 inches	1/2 inch	9 feet
3 and 4 inches	1/2 inch	10 feet

- 2) Horizontal cast iron soil pipe shall be supported with one hanger for each pipe length and at fittings as required for proper support with hanger located close to hub or joint.
- b. Vertical Piping: When support locations are not indicated on the drawings, cast iron pipe shall be supported at every floor and cast iron soil pipe, and copper pipe at every other floor or as required to prevent vibration.
- c. Devices for attaching pipe supports to building structure shall be provided as

required and shall be as herein specified.

- 1) Grinnell Type CB insert shall be provided for poured-in-place concrete construction. Drilled inserts approved equal to "Phillips" self-drilling inserts shall be provided in existing concrete construction and in precast and cast-in-place concrete construction where drilled inserts are approved by the Engineer. Other type inserts, if required, are specified in the section of this Division requiring such inserts.
 - 2) Grinnell Figure 86 malleable C - clamp with restraining clip shall be provided for attaching 2" and smaller piping to steel structure. MSS-SP-69 malleable beam clamp with extension piece shall be provided for attaching 2-1/2" and larger piping to steel structure.
- d. Intermediate attachments shall be hanger rods of size herein before specified and with vibration control devices as specified in the separate section of the Division. Rods may be continuous threaded or threaded each end as required. No chain, wire or perforated strap hangers shall be used.
- e. Pipe attachments and spring hangers shall be as specified in individual section of this Division of the specifications.

C. ESCUTCHEON PLATES

1. Pipes entering finished or occupied areas shall be provided with polished chrome plated escutcheon plates, held in place with set screws. Escutcheon plates shall be Grinnell Figure 20 or approved equal.

22 05 01.03 EXECUTION

A. GENERAL

1. All products shall be installed as per the manufacturer's instructions.

B. CLEANING UP

1. Cleaning up is the responsibility of the Contractor. During construction, the site shall be kept neat so as not to be a safety hazard. Upon completion of the work, all surplus construction materials and debris shall be removed from the property.

C. PIPE TEST

1. All new soil, waste, drainage and vent piping shall be tested before fixtures are installed by capping or plugging the openings, and filling the entire system with water to a minimum height of 10 feet above grade or the highest fixture opening of the section being tested, and allowing it to stand thus filled for a period of four hours.
2. All water supply piping shall be tested before fixtures or faucets are connected by capping or plugging the opening and applying a hydrostatic test pressure of 150 psig.
3. Pipe found defective during tests shall be replaced at no additional cost to the

Owner. Pipe joints found defective during tests shall be taken apart and remade.

4. The Contractor shall notify the Architect 72 hours before tests are to be made. Concealed work shall remain uncovered until specified tests are completed. All tests shall be conducted in the presence of the Architect or his representative. Repairs to defects disclosed by the test shall be made with new materials. Caulking of screwed joints, cracks or holes will not be permitted. Test shall be repeated until system is proven tight.

DIVISION 22

SECTION 22 07 00: INSULATION (PLUMBING)

22 07 00.01 GENERAL

A. DESCRIPTION

1. This section of specifications and related drawings describe requirements pertaining to insulation.
2. Provide all insulation in conjunction with equipment, piping and ductwork furnished under this division.
3. The provisions of Section 22 05 00 apply to all the work in this section.

B. QUALITY ASSURANCE

1. Products of the manufacturers listed under MATERIALS will be acceptable for use for the specific functions noted. Adhesives, sealers, vapor barriers, and coatings shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.
2. Materials shall be applied subject to their temperature limits. Any methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.
3. Insulation shall be applied by experienced workers regularly employed for this type of work.

C. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Catalog cuts.
2. Materials ratings.
3. Insulation instructions.

D. RATING

1. Insulation and accessories such as adhesives, mastics, cements, tape and jackets, unless noted otherwise, shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials that are factory applied shall be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.
2. Flame spread and smoke developed ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E-84, UL 723.
3. Products of their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

4. Treatment of jackets or facings to impart flame and smoke safety shall be permanent. The use of water-soluble treatment is prohibited.
5. Certify in writing, prior to installation, that products to be used will meet RATING criteria.

22 07 00.02 PRODUCTS

A. PIPE INSULATION

1. Materials shall be heavy density fiberglass with an all-service jacket composed of an outer layer of vinyl, fiberglass scrim cloth, aluminum foil, and kraft paper, in that order, from outside to inside of pipe covering.
 - a. Domestic cold water supply and hot water supply and return piping.
2. Thicknesses:
 - a. Domestic cold water supply: All pipe sizes 1".
 - b. Domestic hot water supply and return: Pipe size 2-1/2" and larger - 1-1/2", Pipe size 2" and smaller - 1".

B. EQUIPMENT

1. Tanks and other equipment handling hot water (not factory insulated). Insulate with semi-rigid fiberglass board 1 1/2" thick. Cut to fit and cover with 8 oz. canvas jacket.

22 07 00.03 EXECUTION

A. PIPE INSULATION

1. Application:
 - a. Insulation and surfaces to be insulated shall be clean and dry when insulation is installed and during the application of any finish.
2. Fiberglass Insulation:
 - a. All fiberglass pipe covering shall be furnished with self-seal lap and 3" wide butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applies to longitudinal as well as circumferential joints. Under no circumstances will staples be allowed. Care shall be taken to keep jacket clean, as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before butt joint strip is applied, and all cold water service lines shall have vapor seal mastic thoroughly coated to pipe at butt joints every 21' and at all fittings. All fittings, valve bodies, unions, and flanges shall be finished as follows:
 - 1) Apply molded or segmental insulation to fittings equal in thickness to

the insulation on adjoining pipe and wire in place with 2#14 copper wires.

- 2) Apply a skim coat of insulating cement to the insulated fitting, if needed, to produce a smooth surface. After cement is dry, apply Owens-Corning Fiberglass Fitting Mastic, Type C, UL labeled.
- 3) Wrap the fitting with fiberglass reinforcing cloth overlapping the preceding layer by 1 to 2". Also, overlap mastic and cloth by 2" on adjoining sections of pipe insulation.
- 4) Apply a second coat of mastic over cloth, working it well into mesh of cloth and smooth the surface. Mastic to be applied at the rate of 40 square feet per gallon. All flanges and fittings on hot and cold lines in utility tunnels shall be insulated according to above. Omit insulation on flanges and unions over 60 degrees F. If painting is required, no sizing is necessary. To maintain the non-combustibility of the system only Glidden acrylic latex paint (#5370) is to be used.
- 5) All piping exposed to view (equipment rooms, etc.) shall be covered with an 8 oz. canvas jacket.

DIVISION 22

SECTION 22 11 16: DOMESTIC WATER SUPPLY PIPING

22 11 16.01 GENERAL

A. SCOPE

1. The provisions of Section 22 05 00 and 22 07 00 apply to all the work in this Section.
2. Contractor shall furnish and install domestic water systems as shown on the plans complete in all respects.
3. Connect to water main and provide supply lines to all fixtures and equipment requiring water service.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

22 11 16.02 PRODUCTS

A. WATER PIPING AND FITTINGS

1. Water Piping:
 - a. All water piping inside the building shall be hard drawn copper tubing ASTM B 88 Type "L" above grade, Type "K" below grade. Fittings for copper tubing shall be ANSI B16.18 or B16.22 solder joint fittings. Ends of pipe shall be reamed, pipe and fittings cleaned. Use only 95-5 (95% tin and 5% antimony) solder with non-corrosive flux on 1-1/4" and smaller and on 1-1/2" and larger use silver solder (Minimum 12% Silver), with a melting point greater than 1000°F. Submit solder for approval.

22 11 16.03 EXECUTION

A. INSTALLATION

1. Piping shall be installed so as to be free floating. 125 pound copper sweat pattern unions shall be provided in the piping as indicated on the drawings. Provide dielectric insulating unions where copper connects to ferrous piping. Use brass nipples or copper adapters at connections to fixtures.
2. Provide isolation valves for each individual riser and toilet group as required to service system.
3. Runouts:
 - a. Runouts to fixtures shall be grouted in place at the fixture stop to prevent pipe movement at this point. Use concrete mortar grout. Remove insulation

from pipe before grouting.

- b. Runouts to urinal and water closet flush valves in block and concrete walls shall have an 8" long piece of 1/2" copper, flattened and soldered to the runout and anchored in the wall. Runouts in stud walls shall have a piece of 1/2" copper flattened and soldered to the runout and fastened to studs with 1/4" bolts with nuts and flat washers (two bolts each end).

4. Unions:

- a. Unions shall be installed at each piece of equipment.

B. STERILIZATION OF WATER PIPING

- 1. Sterilization of water piping shall be in accordance with AWWA Specification 0601. After the pressure tests have been made, the system shall be flushed with water. The chlorinating material shall be liquid chlorine-water mixture calcium hypochlorite, sodium hypochlorite, or chlorinated lime-water mixture. The solution shall have not less than 50 PPM available chlorine. The disinfecting solution shall be allowed to remain in the system for a minimum period of 24 hours. After disinfection, the system shall be flushed with clean water until residual chlorine content is not greater than .02 PPM. After the system is flushed, water samples shall be taken and tested at the Contractor's expense by an independent testing lab and reports shall be furnished to the engineer's for approval. If the water is found unsafe for human consumption, the disinfection procedure shall be repeated.

C. TESTING OF WATER PIPING

- 1. All water supply piping shall be testing before fixtures or faucets are connected by capping or plugging the openings and applying a hydrostatic test pressure of 150 psig. Pressure shall hold constant (exception for temperature variation) for a period of 24 hours or as directed by the Engineer.

DIVISION 22

SECTION 22 13 00: SOIL, WASTE, VENT AND DRAIN PIPING

22 13 00.01 GENERAL

A. SCOPE

1. The provisions of Section 22 05 00 apply to all the work in this Section.
2. All fixtures and equipment specified as requiring waste shall be connected to the sewer system. The sewer system shall be extended as shown on the drawings.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.
2. Installation instructions.

22 13 00.02 PRODUCTS

A. SOIL, WASTE, VENT AND DRAIN PIPING

1. Soil, waste, vent and drain piping shall be solid wall PVC plastic drain, waste and vent pipe and fittings conforming to ASTM D 2665.

B. WASTE ARMS

1. Waste arms serving lavatories, counter sinks and water coolers shall be threaded galvanized schedule 40 steel with schedule 40 drainage pattern fittings and adapters.
2. Waste arms serving urinals shall be standard pipe size threaded red brass pipe, with red brass threaded fittings.

C. SPECIALTIES

1. Cleanout Plugs: Cleanouts shall be of the same size as the pipe except that cleanout plugs larger than 4" will not be required. Cleanouts shall consist of long sweep fittings to an easily accessible place.
2. Traps: Each fixture and piece of equipment including floor drains and hub drains, requiring connections to the drainage system shall be equipped with a trap placed as near to the fixture as possible. No fixtures shall be double trapped. Traps for floor drains and hub drains shall be deep seal "P" traps. All other traps shall be supplied under the "Fixture Paragraph".
3. Floor Flanges: Cast iron floor flanges shall be provided for connection of all floor outlet water closets. The joint between the closet trap and the floor flange shall be made tight with a red or black rubber fixture setting gasket.
4. Flashing: Vent pipes shall be flashed and made watertight as the roof with 4 pound

sheet lead. Flashing shall extend not less than 8" from the vent pipes in all directions. Flashing shall be extended up the vent pipes and shall be turned down into the pipe. Minimum vent through the roof shall be 2" size.

5. Floor Drains: Floor drains shall be sized as indicated on the drawings. See plans for model number. Drains by Zurn, Josam, Jay R. Smith or equal will be acceptable.

22 13 00.03 EXECUTION

A. PIPE INSTALLATION

1. Horizontal drain and waste piping with the building shall be given a grade of 1/8" per foot below ground and 1/8" per foot above ceilings unless otherwise indicated on the drawings. Piping 3" and smaller shall have minimum grade of 1/4" per foot. Main vertical soil and waste stacks shall be extended full size to the roof line and 12" above as vents, unless otherwise indicated on the drawings. Fittings shall be service weight when used on service weight pipe. Reduction of the size of drainage piping in the direction of flow is prohibited. Vent or tap tees will not be permitted on waste lines.

B. JOINTS

1. Joints for PVC pipe shall be solvent cement in accordance with the manufacturer's instructions.

C. CLEANOUTS

1. Cleanouts shall be installed where shown on the drawings but in no case shall they be more than 50 feet apart in piping 3" and under and 75 feet apart in piping 4" and larger.

D. PIPE TEST

1. All new soil, waste, drainage and vent piping shall be tested before fixtures are installed by capping or plugging the openings, except for the highest opening, and filling the entire system with water. If the system is tested in sections the minimum acceptable head shall be 10 ft. of water column. In testing successive sections, at least the upper 10 ft. of the preceding section shall be tested so that no joint or pipe within the building (except the uppermost 10 ft. of the system) shall have been submitted to a test of less than 10 ft. head of water. The water column shall be allowed to stand thus filled for a period of four hours.
2. Pipe found defective during test shall be replaced at no additional cost to the Owner. Pipe joints found defective during tests shall be taken apart and remade.

DIVISION 22

SECTION 22 13 13: ACID WASTE & VENT SYSTEM

22 13 13.01 GENERAL

A. SCOPE

1. The provisions of Section 22 05 00 apply to all the work in this Section.
2. All fixtures and equipment specified as requiring acid waste shall be connected to the acid waste and vent system. The system shall be extended as shown on the drawings.
3. The provisions of Section 22 05 00 apply to all the work in this section.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00.

1. Manufacturer's cuts.
2. Installation instructions.

22 13 13.02 PRODUCTS

A. ACID WASTE & VENT SYSTEM

1. Acid waste drain and vent system, as shown on drawings, shall be NSF listed and CSA certified Schedule 40, polypropylene as manufactured by IPEX. System to include pipe supplied in 10 ft. lengths (or 20 ft. lengths if NFRPP is specified), fittings, traps and neutralization tanks from the same manufacturer. It shall also include recommended adapters to connect to other piping materials, where applicable.
2. Pipe shall be made from NSF listed Type 1, flame retardant polypropylene conforming to ASTM D4101, with a maximum average flame spread of zero seconds and a maximum extent of burning of 13 mm, in accordance with ASTM D635. Matched fittings shall be made from NSF listed flame retardant polypropylene with average maximum burn time of 80 seconds and maximum extent of burning of 20 mm in accordance with ASTM D635. If NFRPP pipe is specified, it shall be made from NSF 14 listed and CSA certified Schedule 40 PP as manufactured by IPEX. Pipe shall comply with ASTM F1412 and material used shall comply with the material requirements of ASTM D4101.
3. Fittings shall be NSF listed and have an integral heavy gauge, nickel/chrome electrical resistance wire molded in place in the fitting body. Copper wire elements, loose wire or other loose joint components, are prohibited. Fittings shall be Enfield or approved equal.
4. Connections between polypropylene pipe and fittings shall be made using the Enfield joint. All joints shall have a fusion cycle controlled by a microprocessor operated, waterproof, Enfusion control unit equipped with input and output voltage sensors, ambient temperature sensors to automatically adjust fusion time and audible alarms to indicate cycle interruptions and completion of the joining process.

The unit shall be capable of fusing multiple joints and with a minimum capability of eight 2" joints with the same fusion time as a single joint. Connections between polypropylene and other piping materials shall be made using Enfield adapters according to manufacturer's (IPEX) recommendations. All electrofusion machines shall be third party certified by UL and CSA.

22 13 13.03 EXECUTION

A. PROTECTION OF FIRE RATINGS

1. Provide "proset" U.L. certified fire stop sleeving system for all water, drainage or any other applicable pipe penetrations through fire rated walls, floors, partitions, ceiling, floor-ceiling assemblies and roofs as tested under ASTM E814-83 "standard method of fire tests of through-penetration fire stops."
2. For plastic drainage, waste and vent penetrations install "Proset System C" sleeving system consisting of stack stubs with "code red" fittings, and floor drain stubs.

B. TESTS

1. Test in accordance with manufacturer's recommendations and local code requirements.

C. UNDERGROUND PIPE

1. The trench as excavated for the pipe installation must be free of loose stones, building materials or outcroppings, and must provide minimum clearance around pipe of half the pipe diameter on each side (horizontally) and one pipe diameter and below (vertically). The trench shall be backfilled over the unexcavated base to a depth of one pipe diameter with clean backfill. The backfill material shall be free of stones and foreign matter and shall be capable of passing a No. 20 screen.
2. The piping shall be installed over this material and tested in accordance with applicable plumbing codes.
3. After testing, initial backfilling must be carefully accomplished, still using No. 20 screen material until fill surrounds the pipe. When the selected backfill meets a depth of one diameter over the pipe, then backfilling can proceed with normal fill until complete. Fill shall be compacted using hand held compacting equipment when fill is midway up the pipe, and again when the fill is over one diameter over the pipe. Heavy duty compacting equipment can be used after the initial backfill is completed.
4. All underground fittings shall be protected prior to backfilling by wrapping in polyvinyl film (5 mil), Scotch Wrap or J. M. Trans-Tex or approved equal.

D. LABORATORY SINK CONNECTION

1. Sink, tailpieces, traps, etc. shall be connected using proper mechanical joints.

E. PIPE SUPPORTS

1. Piping shall be supported as recommended by manufacturer in a manner to allow

for expansion and contraction. Clevis or loop type pipe hangers should be used.

2. Hanger spacing shall be as follows:

<u>Pipe Size</u>	<u>Hanger Spacing</u>
1-1/2"	4 Feet
2"	4 Feet
3"	5 Feet
4" thru 8"	6 Feet
10" thru 12"	7 Feet

3. Contractor shall install piping system as required to absorb pipe expansion. Piping offsets, expansion loops or expansion joint assemblies shall be installed as recommended by the manufacturer and approved by the Engineer.

F. INSTALLATION AND TESTING

1. Installation and testing shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes. Testing with compressed air is prohibited. The entire system shall be installed free of stress and in proper alignment. Horizontal supports shall provide a wide bearing area and be free of burrs or sharp edges. Support spacings shall be in accordance with the manufacturer's recommendations and local plumbing codes. Vertical piping shall have riser clamps at each floor. Pipe supports should be installed so that horizontal piping is in uniform alignment and with a uniform slope of at least 1/8" per foot, or in accordance with the local plumbing codes.

DIVISION 22

SECTION 22 40 00: PLUMBING FIXTURES AND EQUIPMENT

22 40 00.01 GENERAL

A. DESCRIPTION

1. The provisions of Section 22 05 00 apply to all work in this Section.
2. The Contractor shall furnish and install all plumbing fixtures complete with all equipment, fittings, trimmings and supports as specified.
3. Products designed for dispensing potable water shall meet both the NSF 61 and NSF 372 standard.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.
2. Certified capacity ratings.
3. Installation instructions.
4. Operating and Maintenance Instructions.

22 40 01.02 PRODUCTS

A. FIXTURES

1. All fixtures shall be Grade "A". The name or trademark of the manufacturer shall be printed or pressed on all water closets and lavatories and a label, which cannot be removed without destroying it, containing the manufacturer's name and trademark and the quality of the fixtures, shall be affixed to all fixtures.
2. Exposed metal parts of fixtures shall be chromium plated. Where fixtures are to be hung from the wall, the fixture or fixture hanger shall be supported by concealed 3" steel washers and through bolts. Furnish traps and supply fittings with stops for all fixtures.
3. All faucets and supply fittings shall be of the same manufacturer as the fixture except as noted otherwise. All exposed supply and waste piping shall be chrome plated. Supply piping serving flush valves shall be equipped with chrome plated pipe cover.
4. Fixtures shall be white or stainless steel as indicated on drawings.
5. Direct connections between domestic water system and sanitary waste system will not be permitted.
6. All enameled cast iron fixtures shall be Acid Resisting (AR) and shall bear manufacturer's symbol signifying AR materials.

7. All flush valves shall be quiet acting, non-hold open feature and shall have sweat solder adaptor kit. Escutcheon shall be chrome plated brass with set screws.
8. Threaded adapters serving lavatory supply piping shall be concealed in walls. Runouts to fixture shall be chrome plated brass pipe.
9. All exposed waste piping serving fixtures, except service sinks, shall be 17 gauge chrome plated brass pipe with cast brass P-trap. Under Counters will be considered exposed areas.
10. Cut-Off Stops: All fixtures shall have individual loose key cut-off stops on cold and/or hot water lines except as specified hereinafter or indicated on the drawings.
11. Provide appropriate wall hangers for all wall-hung fixtures.

B. ELECTRIC WATER HEATER

1. Type. The water heaters shall be electric with automatic controls and approved by Underwriters' Laboratories, Inc. and approved by the National Sanitation Foundation.
2. Capacity. The storage capacity and recovery capacity shall be shown on the drawings.
3. Tank. Tank shall be heavy gauge steel with inner lining of glass. Tank shall have insulation completely around tank, top and bottom. There shall be a hose thread drain valve at bottom of tank and any pipe nipples used in water connections shall have interior surface to match interior surface of tank. Dielectric unions shall be used to connect glass coated galvanized pipe nipples to cover water pipe. Unit shall be constructed in accordance with ASME Code Section VIII and shall bear the appropriate symbol and be listed with the National Board as required.
4. Jacket. The water heater shall have a jacket of cold rolled steel with white baked on enamel finish. Jacket shall have provisions for access to all controls and heating elements.
5. Relief Valve. The heater shall be equipped with an ASME approved T & P relief valve pipe to drain.
6. Control compartment shall be hinged and shall house 120 volt control circuit transformer, transformer fusing, magnetic contactor(s), immersion style operating thermostat(s), element fusing per N.E.C. and medium watt density commercial grade INCO-LOY sheathed flange mounted elements with prewired leads. Include manual reset high temperature unit switch.
7. Electric Heating Element. Shall be copper sheathed immersion type element and shall be installed with thermostat hot water trap, and cold water inlet baffle.
8. Mounting. The electric water heater shall be set dead level in both directions.
9. Piping Connections. The electric water heater shall have piping connections as shown on the drawings.

10. Cleaning. The electric water heater shall be cleaned and all construction dirt removed at the completion of the project.
11. Insulation shall meet requirements of latest ASHRAE Standard.
12. Units with a storage capacity of 120 gallons or more shall be constructed and stamped pursuant to the ASME Code, Section IV, or Section VIII, Division 1, as applicable.
13. Units with an input capacity of 200,000 BTUH or more shall be constructed and stamped pursuant to the ASME Code, Section IV, or Section VIII, Division 1, as applicable.

22 40 00.03 EXECUTION

A. GENERAL

1. Install all fixtures as per manufacturer's requirements and local codes.

B. CAULKING

1. Fixtures, fittings and accessories shall be caulked at floor and wall perimeter and behind flanges and fittings in a fashion that the wall openings are sealed, but no sealant is exposed.
2. Caulking shall be silicone rubber.
3. Install all caulking per manufacturer's instructions.

DIVISION 23

SECTION 23 05 00: MECHANICAL GENERAL PROVISIONS

23 05 00.01: GENERAL

A. SCOPE

1. Applicable requirements of the General Conditions, Supplementary General Conditions, and Special Conditions bound at the front of these specifications shall govern work under this heading.
2. The Contractor shall coordinate the work and equipment of this Division with the work and equipment specified elsewhere in order to assure a complete and satisfactory installation. Work such as excavation, backfill, concrete, flashing, wiring, etc., which is required by the work of this section shall be performed in accordance with the requirements of the applicable section of the specifications.
3. It is the intention of these specifications and drawings to call for finished work, tested and ready for operation. Whenever the word "provide" is used, it shall mean "furnish and install complete and ready for use".
4. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.
5. This Contractor is referred to the General and Special Conditions of the Contract which shall form a part and be included in this section of the specification and shall be binding on this Contractor.
6. Some items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items or equipment as indicated on the drawings, and as required for complete systems.

B. DEFINITION

1. The word "Contractor" as used in this section of the specification refers to the HVAC Contractor unless specifically noted otherwise. The word "provide" means furnish, fabricated, complete, install, erect, including labor and incidental materials necessary to complete in place and ready for operation or use the item referred to or described herein and/or shown or referred to on the Contract Drawings.

C. CONTRACTOR'S QUALIFICATIONS

1. It is assumed that the Contractor has had sufficient general knowledge and experience to anticipate the needs of a construction of this nature. The Contractor shall furnish all items required to complete the construction in accordance with reasonable interpretation of the intent of the Drawings and Specifications. Any minor items required by code, law or regulations shall be provided whether or not specified or specifically shown where it is a part of a major item of equipment, or of the control system specified or shown on the plans.

23 05 00.02: PRODUCTS

A. MATERIALS AND WORKMANSHIP

1. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Architect shall be furnished.
2. The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers and labor required to unload, transfer, erect, connect-up, adjust, start, operate and test each system.
3. Unless otherwise specifically indicated on the plans or specifications, all equipment and material shall be installed with the approval of the Architect in accordance with the recommendations of the manufacturer. This shall include the performance of such tests as the manufacturer recommends.
4. All work must be done by first-class and experienced mechanics properly supervised and it is understood that the Architect has the right to stop any work that is not being properly done and has the right to demand that any workman deemed incompetent by the Architect be removed from the job and a competent workman substituted therefore.

B. EQUIPMENT APPLICATION AND PERFORMANCE

1. The Contractor and/or Equipment Supplier shall be responsible to see that equipment supplied is correct for the intended application and will perform within the limits of capacity, noise, life expectancy, pressure drop and space limitations intended for that equipment as shown on the plans or described in the specifications. The shop drawings shall show the capacity and operating characteristics of the equipment.

C. EQUIPMENT DEVIATIONS

1. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical, or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted for approval by the Architect.
2. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

D. MOTORS

1. Motors shall be built in accordance with the latest standards of NEMA and as specified. Motors shall be tested in accordance with standards of A.S.A. C40 and conform thereto for installation resistance and dielectric strength. Each motor shall be provided with conduit terminal box, adequate starting and protective equipment as specified or required. The capacity shall be sufficient to operate associate driven devices under all conditions of operation and load and without overload, and at least shall be the horsepower indicated or specified. Each motor shall be selected for quiet operation. Motors shall have a minimum acceptable nominal full load efficiency as required by ASHRAE 90.1.

E. DRIVES

1. Machinery drives shall be provided for all power driven equipment specified in this section.
2. Drives shall be V-belt and shall be selected to overcome the starting inertia of the equipment without slippage, but in no case shall be less than 150% of the full motor load. Drives 1/2 HP and smaller may be provided with single belts. Drives 3/4 HP and larger shall be provided with the number of belts necessary to transmit the required power with 95% minimum efficiency.
3. Where adjustable type sheaves are indicated they shall be selected such that the schedule speed of the driven equipment is at the midpoint in the adjustment range of the sheave.
4. Where fixed type sheaves are indicated the Contractor shall include in his price changing sheave sizes once during the balancing period to achieve proper air quantities.
5. Sheaves shall be machined cast iron of the same manufacturer as the belt provided. Shop drawings shall be submitted of each drive which shall include actual transmission capacity of each drive.

F. FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

1. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all air conditioning equipment, piping, pumps, tanks, compressors, and for all other equipment furnished under this contract, and shall submit drawings to the Architect for approval before purchase, fabrication or construction of same.
2. For all equipment where foundations are indicated, furnish and install concrete pads minimum 4 inches thick or as shown. All pads shall be extended six (6) inches beyond machine base in all directions with top edge hampered. Insert six (6) inch long, 1/2" round steel dowel rods at 12" on center into floors to anchor pads. Shop drawings for all foundations and pads shall be submitted to the Architect for approval before same are constructed.
3. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent and surrounding flooring material.

4. All equipment, unless otherwise shown, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect, not strong enough shall be replaced as directed.

G. VIBRATION ISOLATION

1. All work shall operate under all conditions of loads without any sound or vibration which is objectionable in the opinion of the Architect. If requested, the Contractor shall record sound power level readings in all areas adjacent to mechanical rooms, over, under or beside, after all equipment is fully operational and all wall and ceiling systems are completed. Sound level readings shall not exceed NC levels as recommended in Table 34, Chapter 46 of 1999 ASHRAE Applications Handbook.
2. The readings are to be tabulated in the Maintenance and Operating Instruction Booklets.
3. Sound or vibration conditions in excess of listed quantities shall be corrected in an approved manner by the Contractor at his expense.
4. Unless otherwise noted mechanical equipment over one horsepower shall be isolated from the structure with resilient vibration and noise isolators supplied by one manufacturer to the Mechanical Contractor. Where isolator type and required deflection are not shown, equipment shall be isolated in accordance with the 1999 ASHRAE Applications Handbook, Chapter 46, Table 45. Submittals shall include complete design for the equipment bases, a tabulation of the design data for the isolators, including lateral stiffness, O.D.; free operating and solid height of the spring isolators, free and operating height of the neoprene or fiberglass isolators. Selection of isolators for proper loading to obtain desired efficiency shall be the responsibility of the manufacturer of isolating units to suit the equipment being supplied on the job and shall be fully guaranteed by this supplier. All vibration isolation equipment complete with thorough selection data shall be submitted. Units shall be Vibration Eliminator Company, Mason, Peabody, or approved equal.
5. Flexible duct connections shall be provided at inlet and outlet of all fans or cabinets containing fans and shall be constructed such as to allow a minimum movement of 2 inches in any direction and will not restrict normal movement of any equipment.

H. DIELECTRIC CONNECTIONS

1. Dielectric connections shall be used at any points within the piping systems where dissimilar metals meet. Careful attention shall be given to support brackets and hangers to select proper materials to avoid dissimilar metal contact at these points.

I. DRAINS AND VENTS

1. In addition to the drains and vents indicated on the plans and piping details, the Contractor shall install additional drains and vents as required to remove all water and air from the piping systems.

J. MOTOR STARTERS AND DISCONNECTS

1. Individual motor controllers complete with auxiliary contacts, control transformers,

push buttons, selector switches and remote push button stations not specifically specified to be furnished with the equipment shall be provided under this section. Motor controllers shall comply with NEMA Standards and be complete with proper size heaters and auxiliary contacts and shall be in NEMA enclosures as required. Unless otherwise noted, push button stations shall be oil-tight heavy duty type. Controllers shall be manual, magnetic, or combination type with disconnect switch or circuit breaker as indicated on the drawings or where required by the NEC. Controllers shall include motor over current protection in each phase conductor. Each motor controller shall be provided with phenolic nameplate, black with 1/4" high letters and white border, indicating equipment served, attached using counter sunk screws.

2. The Electrical Contractor shall furnish and install all disconnecting switches unless otherwise indicated or specified. Where disconnecting switches are indicated to be furnished under this Section, they shall be General Electric, Type TH in NEMA 1 enclosures, with voltage and amperage rating appropriate to the application. Unless otherwise noted, fuses shall be Buss "Fusetrons", or approved equal. Unfused motor disconnecting switches shall be Type TH in NEMA 1 or 4 applicable enclosures. Similar and equivalent equipment as manufactured by I.T.E., Square D, or Westinghouse is equally acceptable. Switches used as service switches shall bear such U.L. Label and nameplate on switch shall so indicate.

K. PAINTING

1. Paint material shall be selected from the products listed below and, insofar as practical, products of only one manufacturer shall be used. Contractor shall submit to the Architect the listed manufacturer he proposes to use in the work. Should the Contractor desire to use products of a manufacturer not listed below, or products made by a listed manufacturer but not scheduled herein, Contractor shall submit complete technical information on the proposed products to the Architect for approval. Only products approved by the Architect shall be used.

a. Rust Inhibitive Primer:

- 1) Devco: Bar-Ox Quick Dry Metal Primer, Red.
- 2) Duron: Deluxe Red Primer.
- 3) Glidden: Rustmaster Tank and Structure Primer.
- 4) Pittsburgh: Inhibitive Red Primer.

b. Galvanized Metal Primer:

- 1) Devco: Mirrolac Galvanized Metal Primer.
- 2) Duron: Duron Deluxe Galvanized Metal Primer
- 3) Glidden: Rustmaster Galvanized Iron Metal Primer.
- 4) Pittsburgh: Speedhigh Galvanized Steel Primer.

23 05 00.03: EXECUTION

A. DUTIES OF CONTRACTOR

1. Contractor shall furnish and install all materials called for in these Specifications and accompanying drawings, and must furnish the apparatus complete in every respect.

Anything called for in the specifications and not shown on the drawings or shown on the drawings and not called for in the specifications must be furnished by the Contractor.

2. Contractor is responsible for familiarizing himself with the details of the construction of the building. Work under these specifications installed improperly or which requires changing due to improper reading or interpretation of building plans shall be corrected and changed as directed by the Architect without additional cost to the Owner.
3. The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with installation.
4. The plans are diagrammatic and are not intended to show each and every fitting, valve, pipe, pipe hanger, or a complete detail of all the work to be done; but are for the purpose of illustrating the type of system, showing pipe sizes, etc., and special conditions considered necessary for the experienced mechanic to take off his materials and lay out his work. This Contractor shall be responsible for taking such measurements as may be necessary at the job and adapting his work to local conditions.
5. Conditions sometimes occur which require certain changes in drawings and specifications. In the event that such changes in drawings and specifications are necessary, the same are to be made by the Contractor without expense to the Owner, providing such changes do not require furnishing more materials, or performing more labor than the true intent of the drawings and specifications demands. It is understood that while the drawings are to be followed as closely as circumstances will permit, the Contractor is held responsible for the installation of the system according to the true intent and meaning of the drawings. Anything not entirely clear in the drawings and specification will be fully explained if application is made to the Architect. Should, however, conditions arise where in the judgment of the Contractor certain changes will be advisable, the Contractor will communicate with the Architect and secure his approval of these changes before going ahead with the work.
6. The right to make any responsible change in location of apparatus, equipment, routing of piping up to the time of roughing in, is reserved by the Architect without involving any additional expense to the Owner.
7. It shall be the duty of prospective Contractors to visit the job site and familiarize themselves with job conditions. No extras will be allowed because of additional work necessitated by, or changes in plans required because of evident job conditions, that are not indicated on the drawings.
8. Contractor shall determine the schedule of work as lay down by the General Contractor and must schedule his work to maintain the building construction schedule so as not to interfere with or hold up any other Contractors.
9. Contractor shall leave the premises in a clean and orderly manner upon completion of the work, and shall remove from the premises all debris that has accumulated during the progress of the work.

B. CODES, RULES, PERMITS AND FEES

1. The Contractor shall give all necessary notices, obtain all permits and pay all sales taxes, fees and other costs, including utility connections or extensions, in connection with his work; file all necessary plans prepare all documents and obtain all necessary approvals of all authorities having jurisdiction. Obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment of the work.
2. The Contractor shall include in his work, without extra cost to the Owner, any labor, materials, service, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.
3. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, and with the requirements of all governmental departments having jurisdiction.
4. All materials and equipment for the electrical portion of the mechanical system shall bear the approval label, and shall be listed by the Underwriters' Laboratories, Inc.
5. All work shall be done in accordance with the North Carolina Building Code and requirements of governmental agencies having jurisdiction.

C. COOPERATION WITH OTHER TRADES

1. This Contractor shall give full cooperation to other trades and shall furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.
2. If so directed by the Architect, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than $3/8" = 1'-0"$, clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordination with other trades, or so as to cause any interference with work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.
3. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. RECORD DRAWINGS

1. The Contractor shall furnish drawings showing dimensioned location and depths of all exterior piping and structures, and shall indicate any and all changes in location of piping, ductwork, equipment or valves from that shown on the Contract Drawings. The drawings shall consist of clean, legible sepia prints of the Contract Drawings, available from the Architect on which the Contractor shall mark all notes, dimensions, sizes and information required. The sepias shall be kept for this purpose only. Before final inspection the Contractor shall submit to the Architect eight (8) sets of black line prints of the sepias.

E. SURVEYS AND MEASUREMENTS

1. This Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.
2. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Architect through the General Contractor, and shall not proceed with his work until he has received instructions from the Architect.

F. SAFETY REQUIREMENTS

1. All systems shall be installed so as to be safe operating and all moving parts shall be covered where subject to human contact. All rough edges of equipment and materials shall be made smooth.
2. All safety controls shall be checked under the supervision of the Architect's representative and eight (8) copies of test data showing setting and performance of safety controls shall be submitted to the Architect.

G. SHOP DRAWINGS

1. Contractor shall submit within ten (10) days after award of contract eight (8) copies of a complete list of all manufacturers to be used on the job. No substitutions will be allowed after this date except in extenuating circumstances as determined by the Architect.
2. Submission of a manufacturer's name or equipment number on this list shall not be considered as equipment approved by the Architect.
3. The Contractor shall submit for approval eight (8) sets of detailed shop drawings of all equipment and all material required to complete the project, and no materials or equipment may be delivered to the job site or installed until the Contractor has in his possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Contractor shall furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than eight (8) copies.
4. Prior to delivery of any material to the job site, and sufficiently in advance of requirements to allow the Architect ample time for checking, submit for approval detailed, dimensioned drawings or cuts, showing construction, size, arrangement, operating clearances, performance, characteristics and capacity. Each item of equipment proposed shall be standard catalog product of an established manufacturer and of equal quality, finish, performance, and durability to that specified.
5. Samples, drawings, specifications, catalogs, submitted for approval, shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article number of specification governing, Contractor's Name and Name of Job.

6. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly marked. Data of a general nature will not be accepted. Data shall include eight (8) copies of computation sheets indicating how unit capacity was determined where ratings are at other than standard conditions. No payment for any equipment or labor will be allowed until all major pieces of equipment specified have been submitted to the Architect for approval.
7. The Contractor, as part of the shop drawing submitted, shall submit shop drawing of all ductwork in the mechanical rooms, the risers including takeoffs to the floors with their associated dampers, and ells with unequal legs showing turning vanes.
8. Static pressure drops across fittings, dampers, heaters, attenuators, etc. shall not exceed minimum ASHRAE Standards when not specified.
9. The submittal of shop drawings shall be with the Contractor stamp affixed; this shall assure the Engineer that they are being submitted in accordance with Sub-Paragraph 4.13.4 in AIA Document A201 and/or Paragraph 6.26, in NSPE Document 1910-8. This stamp indicates that the Contractor, by approving and submitting shop drawings, represents that he has determined and verified all field measurements and quantities, field construction criteria, material, catalog material, and similar data that he has reviewed and coordinated information in the shop drawings with the requirements of the work and the Contract Documents. It, also, indicates that any deviation from the Contract Documents has been shown on the submittal and clearly defines the deviations from the specifications.
10. Approval rendered on shop drawings shall not be considered as a guarantee of quantities, measurements, or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail: said approval does not in any way relieve the Contractor from his responsibilities or necessity of furnishing material or performing work as required by the contract drawings and specifications.
11. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of Contract time, and no claim for extension by reason of default will be allowed.
12. All shop drawings and submittals are to be in the office of the Architect within 30 days after the Contracts have been awarded. Contractor shall be financially responsible for any price increase of shop drawing items from the time these drawings are issued until they are returned to the Contractor for purchase of items.
13. Contractor shall keep on the job at all times copies of all approved shop drawings.

H. OBSERVATION

1. The project will be observed periodically as construction progresses. The Contractor will be responsible for notifying the Architect at least 72 hours in advance when any work to be covered up is ready for inspection. No work will be covered up until after observation has been completed on such items as piping and insulation, etc.

I. ACCESSIBILITY

1. Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with the General Contractor and all other Contractors whose work is in the same space, and shall advise the General Contractor of his requirements. Such spaces and clearances shall; however, be kept to the minimum size required.
2. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to traps, cleanouts, motors, controllers, switch-gear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility and any change shall be submitted for approval.
3. The Contractor shall provide the General Contractor with exact locations of access panels for each concealed control damper or other device requiring service. Access panels shall be provided and installed by the General Contractor and as specified in the Architectural sections of the specifications. Locations of these panels shall be submitted in sufficient time to be installed in the normal course of work.

J. CONCEALED PIPE

1. In general, all pipes in finished spaces shall be run concealed in floors, walls, partitions and above ceilings.
2. Concealment of pipe and covering of same shall not be done until authorized by the Architect, after proper tests have been made. This applies to all interior work and exterior work.

K. CUTTING AND PATCHING

1. This Contractor shall provide all cutting and patching necessary to install the work specified in this section.
2. No structural members shall be cut without the approval of the Architect and all such cutting shall be done in a manner directed by him.
3. This Contractor shall arrange for proper openings in building to admit his equipment. If it becomes necessary to cut any portion of building to admit his equipment, portions cut must be restored to their former condition by this Contractor through agreeable arrangement with the General Contractor.
4. The General Contractor will provide all openings or chases in masonry or concrete; however, it is this Contractor's responsibility to advise exact dimensions, shape and locations of openings required in sufficient time for the General Contractor to make the necessary provisions. This Contractor shall be responsible for correct size and location of each opening for his equipment even though these openings are provided by the General Contractor.

L. SLEEVES AND PLATES

1. This Contractor shall provide and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching

required where sleeves and inserts were not installed, or where incorrectly located. This Contractor shall do all drilling required for the installation of his hangers.

2. Sleeves shall be provided for all mechanical piping passing through concrete floor slabs and concrete, masonry, tile and gypsum wall construction. Sleeves shall not be provided for piping running imbedded in concrete or in insulating concrete slabs on grade.
3. Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be packed with oakum and lead and made completely watertight.
4. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:
 - a. Terminate sleeves flush with walls, partitions and ceiling.
 - b. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor or as shown on the plans.
 - c. In all areas where pipes are exposed, extend sleeves 1/4 inch above finished floor, except in rooms having floor drains, where sleeves shall be extended 3/4 inches above floor.
5. Sleeves shall be constructed of schedule 40 black steel pipe unless otherwise indicated on the drawings. Sleeves through concrete beams shall be constructed as indicated on the drawings.
6. Fasten sleeves securely in floor, walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.
7. Where piping penetrates fire rated floors or walls, penetrations shall be sealed with a U.L. approved fire stopping system. System shall be as manufactured and detailed by 3M Company or approved equal.
8. Escutcheon plates shall be provided for all exposed pipes and all exposed conduit passing through walls, floors and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe or conduit. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

M. UTILITIES

1. This Contractor shall bear the cost of utilities required to perform the work under this Contract. Where services such as electricity, hoist, etc. are provided by the General Contractor, he shall be responsible directly to the General Contractor for his portion of the utilities as may be agreed upon.

N. SCAFFOLDING, RIGGING, HOISTING

1. This Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

O. ELECTRICAL CONNECTIONS

1. The Electrical Contractor shall furnish and install all wiring except: (1) temperature control wiring; (2) equipment control wiring and (3) interlock wiring. The Electrical Contractor shall receive from the Mechanical Contractor and mount all individually mounted motor starters and provide all power wiring to the motor terminals unless otherwise indicated. The Electrical Contractor will provide branch circuit protection and disconnects unless otherwise indicated or specified. The Mechanical Contractor shall provide all other control and protective devices, and perform all control and interlock wiring required for the operation of the equipment. Power wiring, from nearest panel, for control components (dampers, panels, etc.) shall be provided by the Mechanical Contractor unless specifically called for by Division 26.
2. After all circuits are energized and complete, the Electrical Contractor shall be responsible for all power wiring, and all control wiring shall be the responsibility of this Contractor. Motors and equipment shall be provided for current characteristics as shown on the drawings.
3. It shall be the responsibility of this Contractor to check with the Electrical Contractor on service outlets provided for this Contractor, to determine that the switches and wiring provided are of adequate size to meet Code requirements for this Contractor's equipment. Any discrepancy shall be brought to the attention of the Architect before work is installed. Otherwise, any cost for changes shall be at the expense of this Contractor, and in any case electrical cost increase due to equipment substitution of different electrical characteristics shall be this Contractor's expense.

P. PIPE WORK

1. All pipe work shown on the drawings and/or specifications or implied herein and required for a complete and operating system shall be done by experienced mechanics in a neat and workmanlike manner and subject to the approval of the Architect.
2. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required and it shall be the responsibility of the Contractor to furnish and install all materials and equipment required for the operating systems.
3. The piping shall be installed as shown on the plans with strict conformity to the sizes listed and due provisions for expansion and contraction.
4. Unless otherwise noted on the plans, all piping shall be installed inside the insulated envelope of the building.

Q. LUBRICATION

1. All bearing, except those specifically requiring oil lubrication, shall be pressure lubricated. All lubrication points shall be readily accessible, away from locations dangerous to workmen. In areas where lubrication points are not readily accessible

Contractor shall provide extended lubrication tubes to positions where lubrication can be easily accomplished. Pressure grease lubrication fittings shall be "Zerk-Hydraulic" type as made by the Stewart-Warner Corporation, or approved equal, for each type of grease required.

2. The Contractor shall furnish lubrication charts or schedules for each piece of equipment or machinery. The charts or schedules shall designate each point of lubrication. Eight (8) copies of charts and schedules shall be submitted to the Architect prior to final inspection and approved copies of each schedule and chart shall be framed by the Contractor in metal frames with glass front and installed in the Equipment Room.

R. PROTECTION

1. The Contractor shall protect all work and material from damage, and shall be liable for all damage during construction.
2. The Contractor shall be responsible for work and equipment until all construction is finally inspected, tested and accepted. He shall protect work against theft, injury or damage; and shall carefully store material and equipment received on site which is not immediately installed. He shall close open ends of work including pipe, duct, or equipment with temporary covers or plugs during storage and construction to prevent entry of obstructing materials or dust and debris.
3. Provide a protective covering of not less than 0.004" thick vinyl sheeting (or a similar approved material) to be used in covering all items of equipment, immediately after the equipment has been set in place, (or if in a place of storage within the building under construction) to prevent the accumulation of dirt, sand, cement, plaster, paint or other foreign materials from collecting on the equipment and/or fouling working parts.

S. CLEANING

1. Clean from all exposed insulation and metal surfaces grease, debris or other foreign material.
2. Chrome plated fittings, fixtures, piping and trim shall be polished upon completion.

T. LABELS AND INSTRUCTIONS

1. Label all switches and controls furnished under this Section with engraved bakelite permanent labels to indicate the function of each and the apparatus serviced.
2. Post in the Equipment Room framed under glass the following:
 - a. Lubrication instructions listing all equipment which requires lubrication, the type of lubricant to be used and the frequency of lubrication.
3. All units shall be marked with unit numbers in three inch high letters with unit designated numbers.
4. A tabulation shall be made of each panel number and circuit number serving each air conditioning unit, fan or other device with electrical service. This list shall be

prepared and be ready to turn over to inspectors prior to calling for final inspection.

U. MOTOR & DAMPER TAGS AND SCHEDULE

1. Each motor and damper shall be provided with an engraved black finish, phenolic tag indicating service and number. Tag lettering shall be at least 1/4" high etched white letters and beveled white trim. Tags to be attached using brass chains.
2. The Contractor shall submit eight (8) copies of charts indicating number, location, service, "normal" position, manufacturer, size and model number to the Architect for approval.
3. Prior to final inspection an approved copy of each chart shall be framed by the Contractor in a metal frame with glass front and installed in the Equipment Room.

V. EQUIPMENT SERVICEABILITY

1. All equipment shall be serviceable. All equipment shall be installed so that it can be removed. All equipment in or connected to piping systems shall have valves to isolate this equipment from the piping system. This includes, but not necessarily limited to control valves, sensors and switches. Unions (screwed or flanged) shall be provided so that all equipment is removable.
2. Equipment installed in walls, ceilings or floors shall be accessible for service or removal without cutting walls, etc.
3. Equipment requiring periodic service shall be installed to allow clearance for service and have removable panels, access doors, etc. through which the service is to be performed.

W. ACCEPTANCE OF EQUIPMENT

1. In the event that the Architect considers it impractical, because of unsuitable test conditions, or some other factors, to execute simultaneous final acceptance of all equipment portions of the installation may be certified by the Architect for final acceptance when that portion of the system is complete and ready for operation.
2. Contractor shall make all necessary tests, trial operation balancing and balance tests, etc., as may be required as directed by the engineer to prove that all work under these plans and specification is in complete serviceable condition and will function as intended.
3. Upon completion of all work the system shall be tested to determine if any excess noise or vibration is apparent during operation of the system. If any such objections are detected in the system or noisy equipment found, the Contractor shall be responsible for correcting same. Ducts, plenums and casings shall be cleaned of all debris and blown free of all particles of rubbish and dust before installing outlet faces. Equipment shall be wiped clean with all traces of oil, dust, dirt and paint spots removed. Temporary filters shall be provided for all fans that are operated during construction and after all construction dirt has been removed from the building, new filters shall be installed. Bearings shall be lubricated as recommended by the equipment manufacturer. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

X. GUARANTEE

1. The Contractor shall guarantee the complete mechanical system against defect due to faulty materials, faulty workmanship or failure due to negligence of the Contractor. This guarantee will exclude normal wear and tear, maintenance lubrication, replacement of expendable components, or abuse. The guarantee period shall begin on the date of the final acceptance and shall continue for a period of 12 months during which time the Contractor shall make good such defective workmanship and materials and any damage resulting there from, within a reasonable time of notice given by the Owner.
2. Refrigeration compressors shall have a five (5) year warranty.

Y. OPERATING AND MAINTENANCE INSTRUCTIONS

1. Submit 3 sets of complete operating and maintenance instructions.
2. Bind each set in plain black vinyl-covered, hard back, 3-ring binder. Individual paper shall be Boorum and Pease Reinforced Ring Book Sheet, No. S-212-101 or equivalent.
3. Organize material in the following format:
 - a. Section I:
 - 1) Name of Project
 - 2) Address
 - 3) Owner's Name
 - 4) General Contractor's Name and Address
 - 5) Mechanical Contractor's Name and Address
 - 6) Warranty Dates
 -
 - b. Section II:
 - 1) Major Equipment List (name, manufacturer, serial no., H.P. and voltage) (include all equipment with motors)
 - 2) Control Sequence Description (Mechanical Only)
 - 3) Routine Maintenance Instructions in Step-by-Step form
 - 4) Lubrication Charts and Schedules
 - 5) Test and Balance Reports (Mechanical Only)
 - 6) Sound Power Level Readings (Where Required)
 - c. Section III:
 - 1) Operating and Maintenance Instructions by Manufacturer
 - 2) Shop Drawings (Major Requirement)
 - 3) Wiring Diagrams
 - 4) Control Drawings (Mechanical Only)

Z. PAINTING

1. Painting shall be performed as detailed in Division 9.

2. All surfaces to receive paint shall be dry and clean.
3. Before priming, all surfaces shall be thoroughly cleaned of all dirt, oil, grease, rust, scale and other foreign matter. Cleaning shall be done with sandpaper, steel scraper, or wire brush where appropriate and necessary. Metallic surfaces which have been soldered shall be cleaned with benzol and all other metal surfaces washed with benzine.
4. Mixing shall be in galvanized iron pans. Paint shall be mixed in full compliance with manufacturer's directions. Thinning shall be done only in full compliance with manufacturer's directions.
5. Workmanship shall be highest quality, free from brush marks, laps, streaks, sags, unfinished patches, or other blemishes. Edges where paint joins other material or colors shall be sharp and clean without overlapping. Paint shall be brushed or sprayed on in strict compliance with manufacturer's directions and shall work evenly and be allowed to dry at least 48 hours before subsequent coating. Paint shall not be applied in damp or rainy weather or until surface has thoroughly dried. Contractor shall furnish and lay drop-cloths in all areas where painting is done as necessary to protect work of other trades. Varnish and enamel shall not be applied when temperature in the area is less than 60 degrees Fahrenheit nor paint when under 50 degrees Fahrenheit. Prior to final acceptance, Contractor shall touch up or restore any damaged finish. All insulation materials shall be provided with a paint suitable jacket.
6. The following materials and equipment require painting as noted:
 - a. All concealed piping, sheet metal, hangers and accessories except galvanized sheet metal or piping:
 - 1) One coat rust-inhibitive primer except where exterior insulation is provided.
 - b. All exposed, exterior and interior, piping, sheet metal, hangers and accessories, air handling units, pumps, etc. except galvanized sheet metal or piping:
 - 1) One coat rust-inhibitive primer except where exterior insulation is provided.
 - c. All concealed galvanized sheet metal, piping and accessories.
 - 1) One coat galvanized metal primer on threaded portions of piping and on damaged galvanized surfaces.
 - d. All exposed, exterior and interior galvanized sheet metal, piping and accessories.
 - 1) One coat galvanized metal primer except where exterior insulation is provided.
 - e. All exposed, exterior and interior, insulation equipment.

- 1) Two coats exterior glass enamel over paint suitable insulation jacket.
7. All piping in Equipment Rooms shall be painted (color shown below) and identified by stenciling with letters minimum 1/2" high in a contrasting color. Piping outside Equipment Rooms shall be stenciled. Stenciling shall occur at each change of direction and every 20 feet. Arrows should be placed adjacent to letters signifying direction of flow.
- a. Standard piping color codes:
- 1) Drains - Natural with Walls
 - 2) Electrical - Natural with Walls

DIVISION 23

SECTION 23 05 93: TESTING, ADJUSTING, AND BALANCING

23 05 93.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.
2. Work shall be performed by technicians shall be competent in the trade of testing and balancing environmental systems and shall be done in an organized manner utilizing appropriate test and balance forms.
3. The test and balance report shall be submitted prior to the final inspection. The TAB sub-contractor shall attend the final to spot check air and water flows.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cut sheets for all equipment to be used.
2. Sample balancing charts and forms.
3. Completed final balancing data.

23 05 93.02 PRODUCTS

A. INSTRUMENTATION

1. Instruments for use in the test and balancing procedures shall be of first quality and be accurately calibrated at the time of use. The following list is provided to indicate the instruments expected, however, other instruments as necessary to properly perform the work will be provided and subject to approval of the Architect.
 - a. Inclined manometer calibrated in no less than .006-inch divisions.
 - b. Combination inclined and vertical manometer (0 to 10 inch is generally the most useful).
 - c. Pitot Tubes. (Usually 18 and 48 inch tube covers most balance requirements.
 - d. Tachometer. This instrument should be of the high quality self-timing type.
 - e. Clamp-on ampere meter with voltage scales.
 - f. Deflecting vane anemometer.
 - g. Rotating vane anemometer.
 - h. Thermal type (hot wire) anemometer.
 - i. Hook gage.
 - j. Dial and glass stem thermometers.
 - k. Sling psychrometer.
2. The accuracy of calibration of the field instruments used is of the utmost importance. All field instruments used in the balance should have been calibrated at least within the previous three months. Naturally, any suspect instruments should be checked more frequently.

23 05 93.03 EXECUTION

A. SYSTEM START-UP

1. Starting date for mechanical system shall be scheduled well in advance of expected completion date and shall be established a minimum of two weeks prior to acceptance date. The system shall be in full operation with all equipment functional prior to acceptance date.
2. Performance readings shall be taken and recorded on all air distribution devices and the system shall be balanced out prior to acceptance. System shall be balanced to +10%/-5% of specified values. Balancing of the system shall be accomplished with duct dampers and only minor adjustments made with grille dampers. Record and submit results in table form along side of scheduled quantities.
3. All controls shall be calibrated by qualified personnel prior to acceptance date. Thermostats shall be in close calibration with one another and shall operate their respective units without interference from adjacent units.
4. All units shall be checked out thoroughly and the information recorded on each machine. Check sheets shall be included in Operating and Maintenance instructional Manual.
5. Replace fan sheaves as necessary to produce design air volume.

DIVISION 23

SECTION 23 07 00: INSULATION (MECHANICAL)

23 07 00.01 GENERAL

A. DESCRIPTION

1. This section of specifications and related drawings describe requirements pertaining to insulation.
2. Provide all insulation in conjunction with equipment, piping and ductwork furnished under this division.
3. The provisions of Section 23 05 00 apply to all the work in this section.

B. QUALITY ASSURANCE

1. Products of the manufacturers listed under MATERIALS will be acceptable for use for the specific functions noted. Adhesives, sealers, vapor barriers, and coatings shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.
2. Materials shall be applied subject to their temperature limits. Any methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.
3. Insulation shall be applied by experienced workers regularly employed for this type of work.

C. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Catalog cuts.
2. Materials ratings.
3. Insulation instructions.

D. RATING

1. Insulation and accessories such as adhesives, mastics, cements, tape and jackets, unless noted otherwise, shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials that are factory applied shall be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.
2. Flame spread and smoke developed ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E-84, UL 723.
3. Products of their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

4. Treatment of jackets or facings to impart flame and smoke safety shall be permanent. The use of water-soluble treatment is prohibited.
5. Certify in writing, prior to installation, that products to be used will meet RATING criteria.

23 07 00.02 PRODUCTS

A. PIPE INSULATION

1. Materials shall be heavy density fiberglass with an all-service jacket composed of an outer layer of vinyl, fiberglass scrim cloth, aluminum foil, and kraft paper, in that order, from outside to inside of pipe covering.
 - a. Condensate drain lines.
 - b. Refrigerant Suction Piping - flexible foamed elastomeric plastic tubing with a density of 6 lbs./CF, K of 0.27 @ 70 degrees F., self-extinguishing, and a water vapor transmission of less than 0.05 perm in., flame spread rating 25 or less, smoke developed rating of 50 or less (ASTM E84-75).
2. Thicknesses:
 - a. Condensate drain lines: 1".

B. DUCT INSULATION

1. Materials. Insulation shall be Owens-Corning as specified hereinafter or products of Certain-Teed/St. Gobain or Manville. Adhesives shall be as manufactured by 3-M Foster or Insulation Manufacturer. Insulation shall have composite (insulation, jacket and adhesive) fire and smoke hazard rating as tested by ASTM E-84, not exceeding Flame Spread -25 and Smoke Developed -50.

23 07 00.03 EXECUTION

A. PIPE INSULATION

1. Application:
 - a. Insulation and surfaces to be insulated shall be clean and dry when insulation is installed and during the application of any finish.
2. Refrigerant Piping.
 - a. End joint strips and overlap seams shall be adhered with a vapor barrier mastic. Valves, fittings, and flanges shall be insulated with strips of pipe insulation, and finished with tape and vapor barrier mastic. Seal off vapor barrier to pipe at all fittings, hangers, and every 20 feet on straight runs.
3. Fiberglass Insulation:
 - a. All fiberglass pipe covering shall be furnished with self-seal lap and 3" wide

butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applies to longitudinal as well as circumferential joints. Under no circumstances will staples be allowed. Care shall be taken to keep jacket clean, as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before butt joint strip is applied, and all cold water service lines shall have vapor seal mastic thoroughly coated to pipe at butt joints every 21' and at all fittings. All fittings, valve bodies, unions, and flanges shall be finished as follows:

- 1) Apply molded or segmental insulation to fittings equal in thickness to the insulation on adjoining pipe and wire in place with 2#14 copper wires.
- 2) Apply a skim coat of insulating cement to the insulated fitting, if needed, to produce a smooth surface. After cement is dry, apply Owens-Corning Fiberglass Fitting Mastic, Type C, UL labeled.
- 3) Wrap the fitting with fiberglass reinforcing cloth overlapping the preceding layer by 1 to 2". Also, overlap mastic and cloth by 2" on adjoining sections of pipe insulation.
- 4) Apply a second coat of mastic over cloth, working it well into mesh of cloth and smooth the surface. Mastic to be applied at the rate of 40 square feet per gallon. All flanges and fittings on hot and cold lines in utility tunnels shall be insulated according to above. Omit insulation on flanges and unions over 60 degrees F. If painting is required, no sizing is necessary. To maintain the non-combustibility of the system only Glidden acrylic latex paint (#5370) is to be used.
- 5) All piping exposed to view (equipment rooms, etc.) shall be covered with an 8 oz. canvas jacket.

B. DUCT INSULATION

1. All vapor barriers and joints shall be sealed to prevent condensation. Clean and dry all ductwork before installing insulation. All weld joints shall be wire brushed and give one (1) coat of red lead before insulating. Staples will not be permitted in insulation.
2. Lined Duct:
 - a. Where noted on plans, ductwork shall be lined with Owens-Corning Aeroflex Vapor-Seal Duct Insulation, 1 ½ pcf, 1" thick, or equal by Certain-Teed/St. Gobain or Johns Mansville.
 - b. Duct liner and adhesive shall meet requirements of NFPA 90A and shall have UL fire hazard classification not to exceed the following: flame spread -25; fuel contributed -50; smoke generated -50. There will be no erosion of duct liner material at velocities up to 4000 fpm. Duct liner shall be applied to the sheet metal with 100% coverage of adhesive. The duct liner shall be cut to assure corner joints with no gaps. On horizontal runs, tops of ducts over 12" in width and sides of 16" in height shall be additionally secured with mechanical fasteners. On spans less than 30" fasteners are to be placed at midpoints. On vertical runs, fasteners shall be placed on a maximum of 15" centers on all width dimensions over 12". Fasteners shall be flush with the liner surface. All exposed edges and leading edges of all transverse and

longitudinal joints of the liner shall be coated with a fire resistant adhesive. The exposed mechanical fasteners shall be coated with a fire resistant adhesive. The upstream end must be continuously adhered to for a 6" width.

3. Wrapped Duct:

- a. All supply and outside air duct unless noted otherwise on plans or in specifications shall be insulated by wrapping with 2" thick, $\frac{3}{4}$ lb. density, fiberglass with vapor barrier jacket with joints overlapped a minimum of two inches. Insulation shall be adhered to duct with non-combustible insulation bonding adhesive applied in 4" strips, 8" on center. All joints shall be secured with flare door staples on 3" centers through all laps over duct tape.

DIVISION 23

SECTION 23 20 00: HVAC PIPING

23 20 00.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all work in this Section.
2. Furnish and install all refrigerant and condensate drain piping as shall be required in order to provide a complete and satisfactory system.

23 20 00.02 PRODUCTS

A. REFRIGERANT PIPING

1. All refrigerant piping shall be Type "K" hard drawn copper of "ACR" tubing with wrought copper sweat fittings. All joints are to be made with hard solder such as "Sil-Fos" or "Silver Solder."
2. All joints in refrigeration pipe work shall be soldered with the use of nitrogen gas. Refrigerant piping shall be tested, evacuated, charged with nitrogen and completely dried before charging with freon.
3. All refrigerant piping underground shall be encased in plastic or PVC conduit.
4. Refrigerant piping shall include best grade brass refrigerant fittings, consisting of expansion valve, solenoid valve, sight glass with moisture indicator, filter dryer, check valves and/or specialties as may be recommended or required by the manufacturer or as shown on the drawings.
5. Refrigerant piping shall be sized based on length and routing shown on the contract documents by the equipment supplier. Diagrams shall be submitted as part of the shop drawing review.

B. DRAIN PIPING

1. All drain lines shall be Type "L" hard drawn copper.

23 20 00.03 EXECUTION

A. PIPE AND PIPE FITTINGS

1. Provide all piping and connections to all items of equipment as shown and/or required to fully complete the system indicated, including drains and other connections. The drawings show the arrangement desired and the Contractor shall follow the drawings as accurately as possible. If conflict should arise, the Contractor shall verify all measurements on the job and cut pipe unless specifically noted for expansion loops. All piping shall be reamed or filed and cleaned to remove burrs and other obstructions.

2. The Contractor shall be responsible for installing all piping work in a neat workmanlike manner. This shall be interpreted to mean that all piping shall be neatly aligned, installed and supported in equally spaced parallel runs using trapeze hangers where applicable, install square, true and plumb with walls, equipment or other related surfaces using standard fittings. Any pipe work installed in a disorderly or unworkmanlike manner as adjudged by the Architect shall be corrected by the Contractor at the Contractor's expense.

B. BLOWING-OUT SYSTEM

1. All piping and equipment shall be thoroughly blown-out under pressure and clean of all foreign matter wasting condensate through temporary connections so long as necessary to thoroughly clean before system is placed in operation. Use every precaution to prevent pipe compound, scale, dirt, welding and other objectionable matter getting into piping system and equipment.

C. HANGERS

1. All piping shall be supported on not less than 10' centers and within 30" of each change of direction except that piping 1-1/4" size and smaller shall be supported on 8'-0" centers.
2. All piping shall be hung by means of split type wrought iron hanger rings similar to Grinnell Figure 104 except as otherwise noted. Copper piping not insulated shall be hung from copper plated hangers similar to Figure CT-97. All insulated piping shall be hung by means of clevis type hangers sized to fit outside of insulation, Grinnell Figure 260.
3. Pipe hangers shall be supported by means of iron hanger rods from the building construction or from structural steel members, and in an approved manner. Where required, piping shall be hung from angle iron slips or suitable brackets attached to sides of masonry construction.
4. All insulated piping shall be provided with insulating protection sheet metal saddles. These shall be 20 gauge galvanized iron. Saddles shall be of a length equal to two times the outside diameter of the insulation and shall extend to above the center line of the pipe.
5. Spring type isolators and wood blocking under insulation jacket shall be provided at large piping subject to vibrations as indicated in the plans and details. Contractor shall provide spring isolator submittal indicating construction, spacing, loading and efficiency.
6. Where piping passes through masonry construction, steel pipe sleeves shall be provided, sized to allow at least 1/2" clearance around pipe or insulation where pipe is insulated. Sleeves shall be flush with finished walls and extend 1/2" above finish floors. A watertight seal shall be provided between floor and sleeve and space between pipe and sleeve shall be caulked with lead wool.

DIVISION 23

SECTION 23 30 00 AIR DISTRIBUTION

23 30 00.01 GENERAL

A. SCOPE

1. Furnish and install all sheet metal work shown or called for including ductwork and connections to fans and equipment.
2. Ductwork shall be provided and installed as shown on the drawings. All details of ductwork are not indicated, and necessary bends, offsets and transformation must be furnished whether shown or not.
3. The provisions of Section 23 05 00 apply to all the work in this Section.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cuts.
2. Certified capacity ratings.
3. Installation instructions.

C. RELATED DOCUMENTS

1. Section 23 07 00 - Insulation.

23 30 00.02 PRODUCTS

A. GENERAL

1. All ductwork, plenums and casings shall be constructed of sheet metal, as herein specified. All sheet metal construction shall conform to the pressure classification shown on the contract drawings, or herein specified and shall be in accordance with the construction and installation details in Chapter 19 of the 2012 ASHRAE Systems and Equipment Handbook or the appropriate SMACNA Standards.
2. Duct sizes on drawings represent gross sheet metal dimensions. Allowance has been made, where applicable, for duct liner.

B. LOW PRESSURE DUCTWORK

1. Low pressure ductwork shall be constructed of zinc coated sheet steel and shall conform to the 2nd Edition of SMACNA HVAC Duct Construction Standards -Metal and Flexible, 1995, as follows:
 - a. Rectangular Duct:
 - 1) 1" w.g. pressure class - Table 1-4.

b. Round Duct:

- 1) 2" w.g. pressure class - Table 3-2A.

C. GENERAL EXHAUST DUCTWORK

1. Unless otherwise noted, all exhaust ductwork shall be constructed the same as specified for low pressure ductwork.

D. EXPOSED DUCTWORK

1. Where round or flat oval ductwork is called for on plans, it shall be prefabricated spiral lock seam conduit with prefabricated fittings as manufactured by United Sheet Metal Co., Inc. or equal.
2. Construction shall be an airtight, outer pressure shell, a 1" insulation layer, and a perforated metal inner liner that completely covers the insulation throughout the system. The outer shell shall be manufactured from galvanized steel meeting ASTM A-517-67.
3. Fittings shall be manufactured to published standards for dimensions and construction details. Installation manuals shall be supplied to the Contractor to provide detailed instructions on methods and procedures for assembly.
4. All seams in the pressure shell of all fittings are to be continuously welded. Galvanized areas that have been damaged by welding shall be coated with corrosion resistant aluminum paint.
5. Inner liners of both duct and fittings are to be adequately supported by metal spacers welded in position to maintain spacing and concentricity.
6. Provide an inner coupling to align the inner lining to maintain good air flow conditions equivalent to standard round high pressure duct joints.
7. Openings shall be factory cut and framed for the grille mounting bracket and the framing shall not have excessive welding that will be noticeable beyond the grille frame.
8. All exposed duct shall be mill phosphatized so as to accept painting by the General Contractor.
9. 90 degrees elbows shall be 5 piece gored elbows.
10. All joints shall be sealed using Benjamin Foster 30-02 sealed between screwed metal seams banded with fiberglass tape.

E. FLEXIBLE DUCTWORK

1. Flexible air duct for connections between low pressure duct to diffusers shall be equal to Thermaflex M-KE. Duct shall be listed by Underwriter's Laboratories under UL 181 standards as Class 1 flexible air duct material and shall comply with NFPA Standards 90A and 90B. Duct shall be rated to operate at pressures up to 6" w.g. for sizes 10" and 4" w.g. for sizes 12" and above. Maximum length of flexible air

duct shall be 6 feet.

2. Duct shall be a factory fabricated assembly composed of a polymeric liner duct bonded permanently to a coated spring steel wire helix and supporting a fiberglass insulating blanket. Outer vapor barrier shall be of fiberglass reinforced film laminate. Connections shall be made with Thermaflex, or equal, duct straps.

F. FIRE DAMPERS

1. Furnish and install, at locations shown on plans, or where required by code, fire dampers constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have 1-1/2 hour fire protection rating. In addition each fire damper shall include a 212°F fusible link, and shall include a UL label in accordance with established UL labeling procedures. Damper manufacturer's literature submitted for approval prior to installation shall include comprehensive performance data developed from testing in accordance with AMCA Standard 500 and shall illustrate pressure drops for all sizes of dampers required at all anticipated airflow rates. Fire dampers shall be equipped for vertical or horizontal installation as required by the location shown. Fire dampers required by the location shown. Fire dampers shall be installed in wall and floor openings utilizing steel sleeves, angles, other materials and practices required to provide an installation equivalent to that utilized by the manufacturer when dampers were tested at UL. Installation shall be in accordance with the damper manufacturer's instructions. Fire dampers shall be style "A", "B" or "C" as required.

G. SMOKE DAMPERS

1. Furnish and install at locations shown on plans, or as described in schedules, smoke dampers meeting or exceeding the following specifications.
2. Each damper shall be classified by Underwriters Laboratories as a Leakage Rated Damper for use in Smoke Control Systems under the September, 1983, or latest version of UL Standard 555S and shall bear a UL label attesting to the same.
3. Damper manufacturer shall have tested and qualified a complete range of damper sizes covering all smoke dampers required by this specification. Leakage ratings shall be comparable with, or better than, that listed herein.
4. Smoke dampers and their operators shall be qualified under UL444A to a minimum elevated temperature of 250 degrees F. Appropriate electric operators shall be installed by the damper manufacturer at time of damper fabrication. Damper shall be equal to Ruskin Model SD50 qualified to Leakage Class 1, or SDRS25 qualified to Leakage Class 1, as required.

H. COMBINATION FIRE/SMOKE DAMPERS

1. Furnish and install at locations shown on plans, or as described in schedules, combination fire smoke dampers meeting or exceeding the following specifications. Frame shall be a minimum of 16 gage (1.52) galvanized steel formed into a structural hat channel shape with tabbed corners for specifications. Frame shall be a minimum of 16 gage (1.52) galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. The blades shall be airfoil shaped double

skin construction with 14 (1.90) gage equivalent thickness. Blade edge seals shall be silicone rubber and galvanized steel mechanically locked in blade edge (adhesive or clip fastened seals not acceptable) and shall withstand 450oF. Jamb seals shall be stainless steel flexible metal compression type. Blade action must be parallel blade or opposed as shown on the schedule.

2. Each combination fire smoke damper shall be 1-1/2 hour fire rated under UL Standard 555, and shall further be classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. Damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this specification. Testing and UL qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be no higher than leakage class 1 (4 cfm/ft. a 1" w.g. and 8 cfm/ft. at 4" w.g. or .02 m3/s/m2 at 249 Pa or .04 m3/s/m2 at 996 Pa). As part of the UL qualification, dampers shall have demonstrated a capacity to operate (to open and close) under HVAC system operating conditions, with pressures of at least 4" w.g. (996 Pa) in the closed position, and 4000 fpm (20.32m/s) air velocity in the open position.
3. In addition to the leakage ratings already specified herein, the combination fire smoke dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250oF, depending upon the actuator. Appropriate electric actuators shall be installed by the damper manufacturer at time of damper fabrication. Damper and actuator shall be supplied as a single entity which meets all applicable UL555 and UL555S qualifications for both dampers and actuators. Manufacturer shall provide factory assembled sleeve of 16" (406) minimum length (contractor to verify requirement). Factory supplied caulked sleeve shall be 20 gage (.91) for dampers through 84" (2134) wide and 18 gage (1.21) above 84" (2134) wide. Damper and actuator assembly shall be factory cycled 10 times to assure operation.
4. Fusible Link. Each combination fire smoke damper shall be equipped with a fusible link which shall melt at (specifier select one) 165oF (74oC) causing damper to close and lock in a closed position.

I. ACCESS DOORS

1. Ventifabrics, Krueger or Duro-Dyne, (Min. 12" x 10" - use 16" x 12" where size permits) insulated doors shall be provided for fire dampers, control dampers, smoke dampers, smoke detectors, and other locations where shown. Door shall be minimum 24 gauge galvanized, double construction with 1" insulation complete collar mounting frame, steel butt hinges, felt gaskets, fasteners and handles. Doors shall be labeled as to function, (fire damper, smoke detector, etc.).

J. TURNING VANES

1. Turning vanes and Deflector Controls, Barber-Colman, Carnes Corporation, Kruger or Titus in length up to 18"; Aero-Dyne Duro-Dyne, or Airsan double thickness about 24" in length, installed in rails.

K. FLEXIBLE CONNECTIONS

1. Flexible duct connections shall be provided where ductwork connects to equipment; ventifabrics or Duro-Dyne 28 ounce minimum waterproof and fire retardant woven

glass fabric double coated with neoprene, approved by UL. Maximum length of flexible connections shall be 10 inches.

L. MANUAL AND MOTOR OPERATED DAMPERS

1. American Warming and Ventilating Company Type DAA-P-50, opposed blade, constructed with 15 gauge steel blades. Manual dampers shall be provided with Ventlock No. 637 hand operated locking quadrants located outside of ducts. Locking quadrants shall be elevated 1-1/2" for insulation. Manual dampers 18" x 10" or smaller may be single blade type construction of 16 gauge galvanized sheet metal. Dampers of Ruskin, Krueger, Louvers and Dampers, or Advanced Air, Inc. will be acceptable.

M. SPLITTER DAMPERS

1. Install where shown and at duct splits; provide with Ventlock No. 690 self-locking device; constructed of 16 gauge galvanized steel with hemmed leading edge and reinforced at hinged side.

N. GRILLES, REGISTERS AND DIFFUSERS

1. Grilles, registers and diffusers shall be of the type, size and design as shown on the drawings and/or as specified below. Grilles within the same room or areas shall be of the same type and style to provide architectural uniformity.
2. Each supply, return and exhaust device shall be of the proper design as indicated to handle quantities of air within the space with maximum diffusion and without objectionable air movement or noise level.
3. Each supply outlet and register shall have a volume damper control operable from the front of the device with removable key. Where indicated on the drawings, all side wall registers shall be equipped with deflectors.

23 30 00.03 EXECUTION

A. DUCTWORK

1. All ductwork shall be provided in a neat workmanlike manner. The ducts shall be properly braced and reinforced. All slip joints shall be made in the direction of flow. All ducts shall be true to the dimension indicated and shall be straight and smooth on the inside with neatly finished airtight joints. The ducts shall be securely anchored into the building construction in an approved manner and shall be completely free from vibration under all conditions of operation. All supply, return fresh-air and exhaust systems shall be completely balanced.
2. No duct transformation shall be of a ratio less than four to one and where possible, shall be of a ratio of six to one. No less than three vertical splitters shall be provided where these ratios cannot be met. No elbow shall have a throat center line radius of less than one and one-half times the duct width at the turn. All turns of less than this amount in rectangular duct shall be provided with duct turning vanes of standard design. Splitters or multi-blade volume dampers, where indicated, shall be provided in all branch.

3. Turning vanes shall be provided at all tees and square elbows. Turning vanes shall be factory fabricated and designed in accordance with the SMACNA or ASHRAE Guide for formed vanes. The first set of turning vanes on the leaving side of fans shall be of the acoustical type to aid in the elimination of unit noise with the exception of room fan coil units.
4. Splitter dampers and volume extractors shall be provided in all low velocity ductwork for proper air distribution. Each damper shall be provided, lubricated bearings at both ends of the shafts, adjustments quadrant, and locking devices and shall be constructed of galvanized iron or steel sheet one gauge heavier than the duct in which they are installed. Access doors shall be located at all splitter dampers.
5. Handholes of not less than 6" x 6" shall be provided at all points where access is required. Manholes of not less than 18" x 24" shall be provided at all points where it is necessary to clean or remove parts of equipment. All access doors and handholes shall be rubber gasketed insulated type with frame and latches.
6. Install access doors at each fire damper, and smoke detector. Label all access doors.
7. All ductwork must be sealed in accordance with Seal Class C as defined in SMACNA HVAC Duct Construction Standards - Metal and Flexible, 1995.

B. DUCT HANGERS AND SUPPORTS

1. Duct hangers and supports shall conform to those shown in Tables 4-1 and 4-2 of SMACNA HVAC Ductwork 1985, 1st Edition.

C. WALL PENETRATIONS

1. Where ducts pass through non-rated walls and is exposed to view the duct shall be finished with suitable metal collar.
2. Where ducts pass through one hour fire walls, provide not less than 1/2" clearance between the duct and combustible material. Seal the clearance space with non-combustible material retained, and the duct secured in place by steel collars of a gauge equivalent to that of the duct and fastened to both the duct and the enclosure.
3. Where fire dampers are shown or required, dampers shall be installed per manufacturer's UL listing.

D. CLEANING DUCT SYSTEMS

1. Before fan systems are put in operation, vacuum clean inside of air units, plenums and apparatus housing. Filters are to be installed before moving air through duct systems.

DIVISION 23

SECTION 23 34 00: FANS

23 23 00.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.
2. Furnish and install fans as required to provide a complete and satisfactory job.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cuts.
2. Certified capacity ratings.
3. Installation instructions.
4. Operating and Maintenance Instructions.

23 23 00.02 PRODUCTS

A. IN-LINE FANS - DIRECT DRIVE

1. Supply or exhaust fans shall be direct driven in-line type. The square fan housing shall be four sides of heavy gauge galvanized steel. One of the sides shall be hinged and shall support the motor and wheel assembly allowing the assembly to swing out for cleaning, inspection, or service without dismantling the unit in any way. The motor shall be isolated from the air stream by a motor enclosure and shall draw cooling air from outside the fan housing.
2. The fan inlet shall be spun venturi throat overlapped by a backward curved centrifugal wheel with spun cone for maximum performance.
3. Fans shall be internally insulated with 1" thick duct liner.
4. Air and sound shall be AMCA licensed.

B. IN-LINE FANS - BELT DRIVE

1. Supply or exhaust fans shall be belt driven in-line type. The square shaped fan housing shall be of heavy gauge galvanized steel. One of the sides shall be hinged and shall support the entire drive assembly and wheel allowing the assembly to swing out for cleaning, inspection, or service without dismantling the unit in any way. The motor shall be mounted on the hinged side exterior isolated from the airstream. The belt and pillow block ball bearings shall be protected from the airstream by an enclosure. The shaft shall be keyed to both the wheel and pulley.
2. The fan inlet shall be a spun venturi throat overlapped by a backward curved centrifugal wheel with spun cone for maximum performance.

3. Fans shall be internally insulated with 1" thick duct liner.
4. Air and sound shall be AMCA licensed.

C. CEILING EXHAUST FAN

1. Type: The fan shall have a forward curved centrifugal wheel.
2. Housing: The fan housing shall be constructed of heavy gauge galvanized steel. The housing interior shall be acoustically lined with 1/2" thick insulation. The discharge outlet shall be adaptable for horizontal or vertical mounting.
3. Motor: The motor shall be mounted on resilient elastic grommets.

23 23 00.03 EXECUTION

A. INSTALLATION

1. Fans shall be installed in accordance with manufacturer's installation instructions.

DIVISION 23

SECTION 23 81 19: VERTICAL SELF CONTAINED HEAT PUMP

23 81 19.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.
2. Furnish and install vertical air to air self-contained heat pumps as required to provide a complete and satisfactory job.
3. Heat pump shall be interior floor mounted or exterior wall hung per the appropriate details on the plans.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

- 1 Manufacturer's Cuts.
- 2 Certified Capacity Ratings.
3. Installation Instructions.
4. Operating and Maintenance Instructions.

23 81 19.02 PRODUCTS

A. GENERAL

1. The Heat Pump Equipment Supplier is responsible for all work under this Section as stated or modified below
2. The Heat Pump Supplier will furnish dimensioned rough-in drawings for electrical, plumbing, and HVAC hook-up within thirty (30) days after Notice to Proceed.
3. Furnish and install a self-contained, vertical heat pump to be manufactured by Bard Manufacturing Company, Inc. The unit shall be approved and listed by Intertek ETL Listed (ETL US/C). Unit shall be factory assembled, pre-charged, pre-wired, tested and ready to operate. Unit performance shall be certified in accordance with the Air Conditioning Heating and Refrigeration Institute (AHRI) Standard 390-2003 for Single Package Vertical Units (SPVU). Unit efficiency shall be specified in terms of EER, IPLV, and COP.
4. Unit shall include 5-year parts warranty covering compressor, and 5-year warranty covering parts, heat exchange coils, ventilation packages, subject to terms and conditions of Bard Limited Warranty agreement. No labor is included in Bard warranty. 5 and 5 warranty shall be provided for all SPVU equipment.
5. Manufacturers: Capacities shall be as indicated on drawings and units shall be manufactured by Bard Manufacturing Company, Inc. or approved equal based on pre-approval of submittal.

B. CONSTRUCTION

1. Unit shall be constructed of 20 gauge pre-painted steel exterior finish. Exterior panels shall be of double wall construction. No screws shall be exposed on the exterior panels. Color options available for selection by Architect:
 - a. Beige – Painted Steel Finish
 - b. Gray – Painted Steel Finish
 - c. White – Painted Steel Finish
2. Front panel shall be hinged and lockable for filter service and access to primary functional electrical controls. Front and side panels shall be easily removable for separation of top and bottom sections. Back of unit shall be painted in neutral color to reduce visibility from outdoors.
3. Exterior panels shall be easily removable, and cabinet shall consist of two modules, easily separated by removing 4 bolts, with fork slots allowing for modules to be separated. One module shall contain complete sealed refrigeration system and one module shall contain the ventilation system. Each module shall pass thru standard door frame, and into standard sized elevator doors without tilting or laying equipment down.
4. No fiberglass insulation shall be exposed to the airstream. Exterior cabinet components shall consist of double wall construction with insulation between panels.
5. Unit shall be suitable for right or left hand corner installation without modification. No clearance is required. All service access shall be thru the front of the unit. Side supply air grilles on air distribution box shall include adjustable opposed dampers to limit airflow in corner installations.

C. COMPRESSORS

1. Units shall use a high efficiency 2-stage scroll compressor for maximum efficiency and reliability. Equipment shall be designed to provide 2 stages of cooling and reverse cycle heating. The compressor shall be covered by a 5-year parts warranty. The refrigeration circuit shall be equipped with factory installed high and low pressure controls, liquid line filter dryer, and discharge muffler.
2. Modulating low ambient control to 20 degrees shall be factory installed.
3. The compressor shall be mounted on double floating isolation mounting system and be fitted with factory installed sound attenuation jacket.
4. The refrigeration control shall be a factory installed TXV. Heating and cooling TXV shall be provided. Refrigerant shall be R-410A.

D. CONDENSATE DRAIN SYSTEM

1. Condensate shall be removed from the unit by connections located in the back of the unit. Both indoor and outdoor coil drain pans shall be constructed of non corrosive materials and shall not allow standing water in the drain pan. A

condensate overflow protection system shall monitor both drain pans and shut down system to prevent condensate overflow. Two condensate drain connections are manifolded together providing for either right or left access. The I-tec does not require a trap. The lower rear portion of the cabinet provides room for P trap if required.

E. FANS

1. The condenser fan motor shall be variable speed ECM, allowing for modulating low ambient control and low sound performance.
2. The indoor blower motor shall be a variable speed (ECM) type to produce the same rated air flow from 0 to .5 inch WC of external static pressure at low sound levels. The motor is to be self adjusting to provide proper rated air flow at high static pressures without user adjustment or wiring changes by the user. The motor shall be programmed for 20-second ramp up and 60-second down rate for quiet, smooth starting and stopping. PSC motor shall not be acceptable. Motor shall automatically adjust to proper blower speed:
 - a. Ventilation, stage 1 cooling or heating operation, stage 2 cooling or heating operation. Submittals shall include rated cfm for high speed, low speed, and ventilation speed.

F. ELECTRICAL COMPONENTS

1. Electrical components are easily accessible for routine inspection and maintenance through front service panels. Circuit breaker is standard on all 208/230 volt models and toggle disconnect standard on all 460 volt models. Circuit breaker/toggle disconnect access is through lockable access panel. Lock and key are provided with each unit. Unit shall have single point entry for line voltage. Electrical component access point shall be located at standard eye level to allow easy serviceability

G. CONTROL CIRCUIT

1. The internal control circuit shall consist of a current limiting 24 VAC type 75 VA transformers with circuit breaker. The defrost circuit shall consist of a solid state electronic heat pump control. A 90-minute timer shall initiate a defrost cycle if the outdoor coil temperature indicates the possibility of an iced condition. The thermistor sensor, speed-up terminal for service, and a ten-minute defrost override shall be all be standard on the electronic heat pump control. To prevent rapid compressor short cycling, a five-minute time delay circuit shall be incorporated into the heat pump control board. A low pressure bypass shall be incorporated into the heat pump control board to prevent nuisance tripping during low temperature start-up.
2. All units with 3-phase power shall include factory mounted phase rotation monitor. This device shall protect scroll compressor from reverse rotation and also protect unit from phase failure. If 3-phase power is incorrectly connected at the field power connections, the phase monitor shall lock out the unit and a red light will illuminate indicating incorrect phase. Also if a power leg is lost, the phase monitor will lockout the unit due to phase imbalance. Once the condition is corrected, turning the power off at the circuit breaker or disconnect will reset the phase monitor.

H. ELECTRIC HEAT

1. The heat pump shall have a factory installed electric resistance heater available that is designed specifically for application in the I-TEC Series heat pump. Heater shall include automatic limit safety controls.

I. VENTILATION

1. Unit shall provide independent control of ventilation air with a dedicated low voltage ventilation terminal connection. Operation of supply air fan shall be required for ventilation operation.

J. FILTER

1. 2" pleated MERV 13

K. DEHUMIDIFICATION CYCLE

1. The dehumidification circuit shall incorporate an independent DX coil in the supply air stream in addition to the standard evaporator coil. This coil shall be mounted in the reheat position, and sized to nominally match the sensible cooling capacity of the evaporator coil. Extended run times in dehumidification mode can be achieved using waste heat from the refrigeration cycle to achieve the reheat process. Models that also have electric heaters installed shall have the electric heat inhibited during dehumidification mode, unless a call for emergency heat is initiated.
2. The dehumidification cycle shall be energized by a rise in relative humidity above set point. The unit shall energize in the cooling mode and also a two position valve will energize, allowing hot refrigerant gas to pass thru the reheat coil, reheating the cold air leaving the evaporator coil. The dehumidification cycle shall have on/off capability. If the thermostat calls for cooling or heating during the dehumidification cycle, the unit shall terminate dehumidification to satisfy the call from the thermostat. A solid state circuit board shall control the dehumidification function. The dehumidification option shall be factory installed only.

L. COILS

1. Evaporator coil shall be constructed of hydrophilic fin stock (green) providing acrylic coating with no bead-up condensate, lower wet coil pressure drop and improved draining and reduced re-entrainment of moisture back into the air stream. Acrylic coating shall also provide antimicrobial properties providing resistance to microbial and fungicidal growth. Coil coating shall meet ASTM D2372-
no growth.
2. Condenser coil shall be constructed of aluminum fin stock and copper tube.

M. CONTROLS

1. CompleteStat THO (Temp. Humidity, Occupancy)
2. CO2 sensor

N. ACCESSORIES

1. Wall sleeve shall be factory supplied and must be constructed of galvanized steel, coated with an epoxy primer and baked-on polyester enamel paint. It shall be designed to withstand a minimum of 1000 hours of salt spray protection when tested per ASTM B117-03 standard. One sleeve size fits all models (select 1 of 3 adjustable depth sleeves: 5.5" to 8.5", 8.0" to 13.5", 13.0" to 23.5"). Sleeve location shall be at least 31" above finished floor and shall be adjustable by +3". Floor base shall be provided to raise height over 34" above finished floor. Wall sleeve shall be continuous from outside wall to rear of unit for weather tight installation.
2. Furnish factory 1" louver designed for condenser air and outside air intake and exhaust. Louver shall be aluminum construction with removable core for service. Access to removable core is by tamper-proof screws. Louver shall have a powder coat finish. See our color chart for color selections.
3. Painted 3-sided assembly to enclose ductwork, piping as required, or to fill space from duct-free plenum boxes to ceiling if desired.

23 81 19.03 EXECUTION

A. INSTALLATION

1. Installation shall be in strict accordance with manufacturer's instructions.
2. Factory Startup shall be provided by the Manufacturer's Certified Service Technician. Written startup log report to be turned into the owner, including Unit Tag, Model and Serial Number.

DIVISION 23

SECTION 23 81 26: SPLIT SYSTEM AIR CONDITIONING UNIT (DUCTLESS)

23 81 26.01: GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.
2. Furnish and install split system air conditioning units required to provide a complete and satisfactory job.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cuts.
2. Certified capacity ratings.
3. Installation instructions.
4. Operating and Maintenance Instructions.

23 81 26.02: PRODUCTS

A. SPLIT SYSTEM A/C UNIT (DUCTLESS)

1. Furnish and install an air cooled condensing unit/direct expansion fan coil combination. The outdoor section shall be factory assembled, having direct drive fans with horizontal air discharge, reciprocating compressor, refrigerant coil fan motor(s) prewired control panel and a holding charge of refrigerant. The indoor fan coil unit shall have horizontal discharge and will include refrigerant coil, fan and motor, condensate pan with drain, thermal expansion valve, prewired control panel and remote thermostat control.
2. Refrigerant coils shall be of nonferrous construction with mechanically bonded, smooth plate fins. All tube joints shall be brazed with phoscopper or silver alloy. Coils shall be pressure tested at the factory.
3. Unit shall be furnished with direct drive, propeller type fans arranged for horizontal discharge. Condenser fan motors shall have inherent protection, and shall be of the permanently lubricated type resiliently mounted for quiet operation. Each fan shall have a safety guard.
4. Evaporator fan section shall have forward curved blade, double inlet fans mounted on a solid shaft. Fan shall be statically and dynamically balanced and shall run on permanently lubricated bearings.
5. Cabinets shall be made of galvanized steel, bonderized and finished with baked enamel.
6. Compressor shall be serviceable hermetic type. It shall be mounted so as to avoid

vibration. It shall be equipped with high and low pressure protection.

7. System Control. The system shall utilize a microprocessor controller with diagnostic capability, located in the indoor unit. Wall mounted remote control with operation indicator lamps to be used for temperature control, airflow selection rate (including automatic airflow rate change according to room temperature), motorized air vane operation, economy operation selection feature, and on/off switching.
8. Room Air Dampers. Indoor unit shall have motorized air vanes which sweep air from front to back of room by modulating the horizontal air vanes in the vertical plane. Air vanes can be set in a fixed position by a switch on the remote control. Horizontal discharge shall be manually adjusted to desired direction by setting vertical vanes located behind the horizontal motorized air vanes.
9. Return Air shall be filtered by means of easily removable, washable filters. The filters shall be accessible without tools or exposure to hazardous electrical or moving parts. Provision shall be made to have a filtered outdoor air duct connection to provide fresh air to the unit.
10. Manufacturer shall have been established in the United States for a period of 5 years and shall have parts and service organizations located not more than 100 miles from the site.

DIVISION 23

SECTION 23 81 43: SPLIT SYSTEM HEAT PUMP

23 81 43.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.
2. Furnish and install split system heat pump required to provide a complete and satisfactory job.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cuts.
2. Certified capacity ratings.
3. Installation instructions.
4. Operating and Maintenance Instructions.

23 81 43.02 PRODUCTS

A. SPLIT SYSTEM HEAT PUMP

1. Furnish and install an air-to-air electric heat pump (outdoor unit) in combination with a direct expansion fan-coil heat pump (indoor unit) in the location and manner shown on the plans.
2. Coils shall be constructed with aluminum plate fins mechanically bonded to non-ferrous tubing with all joints brazed.
3. Outdoor unit shall contain hermetically sealed compressor with automatically reversible oil pump, internal and external motor protection. Outdoor fan shall be propeller type, arranged for vertical discharge, and direct driven by a factory lubricated motor.
4. Indoor unit shall operate properly in either vertical upflow or horizontal position with or without ductwork. Unit may be installed vertically or horizontally with electric resistance heater and shall contain refrigerant metering device and indoor fan relay. Fan shall be centrifugal type, direct driven.
5. Controls and protective devices shall include a high pressurestat, 2 low pressurestats, crankcase heater, suction line accumulator and pressure relief device. Motor compressor shall have both thermal and current sensitive overload devices. Outdoor unit wiring shall incorporate a positive acting timer to prevent compressor short cycling if power is interrupted. Device shall prevent compressor from restarting for a five minute period. An automatic defrost control shall be included to accomplish defrosting (only if required) every 90 minutes for a period of not more than 10 minutes. A 24 volt transformer shall be factory installed and wired on

outdoor units for external control circuit.

23 81 43.03 EXECUTION

A. INSTALLATION

1. Fan coil and heat pump shall be installed in accordance with the manufacturer's recommendations.
2. Fan coil and heat pump shall be installed in fully accessible locations.

DIVISION 26

SECTION 26 00 00: ELECTRICAL GENERAL REQUIREMENTS

26 00 00.01: GENERAL

A. SCOPE

1. General Conditions of the contract, special conditions and instructions to bidders contained herein are a part of these specifications.
2. This contractor shall furnish all labor, materials and equipment and perform all operations necessary for installation of complete electrical work within the intent of, and as indicated on the drawings, and as herein specified.
3. All roof penetrations shall be by the General Contractor. The Electrical Contractor shall coordinate all roof penetrations with the General Contractor.

B. CONTRACT DOCUMENTS

1. The contract drawings are diagrammatic and are not intended to indicate every detail of construction or every item of material or equipment required.
2. Contractor shall maintain on the job site one complete set of contract documents of all trades, and shall coordinate with other trades so as to avoid conflicts.
3. Indicated locations of outlets, equipment connections, etc., are approximate and shall be verified by reference to related documents (i.e., Architectural casework drawings, equipment shop drawings, lab casework drawings, etc.).
4. If there are any conflicts between the Contract Documents, and applicable codes, the applicable codes shall take priority, and Contractor shall notify Engineer immediately of conflict.

C. RECORD DRAWINGS

1. During construction of this project, contractor shall maintain one complete set of electrical contract drawings on which shall be recorded all significant changes in equipment locations, circuit assignments, etc. This set of drawings shall be used to prepare as-built drawings to be submitted to the Owner upon completion.
2. Upon completion of the project, contractor shall prepare operation and maintenance manuals for all electrical equipment. It shall include catalog data, equipment information, wiring diagrams, warranty information, etc., for the electrical installation. Submit five copies to the Architect/Engineer for approval and presentation to the Owner.

D. REGULATIONS AND COMPLIANCE

1. Latest editions of National Electrical Code, Gates County Schools Requirements & Guidelines, state codes, or ordinances, including ASHRA 90.1 Building Code, govern this work. All their requirements shall be satisfied.

2. This contractor shall secure and pay for all permits, fees, inspections and licenses required (see the General Conditions). Upon completion of the job, he shall present to the Architect/Engineer a certificate of inspection and approval from inspection authorities.

E. TEST AND GUARANTEE

1. Upon completion of work, contractor shall demonstrate installation and make such tests as may be required to satisfy the Architect/Engineer and the Owner that work is installed in accordance with drawings, specifications and instructions.
2. Contractor shall guarantee the work is done in accordance with drawings and specifications and is free of imperfect materials and defective workmanship. Anything unsatisfactory shall be corrected immediately and at contractor's expense.
3. For a period of one year after acceptance, contractor shall replace, without any expense to the Owner, any imperfect materials or defective workmanship.

26 00 00.02: PRODUCTS

A. GENERAL

1. All materials, devices, appliances, and equipment shall be new, label listed by an approved third party testing agency approved by this state, and provided with manufacturer's label or nameplate giving complete electrical data.
2. Where a manufacturer's catalog number is used, all parts shall be furnished to make it complete and fit the construction intended.
3. Materials shall be the make and number given in these specifications or shown on drawings or approved equivalent. If contractor wishes to furnish another make or number, he shall furnish complete, detailed data and obtain approval of it in writing from the Architect/Engineer.
4. Complete adequate housing shall be provided on the site for orderly and careful storage of all materials and equipment.

B. SUBMITTALS, ETC.

1. Within twenty days after award of contract, contractor shall submit to Architect/Engineer a complete list in triplicate of all materials he proposes to use. List shall show a single manufacturer for each item. List shall include not only major materials and equipment, but also such items as conduit fittings, bushings, ground clamps, anchors, outlet boxes, gutters, terminal cabinets, wire-pulling compound, splice connections, tape, wire markers, fuses, lamps, etc.
2. Submit cuts of any descriptive materials requested, in six copies.

26 00 00.03: EXECUTION

A. EXCAVATION

1. Required excavation for installation of all electrical work shall be provided by the Electrical Contractor.

B. CUTTING, PATCHING, ETC.

1. Contractor shall place his own sleeves and advise other trades of required chases and openings so they can be properly built-in. Where any raceways, supports, etc., installed under this contract pierce the roof, suitable pitch pockets shall be provided and coordinated with the roofing contractor as necessary to be acceptable to the Architect. Provide suitable fittings where any raceways or equipment cross expansion joints. Expansion fittings shall be complete with grounding type bond fittings.
2. Permitted cutting or patching necessary to the electrical installation shall be done by this contractor. Structural members shall not be cut except by written permission of Architect/Engineer.

C. CLEANING, ETC.

1. Contractor shall properly protect his work against damage by weather or other trades. All work shall be left well cleaned, and damaged finishes shall be restored to original conditions.
2. Contractor shall keep premises free of debris resulting from this work.

D. PAINTING, FINISHING

1. Suitable finishes shall be provided on all items of electrical equipment, conduit, etc., which are exposed. This shall consist of either an acceptable finish as manufactured and supplied to the job or application of suitable finishes after installation.
2. Where installed in finished areas, exposed equipment, raceways, etc. (e.g. panel covers, wiremold, etc.), shall be supplied with prime coat and shall be professionally painted or enameled as directed to match or blend with adjacent surfaces.
3. In unfinished areas, such as equipment rooms, etc., exposed equipment shall be furnished with suitable factory applied finishes. (i.e., standard gray enamel finish for panelboards, etc.).
4. Equipment furnished in finishes such as stainless steel, brushed aluminum, etc., shall not be painted.
5. All finishing shall be as directed by and shall be satisfactory to the Architect/Engineer.

E. EQUIPMENT LABELS

1. Label all receptacles and light switches with feeder/branch circuit panelboard name and circuit number. Use dyno-type labeling. Black background with white letters. Labels to be installed under cover plates of receptacles and switches.
2. Suitable labels shall be provided for the identification of major items of electrical equipment including switchboards, panelboards, motor starters, safety switches, transformers, enclosed circuit breakers, etc. Label shall indicate Name, Voltage, # Phases, # Wires, and feeder origination. Labels to be engraved, laminated, phenolic nameplates. Black background with white letters. For example:

1LA 120/208V
3-phase, 4-wire
Fed from MSB

- a. Engraving shall be of professional quality, with block style letters, minimum 1/2" high.
- b. Nameplates shall be attached with 2 cadmium plated screws. Nameplates shall under no conditions be attached with epoxy glue or double stick tape.

END OF SECTION 26 00 00

DIVISION 26

SECTION 26 00 10: ELECTRICAL TESTING

26 00 10.01: GENERAL

A. SCOPE

1. Furnish all required testing as herein specified along with all required equipment, consumables, wires, men, tools, etc.

26 00 10.02: PRODUCTS

A. FEEDER INSULATION RESISTANCE TEST

1. All current-carrying phase conductors and neutrals shall be tested as installed and before connections are made for insulation resistance and accidental grounds. This shall be done with a 500-volt high type megger.
2. Minimum readings shall be one million (1,000,000) or more Ohms for #6 wire and smaller; 250,000 Ohms or more for #4 wire or larger between conductors and the grounded metal raceway.
3. After all fixtures, devices, and equipment are installed and all connections completed to each panel, disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded can. If this reading is less than 250,000 Ohms, disconnect the branch circuit (or sub-feeder) neutral wires from this neutral bar. Test each one separately to the panel can until the low reading ones are found. Correct troubles, reconnect and retest until at least 250,000 Ohms from the neutral bar to the grounded panel can is achieved with only the neutral feeder disconnected.
4. Send a letter to the Engineer certifying that the above has been done and tabulating the megger readings for each new panel. This shall be done at least four days before final review is called for.

B. GROUND SYSTEM TESTS

1. Testing of the new ground system shall consist of the following:
 - a. Visual inspection of all connections.
 - b. Full Potential Test per IEEE Standard #81, Section 9.04 and NETA test Specification Section 7.16.
 - c. All ground reading shall be 5 Ohms or less. If readings are above 5 Ohms, notify the Engineer prior to additional work being performed.

C. CIRCUIT BREAKER TESTS

1. Perform the following tests on the new circuit breakers which have adjustable trips, and tabulate all readings. Testing shall be performed by a qualified factory technician:

- a. Phase tripping tolerance (within 20% of UL requirements).
- b. Trip time (in seconds) per phase.
- c. Instantaneous trip (amps) per phase.
- d. Insulation resistance (mega-ohms) at 100V: Phase to Phase and Line to Load.

D. NEUTRAL-TO-GROUND ISOLATION TEST

1. Perform a neutral-to-ground isolation test to verify that all neutral and ground bus are isolated in all panels except the main service equipment and at separately derived systems.

26 00 10.03: EXECUTION

A. DOCUMENTATION

1. All tests specified shall be completely documented indicating time of day, date, temperature, and all pertinent test information.
2. At final review, upon request, the contractor shall furnish a megger and show the Engineer's Representative that the panels comply with the above requirements. He shall also furnish a hook on type ammeter and a voltmeter and take current and voltage readings as directed by the Engineer.

END OF SECTION 26 00 10

DIVISION 26

SECTION 26 00 20: EQUIPMENT CONNECTIONS

26 00 20.01: GENERAL

A. SCOPE

1. Electrical Contractor shall connect and/or provide final connections to all mechanical, plumbing, kitchen and owner provided.
2. Electrical Contractor shall coordinate all connections prior to rough-in using approved catalog cut sheets and shop drawings. Any adjustments to feeder, breaker, fuse and/ or disconnect sizes, due to a lack of coordination, shall be done at the contractor's expense.

B. ELECTRICAL/MECHANICAL COORDINATION

1. The Electrical Contractor shall provide and install all manual motor starter switches, disconnect switches, receptacles, etc., to mechanical, plumbing, owner provided and lab equipment indicated on drawings.
2. Electrical Contractor shall provide final connections to all mechanical, plumbing, kitchen, lab and owner provided equipment as required.
3. All disconnect switches and fuse sizes shall be coordinated with shop drawings prior to installing. Any equipment installed incorrectly because of lack of coordination will be removed and installed correctly at Electrical Contractor's expense.
4. Electrical Contractor shall install all starters provided by other trades.

26 00 20.02: PRODUCTS

A. GENERAL

1. Provide all required receptacles and disconnect switches for equipment as required. Refer to other Sections of the Electrical Specifications for types to be used.
2. Provide all cords, plugs and cables on equipment requiring such items.

26 00 20.03: GENERAL

A. GENERAL

1. All connections shall be torque-tightened to manufacturers' instructions and recommendations.
2. Utilize all approved wiring diagrams, if any, when making connections.
3. Installation of all equipment and connections shall comply with N.E.C. requirements and manufacturers' recommendations.

END OF SECTION 26 00 20

DIVISION 26

SECTION 26 04 10: CABLE TRAY

26 04 10.01: GENERAL

A. SCOPE

1. Provide and install as directed on the electrical drawings and as herein specified a complete cable tray system including, but not limited to, cable tray, fittings, splices, mounting hardware and all incidental equipment required.

26 04 10.02: PRODUCTS

A. CABLE TRAY

1. The cable tray shall be 12" wide, 4" deep wire basket type. See 270000 and 280000 series specification for additional requirements.
2. Provide all splices, couplings, connectors as required for a complete installation.

26 04 10.03: INSTALLATION

A. EXECUTION

1. Install length of cable tray as shown on electrical drawings.
2. Support cable tray from 1/4" threaded steel rods or as recommended by manufacturer.
3. Support cable tray from structure only. Do not hang from ceiling system, duct work, conduit, etc.
4. Do not support ductwork, light fixtures, ceiling systems, conduit, etc., from cable tray.

END OF SECTION 26 04 10

DIVISION 26

SECTION 26 05 19: CONDUCTORS

26 05 19.01: GENERAL

A. SCOPE

1. Furnish and install a complete system of wiring and cable as shown, specified and required.

26 05 19.02: PRODUCTS

A. MATERIALS

1. Conductors shall be as manufactured by Pirrelli, Colonial, Triangle, Southwire or approved equivalent.
2. Normal trade standard "Building Wire" shall be copper, type THHN/THWN. All wire to be used shall be new manufactured within the last 6 months.
3. All conductors shall be stranded.
4. Each conductor shall bear easily readable markings along entire length, indicating size and insulation type. Dates of manufacturer shall be submitted to Architect/Engineer upon request.
5. Insulation on phase conductors #8 AWG and smaller shall be suitably colored in manufacturing.
6. Insulation on service and feeder conductors shall be 600 volt type THHN/THWN, unless code requires a different type.
7. Branch circuit conductors shall be minimum #12 AWG, with 600 volt type THHN/THWN insulation, unless code requires a different type.
8. Conductors in any location subject to abnormal temperature shall be furnished with an insulation type suitable for temperature encountered.
9. Where no indication is made of wire size (including that noted in panel schedules), the conductor shall be of N.E.C. size to match its over current protective device or equipment nameplate, whichever is larger, but in no case smaller than #12 AWG unless specifically called for.
10. Control and signal conductors shall be type and size indicated in those sections of the specifications.
11. Type AC, NM and MC cables shall not be used.
12. The use of aluminum conductors is prohibited.

26 05 19.03: EXECUTION

A. INSTALLATION

1. Joints in conductors #10 AWG and smaller shall be made with approved twist-on type connectors and manufactured by T & B, Ideal, or approved equivalent.
2. Joints in conductors #8 AWG and larger shall be made with mechanical pressure type connectors or lugs.
3. Circuit joints may not be made up on terminal screws of wiring devices. Make circuit joints as above, and connect single leads to device terminals.
4. Conductors shall be labeled within all junction boxes, etc., using plastic "punch" tape, identifying the conductors according to circuit numbers.
5. Where connected under screw or bolt heads, stranded wire shall be fitted with a lug of proper size. Make solid conductor loops clockwise so as to be forced closed as screw is tightened. Only one solid wire loop may be held with a single screw.
6. Make all connections tight. Torque-tighten all connections to lugs per manufacturer's and UL requirements.
7. Wires within panelboards, terminal cabinets, and similar equipment shall be neatly squared and "bunched" together and loosely held so with plastic ties at several places.
8. Where paralleling of conductors is shown for feeders or service entrance, it is absolutely required they be exactly the same length between points of bonding together.
9. Each 120 volt circuit shall have its own full-sized neutral with no sharing of neutrals.
10. Show location of all exterior underground power circuit wiring on Record Drawings.
11. All Communications and Low-Voltage Systems cabling shall be plenum rated. Non plenum rated cabling is acceptable only for Fire Alarm Cabling installed entirely in conduit.
12. Every feeder and branch circuit shall have a green equipment grounding conductor sized in compliance with N.E.C.

B. COLOR CODING

1. All wiring shall be color coded.
2. On 120/208V, 3 Phase, 4 Wire power system, conductors shall be color coded black (Phase A), red (Phase B), blue (Phase C) and white (Neutral). On 277/480V, 3 Phase, 4 Wire Systems, conductors shall be color coded brown (Phase A), orange (Phase B), yellow (Phase C), and gray (Neutral).
3. Ground conductors on all systems shall be green.

4. Phase conductors #4 AWG and larger may be identified with two or more bands of proper color plastic tape applied near each termination. Painting of wire will not be acceptable.
5. Neutral conductors #6 AWG and smaller shall have white or gray insulation along entire length of conductor. Neutral conductors larger than #6 AWG may be identified with two or more bands of proper color plastic tape applied near each termination. Painting of wire will not be acceptable.
6. Unless noted otherwise, or another arrangement is approved by the Engineer, busses in panels and switch gear shall be considered "A", "B", and "C" from left to right, top to bottom or front to back when facing equipment.
7. Control and signal wiring shall not use the above named colors except green for grounding. Any other colors or striping may be used but the coding shall provide same color or striping between any two terminals being joined.
8. "Travelers" in switching circuits shall be of same color as phase conductors serving the circuits.

C. WIRING METHOD FOR BRANCH CIRCUITS

1. Unless shown differently, three-phase circuits shall be limited to one circuit per raceway (three different phase wires and a neutral if needed). Although not prohibited by the NEC conductors serving two separate power system (i.e., 208/120 Volts and 277/480 Volts) shall not be mixed in the same raceway, pull box or junction box. Exception is where control wiring is a different voltage than the power.
2. In "3 wire" and "4 wire" branch circuits, a neutral shall be provided for each phase conductor. The neutral carrying all or any part of the current of any specific load or run shall be contained in the same raceway or enclosure with the phase wire or wires also carrying that current. No split neutrals permitted.
3. Circuits shall be connected to panels as shown in the panel schedules.
4. Conductors feeding lighting outlets shall not be combined in the same raceway with conduit feeding convenience receptacles. Lighting outlets and convenience receptacles shall not be put on the same circuit unless specifically indicated.

END OF SECTION 26 05 19

DIVISION 26

SECTION 26 05 26: GROUNDING AND BONDING

26 05 26.01: GENERAL

A. SCOPE

1. Ground and bonding of the electrical system shall be provided in accordance with requirements of the National Electrical Code and the requirements of these specifications and the drawings.
2. The contractor shall note that not all required grounding conductors are specifically noted on the drawings or in the schedules or specifications.

26 05 26.02: PRODUCTS

A. GROUNDING CLAMPS, BUSHINGS, ETC.

1. Materials shall be as manufactured by T & B or approved equal.
2. Clamps for attachment of grounding conductors to water pipes, etc., shall be of bronze or brass, with conduit hub with insulated bonding bushings and compression type LUGS.

B. GROUNDING CONDUCTORS

1. Grounding conductors shall be sized in accordance with the requirements of the NEC, or as noted on the drawings or specified herein.
2. Grounding conductors shall be of copper. Insulation as required by NEC or as noted or specified. Otherwise, bare conductors will be acceptable.

C. MADE ELECTRODES

1. Provide "made" grounding electrodes in accordance with NEC Article 250H and as detailed on the drawings.
2. Driven grounding electrodes shall consist of copper clad steel rods not less than 10 feet in length and 3/4 inch in diameter.

26 05 26.03: EXECUTION

A. GENERAL INSTALLATION

1. All systems and equipment shall be grounded in accordance with NEC Article 250H.
2. All grounding conductors shall be contained within raceway, unless specifically noted otherwise.

B. SERVICE GROUNDING

1. Where available on the premises, bond together the following:
 - a. Metal water pipe.
 - b. Building metal frame.
2. Where required by NEC Article 250, and as shown on drawings, provide "made" grounding electrodes to supplement the above. Bond together all available and made electrodes.
3. Service ground clamps shall be attached to cold water main at an accessible point and before its size is reduced. Clamp shall be accessible after construction is complete. Grounding conductors shall be without splice into the service enclosure where it shall be connected to main service ground buss, and interconnected with system neutral.

C. EQUIPMENT GROUNDING, ETC.

1. Ground all fixed and portable appliances and equipment connected under this contract with a green grounding conductor. This wire shall be carried inside the raceway and flex from equipment to nearest grounding portion of raceway system. Connect at both ends with suitable lugs.
2. Each grounding type receptacle shall be grounded. Grounding may be through the grounding yoke.
3. Any feeder raceway anywhere in the system which enters a box or cabinet through part of a concentric knockout shall be fitted with a bonding bushing and jumper. The jumper shall be sized by NEC Table 250-94 and be lugged to the box.

D. TRANSFORMER SECONDARY GROUNDING

1. Equipment on the secondary side of transformers shall be considered "service" and be bonded and separately grounded directly to the main service ground bus or electrode. Grounding conductor may be run in feeder raceways back to main service enclosure.
2. In addition, transformer secondaries shall be provided with a local grounding electrode consisting of a clamp on a local 3/4" (minimum) copper cold water pipe or a grounded steel structural member. Grounding conductor shall be sized as shown on plans.
3. All grounding system tests shall be fully documented as to time of day, weather condition, ground moisture, "megger" readings, etc. Submit report in writing to the Engineer/Architect.

END OF SECTION 26 05 26

DIVISION 26

SECTION 26 05 33: RACEWAYS AND FITTINGS

26 05 33.01: GENERAL

A. SCOPE

1. Provide a complete system of raceways for the installation of wiring as indicated on the drawings, as herein specified and as required by applicable codes.
2. All wiring shall be installed in raceways unless specifically noted otherwise. Multiple outlet raceways shall utilize 1 ¼" knockouts. An example is the telecom raceway serving the wiremold 4000 series wireways.
3. All work includes furnishing and installing fire and smoke barrier penetration seals for openings in floors, walls and other elements of construction.

26 05 33.02: PRODUCTS

A. MANUFACTURERS

1. Metal raceway system components shall be as manufactured by G.E., Kaiser, Republic, T & B or other approved manufacturers.
2. Non-metallic raceway system components shall be as manufactured by Carlon, Queen City Plastics, Georgia Pipe, Southern Pipe, or other approved manufacturers.

B. CONDUITS

1. Raceways shall be of metal except as specifically noted or where non-metallic raceway is permitted by these specifications. **All conduit within the footprint of the building shall be run overhead.** Grounding conductors shall be provided in all raceways.
2. Use heavy wall rigid metal conduit (RMC) for any metal conduit run underground or in poured concrete.
3. Use electrical metallic tubing (EMT) for most other general applications.
4. Use flexible metal conduit for appropriate applications. Use galvanized type for dry locations and liquid-tight type for wet locations or as noted. Flexible conduit shall be minimum 1/2" diameter. Liquid-tight flexible metal conduit shall be used for final connection to all motors, transformers and other rotating or vibrating equipment. Flexible metal conduit shall be used for final connection to fluorescent lighting fixtures mounted in or on suspended ceilings and similar applications.
5. Non-metallic raceway shall be minimum Schedule 40 PVC. Non-metallic raceway will only be permitted for use underground or in poured concrete outside the footprint of the building, provided all 90 degree Ells, and Ells up out of the floor are heavy wall rigid metal conduit. Non-metallic raceways will not be permitted for any exposed work or for raceways in ceiling spaces or for raceway in stud walls. Non-

metallic raceway used for outdoor underground branch circuits and low voltage wiring shall be buried a minimum of 36" below grade.

6. Raceways exposed in finished spaces shall be of an appropriate "panduit" type surface raceway or approved equivalent and white finish. Any raceway with power wiring and low voltage cabling shall be Panduit Twin 70. All low voltage outlets shall be angled down.
7. Minimum metal conduit size shall be $\frac{3}{4}$ " for homeruns and $\frac{1}{2}$ " for all other power circuit installations (interior) and 1" (exterior) for premises wiring system.
8. Schedule 40 PVC conduit encased in a minimum of 3" of concrete on all sides shall be used for any service entrance, feeder.
9. Size raceways for signal and communication cable based on 40% fill. Minimum conduit size for Telephone, Data, CATV and Fire Alarm systems shall be $\frac{3}{4}$ ". Minimum conduit size for under slab conduit shall be 1" unless otherwise noted. All conduits shall have pull strings.
10. Panduit surface non-metallic raceway shall be used on existing walls. See 270000 and 280000 series sections for additional requirements.
11. Rigid Metal Conduit (RMC) or Intermediate Metal Conduit (IMC) shall be used outdoors for all feeders, above ground branch circuits and above ground low voltage/communications wiring.

C. COUPLINGS, CONNECTIONS, ETC.

1. EMT couplings and connectors shall be compression gland type or set screw type of zinc coated steel or malleable iron. Connectors shall be insulated throat type. Indenter type are not permitted.
2. Flexible conduit connectors shall be T & B "Tite-Bite" type or approved equivalent, by Raco, Steel City or Appleton, with insulated throats and "Anti-short" bushings.
3. "Split" or "Erickson" couplings shall be manufactured by O.Z. Gedney or approved equivalent by Raco, Steel City or Appleton.
4. Expansion couplings shall be manufactured by O.Z. Gedney or approved equivalent by Raco, Steel City or Appleton.
5. Conduit shall be securely fastened to all sheet metal enclosures with double galvanized locknuts and insulated bushing, care being taken to see that the full number of threads project through to permit the bushings to be drawn tight against the end of conduit, after which the locknuts shall be made sufficiently tight to insure positive ground continuity between conduit and box.

D. PENETRATION SEALS

1. Performance: Materials shall have been tested to provide fire rating equal to that of the construction in which materials will be installed.

2. Deliver materials undamaged in manufacturers clearly labeled, unopened containers, identified with brand, type, grade and UL label, where applicable.
3. Subject to compliance with requirement, provide products of one of the following manufacturers as further defined in the Systems and Application Schedule in Part 2.5 of this section.
4. Provide materials classified by UL to provide fire stopping equivalent to time rating of construction being penetrated.
5. Provide asbestos free materials that comply with applicable codes and have been tested under positive pressure in accordance with UL 1479 or ASTM E 814.

E. PENETRATION SYSTEMS AND APPLICATION SCHEDULE

1. All holes or voids created to extend electrical systems through fire rated floors and walls shall be sealed by the electrical contractor with an intumescent material capable of expanding up to 10 times when exposed to temperatures beginning at 250 degrees F. It shall be UL Classified and have I.C.B.O., B.O.C.A.I. and S.B.C.C.I. (NEAR 243) approved rating to 4 hours per ASTM E-814 (UL 1479).
2. Acceptable Material: 3M Fire Barrier Caulk, Wrap/Strip, Moldable Putty, and Sheet forms. Approved equivalent materials by Hilti or Tremco, Inc. are also acceptable.
3. U.L. Schedule:

CONSTRUCTION

UL DESIGNATION

1. Metal pipe and conduit through round opening.....	49, 95, 138, 202, 319, 321
2. Metal pipe or conduits through large opening.....	49,63,93,94,137,233,234,319,321
3. Busway through rectangular opening.....	97,99
4. Cables through opening.....	33,65,140,201,320
5. Cable tray.....	66,105,139
6. Blank opening.....	61,62,92,102,104,136,318,318,J900B,J900C,U900C,U900J,J900L
7. Non-metallic (plastic) pipe or conduit through opening.....	64
8. Metal pipe or conduit through gypsum board wall.....	147,322
9. Non-metallic (plastic) pipe or conduit through gypsum board wall.....	148
10. Cables through gypsum board wall.....	149
11. Metal pipe on conduit through wood construction.....	159,169
12. Non-metallic (plastic) pipe or conduit through wood construction.....	160,167
13. Cables through wood construction.....	168

26 05 33.03: EXECUTION

A. INSTALLATION

1. Heavy wall and intermediate metal conduit shall be made up with full threads to which a conductive pipe compound (T & B Kopr-Shield or equivalent) has been applied and butted in couplings.
2. Underground runs shall have minimum of 24" cover, (underground PVC shall have a minimum depth of 36") filled and tamped in 6" layers. An 8" wide, yellow warning

tape reading "Danger Electrical Conduits" shall be provided for each underground conduit run and shall be buried a maximum of 6" below finished grade entire length of conduit run. Additionally, all underground non-metallic conduit shall be marked with metallic tracing tape adhered directly to the conduit for the entire length of run.

3. Support conduits with approved straps or hangers within two feet of each termination and as required by the National Electrical Code.
4. All raceways shall be concealed unless specifically shown or approved otherwise.
5. Make all cuts square. Remove any burrs by reaming.
6. EMT shall be attached to boxes or enclosures with approved couplings only.
7. RMC and IMC shall be attached to boxes or enclosures with double locknuts (one inside and one outside) and insulating bushing.
8. All raceways, both exposed and concealed, shall be run at right angles, both parallel or perpendicular to building lines. All exposed raceways shall be painted to match surrounding finishes.
9. Install penetration seal materials in accordance with printed instructions of the UL fire Resistance Directory and in accordance with manufacturer's instruction.
10. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
11. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor.
12. All conduit/sleeve penetrations through rated or un-rated walls shall be fire-stopped. If wall is rated, fire-stopping shall be as defined above. If wall is un-rated, fire-stopping shall provide minimum of 1-hour rating.
13. Keep areas of work accessible until inspection by applicable code authorities.
14. PVC runs that stub-up in pad-mounted equipment may utilize PVC elbows vertically. Termination fittings with plastic bushings shall be installed in ends of conduit stub-ups.
15. PVC runs that turn up inside walls should transition to EMT no greater than 18" above the slab, on grade.
16. All conduit turning up thru slab in exposed areas shall be rigid steel.

B. SLEEVES AND PENETRATIONS

1. Electrical Contractor shall provide sleeves and openings for raceways penetrating exterior wall, interior walls and partitions, floors and roofs. Provisions for all such penetrations shall be as approved by the Architect/Engineer.

2. For any raceway passing through an exterior wall, above or below grade, provide appropriate sleeve and water-proofing. Fill space between conduit and sleeve with appropriate compound (e.g. lead and oakum) and then apply caulking compound - Thiocaulk or approved equivalent - flush with finished surfaces.
3. For raceways penetrating interior walls or partitions (except as in Item D. below, provide steel pipe or galvanized sheet metal sleeves, cut off flush with the wall on both sides of the partition.
4. For raceways penetrating floor slabs, smoke partitions, and other fire-rated walls, provide steel pipe sleeves and seal with high temperature non-shrink grout or other material as approved by the Architect/Engineer. Sealing compound used shall provide same fire rating as barrier being penetrated. (See schedule in Section 2.5).
5. Conduits penetrating roof surfaces for purpose of connecting to mechanical equipment (e.g. rooftop HVAC units, exhaust fans, etc.) shall utilize opening, curbs, etc., provided for the equipment where possible.
6. For raceway penetrations through roof (except as described in item E. above), contractor shall provide appropriate prefabricated roof curb assembly - "Pipe Portal System" as manufactured by Roof Products & Systems Corp., Addison, Illinois, or equivalent method as approved by Architect/Engineer and roofing Subcontractor.
7. After service entrance conduits have been installed, wire pulled, megger tested and accepted, seal using UL listed and approved duct seal.

END OF SECTION 26 05 33

DIVISION 26

SECTION 26 05 34: OUTLET AND JUNCTION BOXES

26 05 34.01: GENERAL

A. SCOPE

1. Provide and install outlet boxes, junction boxes, etc., as required for installation of electrical work, as shown, specified and required.

26 05 34.02: PRODUCTS

A. MATERIALS

1. Unless specifically noted or approved otherwise, boxes shall be of metal (steel or aluminum) as manufactured by Steel City, T & B, Racor, Appleton or approved equivalent.
2. Size all boxes in accordance with applicable NEC articles (e.g. 312, 314, 376, 378 etc.). Minimum size junction box shall be 4" square X 2-1/8" deep.
3. Device boxes shall be section type of 4" square, equipped with plaster rings as required to mount devices.
4. Where appropriate, use masonry boxes as manufactured by Racor, Steel City, T&B, Appleton, or approved equivalent.

26 05 34.03: EXECUTION

A. INSTALLATION

1. Set all boxes with edges flush with finished surface.
2. Immediately after installation, cover raceways and boxes to prevent entrance of foreign matter, paint, etc.
3. Contractor shall coordinate with other trades, and shall study the Architectural and laboratory plan drawings, Casework Drawings, etc., to determine proper placement and mounting heights of all devices.
4. Where not shown or required otherwise, the following "standard" mounting heights and positions shall apply:
 - a. Switch boxes 48" from finished floor to center. Boxes beside doors shall be mounted so edge of trim plate is 2" from edge of door trim on strike side.
 - b. Panelboard enclosures 6'-4" maximum from finished floor to top circuit breaker.
 - c. Fire alarm pull stations 48" from finished floor to bottom of device.

- d. Fire alarm signal devices 86" to center of strobe device - or 6" below ceiling to top of strobe device, whichever is lower.
 - e. Receptacle boxes 18" from finished floor to center, mounted vertically.
 - f. When multiple switch/fire alarm pull stations are mounted side-by-side on same wall, all devices shall be mounted at the same height (does not include receptacle/telephone).
5. Where receptacles, telephone outlets, etc., occur over counter tops, etc., install box so that device is centered 4" above counter or backsplash, or higher if required to coincide with blockwork coursing. Carefully coordinate so that trim plates are completely clear of backsplashes, etc.
6. There shall be no more than one box extension permitted.

END OF SECTION 26 05 34

DIVISION 26

SECTION 26 22 00: DRY TYPE TRANSFORMERS

26 22 00.01: GENERAL

A. SCOPE

1. Transformers shall be as manufactured by Square D (Sorgel), General Electric, or Westinghouse.
2. Transformers specified are those of Sorgel, and the standard construction features of those units shall be considered as minimum requirements, with additional requirements as may be specified herein or noted on the drawings.

26 22 00.02: PRODUCTS

A. RATINGS

1. KVA rating as shown on the drawings.
2. Voltage ratings as indicated on the drawings, unless otherwise indicated, transformer primary voltage shall be 480V, 3 Phase, "Delta", and secondary voltage shall be 120/208V, 3 Phase, 4 Wire "WYE".
3. For transformers 15 KVA or less, furnish four (4) voltage adjustment taps, two 2-1/2% FCAN, and two 2-1/2% FCBN.
4. For transformers above 15 KVA, furnish six (6) voltage adjustment taps, two 2-1/2% FCAN and four 2-1/2% FCBN.

B. INSULATION

1. Unless specifically noted otherwise, insulation system shall be designed for full load operation with maximum temperature rise of 115 degree C above a 40 degree C ambient.
2. Insulation system shall be per NEMA Standards for 220 Degree C rating.

C. CONSTRUCTION FEATURES

1. Enclosures shall be indoor type (unless noted otherwise), fully ventilated, constructed of heavy gauge steel.
2. Finish shall be of outdoor grade baked enamel.
3. Core-and-coil assemblies shall be internally isolated.
4. Provide internal vibration pads for units 40 KVA and larger.

26 22 00.03: EXECUTION

A. MOUNTING

1. For floor mounted units, provide 3" high, poured concrete pad. Provide vibration isolating pads under frame supports.
2. Where transformers are indicated for wall mounting, provide manufacturer's standard mounting brackets. Maximum of 75KVA for wall mounting. Larger than 75 kVA shall be floor mounted.
3. Trapeze mounted transformers shall be supported on steel channel frames, attached to wall and suspended from building structure using 1/2" diameter threaded steel rods. Assembly and mounting method to be approved by Architect/Engineer.

B. CONDUIT CONNECTIONS

1. Where feasible, primary and secondary feeder conduits shall enter the enclosures of floor mounted transformers from underneath.
2. Where conduits must attach to transformer housing, utilize minimum 12" length of liquid-tight flexible conduit. Attach with hub and bonding bushing.

C. SECONDARY CONNECTIONS

1. Transformer secondary shall be grounded as a derived service. See Section 26 05 26 "Grounding and Bonding".
2. Transformer secondary protection shall be provided for all transformers in accordance with the requirements of the NEC and local requirements.

D. LABELING

1. Unit shall bear manufacturer's nameplate indicating transformer ratings, wiring diagrams, etc.
2. Provide label indicating transformer designation, voltage, and device from which transformer is fed. Example: "30KVA-480V, 3 Phase, 208Y/120V, 3 Phase, 4 Wire fed from Panel -L1"

END OF SECTION 26 22 00

DIVISION 26

SECTION 26 24 13: SWITCHBOARDS

26 24 13.01: GENERAL

A. SCOPE

1. Furnish and install the service entrance switchboards as herein specified and shown on the associated electrical drawings. The switchboards shall meet the latest requirements of Underwriters Laboratories Standard #891, NEMA PB2, and the National Electrical Code. The switchboards shall be furnished with an Underwriters Laboratories label for service entrance.

26 24 13.02: PRODUCTS

A. MANUFACTURERS

1. Switchboards shall be as manufactured by Square D or approved equal.
2. Switchboard design features and components indicated on the drawings are those of Square D, and the standard construction features of that manufacturer shall be considered as minimum requirements, with additional requirements as specified herein.

B. CONSTRUCTION FEATURES

1. Enclosure Construction: The switchboard shall be deadfront with front accessibility required. The switchboard frame shall be of formed code gauge steel rigidly welded and bolted together to support all cover plates, bussing and component devices during shipment and installation. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for floor mounting. Each switchboard section shall have an open bottom and an individually removable top plate for installation and termination of conduit. The switchboard enclosure shall be painted on all exterior and interior surface. The paint finish shall be a medium light gray. All front covers shall be screwed on and removable and all doors shall be hinged with removable hinge pins. Top and bottom conduit areas shall be clearly indicated on shop drawings. Hinged wireway doors shall be provided on each distribution section for easy access to load-side terminals of branch circuit breakers.
2. Bussing: The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise. Through bus shall be aluminum. The through bus shall have an ampacity as shown in plans and shall be rated to withstand a short circuit rating of 100,000 RMS symmetrical amperes. The through bus supports, connections and joints are to be bolted with hex-head bolts and Belleville washers to minimize maintenance requirements and shall have provisions for the addition of future sections.
3. Short Circuit Current Ratings: Each switchboard, as a complete unit, shall be given a single short circuit current rating by the manufacturer. such ratings shall be established by the actual tests by the manufacturer, in accordance with UL specifications, on equipment constructed similarly to the subject switchboard.

4. Current Limiting Distribution Circuit Breakers:

- a. Current limiting circuit breakers shall be Square D type rated at 480V.AC with an interrupting rating of 200,000 RMS symmetrical amperes. Circuit breakers shall meet UL requirements as current limiting circuit breakers.
- b. Current limiting circuit breakers shall be supplied in unit mounted molded case construction. The circuit breaker section shall have an overcenter, trip-free toggle-type mechanism with quick-make, quick-break action. A push-to-trip button shall be provided on the cover for mechanically tripping the circuit breaker. The circuit breaker shall have permanent trip units containing individual thermal and magnetic trip elements in each pole. The thermal trip element shall be calibrated for 40 degree C. ambient temperature.
- c. The current limiting circuit breakers shall have removable lugs. Lugs shall be UL listed for copper only conductors. Breakers shall be UL listed for installation of mechanical type lugs.
- d. On high level fault currents, the I-LIMITER circuit breaker shall limit peak current and let-thru energy and provide a voltage transient-free interruption at near unity power factor. On fault currents below the threshold of limitation, the circuit breaker shall provide conventional overload and short circuit protection.
- e. Series Rated Systems will not be allowed. All ground fault, thermal magnetic and time delay settings shall be done by the gear manufacturers.

5. Molded Case Circuit Breakers:

- a. Molded cased circuit breakers shall be Square D three pole rated as indicated 480V.AC. Breakers shall be extra high interrupting construction (100,000 AIC). All circuit breakers shall be UL and CSA listed, and meet NEMA Standard AB1-1975. Breakers covered under this section of the specification shall be installed in switchboards.
- b. Molded case circuit breakers shall have overcenter toggle-type mechanisms, providing quick-make, quick-break action. Breakers shall be calibrated for operation in an ambient temperature of 40 degrees C. Each circuit breaker shall have trip indication by handle position and shall be common trip. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. Circuit breakers with frame sizes greater than 100 amperes shall have variable magnetic trip elements which are set by a single adjustment (to assure uniform tripping characteristics in each pole). A push-to-trip button shall be provided on the cover for mechanically tripping the circuit breaker. The circuit breaker shall have reverse connection capability and be suitable for mounting and operating in any position.
- c. Circuit breakers shall have removable lugs. Lugs shall be UL listed for copper conductors only. Breakers shall be UL listed for installation of mechanical type lugs.

6. Metering:

- a. In the service entrance section of the switchboard, provide metering equipment, including voltmeter and ammeter, with phase selector switches and associated current transformers, potential transformers, etc.

26 24 13.03: EXECUTION

A. INSTALLATION

1. Provide 4" raised housekeeping pad completely underneath and around switchboard as detailed on the drawings.
2. Installation shall be in strict accordance with manufacturer's instruction and recommendations.
3. Mount switchboard freestanding minimum of 42" out from wall for rear maintenance as detailed on the drawings. Switchboard shall be a minimum of 36" deep.
4. **An arc flash study must be performed at each panel and labeled with its associated hazard level. Contractor shall include in his price for the manufacturer to perform coordination and fault current studies for the setting of all adjustable breakers.**

B. LABELING

1. Provide an engraved phenolic label for each distribution circuit breaker. Label shall be black background with 1/4" high minimum white letters stating the appropriate load served. Attach with two cadmium plated screws.
2. Provide label, as specified in "A" above for main circuit breaker to read: "MAIN SERVICE DISCONNECT".

END OF SECTION 26 24 13

DIVISION 26

SECTION 26 24 16: PANELBOARDS

26 24 16.01: GENERAL

A. SCOPE

1. Furnish and install circuit breakers, power distribution panelboards and branch circuit panelboards as scheduled on the drawings and as herein specified.

26 24 16.02: PRODUCTS

A. MANUFACTURERS

1. Panelboards shall be as manufactured by Square D, General Electric Co. or Siemens ITE.
2. Panelboard types indicated on the drawings are those of Square D, and the standard construction features of those types shall be considered as minimum requirements, with additional requirements as specified herein.

B. DISTRIBUTION TYPE PANELBOARDS

1. Panelboard bus structure and main lugs or main circuit breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50 degree C rise above ambient. Heat rise tests shall be conducted in accordance with Underwriters Laboratories Standard UL 67. The use of conductor dimensions will not be accepted in lieu of actual heat tests. Bussing shall be copper. All bussing shall be 100% rated, including neutral and ground busses.
2. Circuit breakers shall be equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Large, permanent, individual circuit numbers shall be affixed to each breaker in a uniform position. Tripped indication shall be clearly shown by the breaker handle taking a position between "ON" and "OFF". Provisions for additional breakers shall be such that no additional connectors will be required to add breakers.
3. Series rated equipment will not be allowed.
4. Panelboard assembly shall be enclosed in a steel cabinet. The size of wiring gutters shall be in accordance with UL Standard 67. Cabinets to be equipped with latch and tumbler-type lock on door of trim. Door over 48" long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. End/walls shall be removable. Fronts shall be of code gauge steel. Finish shall be gray baked enamel finish electrodeposited over cleaned phosphatized steel. Panelboard shall be dead-front type.
5. The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breakers shall have barriers on five sides. The barrier

in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall have barriers.

6. Distribution panels shall be listed by Underwriters Laboratories and shall bear the UL label. When required, panelboards shall be suitable for use as service equipment. Panelboards shall be I-Line type.

C. BRANCH CIRCUIT PANELBOARDS

1. Panelboard bus structure and main lugs or main circuit breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests, conducted in accordance with UL Standard 67. Bus structure shall be insulated. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or phase sequence type and shall be bolt-on type circuit breakers. All current carrying parts of the bus structure shall be tin plated copper. Each panelboard shall be provided with 100% rated, copper, ground and neutral busses.
2. The panelboard bus assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. Wiring gutter space shall be in accordance with UL Standard 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust resistant steel. Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted with completely concealed steel hinges. Fronts shall not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Panelboard shall be dead-front type.
3. Series rated equipment will not be allowed.
4. Panelboards shall be listed by Underwriters Laboratories and bear the UL label. When required, panelboards shall be suitable for use as service equipment. Panelboards shall be equivalent to Square D type, NQOD, or NF.
5. All flush mounted panelboards shall have a minimum of five empty $\frac{3}{4}$ " conduits stubbed out into the ceiling space above the panel for future use. Seal ends of conduit with caps.
6. Loadcenters are not acceptable without prior written approval from Engineer/Owner.
7. Provide the following for branch circuit panels:
 - a. A flush latch and tumbler type lock, so panel door may be held closed without being locked. All such locks shall be keyed alike. Furnish two keys with each lock or a total of 10 keys for the project.
 - b. Four or more cover fasteners of a type which will permit mounting plumb on box. Cover shall also have inside support studs to rest on lower edge of can while being fastened. For flush mounted panelboards, cover fastener hardware shall be concealed behind the hinged door.

- c. A means of readily adjusting projection of panel interior assembly with all connections in place shall be provided. A method requiring stacking of washers is not acceptable.
- d. Interior trim shall fit neatly between interior assembly and cover leaving no gaps between the two. Where (2) section panels are specified, both panel trims shall be the same height.
- e. Minimum interrupting capacity rating of any panelboard assembly shall be 10,000A. Furnish panelboards with higher rating where so noted or where evidently intended by specification of circuit breaker frame types, etc.
- f. Where drawings schedules indicate spaces for addition of future circuit breakers, furnish all necessary bussing, brackets, hardware, etc.
- g. Breakers in branch circuit panelboards shall be physically arranged in locations shown in panel schedules on the drawings. They shall be connected to the phases as shown.

D. DISTRIBUTION CIRCUIT BREAKERS

- 1. Circuit breakers shall be one, two, or three pole molded case circuit breakers rated 600VAC, as specified on the drawings. Breakers shall be high interrupting construction. All circuit breakers shall be UL and CSA listed, IEC 157-1 rated, meet NEMA Standard AB1-1975 and Federal Specification W-C-375B/GEN, when applicable. Breakers covered under this specification shall be installed in distribution panels.
- 2. Molded case circuit breakers shall have overcenter toggle-type mechanisms, providing quick-make, quick-break action. Breakers shall be calibrated for operation in an ambient temperature of 40 degree C. Each circuit breaker shall have trip indication by handle position and shall be trip-free. Two and three pole breakers shall be common trip. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. Circuit breakers with frame sizes greater than 100 amperes shall have variable magnetic trip elements which are set by a single adjustment (to assure uniform tripping characteristics in each pole). A push-to-trip button shall be provided on the cover for mechanically tripping the circuit breaker. The circuit breaker shall have reverse connection capability and be suitable for mounting and operating in any position.
- 3. Circuit breakers shall have removable lugs. Lugs shall be UL listed for copper conductors only, rated 75 degree C. Breakers shall be UL listed for installation of mechanical type lugs.

E. BRANCH CIRCUIT BREAKERS

- 1. Branch breakers shall be bolt-on thermal-magnetic, molded case circuit breakers. Breakers shall be 1,2, or 3 pole with an integral crossbar to assure simultaneous opening of all poles in multipole circuit breakers. Breakers shall have an overcenter, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication. Handles shall have "ON", "OFF", and "Tripped" positions. Bolt-on circuit breakers shall be able to be installed in the panelboard without requiring additional mounting hardware. Circuit breakers shall be UL listed in accordance with UL Standard 489 and shall be rated with continuous current ratings and voltage as noted on the plans. Interrupting rating shall be as specified by

frame type. Single pole, 15 and 20 ampere circuit breakers intended to switch fluorescent lighting loads on a regular basis shall carry the SWD marking.

GENERAL REQUIREMENTS

1. Any panelboard fed from a transformer shall be "service" rated.
2. Any panelboard fed from a panelboard in a different building shall be "service" rated.
3. All panelboards shall have main circuit breaker. This includes sub-panelboards fed from other panelboards, except where sub-panelboard is located in same room as upstream panelboard.

26 24 16.03: EXECUTION

A. INSTALLATION

1. Front edges of all flush mounted panel housings shall be exactly flush with finished wall.
2. All equipment, either surface or flush mounted, shall be perfectly plumb and level.
3. All openings in boxes, cabinets, or gutters shall be cut or sawed with tools made for that purpose. Burning of openings is absolutely unacceptable.
4. All unused openings shall be closed.
5. Only one solid wire is allowable under a screw. Provide an approved lug for connecting stranded wire or more than one solid conductor.
6. **An arc flash study must be performed at each panel and labeled with its associated hazard level. Contractor shall include in his price for the manufacturer to perform coordination and fault current studies for the setting of all adjustable breakers.**

B. LABELING

1. For branch circuit power panelboards, directory cards shall be neatly typed to indicate load served by each breaker or fuse. Directory cards shall indicate circuits in a manner analogous to the physical circuit breaker arrangement (eg. odd numbered circuits in one column, even numbered circuits in another). Mount cards behind heavy plastic shields. Existing panelboard directories must be updated with this project. Do not use "white-out" or scratch out existing information. Do not use pencil to update. Retype entire schedule if necessary.
2. Next to each breaker within distribution panelboards, attach a label indicating load served. Wording shall be as shown on its diagram or schedule on the drawings.
3. All panelboard labeling shall be as specified in Section 26 00 00- "Electrical General Requirements".

END OF SECTION 26 24 16

DIVISION 26

SECTION 26 27 26: WIRING DEVICES

26 27 26.01: GENERAL

A. SCOPE

1. The contractor shall furnish and completely install lighting switches, convenience outlets, special purpose receptacles, etc., along with appropriate outlet boxes, trim plates, etc., as indicated on the drawings and schedules, and as herein specified.
2. Where connection to an item of equipment is required under this contract, and where such equipment requires a wiring device (special purpose receptacle) for connection, the contractor shall furnish and install the appropriate device, whether or not the device is specifically shown or specified. See Section 26 27 26.

26 27 26.02: PRODUCTS

A. MANUFACTURERS

1. All wiring devices of any one general type (e.g. all duplex receptacles, all wall switches, etc.) shall be of the same manufacturer and shall match throughout.
2. Wiring devices and trim plates shall be as manufactured by Hubbell, Sierra, Leviton, P & S, Arrow, or approved equivalent.
3. All wiring devices (i.e., receptacles and switches) shall be side wired, and shall be of the best quality available. Snap switches shall be rated 20 Amp, 120-277 Volts, 60 Hz, AC. All duplex receptacles shall be rated 20 Amp, NEMA 5-20R unless otherwise indicated.

B. GROUND-FAULT INTERRUPTER

1. Where indicated, provide general-duty, duplex receptacles, ground-fault circuit interrupters; grounding type UL-rated Class A, Group 1, 20 Amperes Rating, 120 Volts, 60 Hz; with solid state ground-fault sensing and signaling; with 5 milli-amperes ground-fault trip level; equip with 20-ampere plug configuration, NEMA 5-20R.

C. WIRING DEVICES

1. Devices shall be specification grade.
2. Devices, unless otherwise noted or approved, shall be white in color. Devices mounted in white wiremold shall be white in color.

D. TRIM PLATES

1. All trim plates shall be of same style, matching throughout project.

2. Unless noted otherwise, trim plates shall be of #302 brushed stainless steel. Minimum of .040" thick.
3. All telephone/data device trim plates in finished walls shall be 302 brushed stainless steel.
4. All unused outlet boxes shall have blank covers by the electrical contractor.

26 27 26.03: EXECUTION

A. INSTALLATION

1. Devices shall be mounted tightly to boxes and be adjusted plum and level.
2. Where two or more devices are indicated for gang installation, they shall be trimmed with gang type plates.
3. Ground each receptacle by means of a separate code size ground wire (#12 minimum) connecting the receptacle ground terminal to the ground bus in the branch circuit panelboard.

END OF SECTION 26 27 26

DIVISION 26

SECTION 26 27 30: FASTENINGS AND SUPPORTS

26 27 30.01: GENERAL

A. SCOPE

1. Full and proper support shall be provided for all items for electrical equipment, raceways, etc.

26 27 30.02: PRODUCTS

A. MATERIALS

1. Materials used shall be good quality, made of steel or of other non-corroding material.
2. Insert in masonry shall be lead, plastic, or fiber type, installed in drilled holes. Lead only shall be used for exterior locations or for interior locations subject to moisture.

26 27 30.03: EXECUTION

A. INSTALLATION

1. All equipment and flat raceways attached to outside walls or interior walls subject to permanent moisture shall be shimmed out with non-corrodible material so as to provide 1/4" air space between wall and equipment or raceway.
2. All materials, whether exposed or concealed, shall be firmly and adequately held in place. Fastening and support shall afford safety factor of three or higher.
3. All fixtures, raceways and equipment shall be supported from the structure. Nothing may be supported on suspended ceilings unless definitely noted so on the drawings or specifically permitted by the Architect/Engineer.
4. Fixtures shall be supported with (minimum) 10 gauge steel wire, or with threaded steel rods, adjusted as necessary to level fixture. For fluorescent fixtures 18" wide or less, use minimum of two supports; for wider units, use four supports - one for each corner.
5. Where installed recessed in grid type ceilings, attach each fluorescent fixture to grid with minimum of one sheet metal screw in each corner (total of four). This requirement is in addition to "4" above.

END OF SECTION 26 27 30

DIVISION 26

SECTION 26 28 16: DISCONNECT SWITCHES

26 28 16.01: GENERAL

A. SCOPE

1. This section includes low voltage disconnect switches.
2. Disconnects shall be manufactured by Square D or equal.
3. Switches shall be heavy duty.
4. Switch enclosures shall be NEMA 3R for outdoor use.

26 28 16.02: PRODUCTS

A. LOW VOLTAGE FUSIBLE SWITCHES RATED 600 AMPERES AND LESS:

1. Quick-make, quick-break type in accordance with UL98, NEMA KS 1 and NEC.
2. Shall be capable of accepting UL and NEMA standard fuses.
3. Shall have the following features:
 - a. Switch mechanism shall be the quick-make, quick-break type.
 - b. Copper blades, visible in the OFF position.
 - c. An arc chute for each pole.
 - d. External operating handle shall indicate ON and OFF position and shall have lock-open padlocking provisions.
 - e. Mechanical interlock shall permit opening of the door only when the switch is in the OFF position, defeatable by a special tool to permit inspection.
 - f. Fuse mounting for the size and type of fuses specified. Furnish switches completely fused. Furnish a complete set of spare fuses for each switch being installed. Deliver the fuses to the Owner prior to the final inspection.
 - g. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
 - h. Enclosures:
 - 1) Shall be the NEMA types shown on the drawings for the switches.
 - 2) Where the types of switch enclosures are not shown, they shall be the NEMA types which are most suitable for the environmental conditions where the switches are being installed.
 - i. Shall be horsepower rated as required.

B. LOW VOLTAGE UNFUSED SWITCHES RATED 600 AMPERES AND LESS:

1. Shall be the same as Low Voltage Fusible Switches rated 600 amperes and less, except it shall not accept fuses.
2. All switches shall be installed with clearances as required by NEC Article 110.26.

END OF SECTION 26 28 16

DIVISION 26

SECTION 26 32 13: EMERGENCY STANDBY GENERATOR SYSTEM-DIESEL

26 32 13.01: GENERAL

A. SCOPE

1. Contractor shall furnish and install, as indicated on the plans and as herein specified, a complete system for the generation, control, and distribution of electrical power upon failure of normal source.
2. System shall include engine-generator unit, automatic transfer switches, fuel supply system, and all other wiring, raceways, equipment, hardware, etc. necessary for a complete and properly functioning system, whether or not every such item is specifically shown or mentioned.
3. System shall comply with the requirements of NFPA 110 and 37, NEC Article 700, International Building Code, and all local codes and requirements.

B. MANUFACTURER

1. The engine and generator shall be the product of one American Manufacturer who has been regularly engaged in the design and production of generator sets for a minimum of ten years. Acceptable manufacturers are Caterpillar Tractor Co., Kohler, Onan, and Cummins Atlantic. The unit shall be factory assembled and tested as performed by Caterpillar Tractor Co.
2. The engine-generator supplier shall maintain a local parts and service facility within 100 miles of this installation. The supplier must carry sufficient inventory to cover no less than 80% parts service within 24 hours and 95% within 48 hours. Further, the supplier shall have factory-trained service representatives to furnish all installation, test, and start-up supervision necessary for final approval and acceptance as well as perform maintenance and repairs on all components as required.

C. FUNCTION

1. Upon failure of normal power source to the automatic transfer switch, system shall function automatically to restore power to designated loads from the engine-generator set within 10 seconds.
2. Other system functions and particulars of the generator system shall be as herein specified, as noted on the drawings.

D. SUBMITTALS

1. The following minimum information shall be provided for approval:
 - a. Make and model of engine and generator along with data sheets.
 - b. Makes and models of auxiliary equipment, including automatic transfer switch, vibration isolators, radiator, weatherproof housing, etc.

- c. Manufacturer-produced dimension drawings of the complete engine-generator set clearly showing entrance points for each of the interconnections required.
- d. Manufacturer-published kilowatt output curve and published fuel consumption curve.
- e. Unit ventilation and combustion air requirements.
- f. Manufacturer-published transient response data of the complete engine-generator set upon 50%, and 75% block loads at 1.0 pf. Data shall include maximum voltage dips, maximum frequency dips, and recovery time periods.
- g. Locations and descriptions of the supplier's parts and service facilities within a 100 mile radius of the job site, including parts inventory and number of qualified generator set service personnel.
- h. Actual electrical diagrams, including schematic diagrams and interconnection wiring diagrams for all equipment to be supplied.
- i. Manufacturer warranty statements.
- j. Engine altitude deration curve.
- k. Generator motor starting curves showing the voltage dips versus starting KV.A based on actual load data shown on drawings.
- l. Manufacturer-published service manuals for engine and generator.

26 32 13.02: PRODUCTS

A. GENERATOR SET (BASED ON CATERPILLAR)

- 1. Power rating of the diesel engine-generator set shall be based on operation at rated rpm when equipped with all necessary operating accessories such as air cleaners, lubricating oil pump, fuel transfer pump, fuel injection pumps, jacket water pump, governor, alternating current generator, and exciter regulator. Radiator fan shall be included as necessary operating accessory. Rating shall apply at site conditions.
- 2. The engine shall be water-cooled, in-line or Vee type, with four-stroke cycle.
- 3. The engine shall be equipped with fuel, lube oil, intake air filters, lube oil cooler, running time meter, charging alternator, gear-driven water pump, and instruments, including a fuel pressure gauge, water temperature gauge, lubricating oil pressure gauge as herein specified.
- 4. The engine governor shall maintain frequency regulation within $\pm 0.33\%$.
- 5. The generator shall be rated for continuous stand-by service at KW and service voltage noted on the drawings.
- 6. The generator shall be three-phase, single-bearing, synchronous type, wet wound, tropicalized, and built to NEMA standards. Class F insulation shall be used on the stator and rotor, and both shall be further protected with an asphalt modified epoxy on all end coils. The generator shall incorporate reactive droop compensation for parallel operation and shall also include a resettable thermal protector and fuse for exciter/regulator protection against extended low power factor loads and faults. The generator rotor shall be dynamically balanced with 0.0005 in. peak-to-peak amplitude displacements at both ends of shaft and shall sustain 25% overspeed.

7. An automatic volts-per-hertz type, solid-state exciter/regulator, manufactured by the generator manufacturer, shall be included and shock mounted inside the generator. Voltage regulation shall be +1% from no load to full rated load. Readily accessible voltage droop, voltage level, and voltage gain controls shall be included in the module. Voltage level adjustment shall be a minimum of +10%. The module shall include the following protective features:
 - a. Current limit circuits shall restrain the exciter field current while allowing full forcing voltage to be applied to obtain rapid response during transient conditions or service overloading on the generator.
 - b. A time-delay circuit shall sense the current limit operation and cut off all field current to the generator after ten seconds.
 - c. Voltage regulator shall be three phase sensing. Single sensing not acceptable.

B. RADIATOR

1. An engine-mounted radiator with blower type fan shall be provided to maintain safe operation at 110oF* (43oC) ambient temperature. Total air flow restriction to and from the radiator shall not exceed 0.5 in.H2 O (0, 12 kPa).
2. The engine cooling system shall be pretreated by the engine supplier for the inhibition of internal corrosion. In addition, a solution of 50% ethylene glycol shall be added, to prevent freezing of system due to extreme temperatures.

C. EXHAUST SYSTEM

1. A residential exhaust silencer, and all required accessories and fittings, shall be provided. mounting shall be on the weatherproof enclosure. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth, due to thermal expansion, be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer.
2. The exhaust silencer shall be mounted directly on the exhaust elbow of the engine and shall protrude through the enclosure. A rain cap shall also be provided.

D. GENERATOR STARTING SYSTEM

1. The engine shall be equipped with a 24 volt electric starting system with positive engagement drive and of sufficient capacity to crank the engine at a speed which will start the engine under operating conditions. The starting pinion will disengage automatically when the engine starts. The starting system shall incorporate an automatically reset circuit breaker for anti-butt engagement.
2. Fully automatic generator set start-stop controls in the generator control panel shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, overspeed, overcrank, and one auxiliary contact for activating accessory items. Controls shall include one 30-second cranking cycle with lockout and manual reset feature.

3. An engine-mounted thermal circulation tank-type immersion water heater incorporating an adjustable thermostatic switch shall be furnished to maintain engine jacket water to 90oF (32.2oC) in a still air, ambient temperature of 30oF (-1.1oC). The heater shall be 120 volt or 240 volt, single phase, 3kW, 60 Hz. Vee-type engines of 12 cylinders or more shall have one heater per each bank of cylinders.
4. A lead-acid storage battery set of the heavy duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system. The battery set shall be rated no less than 220 ampere hours. A battery rack constructed in conformance with N.E.C. requirements and necessary cables and clamps shall be provided.
5. Batteries shall be capable of cranking engine at rated ambient for a minimum of five minutes.
6. A current limiting, float-equalize charger shall be furnished to automatically recharge batteries. The charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It should include overload protection, silicon diode full wave rectifiers, voltage surge suppressers, DC ammeter, and fused AC output. AC input voltage shall be 120 volts single phase. Amperage output shall be no less than 5 amperes. Charger shall be wall-mounting type in NEMA 1 enclosure.

E. GENERATOR LOAD SIDE ELECTRICAL CONNECTION

1. Provide appropriately sized output lugs for connection by the electrical contractor. No output breaker shall be provided. Breakers/disconnects will be remotely mounted on the building.

F. GENERATOR CONTROL PANEL

1. Control panel shall be obtained from same manufacturer as generator set and shall include factory warranty and manufacturer's parts and service support.
2. A generator mounted NEMA 1-type, vibration isolated, dead front, 14 gauge, steel control panel shall be provided. The control panel shall contain, but not be limited to, the following equipment:
 - a. Illuminating lights and switch.
 - b. AC voltmeter, 3-1/2" (9 cm), 2% accuracy.
 - c. AC ammeter, 3-1/2" (9 cm), 2% accuracy.
 - d. Ammeter-voltmeter, phase selector switch.
 - e. Frequency meter, 3-1/2" (9 cm), dial type (45-65 Hz).
 - f. Automatic starting controls as specified.
 - g. Voltage level adjustment rheostat.
 - h. Dry contacts for remote alarms wired to terminal strips.
 - i. Fault indicators for low oil pressure, high water temperature, overspeed, and overcrank.
 - j. Dry contacts for remote alarms wired to terminal strips.
 - k. Fault indicators for low oil pressure, high water temperature, overspeed, and overcrank.

- l. Four position function switch marked "auto", "manual", "off/reset", and "stop".
- m. Hinged, solid protective cover with provision for padlock.
- n. Running time meter.

G. WEATHERPROOF ENCLOSURE

- 1. Weatherproof enclosure for generator and all other items to be designed and built by engine manufacturer as an integral part of the entire generator set and be designed to perform without overheating in the ambient temperature specified.
- 2. Constructed of 14 and 16 gauge corrosion resistant sheet metal, suitably reinforced to be vibration free in the operating mode.
- 3. Hinged doors as required, to provide complete access without their removal.
- 4. Each door to have at least two latch-bearing points.
- 5. Side and rear panels to be completely and simply removable to major service access.
- 6. Locks by padlocks (lock in door handle is not suitable).
- 7. Roof to be peaked to allow drainage of rain water.
- 8. Baked enamel finish with primer and finish coat to be painted before assembly. All fasteners to be rust resistant.
- 9. Unit shall have sufficient guards to prevent entrance by small animals.
- 10. Batteries to fit inside enclosure and alongside the engine. (Batteries under the generator are not acceptable.)
- 11. Unit shall have coolant and oil drains outside the unit to facilitate maintenance. Each drain line is to have a high quality valve located near the fluid source.
- 12. Fuel filter must be inside the base perimeter and located so spilled fuel cannot fall on hot parts of engine or generator. A cleanable primary fuel strainer shall be used to collect water and sediment between tank and main engine fuel filter.
- 13. Crankcase fumes disposal shall terminate in front of the radiator to prevent oil from collecting on the radiator core and reducing cooling capacity.

H. FUEL SYSTEM

- 1. Provide a skid mounted fuel tank. It shall be double wall construction and UL Listed. It shall be of welded construction, have a lockable filler cap, fuel gauge, low fuel level alarm, tank rupture alarm and a water separator.

I. AUTOMATIC TRANSFER SWITCH

- 1. Provide and install automatic transfer switch to operate on a 277/480 volt, 3 phase, 4 wire, 60 HZ voltage. Amperage as noted on drawings. Transfer switch shall be 4

pole. The entire assembly shall be UL listed under U1-1008 and comply with National Electrical Code requirements.

2. The transfer switch shall be double throw, actuated by a single electrical operator, momentarily energized; and connected to the transfer mechanism by a simple over-center-type linkage with a total transfer time not to exceed one-half second. The transfer switch shall be capable of transferring successfully in either direction with 70% of rated voltage applied to the switch terminals.
3. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and emergency positions without the use of hooks, latches, magnets or springs and shall be silver-tungsten alloy. Separate arcing contacts, with magnetic blowouts, shall be provided on all transfer switches. Interlocked molded case circuit breakers or contactors are not acceptable. The transfer switch shall be equipped with a permanently attached safe manual operator designed to prevent injury to operating personnel.
4. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.
5. Engine starting contacts shall be provided to start the generating plant should the voltage of the normal source drop below 80% on any phase after an adjustable time delay of 0.5-3 seconds to allow for momentary dips. The transfer switch shall transfer to emergency when 90% of rated voltage and frequency has been reached. After restoration of normal power on all phases to 90% of rated voltage, an adjustable time delay period of zero to 25 minutes shall delay retransfer to allow stabilization of normal power. If the emergency power source should fail during this time delay period, the switch shall automatically return to the normal source. After retransfer to normal, the engine-generator shall be allowed to operate at no load for a period of 5 minutes. A test switch shall be included to simulate normal power failure, and pilot lights shall be mounted on the cabinet door to indicate the switch position. Two auxiliary contacts rated 25 amp, 120 volts shall be mounted on the main shaft; one closed on normal, and the other closed on emergency. In addition, one set of relay contacts shall be provided to open upon loss of the normal power supply. All relays, timers, control wiring and accessories shall be front accessible. All control wire terminations are to be identified by tubular sleeve-type markers.
6. The automatic transfer switch shall include the following accessories:
 - a. Time Delay to override momentary normal source power outages. To delay engine start signal and transfer switch operation. Adjustable 0.5-3 seconds, factory set at 3 seconds.
 - b. Time Delay on retransfer to normal. Motor driven type adjustable 0-25 minutes, factory set at 5 minutes with engine overrun to provide fixed 5 minute unloaded engine operation after retransfer to normal.
 - c. Load Test Switch to simulate normal power failure. (Maintained Type).
 - d. Contact to close on failure of normal source to initiate engine starting or other functions.

- e. Contact to open on failure of normal source to initiate engine starting or other functions.
- f. Green Pilot Light to indicate switch in normal position.
- g. Red Pilot Light to indicate switch emergency position.
- h. Auxiliary Contact closed in normal position.
- i. Auxiliary Contact closed in emergency position.
- j. Adjustable Relay to prevent transfer to emergency until voltage and frequency of generating plant have reached acceptable limits. Factory set at 90% of rated value.
- k. Generator system exerciser control to permit exerciser of generator with or without load transfer with selector switch. Exerciser shall operate for minimum of 30 minutes every 168 hours of real time.

26 32 13.03: EXECUTION

A. GENERATOR

- 1. All installation shall be as recommended by the engine-generator manufacturer for proper operation.
- 2. Weatherproof enclosure shall be UL listed and approved (if applicable), provided by generator manufacturer.

B. AUTOMATIC TRANSFER SWITCH

- 1. Installation shall be in strict accordance to manufacturer's requirements and recommendations.
- 2. Carefully "OHM" out control wiring between ATS and generator set prior to connecting. Check for opens, shorts, or grounds.
- 3. Test ATS functions prior to connecting load. Check normal and emergency input feeders, prior to connection, for insulation breakage, opens, shorts, or grounds.

C. TESTING

- 1. The generator set shall be tested at the equipment manufacturer's facility prior to shipment. All tests shall be recorded and submitted to the Architect/Engineer. Minimum testing to include, but not limited to, the following:
 - a. Transient response.
 - b. Voltage dip at 50,75 and 100% load.
 - c. Frequency dip.
 - d. Recovery time.
- 2. Prior to acceptance of the equipment, it shall be tested at full rated load through the use of resistive load banks. The test shall be performed at the site and must prove that the generator set is free of any defects and will perform to the specifications claimed by the equipment manufacturer. All consumables necessary for the test shall be furnished by the electrical contractor. Block loading (50% and 75% loads) shall be done in the presence of the Owner's Engineer or his appointed representative and shall be for a period of 8 hours. Transient responses, including

voltage dips, frequency dips, and recovery time period, shall be measured and agree with the data submitted with the factory testing results.

D. START-UP REQUIREMENTS

1. On completion of the installation, start-up shall be performed by the generator set manufacturer -- trained dealer service representative. Parts books covering the engine, generator, and major auxiliary equipment shall be provided to the Owner at this time. Procedures on operating and maintenance of the standby power system shall be explained to operating personnel.

E. WARRANTY

1. Equipment furnished under these specifications shall be guaranteed against defective parts and workmanship under terms of the manufacturer's and dealer's standard warranty. But, in no event, shall it be for a period of less than two years from date of initial start-up of the system and shall include labor and travel time for necessary repairs at the job site. Running hours shall not be a limiting factor for the system warranty.

F. SERVICE CONTRACT

1. The equipment manufacturer of the standby power system shall provide and make available to the Owner a service contract which, at the Owner's option, may be accepted or refused. The contract shall be for the complete services rendered over a period of one year and shall include, but not be limited to, the following:
 - a. Engine manufacturer's recommended procedures for weekly (biweekly) inspection and maintenance to be done by user.
 - b. Quarterly inspection by the supplier personnel to review the weekly (biweekly) maintenance records being kept by user and train any new owner operating personnel. Inspection will include scheduled oil sampling for lube oil contaminants. A 75% load test run on the generator set shall also be included.
 - c. Annual inspection shall include all of items in above paragraph except that the generator set shall be run under load, system load, or load provided by equipment manufacturer.

END OF SECTION 26 32 13

DIVISION 26

SECTION 26 51 00: LIGHTING FIXTURES

26 51 00.01: GENERAL

A. SCOPE

1. Contractor shall furnish and install completely the lighting fixtures indicated on the Drawings and as herein specified.
2. All fixtures shall be equipped with lamps.
3. A lighting fixture shall be provided for every lighting outlet indicated. Any omission shall be brought to the attention of the Architect/Engineer before submitting proposal; otherwise, a unit selected by the Architect/Engineer shall be furnished and installed at no additional charge.
4. The Electrical Contractor shall provide submittals to the Engineer as previously specified. Submittals shall include photometric information, ballast performance criteria, ballast cut sheets, and lamp cut sheets. Provide samples upon request for substituted equipment.
5. Contractor shall refer to Architectural Drawings for exact locations and height of all light fixtures.

26 51 00.02: PRODUCTS

A. FIXTURES

1. Fixture types and manufacturers shall be as indicated on the drawings.
2. Catalog numbers shown on the drawings are for general identification of fixtures only. All related parts, such as plaster rings, junction boxes, louvers, shields, mounting stems, canopies, connectors, straps, nipples, etc., required to fit them properly to the construction, shall be furnished and installed.
3. Recessed incandescent fixtures shall be thermally protected in compliance with NEC Section 410.65.
4. Provide all lighting fixtures with a specific means for grounding their metallic wireways and housings to an equipment grounding conductor.

B. LENSES

1. Shall be 100 percent virgin acrylic prismatic or injection molded as noted in light fixture schedule on the drawings.
2. Flat lens panels shall have not less than 1/8 inch thickness at any point of the lens, and shall have KSH-12 type pattern.

C. LAMPS

1. All fixtures shall be LED unless otherwise noted on the plans.
2. All incandescent lamps (when specified) shall be 130 volt type and of the energy saving type noted.
3. HID lamps shall be phosphorus coated unless specified otherwise.

26 51 00.02: EXECUTION

A. COORDINATION

1. Contractor shall verify ceiling or wall type in or on which each fixture is to be mounted, and shall furnish unit with appropriate trim type, mounting hardware, etc., to fit the construction. Failure to coordinate ceiling types will result in the Electrical Contractor removing and replacing the fixtures at his own cost.
2. Contractor shall furnish fixtures with appropriate trim type, feed through junction boxes, etc., as required to maintain proper access to system wiring.

B. INSTALLATION

1. Installation shall be in accordance with the NEC and as shown on the drawings.
2. Align, mount and level the lighting fixtures uniformly.
3. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, the light fixture locations shall be changed by the minimum distances necessary as approved by the Architect/Engineer.
4. Lighting Fixture Supports:
 - a. Shall provide support for all fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling. Also, see Section 26 05 29 of this Specification.
 - b. Shall maintain the fixture position after cleaning and re-lamping.
 - c. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
 - d. When fixtures are connected to the rigid raceway system by flexible conduit, then a green grounding conductor shall be run within the flexible conduit. This grounding jumper shall be connected to the fixture and to the raceway system using screws, bolts, or clips, equivalent to Steel City "G" clip.

END OF SECTION 26 51 00

DIVISION 27**SECTION 27 00 50: INTERCOM SYSTEM****27 00 50.01: GENERAL****A. GENERAL REQUIREMENTS**

1. The conditions of the General Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.
2. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the Quantum Multicom IP hybrid IP. The specifying authority must approve any alternate system.
3. Contractors that wish to submit alternate equipment shall provide the specifying authority with the appropriate documentation, at least 15 business days prior to bid opening. The submitted documentation must provide a feature by feature comparison identifying how the proposed equipment meets the operation and functionality of the system described in this specification. Contractor shall provide adequate and complete submittal information, prior to bid date, which shall include but not limited to specification sheets, working drawings, shop drawings, and a demonstration of the system. Alternate supplier-contractor must also provide a list to include six installations identical to the system proposed.
4. The contractor shall also provide the FCC registration number of the proposed system.
5. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system at the contractor's expense.
6. The contractor for this work shall be held to have read all of the bidding requirements, the general requirements of division 1, and contract proposal forms, and the execution of this work. The contractor will be bound by all of the conditions and requirements therein.
7. The contractor shall be responsible for providing a complete functional system including all necessary components whether included in this specification or not.
8. In preparing the bid, the contractor should consider that no claim will be made against the owner for any costs incurred by the contractor for any equipment demonstrations which the owner requests.

B. SCOPE OF WORK

1. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating school communications system including but not limited to:
 - a. Administrative display phone with integrated 4x16 character display
 - b. Administrative VoIP Phone
 - c. Administrative phone

- d. Classroom VoIP speaker(s), ceiling- or wall-mounted
 - e. Classroom speaker(s), ceiling- or wall-mounted
 - f. Call initiation switches capable of placing normal, urgent or emergency calls
 - g. Telemedia control of VCRs, DVDs, and Blu-Ray
 - h. Built in Master Clock with 1024 events, 32 Schedules, including Daylight Savings Time, and up to 32 custom holiday events that can be assigned to any of the 64 time zones
 - i. Wall-mounted paging horns
 - j. One built-in network interface port for system combining and LAN station-to-station calling and WAN access for district-wide all-calls and remote management
 - k. One built-in network interface port for first-time system configuration
 - l. Built-in Web Server for full system programming with Quantum Commander
 - m. Administrative Web-Browser Application for Programming and Day to Day System Operation
2. System can connect to the PSTN (Public Switched Telephone Network) by connecting it to analog CO trunks.
- a. Telephone service with public utilities shall be arranged by the owner, in conjunction with the equipment supplier. Equipment supplier shall generate a one-page document that will provide the Owner with information concerning number of outside lines (minimum of 8, and a maximum of 1,125 per school, maximum of 99 Schools [facilities]).

C. SUBMITTALS

- 1. Specification Sheets shall be submitted on all items including cable types.
- 2. Submit outline drawing of system control cabinet showing relative position of all major components.
- 3. Shop drawings, detailing integrated electronic communications network system including, but not limited to, the following:
 - a. Station wiring arrangement
 - b. Equipment cabinet detail drawing
- 4. Submit wiring diagrams showing typical connections for all equipment.
- 5. Submit a numbered Certificate of Completion for installation, programming, and service training, which identifies the installing technician(s) as having successfully completed the technical training course(s) provided by the system manufacturer.

D. QUALITY ASSURANCE

- 1. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- 2. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least

5 years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.

3. The contractor shall show satisfactory evidence, upon request, that he or she maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his or her facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

E. SINGLE SOURCE RESPONSIBILITY

1. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and minimum of 30 years experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service school. A certificate of this training shall be provided with the contractor's submittal.

F. SAFETY / COMPLIANCE TESTING

1. The communications system shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as ETL, and be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, under direction of a qualified and factory approved distributor, to the approval of the owner.
2. The system is to be designed and configured for maximum ease of service and repair. All major components of the system shall be designed as a standard component of one type of card cage. All internal connections of the system shall be with factory-keyed plugs designed for fault-free connection.
3. The printed circuit card of the card cage shall be silk-screened to indicate the location of each connection.

G. IN-SERVICE TRAINING

1. The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.

H. WIRING

1. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts.
2. All communication system wiring shall be labeled at both ends of the cable. All labeling shall be based on the room numbers as indicated in the architectural graphics package.

I. PROTECTION

1. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
2. The contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information. Such devices are not to be installed above the ceiling.

J. SERVICE AND MAINTENANCE

1. The contractor shall provide a five year equipment warranty of the installed system against defects in material and workmanship. All materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on the date of acceptance by the owner/engineer.
2. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.
3. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

27 00 50.02: EQUIPMENT SPECIFICATION

A. MANUFACTURER

The existing sysem is a Bogen MC-2000.

- 1) Telephone Access Card

1. Administrative Display Phone
 - a. Administrative Display Phones shall be Bogen Model MCDS4. The administrative telephone display panel shows the time of day and day of week, the current time signaling schedule, and the station numbers and call-in priority of staff stations that have called that particular station. A 3-key response is used to scroll the display, and answer or erase normal, urgent, and security calls. Depending upon the system programming, an administrative station can use display menus to activate zone pages, alarm signals and external functions, as well as select program sources and distribute or cancel a program to any or all speakers or zones.
 - b. Administrative Display Phones shall have the ability to dial and have the option of dialing either the loudspeaker or phone at each station location. The system shall automatically switch from phone-to-intercom communication to phone-to-phone communication when the enhanced staff phone on the receiving end of the call is lifted.
 - c. The Administrative Display Phone shall display the classroom number of any station that calls 911. This feature will notify the main office when a classroom has dialed 911 emergency centers so that administrators can direct emergency personnel to the correct physical location in the building

when they arrive. Systems that do not provide this feature will not be deemed equal.

- d. Administrative Display Phones shall have the ability to manually override the active schedule in the facility. Systems that do not have the ability to override the schedule via the administrative phone are not equal.

2. VoIP Phone

- a. The Station goes Off-Hook and dials the 3- to 6-digit (preceded by an * if calling a telephone instead of loudspeaker) number of the desired station. The call is routed to any station (admin/staff). The classroom VoIP phone shall be capable of the following features:

- 1) Speed dials
- 2) Missed call logging
- 3) Ethernet pass through jack
- 4) PoE
- 5) Alarm Distribution
- 6) Audio Program On/Off
- 7) Call Forward activation for All-Calls/Busy/No Answer/Busy or No Answer
- 8) Cancel Call Forward
- 9) Dial administrative phone, dial the station number to call to the speaker or dial the station number preceded with * to call the phone. The call shall be routed to the administrative display phone and/or administrative wall display showing the architectural number that is calling.
- 10) Emergency All-Call shall be broadcasted to all the stations in the facility.
- 11) Place Outside Call
- 12) Single-Zone/All-StationPage

3. Classroom VoIP Speakers, wall- or ceiling-mounted

- 1) Classroom VoIP Speakers shall be Bogen:
 - 1) Wall Baffle VoIP Speakers: WBS810QIP
 - 2) Ceiling Mounted VoIP Speaker: S810QIPPG8U
- 2) Classroom VoIP Stations shall support the following station types:
 - 1) HS201C or HS-202C – Bogen Handsets
 - 2) CA15C – Call Switch
- 3) The VoIP Speakers shall have a line level output
- 4) Shall be capable of Normal/Urgent/Emergency Calls
- 5) Normal/Urgent Call involves pressing the Call Switch once or lifting the Handset. The Call is then switched to the Administrative Display Phone. This requires the display of the architectural number on the Administrative Display Phone and/or Wall Display.
- 6) Emergency Call involves pressing the call switch at least 4 times within 3 seconds with Call Level Normal or Urgent; pressing the call switch one time with Call Level Emergency only. The Call is then switched to the Administrative Display Phone. This requires the display of the architectural number on the Administrative Display Phone and/or Wall Display.

- 7) Emergency Link Transfer - If the emergency call is unanswered by the Administrative Display Phone and the emergency link transfer is provisioned and programmed; the emergency call will be forwarded to the loudspeaker associated with that station. Any station/admin phone with speaker can be programmed for the Emergency Link Transfer except the Administrative VoIP Phone. Systems that do not provide Emergency Link Transfer will not be considered equal.
 - 8) The Classroom VoIP Speakers shall be IEEE 802.3af compliant. VoIP speakers may be placed up to 100 meters (328 Feet) from switch.
 - 9) Software adjustable audio output level - 5 power levels available 4W, 2W, 1W, 1/2W, 1/4W
 - 10) DHCP Deployment for easy install
4. Intercom System Speakers
- a. Classroom Speakers shall be Bogen:
 - 1) Ceiling Mounted VoIP Speaker: S810QIPPG8U Ceiling VoIP Speaker
 - 2) Ceiling Mounted Speakers: CSD2X2 Drop-In Ceiling Speaker
 - 3) Wall Baffle VoIP Speakers: WBS810QIP Wall Baffle VoIP Speaker
 - 4) Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
 - b. Hallway Speakers shall be Bogen:
 - 1) Ceiling Mounted VoIP Speaker: S810QIPPG8U Ceiling VoIP Speaker
 - 2) Ceiling Mounted Speakers: CSD2X2 Drop-In Ceiling Speaker
 - 3) Wall Baffle VoIP Speakers: WBS810QIP Wall Baffle VoIP Speaker
 - 4) Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
 - c. Outdoor / Gym / Locker Room Speakers shall be Bogen:
 - 1) FMH15T mounted in BBSM6 surface-mounted vandal-resistant enclosure/BBFM6 flush-mounted vandal-resistant enclosure with FMHAR8 adapter ring and SGHD8 heavy duty grille
 - 2) KFLDS30T Wide Dispersion Reentrant Horn Loudspeakers
 - d. Common Area Speakers shall be Bogen:
 - 1) HFCS1 High-Fidelity Ceiling Speakers
 - 2) OCS1 Orbit Ceiling Speakers
 - 3) OPS1 Orbit Pendent Speakers

B. SYSTEM PARAMETERS

1. The communication system shall be a Bogen Quantum Multicom IP, and shall provide a comprehensive communication network between administrative areas and staff locations throughout the facility. Non-volatile memory shall store permanent memory and field-programmable memory. A system, which uses a battery to maintain system configuration information, shall not be acceptable.

The system shall provide no less than the following features and functions:

- a. Telephonic communication (complete with DTMF signaling, dial tone, ringing and busy signals, and data display) on administrative stations shall use two wires. Systems that use more than two wires for communication, tones and data display shall not be acceptable.

- b. Amplified-voice communication with loudspeakers shall use a shielded audio pair (shield can be used as one of the two required conductors for administrative phone or call-in switch).
- c. The system shall be available in the following configurations:
 - 1) MC2K Wall-mounted in a custom enclosure Quantum. Station capacity shall be from 24 to 120 stations +10 SIP ports per Node. All stations shall have the ability to support displays, with an option to add up to 15 Central Office phone lines.
 - 2) MC2KR Rack-mounted Quantum. Station capacity shall be from 24 to 240 stations +10 SIP ports per Node. All telephone stations shall have the ability to support displays, with an option to add up to 8 Central Office phone lines.
 - 3) QRC24 & QRC48 Compact Quantum Rack System. Station capacity shall be from 24 to 48 stations +10 SIP ports per node. All stations shall have the ability to support displays, with an option to add up to 8 Central Office phone lines.
 - 4) 2223/2233 MC2KR Rack-mounted and integrated with Bogen Multi-Graphic Series 2223 or Series 2233 equipment. In this configuration, Quantum Multicom IP system station capacity shall be expandable up to 240 stations in increments of 24 per node. All telephone stations shall have the ability to support displays. The Multi-Graphic system equipment provides the following: backup fail safe intercom and paging functions (Note: the systems operate independently; if one were to fail, the other provides intercom for student safety), plus two additional program channels, and additional Multi-Graphic functions. It shall be possible, by use of a separate call-in switch, to announce only to the Multi-Graphic portion of the system without using additional station ports within the Quantum Multicom IP system. For switch banks to work effectively the equipment must be centrally located for switch-bank operation.

The above system configurations represent a single processor in the Quantum Multicom IP. Each processor can be combined with up to 74 additional systems (nodes) for a total single facility capacity of up to 18,750 stations.

- d. The system shall consist of any combination of the following: Administrative Display Phones, Administrative VoIP Phones, and Administrative Phones.
 - 1) Staff Classroom Stations shall consist of wall- or ceiling-mounted loudspeakers with call-in switches.
 - 2) Administrative phone stations shall consist of VoIP phones, display phones, or DTMF dialing 2500 analog-style telephone sets.
 - 3) Administrative Display Phones shall be DTMF-dialing digital telephone sets with a 4x16 character LCD display panel. They shall be equipped with a standard 12-key push-button dialing keypad. Phones requiring external LCD displays shall not be accepted as an equal. Optionally, a loudspeaker may be connected at each administrative station location.
 - a) Up to 5 Administrative Wall Displays may be added to the Administrative Station for large office areas.

- 4) Administrative Display Phones, Administrative VoIP Phones, and Administrative Phones shall have the option of including a loudspeaker.
 - 5) All types of stations except administrative VoIP phones shall utilize the same type of field wiring. Future station alterations shall only require the station type to be changed and the proper software designation to be selected. Alterations shall not require field wiring or system head-end alterations. All field wiring and system head-end equipment shall support any type of station, at the time of installation. All contractor proposals shall reflect this capacity. Failure to submit and bid this project in this manner will be deemed as being in direct conflict of these specifications and will be rejected.
 - 6) There shall be no limit to the number of administrative display stations within the total capacity of the system including nodes. Systems that require different head-end equipment to make admin phone work shall not be acceptable.
 - 7) It shall be possible at any time to change the type of station at any location without equipment or wiring changes except for administrative VoIP phones that utilize existing LAN connections. Systems that limit the quantity of each station type or require future additional equipment and/or system expansion to provide additional administrative telephones shall not be accepted as an equal.
- e. The system shall be a global switching system, providing up to 600 unrestricted simultaneous private telephone paths per facility. The system shall also be capable of providing up to 600 amplified intercom paths per facility. One amplified intercom path shall automatically be provided with each increment of 24 stations of system capacity. All hardware, etc., required to achieve the necessary number of amplified-voice intercom channels for this system shall be included in this submittal. Amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk switch on administrative telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the switch sensitivity and delay times of the VOX circuitry.
- f. The system shall provide 911 Dial-Through with specific outside line(s) dedicated only for this function to ensure that the line is available all the time for 911 calls. The 911 Dial-Through is available to any station that can dial.
- 1) The 911 CO lines can be pre-configured and reserved. If the 911 reserved lines are busy, the normal CO lines will be connected to route the 911 calls. If all the normal CO lines are busy, then one of the ongoing call shall be disconnected and the 911 call shall be placed.
 - 2) When 911 is dialed from an Administrative VoIP Phone or Administrative Phone its Administrative Display Phone or Wall Display will receive a message that that room dialed 911.
- g. It is of highest importance that emergency calls from staff stations receive prompt attention. Therefore, it is important that there be an alternate

destination in case the emergency call does not get answered at the primary location. To this end:

- 1) Staff-generated Emergency calls shall be treated as the second highest system priority. Therefore, all Emergency calls shall announce at the top of the call queue of their respective administrative display phone. Should that emergency call go unanswered for 15 seconds, the call shall be re-routed to an alternate speaker station then a tone prompts the caller to make a verbal call for help. During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency Ring. Should the Emergency Transfer to Station have an associated administrative telephone, it too shall ring the distinctive Emergency ring.
 - 2) The Emergency Transfer to Station shall be field programmable.
 - 3) Should the original administrative display phone be engaged in a non-emergency conversation, its conversation shall be automatically terminated, indicated with an alert tone, and then reconnected to the station that generated the Emergency Call.
 - 4) Should the administrative display phone be engaged in an emergency conversation, successive emergency calls shall log into the call queue as well as transfer to the Emergency Transfer Station for their verbal call for help. Upon termination of the initial emergency conversation, the next one shall immediately ring the administrative telephone.
 - 5) Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the administrative display phone shall not be deemed as equal.
- h. There shall be a System-Wide Facility Emergency All-Call feature. The Emergency All-Call shall be accessed from designated administrative phones or by the activation of an external contact closure which shall give the third audio program input emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tones, Normal All-Call or Zone Pages or Audio Distribution.
- 1) Considering that emergencies calls are to be treated with the highest level of concern. Systems which do not regard Emergency-All-Call page from an administrative station with the highest priority shall not be deemed as equal.
 - 2) Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access emergency functions.
 - 3) The Emergency All-Call shall capture complete system priority, and shall be transmitted over all speakers in the facility. It shall also activate an external relay, which can be used to automatically override volume controls and other sound systems.
 - 4) Systems without Emergency All-Call, or systems with All-Call that cannot be activated by external means, or which do not capture complete system priority or activate an external relay, shall not be acceptable.
- i. There shall be at least four Dedicated Emergency Alarm Tones. Each may be accessed by dialing a three-digit number from designated administrative

display phone. These emergency tones should be separate from the time tones. Systems using external alarm generators, or having less than four emergency alarm tones shall not be acceptable.

- 1) Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access Emergency Alarm Tones.
- j. There shall be four (4) External-Function Relay Driver Outputs, accessible from designated Quantum Commander User or Administrative Display Telephones by dialing a four-digit number. These outputs remain set until accessed and reset at a later time. The user shall have the ability to review the status of each relay driver. A plain English menu, prompting the user through the fields without requiring the user to remember any dialing sequences shall support this feature. Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be deemed equal.
- 1) The stations shall be capable of being programmed for security contact relays for use with magnetic locks, motion detectors, cameras or any low-voltage, dry contact creating device. System using security stations for control of external functions shall not be acceptable.
 - 2) Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access external relay functions.
- k. There shall be a program-material interface included with each node, which shall accept up to four (4) program input modules. Systems requiring an external program source interface shall not be acceptable.
- l. There shall be an outside line feature. The circuitry shall interface with the station ports of an external telephone system or CO lines, and shall provide facilities for up to 1,125 incoming lines per facility which shall be designated by the user to ring "day" and "night" administrative display stations or administrative stations. Where an administrative display station is designated to receive outside line calls, the phone shall ring with a unique tone and the outside line number shall appear on the display panel. The option shall also provide the ability to make outside line calls from Administrative Display Stations or Administrative Stations. This ability shall be programmable for each phone and there shall be thirty-two Classes of Service available to any station. This feature shall be capable of supporting DID, DISA, and a Security DISA function.
- 1) Cellular system access for Security is of the utmost concern. Wireless security page offers a password-protected Security DISA feature that shall be accessible only from authorized Police, Fire, Emergency personal or an off-premise security office, which monitors the facility's security system. It shall function as follows: upon confirmation of the password DISA number, the system shall allow security personnel to dial access any station and monitor the activity without pre-announce tone or the privacy tone. This will then allow

the security office to determine exactly what the conditions are in the station and the actions need to be taken.

- m. The system shall provide for field-programmable three-, four-, five-, or six-digit architectural station numbers.
- n. There shall be an automatic level control for return speech during amplified-voice communications.
- o. Each station loudspeaker shall be assignable to any one, any combination, or all of 64 Multi-purpose zones or any of the 18,000 hard-wired zones per facility.
 - 1) Each station loudspeaker shall be assignable to any one, any combination, or all of 64 Multi-purpose zones. Systems with less than 64 Multi-purpose zones shall not be acceptable.
- p. There shall be thirty-two (32) Flexible Time-Signaling Schedules with a total of 1024 user-programmed events per facility. Each event shall sound one of user-selected tones or external audio. It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized Quantum Commander User via Web browser or MCDS4 phone. Systems, which do not provide a minimum of thirty-two (32) flexible time-signaling schedules or a choice of eight (8) time tones plus external audio, shall not be acceptable.
- q. An internal program clock (with battery backup) shall be included, allowing a total of 1024 user-programmed events per facility. It shall be possible to synchronize the internal program clock with an external master clock. Systems, which do not provide an internal program clock and/or cannot synchronize with an external master clock to meet these specifications, are not equal.
 - 1) There shall be thirty-two (32) flexible time-signaling schedules. It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized Quantum Commander User via Web browser on the LAN or WAN. Systems that require external equipment or server to perform these functions are not considered equivalent.
 - 2) The built-in Master Clock corrects time by accessing the networks Network Time Server.
 - 3) The Quantum Processor is capable of adjusting the Daylight Savings Time automatically.
 - 4) Each event shall be able to be directed to any one or more of the sixty-four (64) Multi-purpose time-signaling zones.
 - 5) Each of the 64 Multi-purpose zones shall have a programmable "tone duration" unique unto itself. For example: the gymnasium can receive a time tone for ten (10) seconds while the rest of the facility receives a tone for five (5) seconds.
 - 6) Each event shall sound one of eight (8) user-selected tones or external audio. Each event may utilize a different custom tone. It shall be utilized to send the gymnasium, shop classes, and pool (if necessary), a separate time tone to indicate "clean up." Minutes later the entire facility can then receive the same time tone to indicate class change.
 - 7) Each of the eight (8) Distinct Time Tone Signals may be manually activated by selected Administrative Display Phones or an authorized

Quantum Commander User via web-browser. These tone signals shall remain active as long as the telephone remains off-hook, or until canceled from the keypad or Quantum Commander.

- a) Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter the next digit. In this way, the user shall not be required to memorize complicated key sequences in order to access manual time-tone functions.
 - b) Systems that do not provide at least thirty-two (32) flexible time signaling schedules or do not provide automatic activation of schedules shall not be acceptable.
- r. There shall be a zone-page/all-page feature that is accessible by selected administrative VoIP phones and administrative phones.
 - 1) There shall be automatic muting of the loudspeaker in the area where a page is originating.
 - 2) There shall be a pre-announce tone signal at any loudspeaker selected for voice paging.
- s. There shall be a voice-intercom feature that is accessible by selected administrative phones, administrative VoIP phones and all administrative display phones.
 - 1) There shall be a privacy tone every 16 seconds to signal at any loudspeaker selected for amplified-voice intercom is in progress.
 - 2) There shall be a pre-announce tone signal at any loudspeaker selected for voice-intercom communication.
 - 3) Privacy and pre-announce tone signals shall be capable of being disabled during system initialization.
 - 4) There shall be an automatic switchover to private telephone communication should the person at the loudspeaker pick up his analog phone handset.
 - 5) By picking up the receiver and dialing the first digit of the number of the station to be called, that number shall appear on the display along with a loudspeaker symbol, prompting the user to enter the next digits. There should be no confusion as to type of conversation, whether speaker/intercom or telephonic to be established.
- t. There shall be a telephonic communication feature, which is accessible by all Administrative VoIP Phones, Administrative Phones, and Administrative Display Phones.
 - 1) There shall be an audible ring signal announcing that a call has been placed to that station.
 - 2) Upon picking up the receiver and dialing * (star), a telephone symbol shall appear on the display, prompting the user to enter the number of the station to be called. There should be no confusion as to type of conversation, whether speaker/intercom or telephonic to be established.
 - 3) There shall be an automatic disconnect of enhanced Staff Handsets left off-hook to prevent them from tying up communications channels. The station shall receive a busy signal and shall automatically disconnect after 45 seconds.

- 4) There shall be an automatic disconnect of Administrative Display Phones and Administrative Phones to prevent them from tying up communications channels. When a phone goes off-hook and does not initiate a call within ten seconds, the station shall receive a busy signal and shall automatically disconnect after 45 more seconds.
 - 5) Staff and Administrative Phone Stations may be programmed to ring an Administrative Display Phone during day hours and another Administrative Display Phone during night hours. Day and Night Hours shall be user-programmable. Assignment of Staff Stations shall not be restricted to any particular Administrative Station. Systems that limit the number and assignment of staff call-in to particular Administrative Display Station of Administrative Stations shall not be acceptable.
- u. Each staff call station shall be programmable for one of three call-in types, as follows:
- Normal / Emergency
Urgent / Emergency
Emergency
- 1) Staff Call Stations programmed for access Normal / Emergency or Urgent / Emergency shall be able to initiate an emergency call by repeated flashing of the hook switch or repeated pressing of the call-in switch. Systems, which require additional switches and/or conductors to initiate an emergency call, shall not be acceptable.
 - 2) Emergency Calls from Administrative VoIP Phones, Administrative Phones or Staff Call Switch Stations shall interrupt a non-emergency call in progress at the designated Administrative Display Phone. The administrator shall receive a warning tone and be connected to the emergency caller. The disconnected party shall receive a busy signal. Systems which do not provide emergency call interrupt shall not be acceptable.
 - 3) It shall be possible to connect a single push emergency call-in switch to any Administrative Phone, without effecting normal station operation. This feature is not available with the Administrative VoIP Phone.
 - 4) Normal and Urgent calls shall be logged into queue for the designated administrative display phones.
 - 5) Administrative Display Phones shall ring for a period of 30 seconds when they receive a call, and then stop ringing.
 - 6) Each queue shall first be sorted according to call priority (emergency calls, then urgent calls, and then normal calls). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems, which do not sort calls according to priority and order received, shall not be acceptable. 1) The display shall simultaneously show up to four (4) Staff Call Switch Station Calls pending. Additional calls, beyond four (4), shall be indicated by an arrow pointing down thus prompting the user that additional calls are waiting.
 - 7) It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call unless the call has dropped into the queue.

- v. Administrative VoIP Phones shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be a switchover from loudspeaker to private telephone communication when a person picks up the handset and dials #### and enter (check mark).
 - 1) Administrative VoIP Phones shall be able to make a normal call to any Administrative Display Phone by dialing the number. They shall also be able to initiate an Emergency Call by dialing ****. Emergency Calls shall ring the Designated Day/Night Administrative Display Phone. The system shall provide for each station to have a PIN Numbers. By dialing the PIN at any system telephone, the administrator shall have access to emergency paging regardless of the restrictions on the particular phone being used.
- w. Administrative Phones MCESS or MCWESS shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up the handset.
 - 1) Administrative Phones shall be able to make a normal call to any Administrative Phone by dialing the number. They shall also be able to initiate an Emergency Call by flashing the hook switch four times. Emergency Calls shall ring the Designated Day/Night Administrative Display Phone and then their speaker will be connected to the emergency link station if not answered within a predetermined time period. The system shall provide for each station to have a PIN Numbers. By dialing the PIN at any system telephone, the administrator shall have access to emergency paging regardless of the restrictions on the particular phone being used.
- x. Student Phone
 - 1) Student Phone shall be supported. The Student Phone can only make 10-digit (7 digit or less than or equal to 10 digit), 0 local and 911 calls. The call duration shall be set to 5 minutes. The dial tone shall be fed momentarily at 00:04:30, 00:04:40, 00:04:50, then at five minutes, calls are disconnected. The student phone cannot receive any incoming calls.
 - 2) The Station is not allowed to dial the same number within 30 minutes and a busy signal shall be fed to the Station if the number is dialed.
- y. Administrative Display Phones shall be equipped with a 4x16 character alphanumeric display panel.
 - 1) Administrative Display Phones shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired stations. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his handset.

- 2) The display shall normally show the time of day and day of week, the current time signaling schedule, and the numbers of up to four stations calling in along with the call-in status of each station (normal, urgent, emergency). When dialing from the Administrative Display Phone, the display shall indicate the station number and type of station (loudspeaker or handset) being dialed.
 - 3) The display shall also provide user-friendly menu selections to assist the operator when paging and distributing program material. Displays shall be in English with internationally recognized symbols for maximum ease of use. Systems, which require the operator to memorize long lists of operating symbols or control codes, shall not be acceptable.
 - 4) Administrative Display Phones shall be programmable for one of 3 station types for system access, as follows:
 - a) Shall permit dialing any station in the system; turn program material on/off at their location; scroll, erase and auto-dial call-waiting queue; make conference calls and transfer calls; call forward to other administrative stations; make all-zone pages and emergency all-zone pages; have access to outside lines and be designated to receive outside line calls.
 - b) Select and distribute or cancel program material to any combination of stations, paging zones, or all zones; set/reset alarm/external functions and zone paging.
 - c) Bump or join a conversation in progress, manually initiate time tones.
 - 5) Program selection, and its distribution or cancellation shall be accomplished from a designated administrative display telephone, with the assistance of the menu display system. Distribution and cancellation shall be to any one, or combination of speakers, or any zone(s), or all zones. It shall be possible to provide three program channels at the same time.
 - 6) It shall be possible, via an Administrative Display telephone, to manually initiate any of eight (8) tones or any of the emergency tones. The tones shall be separate and distinctly different from the emergency tones. The tone selected shall continue to sound until it is canceled, or until the administrative display phone is placed back on-hook.
 - 7) Each Administrative Display Phone shall maintain a unique queue of all stations calling that particular phone.
- z. Classroom VoIP Speaker, Wall Baffle- or Ceiling-Mounted shall be programmable for one of three call-in types, as follows:
- Normal / Emergency
 Urgent / Emergency
 Emergency
- 1) VoIP Speaker Stations can be programmed for access Normal / Emergency or Urgent / Emergency shall be able to initiate an emergency call by repeated flashing of the hook switch or repeated pressing of the call-in switch. Systems, which require additional

- switches and/or conductors to initiate an emergency call, shall not be acceptable.
- 2) Emergency Calls from VoIP Speaker Call-Switch Stations shall interrupt a non-emergency call in progress at the designated Administrative Display Phone. The administrator shall receive a warning tone and be connected to the emergency caller. The disconnected party shall receive a busy signal. Systems which do not provide emergency call interrupt shall not be acceptable.
 - 3) Normal and Urgent calls shall be logged into queue for the designated administrative display phones.
 - 4) Administrative Display Phones shall ring for a period of 30 seconds when they receive a call, and then the call will drop into the queue and alert the users with the queue alert every 30 seconds until the call is answered / cleared / removed from the Queue.
 - 5) Each queue call shall first be sorted according to call priority (emergency calls, then urgent calls, and then normal calls). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems, which do not sort calls according to priority and order received, shall not be acceptable. 1) The display shall simultaneously show up to four (4) Staff Call Switch Station Calls pending. Additional calls, beyond four (4), shall be indicated by an arrow pointing down thus prompting the user that additional calls are waiting.
 - 6) It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call unless the call has dropped into the queue.
 - 7) The Bogen Ceiling Mounted or Wall Baffle VoIP Speakers are powered via Power over Ethernet (PoE). Use an 802.3af compliant Power over Ethernet Switched port. One PoE switched port is required per VoIP Speaker.
- aa. System programming shall be from an authorized Quantum Commander User via Web browser. All system programming data shall be stored in nonvolatile memory. A valid username and password shall be required to gain access to the following programmable functions:
- 1) Station Initialization shall be accomplished from an authorized Quantum Commander User via web browser. All station initialization data shall be stored in nonvolatile memory. A password (separate from the password necessary for system programming) shall be required to gain access to the following station initialization parameters:
 - a) Programming and diagnostics shall be built into the Quantum Commander Webserver browser and be accessible only by authorized personnel. Diagnostics shall indicate passes and failures of system memory, system clock, all audio busses, tone generators, DTMF generators and decoders and the integrity of the field wiring.
 - b) Systems not capable of supporting web-based diagnostics and any computer interface for programming and diagnostics

or supportive of built-in diagnostics for the end user shall not be deemed as equal.

- c) Systems that require a serial to Ethernet converter requiring additional software on pc for programming are not deemed as equal.

bb. Rollover EOL (End-Of-Line Device)

- 1) This feature shall be supported for all the Stations (Admin Display phone or analog phone) configured with a loudspeaker. Based on the dialed sequence, intercom or telephonic call will be connected to the corresponding telephone or speaker.
- 2) If a handset station, configured with this feature, is busy when an Admin User calls the station, the call shall be rolled over to the associated speaker. If the speaker is also busy in this case, then the Admin can bump the conversation if enabled in CoS for the admin calling.
- 3) Rollover End-of-Line features is only available for the following station types
Admin Phone and Speaker
Analog Phone and Speaker
Handset and Speaker
- 4) For calls initiated by a call switch, rollover to the admin speaker shall not happen.

cc. Admin Group

- 1) This is an Administrative Display Phone feature. This feature shall be programmed from the Commander software. A maximum of 10 Administrative Display Phones will be supported in an Admin Group and there shall be a maximum of 32 Admin Groups per facility.
- 2) Once the Admin Group is set:
 - a) For normal calls, if the primary Day/Night Admin Phone is busy/no answer, all the phones in the Admin Group shall ring.
 - b) For emergency calls, if the primary day/night phone does not answer, all the phones in the Admin Group shall ring.
 - c) On no answer from any of the admin phones and if the emergency announce link is configured, the call shall be transferred to the emergency announce link as per the existing procedures. Administrative VoIP Phones do not have the emergency announce link functionality.
 - d) On answer from any of the Admin Group Phones, all the other phones shall stop ringing.

dd. Call Details Reporting

- 1) The details of every call in a facility can be provided in a report by using this feature. Specify the dates, from and to, of calls that you want to include in your log of call details. Then select Get log to view call details on your screen or select Print log to print the log to your printer or to save to file.
- 2) Call Details Log Screen shows an example of a call log. Calls are listed in the order they were placed. Details for each call include source,

target, call type, type (local or VoIP), time call started, time call ended, and call duration (in seconds).

C. SPEAKERS

1. Classroom VoIP Ceiling speakers shall be Bogen Model S810QIPPG8U Ceiling Speaker
2. Classroom speakers and grilles (ceiling-mounted, flush) shall be Bogen Model CSD2X2 Drop-In Ceiling Speakers
3. Classroom VoIP Wall Baffle Speakers shall be Bogen Model WBS810QIP
4. Classroom speakers (wall-mounted) shall be Bogen Model MB8TSQ or MB8TSL.
5. Wiring shall be done per manufacturer's recommendation, West Penn #357. All terminal connections to be on barrier strips. All cables to be labeled by room.
6. Outdoor horns shall be Bogen FMH15T.

27 00 50.03: EXECUTION

A. EXAMINATION

1. Examine conditions, with the installer present, for compliance with requirements and other conditions affecting the performance of the Integrated Telecommunications/ Time/ Audio/ Media System.
2. Do not proceed until unsatisfactory conditions have been corrected.

B. INSTALLATION

1. The installation, adjustment, testing and final connection of all conduit, wiring, boxes, cabinets, etc., shall conform to local electrical requirements and shall be sized and installed in accordance with manufacturer's approved shop drawings.
2. Low-voltage wiring may be run exposed above ceiling areas where they are easily accessible.
3. Contractor shall install new rack console at location shown on plans.
 - a. Solder each speaker line splice and tape each individual wire.
 - b. Connect remote slave clocks to master clock in console.
4. All classroom phones shall be wall-mounted.
 - a. Mount at 54" AFF.
 - b. All wiring should be concealed.
 - c. Verify exact location with Architect.
5. All Administrative Phones shall be desk- or counter-mounted.

- a. Provide standard wall 120V AC receptacle 16" AFF
 - b. Verify exact location with Architect
6. Speaker and telephone lines run above ceiling and not in conduit shall be tie-wrapped to ceiling joist with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.
7. Connect field cable to each speaker transformer using UL butt splices for 22 AWG wire.
8. Terminate field wiring on wall adjacent to rack using Telco 66 type blocks. Provide neat cross connect system for wiring. Wiring to be labeled to indicate final architectural room number that it services on the Telco block.
9. Rack shall be labeled in numerical order with speaker/phone combinations first, speaker/outside horn combinations last. Labeling and order shall reflect final Architectural room numbers posted outside the rooms. Use three- (3), four- (4), five- (5), or six- (6) digit dialing extensions.
10. Contractor shall provide a minimum of eight (8) hours of operational and programming instruction to school personnel.
11. On the first school day following installation of Multicom System, the Contractor shall provide a technician to standby and assist in system operation.
12. Mark and label all telephone outlets and/or sets with the graphic room numbers. Label all demarks IDF and MDF points with destination point numbers. Rooms with more than one outlet shall be marked XXX-1, XXX-2, XXX-3, etc. where XXX is the room number.
13. No graphic room number shall exceed the sequence from 000001 through 899999.
 - a. All outside speakers shall be on a separate page zone and time zone.
 - b. All zones shall be laid out not to exceed 10 watts maximum per zone.
 - c. All hallway speakers shall be tapped at 1 watt maximum.
 - d. All outside horns shall be tapped at 3.75 watts maximum.
 - e. All classroom speakers shall be tapped at ½ watt maximum.
 - f. Large rooms, such as cafeterias, shall be tapped at 2 watts maximum.

C. GROUNDING

1. Provide equipment grounding connections for Integrated Telecommunications/ Time/ Audio/ Media System as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.
3. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.

4. The contractor shall note in his drawing, the type and locations of these protection devices as well as all wiring information.
5. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

27 00 50.04: EXECUTION

A. DIVISION OF WORK

1. While all work included under this specification is the complete responsibility of the contractor, the following division of actual work listed shall occur.
 - a. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work shall be furnished and installed completely by the electrical contractor. The balance of the system, including installation of speakers and equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative. The entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

B. EQUIPMENT MANUFACTURER'S REPRESENTATIVE

1. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.
2. As further qualification for bidding and participating in the work under this specification, the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of [your state]. The manufacturer's representative shall have completed at least ten (10) projects of equal scope, giving satisfactory performance and have been in the business of furnishing and installing sound systems of this type for at least five (5) years. The manufacturer's representative shall be capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.
3. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state the manufacturer guarantees service performance for the life of the equipment, and that there will always be an authorized distributor assigned to service the area in which the system has been installed.
4. The contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of five (5) years after final acceptance of the project by the owner.

C. INSTALLATION

1. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.
2. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.
3. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall have a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.
4. Shielding: Cable shielding shall be capable of being connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.
5. Provide complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.

D. DOCUMENTATION

Provide the following directly to the Supervisor of Technology Service.

1. Provide a printed copy of all field programming for all components in system.
2. Provide one copy of all diagnostic software with copy of field program for each unit.
3. Provide one copy of all service manuals, parts list, and internal wiring diagrams of each component of system.
4. Provide one copy of all field wiring runs, location and end designation of system.

END OF SECTION 27 00 50

DIVISION 28
SECTION 28 31 11: FIRE ALARM SYSTEM

28 31 11: GENERAL

A. DESCRIPTION

1. This section covers the complete installation of new fire alarm devices to the existing automatic fire alarm system, as well as necessary materials, labor, calibration, testing and training.
2. The complete installation shall be in compliance with NFPA 70, 72, 101 (Life Safety Code) and NEC Article 760. The installation shall also comply with state and local ordinances, as well as the Americans with Disabilities Act (Public Law 101-336).
3. All equipment supplied shall be listed for the purpose and area in which it is used and installed in accordance with any instructions included in its listing.
4. All equipment must be new and bear the UL (Underwriters Laboratories Inc.) Label.

B. SHOP DRAWINGS

1. Fire alarm shop drawings shall contain the following:
 - a. Specification sheet/sheets of technical data on each hardware component
 - b. Specification sheet(s) on wiring to be utilized
 - c. One-line schematic riser diagram made specifically for this job
 - d. Calculation for sizing batteries and power supplies
 - e. Sequence of operation for the entire system
 - f. Copy of vendor's NICET fire alarm certificate (level III or higher)
 - g. Verification of central supervising station (UL Certified)
 - h. Equipment and service warranty
 - i. Scaled floor plans showing fire alarm device locations and wire routing

C. ACCEPTABLE MANUFACTURERS

1. New devices and equipment shall be compatible with existing system.

D. STORAGE AND HANDLING

1. Smoke detectors shall be covered with plastic wrapping if installed prior to the completion of painting, sanding and other work producing dust, etc.
2. The fire alarm control panel(s) shall not be installed until its designated room has been completely painted and cleaned.

28 31 11: PRODUCTS

A. CONTROL PANEL/SYSTEM DESCRIPTION

1. Existing.

B. FIELD DEVICES

1. Manual Stations: Semi-flush, addressable, double action type. Station shall be constructed of high impact red polycarbonate.
2. Area Smoke Detectors: Smoke detectors shall be of the analog, addressable, photoelectric type. A pulsed diode pilot lamp, visible from the floor, shall be provided to indicate alarm condition or component failure. Diode pilot lamp may be pulsed diode type for normal and steady for alarm trouble indication. Detectors shall be self-supervising for component failure as well as line failure. Detector failure or removal of detector shall initiate (zone) trouble signal. Detector shall be capable of monitoring 900 square feet of unobstructed area with spacing not to exceed 30 feet on center. Smoke detectors shall be ceiling mounted and shall be interconnected into alarm system to function in same manner as the manual station. Detectors shall report analog level of smoke/dirt to panel.
3. Duct Smoke Detectors: Detectors shall be of the analog, addressable, photoelectric type. The unit shall consist of a detector and an air sampling assembly housed in a casting designed for duct mounting. The sampling tubes shall extend completely across the duct. Detectors shall report analog level of smoke/dirt to panel. Where detector LEDs are concealed, not easily observable, or greater than 10' above floor, detectors shall have remote LED alarm indicators in a nearby observable location for alarm identification. Each LED shall be labeled to identify location of duct smoke detector.
4. Audible/Visual Devices: Audible/visual devices shall be horns with flashing visual appliances with the word "FIRE" written on the lens. The horns shall produce at least 15 dBa above ambient noise level. Audible and visual devices (including the combination device) shall utilize a 4" electrical backbox. Visual devices shall be multi-candela, field-selectable, with a constant flash rate of one (1) flash per second. The device color shall be white.
5. Any visual device in a sleeping area shall be minimum 110 candela, unless noted otherwise.
6. Addressable relays shall be provided as required to accomplish all mechanical systems and other related control functions.
7. Addressable input monitoring devices shall be provided as required to monitor existing water flow, tamper switch, and other devices.

8. Heat detectors shall be addressable, fixed temperature type rated at 135 degrees F, unless noted otherwise on drawings.
9. Fire phone jacks shall mount on stainless steel single gang plates labeled in red "Fire Emergency Phone."
10. Monitoring of remote fire protection valves on site (if applicable) shall be accomplished via fire alarm system connection.

28 31 11: EXECUTION

A. GENERAL

1. All wiring shall be suitably protected from damage. Wiring shall be routed within conduit where installed in the following areas:
 - a. underground
 - b. damp and wet locations
 - c. where exposed on interior walls
 - d. for all input and output signal wiring for smoke exhaust (including stairwell pressurization) equipment
 - e. where concealed in a wall or inaccessible ceiling
2. All wiring installed exposed within a plenum shall be UL Listed accordingly. Plenum rated cable shall be tied to the building structure at approximately 6'-0" on center using cable ties.
3. Conduit sleeves with bushings shall be installed for fire alarm cabling that passes through walls and floor assemblies. Seal the opening around the conduit and the hole in the conduit with a UL Listed fire rated sealant as required.
4. Provide necessary programming to accomplish the indicated system operation and control functions.
5. All conduit, control wiring, power wiring, relays, and other equipment and devices required to form a complete and operational system shall be provided as part of this Contract.
6. All wiring requirements for shielding certain conductors from others or routing in separate raceways shall be as recommended by the manufacturer.

B. WARRANTY

1. Equipment, materials, workmanship and system performance incorporated into the work shall be guaranteed for a period of one (1) year from the time the Owner receives beneficial use of the fire alarm system and the acceptance tests herein specified have been satisfactorily completed. Any defects due to faulty

materials, methods or installation or workmanship within this period shall be promptly repaired or replaced.

2. Vendor shall provide pricing for system inspections for a period of four (4) additional years after the initial 12-month warranty as a bid alternate to the Owner. Provide inspections per N.F.P.A. 72 and N.F.P.A. 101.
3. Spare Parts: Provide the following spare equipment items to the Owner upon project completion:
 - a. Addressable modules: 2
 - b. Smoke detectors: 2
 - c. Manual stations: 2
 - d. Duct mounted smoke detectors: 1
 - e. Audible/visual devices: 4

C. TESTING AND CERTIFICATION

1. Testing and certification of the life safety system per NFPA 72 shall be as required by the Fire Marshal and Engineer. The Contractor shall be responsible for identifying the required testing, coordinate scheduling, and conducting the test necessary to achieve occupancy certification, and assurance of complete system operation. The Contractor shall submit proof of complete system operation signed by the Fire Marshal to Engineer and Owner.
2. Contractor shall notify the Owner's representative in writing that the Owner is responsible for hiring a monitoring agency for remote supervision of the fire alarm system.

END OF SECTION 28 31 11