PROJECT MANUAL

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Jova/Daniels/Busby-
Lawton, Umemura & Yamamoto, Architects
EDAW, Landscape Architect

PROJECT MANUAL

OUTLINE SPECIFICATION

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PROJECT NO. 82000-001

26 MARCH, 1984

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SECTION	TITLE	PAGE
	TITLE PAGE	
	DIRECTORY	
	TABLE OF CONTENTS	
CONTRACT DOCUMENTS		
00700	GENERAL CONDITIONS	00700-1
00800	SUPPLEMENTARY CONDITIONS	00800-1 thru 9
DIVISION 1 - GENERAL REQUIREMENTS		
01005	SUMMARY OF WORK	01005 - 1 thru 4
01068	DEFINITIONS AND STANDARDS	01068 - 1 thru 12
01155	SCHEDULES, REPORTS, PAYMENTS	01155 - 1 thru 8
01205	PROCEDURES AND CONTROLS	01205 - 1 thru 6
01340	SUBMITTALS	01340 - 1 thru 6
01505	TEMPORARY FACILITIES	01505 - 1 thru 6
01605	PRODUCTS AND SUBSTITUTIONS	01605 - 1 thru 7
01705	PROJECT CLOSEOUT	01705 - 1 thru 6
DIVISION 2 - SITEWORK		
02110	SITE PREPARATION	02110 - 1 thru 3
02130	EXISTING TREE AND PLANT PROTECTION	02130 - 1 thru 4
02200	EARTHWORK	02200 - 1 thru 13
02281	TERMITE CONTROL	02281 - 1 thru 3
02411	FOUNDATION DRAINAGE	02411 - 1 thru 2
02441	UNDERGROUND SPRINKLER SYSTEM	02441 - 1 thru 6
02443	FOUNTAIN MECHANICAL AND ELECTRICAL	02443 - 1 thru 21
02480	PLANTING	02480 - 1 thru 15
02495	LANDSCAPE ACCESSORIES	02495 - 1 thru 4
02500	LAKE DAM	
02513	ASPHALT CONCRETE PAVING	02513 - 1 thru 5
02515	PORTLAND CEMENT CONCRETE PAVING	02515 - 1 thru 7
02517	MASONRY PAVING	02517 - 1 thru 8
02717	FIREWATER SYSTEMS	02717 - 1 thru 5
02719	WATER SERVICE SYSTEM	02719 - 1 thru 5
02720	SEWER COLLECTION SYSTEM	02720 - 1 thru 6
02730	WATERWELL	02730 - 1 thru 6

02812	LIGHTING, ELECTRICAL AND TELECOMMUNICATIONS	02812 - 1 thru 13

DIVISION 3 - CONCRETE

03010	CONCRETE WORK	03010 - 1 thru 25
03350	POST TENSIONED CONCRETE	03350 - 1 thru 8
03450	ARCHITECTURAL PRECAST CONCRETE	03450 - 1 thru 7

DIVISION 4 - MASONRY

04200	UNIT MASONRY	04200 - 1 thru 10
04230	REINFORCED UNIT MASONRY	04230 - 1 thru 5
04400	STONEWORK	04400 - 1 thru 10
04424	RUBBLE STONE MASONRY	04424 - 1 thru 2

DIVISION 5 - METALS

05120	STRUCTURAL STEEL	05120 - 1 thru 11
05210	STEEL JOISTS	05210 - 1 thru 5
05300	METAL DECKING	05300 - 1 thru 6
05400	LIGHTGAGE FRAMING	05400 - 1 thru 5
05500	METAL FABRICATIONS	05500 - 1 thru 13
05520	HANDRAILS AND GUARDRAILS	05520 - 1 thru 6
05800	EXPANSION JOINT CONTROL SYSTEM	05800 - 1 thru 2

DIVISION 6 - WOOD AND PLASTICS

06100	ROUGH CARPENTRY	06100 - 1 thru 5
06180	GLUED LAMINATED WOOD DECKING	06180 - 1 thru 4
06400	ARCHITECTURAL WOODWORK	06400 - 1 thru 14
06602	SYNTHETIC MARBLE COUNTERS	06602 - 1

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07115	SHEET WATERPROOFING	07115 - 1 thru 5
07160	BITUMINOUS DAMPPROOFING	07160 - 1 thru 3
07175	WATER REPELLANTS	07175 - 1 thru 3
07200	INSULATION	07200 - 1 thru 5
07256	SPRAYED-ON FIREPROOFING	07256 - 1 thru 6
07510	BUILT-UP ROOFING SYSTEM	07510 - 1 thru 11
07530	INSULATED ADHERED SHEET ROOFING	07530 - 1 thru 9
07550	INSULATED FLEXIBLE SHEET ROOFING SYSTEM	07550 - 1 thru 6
07570	PENTHOUSE FLOOR ELASTOMERIC MEMBRANE	07570 - 1 thru 6

07600	FLASHING AND SHEET METAL	07600 - 1 thru 5
07662	METAL FASCIAE, SIDING, ROOFING, AND COPINGS	07662 - 1 thru 7
07750	INSULATED FLEXIBLE SHEET	07750 - 1 thru 6
07800	ROOF ACCESSORIES	07800 - 1 thru 4
07900	JOINT SEALERS	07900 - 1 thru 6

DIVISION 8 - DOORS AND WINDOWS

08100	STEEL DOORS AND FRAMES	08100 - 1 thru 6
08210	WOOD DOORS	08210 1 thru 5
08305	ACCESS DOORS	08305 1 thru 3
08331	OVERHEAD COILING DOORS	08331 - 1 thru 5
08341	OVERHEAD COUNTER COOR	08341 - 1 thru 3
08410	ALUMINUM ENTRANCES & STOREFRONTS	08410 - 1 thru 7
08700	BUILDERS HARDWARE	
08800	GLASS AND GLAZING	08800 - 1 thru 8

DIVISION 9 - FINISHES

09200	LATH AND PLASTER	09200 - 1 thru 8
09250	GYPSUM DRYWALL	09250 - 1 thru 12
09300	TILE WORK	09300 - 1 thru 8
09510	ACOUSTICAL CEILINGS	09510 - 1 thru 6
09520	FABRIC WRAPPED PANELS	09520 - 1 thru 2
09550	WOOD FLOORING	09550 - 1 thru 4
09650	RESILIENT FLOORING	09650 - 1 thru 6
09680	CARPETING	09680 - 1 thru 8
09900	PAINTING	09900 - 1 thru 10
09950	WALL COVERINGS	09950 - 1 thru 4

DIVISION 10 - SPECIALTIES

10100	MARKERBOARDS AND TACKBOARDS	10100 - 1 thru 5
10160	TOILET PARTITIONS	10160 - 1 thru 4
10200	LOUVERS AND VENTS	10200 - 1 thru 5
10250	PARABOLIC LOUVERS	10250 - 1
10270	ACCESS FLOORING	10270 - 1 thru 6
10350	FLAGPOLES	10350 - 1 thru 3
10410	DIRECTORIES AND BULLETIN BOARDS	
10440	SPECIALTY SIGNS	
10500	METAL LOCKERS	10500 - 1 thru 4
10520	FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES	10520 - 1 thru 4
10620	OPERABLE PARTITIONS	10620 - 1 thru 3
10800	TOILET ACCESSORIES	10800 - 1 thru 4
10850	WASHROOM UNITS	10850 - 1 thru 3

DIVISION 11 - EQUIPMENT

11062	STAGE CURTAINS	
11131	PROJECTION SCREENS	11131 - 1 thru 3
11150	PARKING EQUIPMENT	
11160	LOADING DOCK EQUIPMENT	11160 - 1 thru 5
11170	WASTE HANDLING EQUIPMENT	11170 - 1 thru 4
11400	FOOD SERVICE EQUIPMENT	
11415	WALK-IN REFRIGERATED STORAGE	11415 - 1 thru 5
11450	RESIDENTIAL EQUIPMENT	11450 - 1 thru 3

DIVISION 12 - FURNISHINGS

12500	WINDOW TREATMENT	12500 - 1 thru 7
12651	ASH RECEPTACLES	12651 - 1
12670	ENTRANCE MATS	12670 - 1 thru 3
12710	AUDITORIUM SEATING	

DIVISION 13 - SPECIAL CONSTRUCTION

NOT USED

DIVISION 14 - CONVEYING SYSTEMS

14225	HYDRAULIC ELEVATORS	14225 - 1 thru 21

DIVISION 15 - MECHANICAL

15010	GENERAL MECHANICAL REQUIREMENTS	15010 - 1 thru 21
15100	BASES, SUPPORTS, & SLEEVES	15100 - 1 thru 7
15200	INSTRUMENTS AND CONTROLS	15200 - 1 thru 23
15300	AIR DISTRIBUTION SYSTEM	15300 - 1 thru 15
15400	EQUIPMENT	15400 - 1 thru 36
15500	PLUMBING FIXTURES & EQUIPMENT	15500 - 1 thru 10
15600	PIPING SYSTEM	15600 - 1 thru 16
15690	PIPING SPECIALTIES	15690 - 1 thru 5
15700	INSULATION	15700 - 1 thru 9
15800	BALANCING & OPERATIONAL TEST	15800 - 1 thru 8
15900	FIRE PROTECTION SYSTEM	15900 - 1 thru 6

DIVISION 16 - ELECTRICAL

16010	GENERAL ELECTRICAL REQUIREMENTS	16010 - 1 thru 10
16100	BASIC MATERIALS	16100 - 1 thru 8
16200	COMMUNICATION & PROTECTION	16200 - 1 thru 4
16300	ELECTRICAL DISTRIBUTION SYSTEM	16300 - 1 thru 7
16400	ELECTRICAL SERVICE SYSTEM	16400 - 1 thru 11
16500	LIGHTING	16500 - 1 thru 9

END TABLE OF CONTENTS

SECTION 00700 - GENERAL CONDITIONS

"General Conditions of the Contract for Construction", AIA Document A201, Thirteenth Edition, August, 1976, Articles 1 through 14 inclusive, is a part of this Contract, and is incorporated herein as fully as if here set forth.

END SECTION

SECTION 00800 SUPLEMENTARY CONDITIONS

1. RELATION TO GENERAL CONDITIONS

The following articles supplement, modify, change, delete from or add to "General Conditions of the Contract for Construction," AIA Document A201, Thirteenth Edition, August, 1976. Where an Article of the General Conditions is modified or a Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or clause shall remain in effect.

2. ARTICLE 1 - CONTRACT DOCUMENTS

A. Add new Paragraph 1.1.5: Miscellaneous Definitions:

1.1.5.1 Term "product" as used in these Supplementary Conditions includes materials, systems, and equipment.

1.1.5.2 Term "Project Manual" as used in these Supplementary Conditions is volume which includes Conditions of Contract and Specifications.

B. Add new Paragraph 1.2.5:

If there is conflict within or between Contract Documents involving quality or quantity of work required, it is intention of Contract that work of highest quality or greatest quantity indicated or specified shall be provided. Whether or not word "all" is used, coverage is intended to be complete, except where partial coverage is specifically and expressly noted. In all cases where an item is referred to in singular number, it is intended that reference shall apply to as many such items as are required to complete work.

3. ARTICLE 4 - CONTRACTOR

A. Paragraph 4.2, Review of Contract Documents

Add new Paragraph 4.2.2:

No verbal agreement or conversation with any officer, representative, agent, or employee of Owner or Architect, either before or after execution of this Contract, shall affect or modify terms of obligations herein contained.

B. Paragraph 4.7, Permits, Fees and Notices

(1) Add Paragraph 4.7.5:

Contractor shall pay for highway fees and for all damages to sidewalks, streets or other public property, or to public utilities.

(2) Add Paragraph 4.7.6:

Contractor shall secure all certificates of inspection and of occupancy which may be required by authorities having jurisdiction over work. Deliver these to Architect upon completion of work.

C. Paragraph 4.9, Superintendent

Add Paragraph 4.9:

Superintendent shall be a full time employee of the Contractor and shall be at the Project Site on a full time basis.

D. Paragraph 4.14, Cutting and Patching of work

Add Paragraph 4.14.3 and 4.14.4:

4.14.3 Perform all cutting of work in a neat workmanlike manner and patch and restore to good condition. Do not cut structural members under any circumstances, except where expressly and particularly authorized by Architect.

4.14.4 Cutting and patching of finished work necessary for installation of mechanical and electrical work shall be included in general building construction.

4. ARTICLE 7 - MISCELLANEOUS PROVISIONS

A. Paragraph 7.5, Performance Bond and Labor and Material Payment Bond

Revise paragraph 7.5.1 to read as follows:

Furnish and pay cost for a Performance Bond and a Labor and Material Payment Bond in full amount of all obligations arising thereunder. Bonds shall be on a form approved by Owner. Bonds shall be written by a Surety Company licensed to do business in State of Georgia and acceptable to Owner. Length of Bond shall be 12 months after payment is made.

B. Paragraph 7.7, Tests

Delete last sentence in subparagraph 7.7.1 and add the following:

Inspections and tests required to establish compliance with Contract Documents, except as otherwise provided in Contract Documents, will be made by a pre-qualified, independent testing agency selected by Owner. Cost of initial services of such agency will be paid by Owner. When initial tests indicate non-compliance with Contract Requirements, subsequent retesting occasioned by non-compliance shall be performed by same agency and cost thereof borne by Contractor. Representatives of testing agency shall have access to work at all times. Contractor shall provide facilities

for such access in order that agency may properly perform its functions.

5. ARTICLE 9 - PAYMENTS AND COMPLETION

A. Paragraph 9.2, Schedule of Values

Add the following at end of paragraph 9.2.1:

Schedule of values shall be divided into not less than one part for each section of Specifications.

B. Paragraph 9.3, Applications for Payment

Add the following at end of paragraph 9.3.1:

The form of Application for Payment shall be AIA Document G702, Application and Certification for Payment, supported by AIA Document G702A, continuation Sheet.

C. Paragraph 9.5, Progress Payments

Add Paragraph 9.5.6:

Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner will make progress payment on account of the Contract Sum to the Contractor as provided in the Conditions of the Contract as follows: On or about the first (1st) day of each month, ninety (90) percent of the proportion of the Contract Sum properly allocable to labor, materials and equipment incorporated in the Work and Ninety (90) percent of the proportion of the Contract Sum properly allocable to materials and equipment suitably stored at the site or at some other location agreed upon in writing by parties, up to the first (1st) day of that month, less the aggregate of previous payments in each case; and upon completion of Fifty (50) percent of the entire work, a sum sufficient to increase the total payments to ninety-five (95) percent of the Contract Sum, less such retainage as the Architect shall determine for all incomplete work and unsettled claims.

D. Paragraph 9.8, Substaintial Completion

Add the following new paragraphs:

9.8.3 Owner shall not occupy any portion of Project prior to time of completion except upon written consent of Contractor. It is agreed that occupany therewith and materials used therein will not constitute final acceptance of workmanship or materials used therein, and will not relieve Contractor from his obligation to complete Project in compliance with Contract Documents.

9.8.4 Liquidated Damages (optional)

1. It is mutually understood and agreed by and between parties of this contract, in execution of same, that time is of essence of the contract. In event that Contractor fails to complete work to be performed under this contract by and at applicable completion time established in Contract, including any extension of time granted under General Conditions, Contractor shall pay to Owner because of delay in completing such building as and for liquidated damages, such as Owner's increased overhead and cost of additional Architectural supervision, and not as a penalty, for each and every calendar day, beginning 90 days after date of established completion that Contractor shall be in default as to such building the sum of ( ).

2. Liquidated damages will be waived for and during extent of delay caused by Contractor's inability to obtain material or equipment by reasons such as Federal embargoes, priority orders, or other restrictions imposed by the United States Government, provided that adequate evidence is presented by Contractor to prove such delay and to enable Owner to determine with exactness the extent and duration of such delay for each item of material and equipment involved.

3. Owner shall have right to deduct liquidated damages from money in its hands otherwise due, or to become due, to Contractor or to sue for and recover compensation for damages for nonperformance of this Contract at time stipulated herein.

6. ARTICLE 11 - INSURANCE

A. Paragraph 11.1, Contractor's Liability Insurance

11.1.1 In the first line following the word "Maintain", insert the words: "in a company or companies licensed to do business in the state in which Project is located and to which Owner has no reasonable objections."

B. Paragraph 11.3, Property Insurance (Builder's Risk)

(1) 11.3.1 Delete first sentence and substitute:

Contractor shall purchase and maintain property insurance upon the entire work at the site to the full insurable value thereof. Such insurance shall be in a company or companies against which Owner has no reasonable objection.

(2) Add new 11.3.1.1

If this insurance is written with stipulated amounts deductable under the terms of the policy, Contractor shall pay difference attributable to deductions in any payments made by insurance carrier on claims paid by this insurance.

(3) 11.3.4 Delete in its entirety and substitute:

Contractor shall file original and one certified copy of all policies with Owner and Architect before exposure to loss may occur. If Owner is damaged by Contractor's failure to maintain such insurance and to so notify Owner, then Contractor shall bear all reasonable costs properly attributable thereto.

(4) 11.3.5 Delete in its entirety

(5) 11.3.6 Add the following sentence to end of the paragraph: The policies shall be endorsed to include such waivers of subrogation.

(6) 11.3.9 Delete second sentence and substitute:

Contractor may terminate this insurance when final payment under the Contract is received, when Project is occupied by Owner under terms of Article 9: Payments and Completion or as mutually agreed to by Owner and Contractor.

C. Add new Paragraph 11.5

11.5 Insurance Schedule

11.5.1 Contractor's Liability Insurance

1. Worker's Compensation

(a) State:	Statutory
(b) Employer's Liability:	$_____
(c) Benefits Required by Union labor contracts:	As applicable

2. Comprehensive General Liability (including Premises-Options: Independent Contractors' Protective; Products and Completed Operations (Broad Form Property Damage):

(a) Bodily Injury:

$_____ Each Occurrence
$_____ Aggregate, Products and Completed Operations

(b) Property Damage:

$_____ Each Occurrence
$_____ Aggregate

(c) Products and Completed Operations Insurance shall be maintained for a minimum period of 2 years(s) after final payment and Contractor shall continue to provide evidence of such coverage to Owner on an annual basis during the aforementioned period.

(d) Property Damage Liability Insurance shall include

coverage for the following hazards:

C (Collapse)

U (Underground)

(e) Contractural Liability (Hold Harmless Coverage);

(1) Bodily Injury:

$_____ Each Occurrence

(2) Property Damage:

$_____ Each Occurrence
$_____ Aggregate

(f) Personal Injury, with Employment Exclusion deleted:

$_____ Aggregate

3. Comprehensive Automobile Liability (owned, non-owned, hired):

(a) Bodily Injury:

$_____ Each Person
$_____ Each Accident

(b) Property Damage:

$_____ Each Occurrence

11.5.2 Owner's Liability Insurance

The Contractor shall provide this insurance with the following limits:

(1) Bodily Injury:

$_____ Each Occurrence
$_____ Aggregate

(2) Property Damage:

$_____ Each Occurrence
$_____ Aggregate

(3) Personal Injury, with Employment Exclusion deleted:

$_____ Aggregate

115.3 Property Insurance

Contractor shall purchase All Risk Insurance on Completed

Value form, in the names of the Owner, Contractor, Subcontractor and Sub-subcontractors as their interests may appear with limits as follows:

Full insurable value of the work.

7. ARTICLE 12 - CHANGES IN THE WORK

A. Add subparagraph 12.1.3.1

The item of "cost" in method 3 above is hereby defined to be and shall include:

(1) Labor costs

The payroll cost for all workmen such as foremen, mechanics, craftsmen, and laborers.

(2) Materials Costs

The cost of all materials and supplies required, delivered to the construction site, which are not furnished by the Owner.

(3) Supplemental Cost

(a) Rental for all power-driven equipment at agreed-upon rates shall be charged against additional or changed work only for the actual time which the equipment is used specifically therefor.

(b) Transportation charges necessarily incurred in connection with such equipment which is not already on the site.

(c) Cost of power, fuel, lubricants and water required for such equipment. (May be included in agreed upon rate)

(d) Additional cost for construction bonds, liability and property damage, and other insurance required, where cost is necessarily increased by coverage of the additional or changed work.

(e) All incidental labor expenses incurred as a direct result in the performance of the work, including payroll taxes, workmen's compensation, pension and retirement allowances, and social insurance, or other regular payroll charges on same.

(f) Sales and use taxes, applicable to such materials and supplies.

(4) The Contractor shall keep and present in such form as the Architect may direct, a correct account of the several items of cost together with vouchers.

(5) The above definitions and requirements apply equally to work done by subcontractors.

(6) The percentage which shall be added to Contractor items of cost under method 12.1.3.3 are as follows:

(a) Labor Costs - Ten percent (10%)

(b) Material Costs - Ten percent (10%)

(c) Supplemental Cost - None

(7) Under method 12.1.3.3 compensation or adjustment for extra work by subcontractors shall be computed on the same basis as that of the Contractor, and the Contractor may add five (5%) percent to the amount charged by the subcontractor.

(8) The above percentages shall be understood to include all other costs and full compensation for profit, overhead, superintendence, field office expense, and all other elements of cost not included in "Labor Costs," "Material Costs" and "Supplemental Costs" as herein defined.

(9) Changed work shall be adjusted considering separately the parts of work added and the parts omitted. Amount of adjustment for parts omitted shall be determined at the time omission of the work is authorized, and the amount credited shall be the Contractor's actual cost without the addition of overhead and profit. The adjustment determined will be deducted from subsequent monthly estimates.

(10) Statements for additional or changed work shall be rendered by the Contractor not later than fifteen days after completion of each assignment of additional or changed work and if found correct will be approved by the Architect and submitted for payment with the next regular monthly estimate.

(11) The Owner reserves the right to contract with any person or firm other than the Contractor for any or all extra work.

(12) The Contractor's attention is especially called to the fact that he shall be entitled to no claim for damages for anticipated profits on any portion of the work that may be omitted.

B. Paragraph 12.1.4

Delete the following phrase from the third sentence: ".....,
and also under Clauses 12.1.3.3 and 12.1.3.4 above, ..."

8. ARTICLE 13 - UNCOVERING AND CORRECTION OF WORK

Add the following two paragraphs:

13.2.7.1 If all or a portion of mechanical or electrical system is used beneficially by any party other than installing Contractor, with prior written authorizaton of Owner, warranty period shall commence on date when such system or portion thereof is placed in operation. Beneficial user, if other than Owner, shall restore such system or portion thereof to a first class operating condition without cost to Owner and before acceptance by Owner.

13.2.7.2 Warranty requirements shall extend to correction, without cost to Owner, of all work found to be defective or nonconforming to Contract Documents. Contractor shall bear cost of correcting all damage resulting from such defects or nonconformance with Contract Documents exclusive of repairs required as a result of improper maintenance or operation, or of normal wear.

9. ARTICLE 14 - TERMINATION OF THE CONTRACT

Delete the following words in paragraph 14.2.1:

"is adjudged a bankrupt, or if he makes a general assignment for the benefit of his creditors, or if a receiver is appointed on account of his insolvency, or if he....."

END SECTION

SECTION 01005 - SUMMARY, ALTERNATES, ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 PROJECT/WORK IDENTIFICATION:

A. General: Name of project is "The Carter Presidential Library" abbreviated as Carter Library on contract documents by the Architect, Jova/Daniels/Busby-Lawton/Umemura/Yamamoto.

B. Contract Documents indicate the work of Contract, and related provisions of project which may include but are not necessarily limited to the following:

(1) Existing site conditions and restrictions.

(2) Other work to be performed concurrently by separate contractors.

(3) Other work subsequent to work of Contract.

(4) Alternates which are work of Contract, and alternates which are not work of Contract.

(5) Allowances established as work of Contract.

C. Summary by References: Work of Contract can be summarized by reference to the Contract, General Conditions, Supplementary Conditions, Specification Sections as listed in the "Index of Specification Sections" bound herewith, Drawings as listed in "Schedule of Drawings" bound with Drawings, addenda and modifications to the contract document issued subsequent to the initial printing of this project manual, and including but not necessarily limited to printed matter referenced by any of these. It is recognized that work of Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the contract documents.

D. Abbreviated Written Summary: Briefly, and without force and effect upon contract documents, work of Contract can be summarized as follows:

(1) The work includes construction of three pavillions and ancillary spaces on site as shown. Landscape development, sewage facilities, water storage, cooling pond, paving and other site work are required. Also, certain finish work, permanent doors, and mechanical and electrical work are required in a large pre-engineered warehouse building constructed prior to the work of

this contract.

(2) The work includes normal concrete work, architectural precast concrete work and post-tentioned concrete work, long-span steel joists, metal roof decking, heavily-insulated built-up roofing, roof accessories, waterproofing, doors, window units, hardware, glazing and interior finishes and furnishings including woodwork, carpeting and vertical blinds.

(3) The work also includes certain items of equipment, including flagpoles, dock bumpers and levelers, food service equipment, waste compaction system, plumbing, fire protection, heating-ventilating-air conditioning, electrical systems, lighting, and communication-alarm-signal systems.

1.3 ALTERATIONS AND COORDINATION:

The work of this Contract includes coordination of entire work of project, including preparation of general coordination drawings/diagrams/schedules, and control of site utilization; from the beginning of activity, through the project close-out and warranty periods.

1.4 MISCELLANEOUS AND GENERAL PROVISIONS:

A. Cutting and Patching:

(1) Definition: Includes cutting and patching of nominally completed portions of Contract work. Excludes shop fabrication of work, and normal installation procedures including the drilling of holes to install fasteners. Excludes special categories of work identified as alterations, demolition, excavating, grading, planting, cleaning, removal/replacement of noncomplying work and similar activities; although some of these activities may require cutting and patching.

(2) General: Specific requirements and limitations for cutting and patching are shown and specified for certain types of work, and specified in other sections of Division 1 as required quality control procedures for general application to performance of the work.

B. Mechanical/Electrical Requirements of General Work:

(1) General: Except as otherwise indicated, comply with applicable requirements of Division 15 sections for mechanical provisions within units of general work, and comply with applicable requirements of Division 16 sections for electrical provisions within units of general work. Refer to Division 15 and Division 16 sections for characteristcs of mechanical and electrical services to be connected to units of general work, and provide units manufactured/ fabricated for proper connection and utilization of available services as indicated.

(2) Service Connections: Except as otherwise indicated, final connection of mechanical services to general work is defined as mechanical work, and final connection of electrical services to general work is defined as electrical work.

(3) Electrical Requirements: Except as otherwise indicated, comply with applicable provisions of NEC and standards by NEMA, for electrical components of general work. Provide UL listed and labeled products where applicable. Electrical components are recognized to include, but not by way of limitation, motors, motor starters, internal equipment wiring, integral control switches and similar electrical devices, electrical heating coils, integrated lighting equipment, electronic equipment, electrical sensors and signals, communication equipment, scientific devices and similar electrical components. Where not otherwise indicated for the general work, comply with the following requirements:

(4) Motors: Except as otherwise indicated or required for heavy- duty service, provide motors with built-in thermal overload protection, NEMA No. 48D frames, rated "Quiet," general purpose continuous-duty Design B, Class B temperature rating, capable of at least 5 starts per hour, and as follows:

Phases: Squirrel-cage induction polyphase for 1/2 hp and larger, with separate windings for phases on 2-speed (if any); and capacitor-start single-phase up to 1/3 hp, or equipment manufacturer's option for 1/6 hp and smaller.

Service Factor: 1.15 for 1.0 hp and larger; 1.25 for fractional hp.

Power Factor: Comply with current energy conservation standards.

Bearings: Ball or roller; regreasable, except permanently sealed where inaccessible; sleeve-type permitted only on light-duty fractional hp motors.

Enclosure Type: Open drip-proof, guarded where accessible; except Type 2 for outdoor use and moisture exposure, or Type 1 where adequately housed.

(5) Starters and Switches: Where only manual control is required on motors 1/3 hp and smaller, provide push-button pilot-light switch, with overload protection if not adequately protected by panelboard circuit breaker. Provide magnetic starters on motors 1/2 hp and larger, and on smaller motors on automatic control, Type 1 general-purpose enclosure, toggle switch, push buttons, pilot light, reset, trip-free relay on each phase, under voltage release, and devices to coordinate with control system (including transformer where voltage exceeds 120 V).

Heating Element Connections: Except as otherwise indicated, 120-volt for less than 2 KW, single-phase higher voltage for up to 5 KW, 3-phase higher voltage for 5 KW and greater.

C. Performance Requirements for Completed Work:

(1) General: The contract documents indicate intended occupancy and utilization of building and its individual systems and facilities. Compliance with governing regulations is intended and required, for the work and for Owner's occupancy and utilization. In addition to requirement that every element of the work comply with applicable requirements of contract documents, it is also required that the work as a whole (the building project) comply with the following general building performances:

(2) External Environmental Performances: As a result of securing approval from governing authorities to proceed with construction of this project, Owner is committed to comply perpetually with terms of an "Environmental Impact Statement" dated 3/17/77 (EIS), copy of which has been transmitted to Contractor prior to execution of Owner-Contractor Agreement (as referenced therein). The project has been designed and contract documents have been prepared with intention that resulting work will comply with EIS. Prior to time of substantial completion (of the work) inspect, test and adjust performance of every element, system, or facility of the work as necessary to ensure overall performance in compliance with EIS. Approximately 30 days after Owner's occupancy and utilization has reached a level of 85%, but not later than 300 days after time of substantial completion, return to project and reinspect, retest, and readjust the work, and measure performances related to specific terms of EIS, to demonstrate and record compliances. Submit report of results to Owner, and instruct Owner's operating personnel on specific operational requirements needed to maintain compliances. Report to Owner those performances by completed-and-adjusted work which appear to be unable to comply with EIS requirements (if any).

1.5 Work Furnished by Owner and Installed by Contractor

A. The following work will be furnished by the Owner to the Contractor. It will be delivered by the Owner to the job site, unloaded, stored, protected and installed by the Contractor.

(1) Shelving

1,200 shelves, 23-3/4" x 41-1/2". Verticals, bracing & hardware shall be furnished by Owner. 139 complete units, each 15" deep 12" wide x 87" high. Install shelving in Museum Spaces F.21 and F.25.

(2) Vault Door F28

Door is existing and will be furnished by Owner to job site. Contractor shall provide a painted steel day gate designed to fit existing vault or Contractor shall install door and gate.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION (not applicable).

END OF SECTION 01005

SECTION 01068 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification apply to work specified in this section.

1.2 DEFINITIONS:

A. General Explanation: A substantial amount of specification language constitutes definitions for terms found in other contract documents, including drawings which must be recognized as diagramatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in contract documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to extent not stated more explicitly in another provision of contract documents.

B. General Requirements: The provisions of requirements of Division-1 sections. General Requirements apply to entire work of Contract and, where so indicated, to other elements which are included in project.

C. Indicated: The term "Indicated" is a cross reference to graphics, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled" and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross- reference, and no limitation of location is intended except as specifically noted.

D. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed," "requested." "authorized," "selected," "approved," "required," "accepted." and "permitted" mean "directed by Architect," or "requested by Architect," etc. However, no such implied meaning will be interpreted to extend Architect's responsibility into Contractor's area of construction supervision.

E. Approve: Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contractor from responsiblities to fulfill requirements of contract documents.

F. Project Site: The space available to Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of project site is shown on drawings, and may or may not be identical with description of land upon which project is to be built.

G. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, and installation, as applicable in each instance.

H. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

J. Installer: The entity (person or firm) engaged by Contractor or its subcontractor or sub-subcontractor for performance of a particular unit of work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

K. Testing Laboratory: An independent entity engaged to perform specific inspections or tests of work, either at project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.

1.3 FORMAT AND SPECIFICATION EXPLANATIONS:

A. Specification Production: None of these explanations will be interpreted to modify substance of requirements. Portions of these specifications have been produced by Architect's standard methods of editing master specifications, and may contain minor deviations from traditional writing formats. Such deviations are a normal result of this production technique, and no other meaning will be implied or permitted.

B. Format Explanation: The format of principal portions of these specifications can be described as follows; although other portions may not fully comply and no particular significance will be attached to such compliance or non-compliance:

(1) Sections and Divisions: For convenience, basic unit of specification text is a "section," each unit of which is named and numbered. These are organized into related families of sections, and various families of sections are organized into "divisions," which are recognized as the present industry- consensus of uniform organization and sequencing of specifications. The section title is not intended to limit meaning or content of section, nor to be

fully descriptive of requirements specified therein, nor to be an integral part of the text.

Each section of specification has been subdivided into 3 (or less) "parts" for uniformity and convenience (Part 1 - General, Part 2 - Products, and Part 3 - Execution). These titles do not limit the meaning of, and are not an integral part of text which specifies requirements.

(2) Subordination of Text: Portions of specification text are subordinated to other portions in the following (traditional) manner (lowest level to highest):

Indented (from left margin) paragraphs and lines of text are subordinate to preceding text which is not indented, or which is indented by a lesser amount.

Paragraphs and lines of text are subordinate to subarticle titles, which are printed in upper/lower-case lettering.

Subarticles are subordinate to article titles, which are printed in upper-case lettering.

Subordination (if any) of certain sections (or portions of sections) to other sections is described within those sections.

(3) Underscoring: Used strictly to assist reader of specification text in scanning text for key works in content (for quick recall). No emphasis on or relative importance of text is intended where underscoring is used.

(4) Imperative Language: Used generally in specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by Contractor, or when so noted, by others.

(5) Section Numbering: Used to facilitate cross reference in contract document. Sections are placed in Project Manual in numeric sequence; however, numbering sequence is not complete, and listing of sections at beginning of Project Manual must be consulted to determine numbers and names of specification sections in contract documents.

(6) Page Numbering: Numbered independently for each section; recorded in listing of sections (Index or Table of Contents) in Project Manual. Section number is shown with page number at bottom of each page, to facilitate location of text in Project Manual.

(7) Article and Paragraph Numbering: Provided in each section, strictly for purpose of facilitating subsequent references to specific text, for addenda, purchasing, subcontracting, modifications, change orders, and similar references.

(8) Project Identification: Project name and number (either complete or abbreviated) are recorded at top of each page of specifications to minimize possible misuse of specifications, or confusion with other project specifications.

C. Specification Content: Because of methods by which this project specification has been produced, certain general characteristics of content, and conventions in use of language are explained as follows:

(1) Specifying Methods: The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive," "open generic-descriptive," "compliance with standards," "performance," "proprietary," or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.

(2) Overlapping and Conflicting Requirements: Where compliance with 2 or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, most stringent requirement (which is generally recognized to be also most costly) is intended and will be enforced, unless specifically detailed language written into contract documents (not by way of reference to an industry standard) clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently-equal-but- different requirements, and uncertainties as to which level of quality is the more stringent, to Architect for a decision before proceeding.

Contractor's Options: Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether specifically indicated as such.

(3) Minimum Quality/Quantity: In every instance, quality level or quantity shown or specified is intended as minimum for the work to be performed or provided. Except as otherwise specifically indicated, actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainity to Architect for decision before proceeding.

(4) Specialists; Assignments: In certain instances specification text requires (or at least implies) that specific work be assigned to specialists or expert entities, who must be engaged for performance of those units of work. These must be recognized as special requirements over which Contractor has no choice or option. These assignments must not be confused with (and are not intended to interfere with) normal application of regulations, union jurisdictions and similar conventions. One purpose of such assignments is to establish which party or entity involved in a specific unit of work is recognized as "expert" for indicated construction processes or operations. Nevertheless, final

responsibility for fulfillment of entire set of requirements remains with Contractor.

(5) Trades: Except as otherwise indicated, the use of titles such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized tradesperson or corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradesperson of that corresponding generic name.

(6) Abbreviations: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual work abbreviations of a self-explanatory nature have been included in texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in section at first instance of use. Trade association names and titles of general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the contract documents so indicates.

1.4 DRAWING SYMBOLS:

Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined on drawings.

1.5 INDUSTRY STANDARDS:

A. General Applicability of Standards: Applicable standards of construction industry have same force and effect (and are made a part of contract documents by reference) as if copied directly into contract documents, or as if published copies were bound herewith.

(1) Referenced standards (referenced directly in contract documents or by governing regulations) have precedence over non- referenced standards which are recognized in industry for applicability to work.

(2) Non-referenced standards are hereby defined to have no particular applicability to the work, except as a general measurement of whether work complies with standards recognized in construction industry.

(3) Non-referenced standards recognized in the construction industry are hereby defined, except as otherwise limited in contract documents, to have direct applicability to the work, and will be so enforced for performance of the work.

B. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contact documents.

C. Copies of Standards: Provide where needed for proper performance of the work; obtain directly from publication sources.

D. Abbreviations and Names: Where acronyms or abbreviations are used in specifications or other contract documents they are defined to mean the industry recognized name of trade association, standards generating organization, governing authority or other entity applicable to context of text provision. Refer to "Encyclopedia of Associations," published by Gale Research Co., availabe in large libraries.

E. Abbreviations and Names: The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:

AA Aluminum Association
818 Connecticut Ave. NW; Washington DC 20006;
202/862-5100

AAMA Architectural Aluminum Manufacturers Association
35 E. Wacker Drive; Chicago, IL 60601 312/782-8256

AAN American Association of Nurserymen
230 Southern Blg.; Washington, DC 20005 202/737-4060

AASHTO American Association of State Highway & Transportation Officials
444 North Capitol; Washington DC 20001; 202/624-5800

AATCC American Association of Textile Chemist and Colorists
P O Box 12215; Research Triangle Park NC 27709 919/549-8141

ACI American Concrete Institute
P.O. Box 19150; Detroit, MI 48219; 313/532-2600

ACIL American Council of Independent Laboratories
1725 K Street, NW; Washington, DC 20006 202/659-3766

ADC Air Diffusion Council
230 N. Michigan Ave.; Chicago, IL 60601; 312/372-9800

AGA American Gas Association
1515 Wilson Blvd.; Arlington, VA 22209 703/841=8400

AHAM Association of Home Appliance Manufacturers
20 N Wacker Dr.; Chicago, IL 60606; 312/984-5800

AI Asphalt Institute
Asphalt Inst Bldg.; College Park, MD 20740 301/277-4258

AIA American Institute of Architects
1735 New York Ave. NW; Washington, DC 20006; 202/626-7474

A.I.A. American Insurance Association
85 John Street; New York, NY 10038 212/699-0400

AISC American Institute of Steel Construction, Inc.
400 N. Michigan Ave.; Chicago, IL 60611; 312/670-2400

AISI American Iron and Steel Institute
1000 16th st., NW; Washington, DC 20036 202/452-7100

AITC American Institute of Timber Construction
333 West Hampden Avenue; Englewood, CO 80110
303/761-3212

AMCA Air Movement and Control Association
30 W. University Dr.; Arlington Heights, IL 60004 312/394-0150

ANSI American National Standards Institute
1430 Broadway; New York, NY 10018 212/272-2283

APA American Plywood Association
P.O. Box 11700; Tacoma, WA 98411; 206/565-6600

ARI Air Conditioning and Refrigeration Institute
1815 N. Fort Myer Dr.; Arlington, VA 2209; 703/524-8800

ASC Adhesive and Sealant Council
1600 Wilson Blvd.; Arlington, VA 22209; 703/841-1112

ASHRAE American Society of Heating, Refrigerating & Air-Conditioning Engineers,
1791 Tullie Circle, NE; Atlanta, GA 30329; 404/636-8400

ASME American Society of Mechanical Engineers
345 East 47th Street; New York, NY 10017 212/705-7722

ASPE American Society of Plumbing Engineers
15233 Ventura Bldv.; Sherman oaks, CA 91403; 213/783-4845

ASSE American Society of Sanitary Engineering
P O Box 9712; Bay Village, OH 44140; 216/835-3040

ASTM American Society for Testing and Materials
1916 Race Street; Philadelphia, PA 19103 215/299-5400

AWI Architectural Woodwork Institute
2310 S. Walter Reed Dr.; Arlington, VA 22206 703/671-9100

AWPA American Wood-Preservers' Association
7735 Old Georgetown Rd.; Bethesda, MD 20814; 301/652-3109
301/652-3109

AWPB American Wood Preservers Bureau
P. O. Box 6085; Arlington, VA 22206; 703/931-8180

AWS American Welding Society
P. O. Box 351040; Miami, FL 33135 305/642-7090

AWWA American Water Works Association
5666 W. Quincy Avenue, Denver, CO 80235 303/794-7711

BHMA Builders' Hardware Manufacturers Association (c/o TGAM)
60 East 42nd Street; Rm 1807; New York, NY 10017
212/682-8142

BIA Brick Institute of America
1750 Old Meadow Road; McLean, VA 22102 703/893-4010

CDA Cooper Development Association, Inc.
405 Lexington Avenue; New York, NY 10174 202/953-7300

CE Corps of Engineers (U. S. Dept. of the Army)
Washington, DC 20314

CFR Code of Federal Regulations
Available from Government Printing Office; Washington, DC
20402 (usually first published in Federal Register)

CISPI Cast Iron Soil Pipe Institute
1499 Chain Bridge Rd.; Mclean, VA 22101; 703/827-9177

CRSI Concrete Reinforcing Steel Institute
933 Plum Grove Rd.; Schaumberg, IL 60195; 312/372-5059

CS Commercial Standard of NBS (U.S. Dept. of Commerce)
Government Printing Office; Washigton, DC 20402

DHI Door & Hardware Institute
7711 Old Springhouse Rd.; McLean, VA 22102; 703/556-3990

EIA Electronic Industries Association
2001 Eye St., NW; Washington, DC 20006; 202/457-4900

FAA Federal Aviation Administration (U.S. Dept. of
Transportation) 800 Independence Avenue, SW; Washington, DC
20590

FCC Federal Communications Commission
1919 M St.; NW; Washington, DC 20554; 202/632-700

FCI Fluid Controls Institute
U. S. Higway One, Plaza 222; Tequesta, FL 33458;
305/746-6466

FGMA Flat Glass Marketing Association
3310 Harrison Avenue; Topeka, KS 66611 913/266-7013

FHA Federal Housing Administration (U.S. Dept. of HUD)
451 - 7th Street, SW; Washington, DC 20201

FM Factory Mutual Engineering Corp.
1151 Boston-Providence Turnpike; Norwood, MA 02062 617/762-4300

FS Federal Specification (General Services Admin.)
Obtain from your Regional GSA Office, or purchase from GSA Specifications Unit (WFSIS); 7th and D Streets, SW; Washington, DC 20406; 202/472-2205 or 2140.

FTI Facing Tile Institute
c/o Box 8880; Canton, OH 44711; 216/488-1211

GA Gypsum Association
1603 Orrington Avenue; Evanston; IL 60201 312/491-1744

HPMA Hardwood Plywood Manufacturers Association
P O Box 2789; Reston, VA 22090; 703/435-2900

IEEE Institute of Electrical and Electronic Engineers, Inc.
345 E. 47th St.; New York, NY 10017; 212/705-7900

IESNA Illuminating Engineering Society of North America
345 E. 47th St.; New York 10017; 212/705-7926

ILI Indiania Limestone Institute of America
Stone City Bank Bldg.; Bedford, IN 47421; 812/275-4426

IRI Industrial Risk Insurers
85 Woodland St.; Hartford, CT 06102; 203/525-2601

ISA Instrument Society of America
P. O. Box 12277; Research Triangle Park, NC 27709; 919/549-8411

MCAA Mechanical Contractors Association of America
5530 Wisconsin Ave.; Chevy Chase, MD 20815; 202/654-7960

MIA Marble Institute of America
33505 State St.; Farmington, MI 48024; 313/476-5558

MIL Military Standardization Documents (U.S. Dept. of Defense) Naval Publications and Forms Center 5801 Tabor Avenue; Philadelphia, PA 19120

ML/SFA Metal Lath/Steel Framing Association
221 North LaSalle Street; Chicago, IL 60601 312/346-1600

MSS Manufacturers Standardization Society of the Valve and Fittings Industry
5203 Leesburg Pike; Falls Church, VA 22051; 703/998-7996

NAAMM National Association of Architectural Metal Mfrs.
221 N. LaSalle St.; Chicago, IL 60601; 312/346-1600

NAPF National Association of Plastic Fabricators
1701 N Street, NW Washington, DC 20036; 202/233-2504

NBGOA National Building Granite Quarries Association
c/o H. E. Fletcher Co.; West Chelmsford, MA 01863

NBS National Bureau of Standards (U.S. Dept. of Commerce)
Gaithersburg, MD 20234; 301/921-1000

NCMA National Concrete Masonry Association
P O Box 781; Herndon, VA 22070; 703/435-4900

NEC National Electrical Code by NFPA

NECA National Electrical Contractors Association
7315 Wisconsin Ave.; Bethesda, MD 20814; 301/657-3110

NEII National Elevator Industry, Inc.
600 Third Avenue; New York, NY 10016 212/986-1545

NEMA National Electrical Manufacturers Association
2101 L St. NW: Washington, DC 20037; 202/457-8400

NFPA National Fire Protection Association
Batterymarch Park; Quincy, MA 02269; 617/328-9290

N.F.P.A. National Forest Products Association
1619 Massachusetts Avenue, NW; Washington, DC 20036
202/797-5800

NHLA National Hardwood Lumber Association
P O Box 34518; memphis, TN 38104; 901/377-1818

NPA National Particleboard Association
2306 Perkins Place; Silver Spring, MD 20910 301/587-2204

NRCA National Roofing Contractors Association
8600 Bryn Marr Ave.; Chicago, IL 60631; 312/693-0700

NSF National Sanitation Foundation
P. O. Box 1468; Ann Arbor, MI 48106 313/769-8010

NSSEA National School Supply and Equipment Association
1500 Wilson Boulevard; Arlington, VA 22209 703/524-8819

NTMA National Terrazzo and Mosaic Association
3166 Des Plains Ave.; Des Plains, IL 60018; 312/635-7744

NWMA National Woodwork Manufacturers Association
205 West Touhy Ave.; Des Plains, IL 60018; 312/823-6747

OSHA Occupational Safety & Health Administration
(U.S. Dept. of Labor) Government Printing Office; Washington,
DC 20402

PCI Prestressed Concrete Institute
20 N. Wacker Dr.; Chicago, IL 60606; 312/346-4071

PDI Plumbing and Drainage Institute
5342 Blvd. Pl.; Indianapolis, IN 46208; 317/251-5298

PEI Porcelain Enamel Institute
1911 N. Fort Myer; Arlington, VA 22209; 703/527-5257

PS Product Standard of NBS (U.S. Dept. of Commerce)
Government Printing Office; Washington, DC 20402

RFCI Resilient Floor Covering Institute
1030 15th St., NW; Washington, DC 20005; 202/833-2635

RIS Redwood Inspection Service (Grading Rules)
627 Montgomery; San Francisco, CA 94111

SAMA Scientific Apparatus Makers Association
1101 16th St.; NW; Washington, DC 20036; 202/223-1360

SDI Steel Deck Institute
P O Box 3812; St. Louis, MO 63122; 314/965-1741

S.D.I. Steel Door Institute
712 Lakewood Cnt, N,; Cleveland, OH 44107; 216/226-7700

SHLMA Southern Hardwood Lumber Manufacturers Association
805 Sterick Bldg.; Memphis, TN 38103; 901/525-8221

SIGMA Sealed Insulating Glass Manufacturers Association
111 E. Wacker Dr.; Chicago, IL 60601; 312/644-6610

SJI Steel Joist Institute
1703 Parham Rd.; Richmond, VA 23229; 804/288-3071

SMACNA Sheet Metal & Air Conditioning Contractors' National Association
P. O. Box 70; Merrifield, VA 22116

SPIB Southern Pine Inspection Bureau (Grading Rules)
4709 Scenic Hwy.; Pensacola, FL 32504; 904/434-2611

SSPC Steel Structures Painting Council
4400 5th Avenue; Pittsburgh, PA 15213; 412/578-3327

TCA Tile Council of America
P O Box 326; Princeton NJ 08540; 609/921-7050

TIMA Thermal Insulation Manufacturers Association
7 Kirby Plaza; Mt. Kisco, Ny 10549; 914/241-2284

TPI Truss Plate Institue
100 W. Church St.; Frederick, MD 21701; 301/694-6100

UL Underwriters Laboratories, Inc.
333 Pfingsten Rd.; Northbrook, IL 60062; 312/272-8800

WCLIB West Coast Lumber Inspection Bureau (Grading Rules)
PO Box 23145; Portland, OR 97223; 503/639-0651

WIC Woodwork Institute of California
1833 Broadway; Fresno, CA 93773; 209/233-9035

WRI Wire Reinforfement Institute
7900 Westpark Drive; McLean, VA 22102; 703;790-9790

WSFI Wood and Synthetic Flooring Institute
2400 E. Devon; Des Plaines, IL 60018; 312/635-7700

WWPA Western Wood Products Association (Grading Rules)
1500 Yeon Blg.; Portland, OR 97204; 503/224-3930

W.W.P.A. Woven Wire Prodcts Association
108 W. Lake St.; Chicago, IL 60601; 312/332-6502

1.6 GOVERNING REGULATIONS/AUTHORITIES:

The procedure followed by Architect has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing contract documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of work.

1.7 SUBMITTALS:

Permits, Licenses and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgements, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION (not applicable)

END OF SECTION 01068

SECTION 01155 - SCHEDULES, REPORTS, PAYMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections apply to work in this section.

1.2 COORDINATION:

Coordinate both the procedural timing and the listing (naming and sequencing) of reports/activities required by provisions of this section and other sections, to afford consistency and logical coordination between submitted reports or lists. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Make appropriate distribution of each report and updated report to entities involved in the work including Architect and Owner. In particular, provide close coordination of progress schedule, schedule of values, listing of subcontracts, schedule of submittals, progress reports, and payment requests.

1.3 PRELIMINARY PROGRESS SCHEDULE:

Bar-Chart Schedule: Not more than 7 days after date established for "commencement of the work", submit a bar-chart type progress schedule indicating a time bar for each major category or unit of work to be performed at site, properly sequenced and intermeshed, and showing completion of the work sufficiently in advance of date established for "substantial completion of the work". With submittal of bar chart, submit a tabulation (by date) of submittals required during first 90 days of Construction Time; as required either directly by date/period relation in contract documents, or necessitated by lead times related to individual time bars shown on schedule for associated work. At Contractor's option, submittal dates may be shown on bar-chart schedule, in lieu of being tabulated.

Superimpose an S-Curve on schedule to show "estimated" total dollar-volume of work performed at any date during Contract Time; with a column of cost figures in left-hand margin, ranging from zero to Contract Sum.

1.4 FULLY DEVELOPED PROGRESS SCHEDULE:

A. Bar-Chart Schedule: Based on preliminary development of progress schedule (if any), and whatever updating and feedback may have occurred during project start-up, secure critical time commitments for performing major elements of the work. Within 60 days of date established for "commencement of the work", submit a comprehensive bar-chart type progress schedule indicating (by stage-coded symbols) a time bar for each major category or unit of work to be performed at site, and including minor units which are, nevertheless, involved in overall sequencing of work. Arrange schedule to graphically show major sequences required in intermeshing of work, and to show how substantial completion is scheduled to allow for Architect's procedure for certification thereto. Prepare and maintain schedule on sufficiently wide sheet or series of sheets, of stable transparency or other reproducable stock, to show required data clearly for entire Construction Time, and to permit reproduction for required distribution.

(1) Phasing: Arrange schedule with notations to show how sequence of work is affected by requirements for phased completion, site restrictions, provisions for future work, seasonal variations, environmental control, and similar provisions of total project. Refer to other sections of Division 1 and other contract documents for such requirements.

(2) Individual Work Stages: By uniform targeted symbols and crosshatched bars, show significant stages for each category or unit of work, including (where applicable), but not necessarily limited to, subcontract letting, submittals, purchases, mockups, fabrication, sample testing, deliveries, installation, testing, adjusting, curing, start up and placement into final use and operation. Within long bars showing fabrication or installation of major units of work (3 months and longer) show estimated percentage-of-completion markers at 10 percent increments. As each unit of work progresses, mark each long bar with a contrasting mark (at 10 percent increments) to show actual percentage-of-completion.

(3) Area Separations: Arrange schedule with an individual time bar for each major area of construction of each major category or unit of work where it must be sequenced or intermeshed with other work as needed for structural completion, permanent space enclosure, and completion of mechanical/electrical work for overall work in that area. Except as otherwise indicated, or subsequently agreed upon with Architect, a "major area" is defined for purpose of this article to mean one story of one pavillion.

(4) Cost Correlation: Immediately below date line at heading of chart, provide a double-line cost correlation line ("precalculated" and "actual") to show dollar-volume of work performed as of same dates used for preparation of payment requests. Refer to subsequent article for cost reporting and payment procedures. Use those same dates as primary vertical lines of schedule. In so far as it is practical to do so, use same units of work in progress schedule as indicated in the "schedule of values" required by General Conditions and further specified herein.

Superimpose an S-curve on schedule (only first sheet for multiple-sheet schedule) to show "precalculated" dollar-volume against time at any point during Contract Time; with a double column of figures in left-hand margin ranging from zero dollars to Contract Sum, and from zero percent to 100. As work progresses and on each date used in payment requests, plot a second S-curve showing "actual" dollar-volume of work performed.

(5) Distribution: Following initial submittal to and response by Architect, print and distribute progress schedule to Architect (3 copies), Owner, separate contractors (if any), principal subcontractors and suppliers or fabricators, and others with a need-to-know schedule compliance requirement. Post copies in project meeting rooms and field (temporary) offices. Distribute and post subsequent updated issues to same entities, when revisions are made; except delete entities from distribution when they have completed assigned work and are no longer involved in performance of scheduled work.

1.5 SUBMITTAL SCHEDULE:

A. General: Immediately following development and acceptance of fully developed progress schedule, prepare a complete schedule of work-related submittals. Submit within 10 days of date required for establishment of progress schedule. Correlate submittal schedule with listing of principal subcontractors, as required by General Conditions, and with the "listing of products" or "procurement schedule" as specified in "Products and Substitutions" sections and elsewhere in contract documents.

B. Form: Prepare schedule in chronological sequence of "first submittals". Show category of submittal, name of subcontractor, generic description of work covered, related section numbers, activity or event number on progress schedule, scheduled date for first submission, and blank columns for actual date of submittal, resubmittal, and final release or approved by Architect or Engineer.

1.6 PROGRESS MEETINGS, REPORTING:

A. General: In addition to specific coordination and pre-installation meetings for each element of work, and other regular project meetings for other purposes, hold general progress meetings twice each month with time coordinated with preparation of payment requests. Require each entity then involved in planning, coordination or performance of work to be properly represented at each meeting. Review each entity's present and future needs including interface requirements, time, sequences, deliveries, access, site utilization, temporary facilities and services, hours of work, hazard and risks, housekeeping, change orders, and documentation of information for payment requests. Discuss whether each element of current work is ahead of schedule, on time, or behind schedule in relation with updated progress schedule. Determine how behind-schedule work will be expedited, and secure commitments from entities involved in doing so. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within Contract Time. Review everything of significance which could affect progress of the work.

(1) Initial Progress Meeting: Schedule initial progress meeting, recognized as "Pre-Construction Meeting", for a date not more than 15 days after date of commencement of the work. Use it as an organizational meeting, and review responsibilities and personnel assignments.

(2) Reporting: Within 3 days after each progress meeting date, distribute copies of minutes-of-the-meeting to each entity present and to others who should have been present. Include a brief summary (in narrative form) of progress of the work since previous meeting and report.

(3) Schedule Updating: Immediately following each progress meeting, where revisions to progress schedule have been made or recognized, revise progress schedule. Reissue revised schedule concurrently with report of each meeting.

B. Daily Reports: Prepare a daily report, recording the following information concerning events at the site; and submit duplicate copies to Architect at regular intervals not exceeding weekly intervals:

List of subcontractors at the site.
List of separate contractors at the site.
Approximate count of personnel at the site.
High/low temperatures, general weather conditions.
Accidents (refer to accident reports).
Meetings and significant decisions.
Unusual events (refer to special reports).
Stoppages, delays, shortages, losses.
Meter readings and similar recordings.
Emergency procedures, field orders.
Orders/requests by governing authorities.
Change orders received, implemented.
Services connected, disconnected.
Equipment system tests and start-ups.
Partial completions, occupancies.
Substantial completion authorized.

1.7 SCHEDULE OF VALUES:

A. General: Prepare schedule of values, as required by General Conditions, in coordination with preparation of progress schedule. Correlate line items with other administrative schedules and forms required for the work, including progress schedule, payment request form, listing of subcontractors, schedule of allowances, schedule of alternatives, listing of products and prinicipal suppliers and fabricators, and schedule of submittals. Provide breakdown of Contract Sum in sufficient detail to facilitate continued evaluation of payment requests and progress reports. Break down principal subcontract amounts into several line items. Round off to nearest whole dollar, but with total equal the Contract Sum. Submit 3 copies of schedule of values to Architect.

B. Time Coordination: In coordination of initial submittals and other administrative "start-up" activities, submit schedule of values to Architect/Engineer at earliest feasible date, but in no case later than 7 days before initial payment request is to be submitted.

C. Listing: Arrange schedule with columns to indicate generic name of item, related specification sections, change orders (numbers) which have affected value, dollar value of item, and percentage of Contract Sum (to nearest one-hundreth percent and adjusted to total 100 percent).

D. Schedule Updating: Update and resubmit schedule of values when change orders affect listing and when actual performance of the work involves necessary changes of substance to values previously listed.

1.8 PAYMENT REQUESTS:

A. General: Except as otherwise indicated, sequence of progress payments is to be regular, and each must be consistent with previous applications and payments. It is recognized that certain applications involve extra requirements, including initial application, application at time of substantial completion, and final payment application.

(1) Waivers of Lien: For each payment application, submit waivers of lien from every entity (including the Contractor) who could lawfully and possibly file a lien in excess of $100 arising out of Contract and related to work covered by payment. Submit partial waivers for amount requested (prior to deduction or retainage) on each item; and when application shows completion of item, submit final or full waivers. Owner reserves right to designate which entities involved in the work must submit waivers.

(2) Waiver Delays: Each progress payment must be submitted with Contractor's waiver for period of construction covered by application; but may, at Contractor's option, be submitted with waivers from subcontractors, sub-subcontractors and suppliers for previous period of construction covered by previous application; except final payment application must be submitted with (or preceded by) final or full waivers from every entity involved with performance of the work.

(3) Waiver Forms: Submit waivers on forms, and executed in a manner acceptable to Owner.

B. Payment Application Times: The "date" for each progress payment is as indicated in Supplementary Conditions.

C. Payment Application Forms: AIA Document G702 and Continuation Sheets G703; available from "Publications, a Division of The AIA Service Corporation", 1735 New York Ave. NW., Washington, DC, 20006 (also available at most local AIA chapter offices).

D. Application Preparation: Except as otherwise indicated, complete every entry provided for on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by Architect without action. Entries must match current data of both schedule of values and progress schedule and report. Listing must include amounts of change orders issued prior to last day of the "period of construction" covered by application.

E. Initial Payment Application: The principal administrative actions and submittals which must precede or coincide with the submittal of first payment application, can be summarized as follows, but not necessarily by way of limitation:

(1) Listing of subcontractors and principal suppliers and fabricators.

(2) Schedule of values.

(3) Progress schedule (preliminary if not final).

(4) Schedule of principal products.

(5) Schedule of unit prices.

(6) Schedule of submittals (preliminary if not final).

(7) Listing of Contractor's staff assignments and principal consultants.

(8) Copies of acquired building permits and similar authorization and licenses from governing authorities for current performance of the work.

(9) Performance and/or payment bonds (if required).

(10) Evidence satisfactory to Owner that Contractor insurance coverage have been secured.

(11) Data needed to acquire Owner's insurance coverages.

(12) Initial progress report, including report of pre-construction meeting.

F. Application at Time of Substantial Completion: Following issuance of Architect's final "certificate of substantial completion", and also in part as applicable to prior certificates on portions of completed work as designated, a "special" payment application may be prepared and submitted by Contractor. The principal administrative actions and submittals which must proceed to coincide with such special applications can be summarized as follows, but not necessarily by way of limitation:

(1) Occupancy permits and similar approvals or certifications by governing authorities and franchised services, assuring Owner's full access and use of completed work.

(2) Warranties, (guarantees), maintenance agreements and similar provisions of contract documents.

(3) Test/adjust/balance records, maintenance instructions, meter readings, start-up performance reports, and similar change- over information germane to Owner's occupancy, use, operation and maintenance of completed work.

(4) Final cleaning of the work.

(5) Application for reduction (if any) of retainage, and consent of surety.

(6) Advice to Owner on coordination of shifting insurance coverages, including proof of extended coverages as required.

(7) Final progress photographs, if required.

(8) Listing of Contractor's incomplete work recognized as exceptions to Architect's certificate of substantial completion.

G. Final Payment Application: The administrative actions and submittals which must precede or coincide with submittal of final payment application can be summarized as follows, but not necessarily by way of limitation:

(1) Completion of project closeout requirements.

(2) Completion of items specified for completion beyond time of substantial completion (regardless of whether special payment application was previously made).

(3) Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed and accepted will be completed without undue delay.

(4) Transmittal of required project construction records to Owner.

(5) Certified property survey.

(6) Proof, satisfactory to Owner, that taxes, fees and similar obligations of Contractor have been paid.

(7) Removal of temporary facilities, services, surplus materials, rubbish and similar provisions.

(8) Change over of door locks and other Contractor access to provisions Owner's property.

(9) Consent of surety for final payment.

H. Application Transmittal: Submit 3 executed copies of each payment application, one copy of which is completed with waivers of lien and similar attachments. Transmit each copy with a transmittal form listing those attachments, and recording appropriate information related to application in a manner acceptable to Architect. Transmit to Architect by means ensuring receipt within 24 hours.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION (not applicable)

END OF SECTION 01155

SECTION 01205 - PROCEDURES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

The types of minimum requirements for procedures and performance of control work of a general nature include but are not necessarily limited to the following categories:

A. Coordination and meetings.

B. Administrative/supervisory personnel.

C. Surveys and records or reports.

D. Limitations for use of site.

E. Special reports.

F. Tradespeople and workmanship standards.

G. Inspections, tests and reports.

H. General installation provisions.

I. Cutting and patching.

J. Cleaning and protection.

K. Conservation and salvage.

1.3 COORDINATION AND MEETINGS:

A. General: Prepare and distribute to each entity performing work at project site, a written memorandum of instructions on required coordination activities, including required notices, reports and attendance at meetings. Prepare similar memorandum for separate contractors where interfacing of work is required.

B. Coordination Drawings: Where work by separate entities requires off-site fabrication of products and materials which must be accurately interfaced and closely intermeshed to produce required results, prepare coordination drawings to indicate how work shown by separate shop drawings will be interfaced, intermeshed, and sequenced for installation. Comply with submittal requirements of "Submittals" sections.

Exterior Wall System: Prepare coordination drawings for integration of structural system/window wall/HVAC work making up prinicpal wall system.

C. Monthly Coordination Meeting: In addition to specific preinstallation meetings and coordination meetings for each major element of work, and regular project meetings for other purposes (as indicated elsewhere in contract documents), hold monthly general project coordination meetings at regularly scheduled times which are convenient for everyone involved. Request representation (at each meeting) by every entity currently involved in coordination or planning for work of the entire project. Conduct meetings in a manner which will resolve coordination problems. Record results of meetings and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

At Contractor's option, monthly coordination meeting can be held integrally with monthly progress meeting as specified in section "Schedules, Reports, Payments."

1.4 SURVEYS AND RECORDS/REPORTS:

A. General: Working from lines and levels established by property survey, and as shown in relation to the work, establish and maintain bench marks and other dependable markers to set lines and levels for the work at each story of construction and elsewhere on site as needed to properly locate each element of entire project. Calculate and measure required dimensions as shown (within recognized tolerances if not otherwise indicated); do not scale drawings to determine dimensions. Advise tradesmen performing the work, of marked lines and levels provided for their use in layout work.

B. Surveyor: Engage a Land Surveyor or a Professional Engineer experienced and specializing in land survey work, who is registered in State where project is located, to perform services specified in this article.

C. Survey Procedures: Verify layout information shown on drawings, in relation to property survey and existing bench marks, before proceeding with layout of actual work. As work proceeds, check every major element for line, level and plumb (where applicable), and maintain an accurate surveyor's log or record book of such checks, available for Architect's reference at reasonable times. Record deviations from required lines and levels, and advise Architect promptly upon detection of deviations exceeding indicated or recognized tolerances. Record deviations which are accepted (not corrected) on record drawings.

D. Final Property Survey: Immediately before the time of substantial completion, prepare a final property survey showing significant features (real property) resulting from construction of project. Include on survey a certification signed by surveyor, to effect that principal lines and levels of project are accurately positioned as shown on survey.

Submit 10 blueline copies of final property survey.

1.5 SPECIAL REPORTS:

A. General: Except as otherwise indicated, submit special reports directly to Owner within one day of occurence requiring special report, with copy to Architect and others affected by occurence.

B. Reporting Unusual Events: When an event of unusual and significant nature occurs at site (examples: visit by Mayor plus news media; extraordinary weather phenomenon), prepare and submit a special report listing chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. When such events are known or predictable in advance, advise Owner in advance at earliest possible date.

1.6 INSPECTIONS, TESTS AND REPORTS:

A. General: Required inspection and testing services are intended to assist in determination of probable compliances of work with requirements, but do not relieve Contractor of responsibility for those compliances, or for general fulfillment of requirements of contract documents. Specified inspections and tests are not intended to limit Contractor's quality control program. Afford reasonable access to agencies performing tests and inspections.

Owner's Tests: Where tests or inspections are indicated as owner's resonsibility, Owner will engage independent testing agency to perform required services.

B. Qualification of Testing Agencies: Except as otherwise indicated and except where manufacturer's testing facilities are located as acceptable, engage independent testing laboratories specializing in required services and complying with "Recommended Requirements for Independent Laboratory Qualification" by ACIL.

C. Reports: Submit test/inspection reports, including agency's analysis of results and recommendations where applicable, in duplicate to Architect except as otherwise indicated, and submit copies directly to governing authorities where required or requested.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS:

A. Pre-Installation Conferences: Well in advance of installation of every major unit of work which requires coordination and interfacing with other work, meet at project site with installers and representatives of manufacturers and fabricators who are involved in or affected by unit of work, and in its coordination or integration with other work which has preceded or will follow. Advise Architect of scheduled meeting dates. At each meeting review progress of other work and preparations for particular work under consideration, including requirements of contract documents, options, related change orders, purchases, deliveries, shop drawings, product data, quality control samples, possible conflicts, compatibility problems, time schedules, weather limitations, temporary facilities, space and access limitations, structural limitations governing regulations, safety, inspection and testing requirements, required performance results, recording requirements, and protection. Record significant discussions of each conference, and record agreements and disagreements, along with final plan of action. Distribute record of meeting promptly to everyone concerned, including Architect.

Do not proceed with the work if associated pre-installation conference cannot be concluded successfully. Instigate actions to resolve impediments to performance of the work, and reconvene conference at earliest date feasible.

B. Installer's Inspection of Conditions: Require Installer of each major unit of work to inspect substrate to receive work, and conditions under which work will be performed, and to report (in writing to Contractor) unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

C. Manufacturer's Instructions: Where installation include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to extent these are more explicit or more stringent than requirements indicated in contract documents.

D. Inspect each item of materials or equipment immediately prior to installation, and reject damaged and defective items.

E. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerances if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual-effect choices to Architect for final decision.

F. Recheck measurements and dimensions of the work, as an integral step of starting each installation.

G. Install work during conditions of temperature, humidity, exposure, forecasted weather,and status of project completion which will ensure best possible results for each unit of work, in coordination with entire work. Isolate each unit of work from non-compatible work, as required to prevent deterioration.

H. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to minimize necessity of uncovering work for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, mount individual units of work at industry-recognized standard mounting heights for applications indicated. Refer questionable mounting height choices to Architect for final decision.

3.2 CUTTING AND PATCHING:

A. General: Do not cut-and-patch structural work in a manner resulting in reduction of load-carrying capacity or load/deflection ratio; submit proposed cutting and patching to Architect for structural approval before proceeding. Do not cut-and-patch operational elements and saftey-related components in a manner resulting in reduction of capacities to perform in manner intended or resulting in decreased operational- life, increased maintenance, or decreased safety. Do not cut- and-patch work which is exposed on exterior or exposed in occupied spaces of building, in a manner resulting in reduction of visual qualities or resulting in substantial evidence of cut- and-patch work, both as judged solely by Architect. Remove and replace work judged by Architect to be cut-and-patched in a visually unsatisfactory or otherwise objectionable manner.

Engage orginal Fabricator/Installer to perform cutting-and-patching of structural work, operational/safety-related components, and visually-exposed work; or, if not available, engage only recognized experts; employ only proven methods.

B. Materials: Except as otherwise indicated or aproved by Architect provide materials for cutting-and-patching which will result in equal-or-better work than work being cut- and-patched; in terms of performance characteristics and including visual effect where applicable. Use materials identical with original materials where feasible and where recognized that satisfactory results can be produced thereby.

C. Temporary Support and Protection: Provide adequate temporary support for work to be cut, to prevent failure. Do no endanger other work. Provide adequate protection of other work during cutting-and-patching, to prevent damage; and provide protection of the work from adverse weather exposure.

D. Cut work by methods least likely to damage work to be retained and work adjoining.

Where physical cutting action is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.

Comply with the requirements of applicable sections of Division 2 where cutting-and-patching requires excavating and backfilling.

E. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.

Where feasible, inspect and test patched areas to demonstrate integrity of work.

F. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.

Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coats.

3.3 CLEANING AND PROTECTION:

A. General: During handling and installation of work at project site clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

B. Limiting Exposures of Work: To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or polution, water, ice, solvents, chemicals, light, radiation, puncture, abrasion heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high speed operation, inproper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping/handling, theft and vandalizm.

END OF SECTION 01205

SECTION 01340 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Types of submittal requirements specified in this section include shop drawings, product data, samples and miscellaneous work-related submittals. Individual submittal requirements are specified in applicable sections for each unit of work. Refer to other Division-1 sections and other contract documents for requirements of administrative submittals.

B. Definitions: Work-related submittals of this section are categorized for convenience as follows:

(1) Shop drawings include specially-prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form general application to a range of similar projects.

(2) Product data include standard printed information on materials, products and systems; not specially-prepared for this project, other than the designation of selections from among available choices printed therein.

(3) Samples include both fabricated and unfabricated physical examples of materials, products and units of work; both as complete units and as smaller portions of units of work; either for limited visual inspection or (where indicated) for more detailed testing and analysis.

Mock-ups are a special form of samples, which are too large or otherwise inconvenient for handling in specified manner for transmittal of sample submittals.

(4) Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurements data, operating and maintenance materials, overrun stock, and similar information, devices and materials applicable to the work and not processed as shop drawings, product data or samples.

1.3 GENERAL SUBMITTAL REQUIREMENTS:

A. Scheduling: Where appropriate in administrative submittals (listings of products, manufacturers, suppliers and subcontractors, and in job progress schedule), show principal work-related submittals and time requirements for coordination and submittal activity with related work in each instance.

B. Listing: Prepare a separate listing, organized by related specification section number sequence, showing principal work- related submittals and their initial submittal dates as required for coordination of the work. Submit listing within 45 days of date of commencement of the work.

C. Coordination and Sequencing: Coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for same work, and for interfacing units of work, so that one will not be delayed for coordination of Architect's review with another.

D. Preparation of Submittals: Provide permanent marking on each submittal to identify project, date, Contractor, subcontractor, submittal name and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking and provide space for Architect's/Engineer's "Action" marking. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through Contractor's office will be returned by Architect "without action".

E. Transmittal Form: Prepare a draft of special transmittal form for project, and submit to Architect for acceptance. Provide places to indicate project, date, "To:"; "From:"; names of subcontractors, suppliers, manufacturers, required references, category and type of submittal, purpose, description, distribution record (for both transmittal and submittals), and signature of transmitter.

Provide Contractor's certification on form, ready for execution, stating that information submitted complies with requirements of contract documents.

1.4 SPECIFIC CATEGORY SUBMITTAL REQUIREMENTS:

A. General: Except as otherwise indicated in individual work sections, comply with requirements specified herein for each indicated category of submittal. Provide and process intermediate submittals (where required between initial and final) similar to initial submittals.

B. Shop Drawings: Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated), with name of preparer indicated (firm name). Show dimensions and note which are based on field measurements. Identify materials and products in the work shown. Indicate compliance with standards, and special coordination requirements. Do not allow shop drawing copies without appropriate final "Action" markings by Architect to be used in connection with the work.

(1) Initial Submittal: One correctable translucent reproducible print and one blue-line or black-line print; reproducible will be returned.

(2) Final Submittal: 3 prints, plus 2 additional prints where required for maintenance manuals; 2 will be retained and remainder will be returned, one of which is to be marked-up and maintained by Contractor as "Record Document".

C. Product Data: Collect required data into one submittal for each unit of work or system; and mark each copy to show which choices and options are applicable to project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one set of product data (for each submittal) at project site, available for reference by Architect or others.

(1) Submittals: Do not submit product data or allow its use on project, until compliance with requirements of contract documents has been confirmed by Contractor. Submittal is for information and record, unless otherwise indicated. Initial submittal is final submittal unless returned promptly by Architect/Engineer, marked with an "Action" which indicates an observed non-compliance. Submit 2 copies, plus 2 additional copies (which will be returned) where required for maintenance manuals.

(2) Provide a preliminary single-copy submittal where required (or desired by Contractor) for selection of options by Architect.

(3) Installer's Copy: Do not proceed with installation of materials, products or systems until copy of applicable product data is in possession of Installer.

D. Samples: Provide units identical with final condition of proposed materials or products for the work. Include "range" samples (not less than 3 units) where unavoidable variations must be expected, and describe or identify variation between units of each set. Provide full set of optional samples where Architect's selection is required.

Prepare samples to match Architect's sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliances with standards. Samples are submitted for review and confirmation of color pattern, texture and "kind" by Architect. Architect will not "test" samples (except as otherwise indicated) for compliance with other requirements, which are therefore the exclusive responsibility of Contractor.

(1) Submittal: At Contractor's option, provide preliminary submittal of a single set of samples for Architect's review and "Action". Otherwise, initial submittal is final submittal unless returned with "Action" which requires resubmittal. Submit 3 sets of samples in final submittal; one set will be returned.

(2) Quality Control Set: Maintain returned final set of samples at project site, in suitable condition and available for quality control comparisons by Architect and by others.

(3) Reusable Samples: Returned samples which are intended or permitted to be incorporated in the work are so indicated in individual work sections, but must be in undamaged condition at time of use.

E. Mock-Ups: Mock-ups and similar samples specified in individual work sections, it is recognized as a special type of sample. Comply with requirements for "samples", to greatest extent possible, and process transmittal forms to provide a record of activity.

F. Inspection and Test Reports: Classify each as either "shop drawing" or "product data", depending upon whether report is uniquely prepared for project or a standard publication of workmanship control testing at point of production, and process accordingly.

G. Warranties: Refer to "Products" section for specific general requirements on warranties, product/workmanship bonds, and maintenance agreements. In addition to copies desired for Contractor's use, furnish 2 executed copies, except furnish 2 additional (conformed) copies where required for maintenance manuals.

H. Survey Data: Refer to "Procedures" section for specific general requirements on property survey, field measurements, quantitative records of actual work, damage surveys, and similar data required by individual work sections of these specifications. None of specified copies will be returned.

(1) Survey Copies: Furnish 2 copies of survey data, except furnish 10 copies of final property survey (if any).

(2) Records of Actual Work: Furnish 4 copies, one of which will be returned for inclusion in "Record Documents" as specified in "closeout" section.

I. Standards: Where copy submittal is indicated, and except where specified integrally with "Product Data" submittal, submit a single copy for Architect's use. Where workmanship at project site and elsewhere is governed by standard, furnish additional copies to fabricators, installers and others involved in performance of the work.

J. Closeout Submittals: Refer to individal work sections and to "closeout" sections for specific requirements on submittal of closeout information, materials, tools and similar items.

(1) Record Document Copies: Furnish one set.

(2) Maintenance/Operating Manuals: Furnish 2 bound copies.

(3) Materials and Tools: Refer to individual work sections for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

K. General Distribution: Provide additional distribution of submittals (not included in foregoing copy submittal requirements) to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for proper performance of the work. Include such additional copies in transmittal to Architect where required to receive "Action" marking before final distribution. Record distributions on transmittal forms.

1.5 ACTION OF SUBMITTAL:

Architect's Action: Where action and return is required or requested, Architect will review each submittal, mark with "Action", and where possible return within 2 weeks of receipt. Where submittal must be held for coordination, Contractor will be so advised by Architect without delay.

A. Final Unrestricted Release: Work may proceed, provided it complies with contract documents, when submittal is returned "Approved".

B. Final-But-Restricted Release: Work may proceed, provided it complies with notations and corrections on submittal and with contract documents, when submittal is returned "Approved as Noted".

C. Returned for Resubmittal: Do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different marking. Do not allow submittals marked "Not Accepted" (or unmarked submittals where a marking is required) to be used in connection with performance of the work.

D. Other Action: Where submittal is returned for other reasons, with Architect explanation included, it will be marked "Returned for Correction".

PART 2 PRODUCTS - (not applicable

PART 3 - EXECUTION (not applicable)

END OF SECTION 01340

SECTION 01505 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

Definitions: Specific administrative and procedural minimum actions are specified in this section, as extensions of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Architect that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions, and support facilities.

1.3 QUALITY ASSURANCE:

A. General: In addition to compliance with governing regulations and rules/recommendations of franchised utility companies, comply with specific requirements, indicated and with applicable local industry standards for construction work (published recommendations by local consensus "building councils").

B. ANSI Standards: Comply with applicable provisions of ANSI A10- Series standards on construction safety, including A10.3, A10.4, A10.5, A10.6, A10.7, A10.8, A10.9, A10.10, A10.11, A10.12, A10.13, A10.14, A10.15, A10.17, A10.18, A10.20, and A10.22.

C. NFPA Code: Comply with NFPA Code 241 "Building Construction and Demolition Operations."

D. Conservation: In compliance with Owner's policy on energy/materials conservation, install and operate temporary facilties and perform construction activities in manner which reasonably will be conservative and avoid waste of energy and materials including water.

1.4 JOB CONDITIONS:

A. General: Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.

B. Conditions of Use: Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary and protective of persons and property, and free of deleterious effects.

PARTS 2 AND 3 - PRODUCTS AND EXECUTION

2.1 TEMPORARY UTILITY SERVICES:

A. The types of services required include, but not by way of limitation, water, sewerage, surface drainage, electrical power and telephones. Where possible and reasonable, connect to existing franchised utilities for required services; and comply with service companies' recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.

B. Sewer Sediment: Prior to start of work at project site, engage an independent sewer inspection service to measure existing levels of sediment in sewers, and to provide recommendations for minimizing entrance of sediment and poluting substances during construction. At time of substantial completion on elements of work affecting inflow of sewage, check desiment levels and submit report recording changes in condition of sediment in existing sewers. Clean sewers where level has increased significantly, as judged by Architect, or as reasonably demanded by sewerage authority. Maintain sewers and temporary connecting sewers in a reasonably clean, nonclogged condition during construction period.

C. Temporary Power: Provide service with ground-fault circuit interrupter features, activated from each circuit of 20-amp or less rating.

D. Metering: Provide meters for water and electrical power services.Read meters and record readings weekly, and include in progress report to Architect at monthly (or less) intervals.

2.2 TEMPORARY CONSTRUCTION FACILITIES:

A. The types of temporary construction facilities required include, but not by way of limitation, water distribution, drainage, dewatering equipment, enclosure of work, heat, ventilation, electrical power distribution, lighting, hoisting facilities, stairs, ladders, and roads. Provide facilities resonabily required to perform construction operations properly and adequately.

B. Water Distribution: Pipe to each floor level and provide hose lengths sufficient to reach entire area of construction work, not less than 3/4 hose size. Prevent freezing of water distribution by either prompt drainage after each use, or by suitable protection. Maintain 30 psi minimum water pressure at hose outlets, by temporary pumping where necessary.

C. Enclosure: Provide temporary enclosure where indicated and where reasonably required to ensure adequate workmanship and protection from weather and unsatisfactory ambient conditions for the work, including enclosure where temporary heat is used. Provide fire-retardant treated lumber and plywood. Provide tarpaulins with UL label and flame spread of 15 or less; provide translucent type (nylon reinforced polyethylene) where daylighting and enclosed space would be beneficial for workmanship, and reduce use of temporary lighting.

D. Heating: Use steam or hot water where available and, where not available, use gas from piped distribution system where available. Where steam, hot water or pipes gas are not available, heat with self-contained LP gas or fuel oil heaters, bearing UL, FM or other approval labels appropriate for application. Vent fuel-burning heaters, and equip units with individual-space thermostatic controls. Use electic-resistance space heaters only where no other, more energy-efficient, type of heater is available and allowable.

E. Electrical Power: Provide weatherproof, grounded, power distribution system sufficient to accommodate construction operations requiring power, use of power tools, electrical heating, lighting, and start-up testing of permanent electric- powerd equipment prior to its permanent connection to electrical system. Provide overload protection. Locate multiple outlets (not less than 4-gang) at each story of construction, spaced so that entire area of construction can be reached by power tools on a single extension cord of 100' maximum length.

Supply power for electric welding, if any, from either temporary power distribution system or by engine-driven power- generator sets, at Contractor's option.

F. Lighting: Provide sufficient temporary lighting to ensure proper workmanship everywhere; by combined use of daylight, general lighting, and portable plug-in task lighting. Provide general lighting with local switching which will enable energy conservation during periods of varying activity (work-in- progress, traffic only, security check, lock-up, etc.).

(1) Provide uniformly spaced general lighting equivalent to not less than 200-watt incandescent lamp per 1000 sq. ft. of floor area, and one 100-watt lamp per 50' of corridor and per flight of stairs.

(2) Provide uniformly spaced general lighting, equivalent in output and energy efficiency to not less than one high-efficienty fluorescent lighting unit with white enameled reflector per 1000 sq. ft. of floor area, and one 40-watt fluorescent fixture per 50' of corridor and per flight of stairs.

G. Access Provisions: Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the work and facilitate its inspection during installation. Comply with reasonable requests of governing authorities performing inspections. When permanent stairs are available for access during construction, cover finished surfaces with sufficient protection to ensure freedom from damage and deterioration at time of substantial completion.

H. Roads: Except as otherwise indicated, develop subgrade and subbase of permanent roadways at earliest possible date, and provide temporary surfacing to serve as temporary roads during construction. Surface sufficiently to provide all-weather, uninterrupted access to construction area, for every form of transporation which can be reasonably expected. Maintain temporary roads during construction. Extend temporary roadway development and surfacing in and around construction site as reasonably required to accommodate construction activities. When no longer needed as temporary roadways, remove temporary surfacing and restore subbases to conditions required by contract documents for permanent development.

2.3 SECURITY/PROTECTION PROVISIONS:

A. The types of temporary security and protection provisions required include, but not by way of limitation, fire protection, barricades, warning signs/lights, site enclosure fence, building enclosure/lockup, watchman service, personnel security program (theft prevention), environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at project site. Provide security/protection services and systems in coordination with activities and in a manner to achieve 24-hour, 7-day-per- week effectiveness.

B. Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at project site. Prove Type A extinguishers at locations of low-potential for either electrical or grease-oil-flammable liquids fires; provide Type ABC dry chemical extinguishers at other locations; comply with recommendations of NFPA No. 10. Post warning and quick- instructions at each extinguisher location, and instruct personnel at project site, at time of their first arrival, on proper use of extinguishers and other available facilities at project site. Post local fire department call number on each telephone instrument at project site.

C. Permanent Fire Protection: Complete each fire protection facility at earliest reasonable date, make ready for emergency use, and instruct personnel at site on availability and proper use.

D. Site Enclosure Fence: At earliest reasonable date enclose project site, or portion thereof determined by Contractor to be sufficient to contain entire construction activity. Provide 6' high chain-link steel fence with 3 strands of barbed wire on angle brackets at top. Provide 8' high gates for both personnel and trucks, withlocks held under strict security control.

E. Building Enclosure and Lockup: At earliest possible date, secure building against unauthorized entrance at times when personnel are not working. Provide secure temporary enclosures at ground floor and other locations of possible entry, with locked entrances.

F. Environmental Protection Procedures: Provide facilities, establish procedures, and conduct construction activities in a manner which will ensure compliance with Owner's environmental impact statement and other regulations controlling construction activities at project site. Designate one person, the Construction Superintendent or other, to enforce strict discipline on activities related to generation of wastes, pollution of air/water/soil, generation of noise, and similar harmful or deleterious effects which might violate regulations or reasonably irritate persons at or in vicinity of project site.

2.4 TEMPORARY SUPPORT FACILITIES:

A. The types of temporary support facilities required include, but not by way of limitation, field offices, storage sheds, fabrication sheds, sanitary facilities, drinking water, first aid facilities, bulletin boards, private and public telephones, clocks, thermometer, project identification signs, clean-up facilities, waste disposal service, rodent/pest control and similar miscellaneous general services, all as may be reasonably required for proficient performance of the work and accommodation of personnel at the site including Owner's and Architect's personnel. Discontinue and remove temporary support facilities, and make incidental similar use of permanent work of the project, only when and in manner authorized by Architect; and, if not otherwise indicated, immediately before time of substantial completion. Locate temporary support facilities for convenience of users, and for minimum interference with construction activities.

B. Owner's Representative Office: Provide office space for 2 professional and one clerical persons, suitably finished, furnished, equipped, locked, heated, naturally ventilated, lighted and wired with electircal power; not less than 250 sq. ft. floor area. Equip office with 2 telephone lines and 3 instruments, and not less than 5 duplex convenience power outlets. In addition to 3 desks and 8 chairs (3 swivel), furnish office with one 36" x 96" plain table, and plan rack to hold 2 complete sets of working drawings and shop drawings.

C. Contractor's Field Office: Provide adequate office space for field office personnel plus one spare work station for incidental use by subcontractor's personnel, suitably finished, furnished, equipped and conditioned. Include separate space for project meetings, with table(s) not less than 4' x 12', and seating for not less than 20 persons; cover main walls with tack-board material for posting of notices, progress schedule and similar information. Provide shelf space adequate for storage of approved samples.

D. Sanitary Facilities: At Contractor's option, provide either piped (wet) toilet facilities or self-contained toilet units of type acceptable to governing authorities, adequate (at all stages of construction) for use of personnel at project site. Provide separate facilities for male and female personnel when both sexes are working

(in any capacity) at project site. Provide piped (wet) wash facilities with hot water; except, during time when only earthwork and foundation work are in progress, wash facilities may be limited to wet-type paper hand tools.

E. Drinking Water: Provide dispenser-type, electrical-power-cooled drinking water units; either piped with potable water or supplied with bottled water; adequate in number and locations for personnel at project site. Furnish paper cups and waste receptacles.

F. Project Identification Sign: At location(s) shown on site plans, provide project identification sign complying with sketch/data sheet included at end of this section. Engage an experienced sign painter to paint graphics on sign as indicated. Construct sign of treated wood framing and posts, and 3/4" plywood panels of exterior type Grade B-C sanded 2 sides. Erect Architect's sign at location shown on site plan.

END OF SECTION 01505

SECTION 01605 - PRODUCTS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definitions: "Products" is defined to include purchased items for incorporation into the work, regardless of whether specifically purchased for project or taken from Contractor's stock of previously purchased products. "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of work. "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, etc.). Definitions in this paragraph are not intended to negate the meaning of other terms used in contract documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," "special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

B. Substitutions: The requirements for substitutions do not apply to specified Contractor options on products and construction methods. Revisions to contract documents, where requested by Owner or Architect are "changes" not "substitutions." Requested substitutions during bidding period, which have been accepted prior to Contract Date, are included in contract document and are not subject to requirements for subsitutions as specified herein. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute "substitutions;" and do not constitute a basis for change orders, except as provided for in contract documents. Otherwise, Contractors' requests for changes in products, materials and methods of construction required by contract documents are considered requests for "substitutions," and are subject to requirements hereof.

C. Standards: Refer to Division-1 section "Definitions and Standards" for applicability of industry standards to products of project, and for acronyms used in text of specification sections.

1.3 QUALITY ASSURANCE:

A. Source Limitations: To the greatest extent possible for each unit of work, provide products, materials or equipment of a singular generic kind and from a single source.

B. Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product or material, select an option which is compatible with other products and materials already selected (which may have been from among options for those other products and materials). Total compatibility among options is not assured by limitations within contract documents, but must be provided by Contractor. Compatibility is a basic general requirement of product/material selections.

C. Owner's Preferred Vendor Listing: Prior to Contract Date, Owner will release to Contractor a listing of "preferred vendors" who produce building construction products. Review list and determine which products required for the work are available as products produced by one or more of preferred vendors. In selecting and listing products for the work, select products produced by preferred vendors, where available at a substantially competitive price.

1.4 SUBMITTALS:

Requests for Substitutions: Submit 3 copies, fully identified for product or method being replaced by substitutions, including related specification section and drawing number(s), and fully documented to show compliance with requirements for substitutions. Include product data/drawings, description of methods, samples where applicable, Contractor's detailed comparison of significant qualities between specified item and proposed substitution, statement of effect on construction time and coordination with other affected work, cost information or proposal, and Contractor's statement to the effect that proposed substitution will result in overall work equal-to-or-better-than work originally indicated.

1.5 PRODUCT DELIVERY-STORAGE-HANDLING:

Deliver, handle and store products in accordance with manufacturer's recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Control delivery schedules to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.

1.6 WARRANTIES (GUARANTEES):

A. Categories of Specific Warranties: Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific categories of Division 2 through 16 of these specifications:

(1) Special Project Warranty (Guarantee): A warranty specifically written and signed by Contractor for a defined portion of the work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by Contractor.

(2) Specified Product Warranty: A warranty which is required by contract documents, to be provided for a manufactured product incorporated into the work; regardless of whether manufacturer has published a similar warranty without regard for specific incorporation of product into the work, or has written and executed a special project warranty as a direct result of contract document requirements.

(3) Coincidental Product Warranty: A warranty which is not specifically required by contract documents (other than as specified in this Section); but which is available on a product incorporated into the work, by virtue of the fact that manufacturer of product has published warranty in connection with purchases and uses of product without regard for specific applications except as otherwise limited by terms of warranty.

B. Refer to individual sections of Division 2 through 16 for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).

C. General Limitations: It is recognized that specific warranties are intended primarily to protect Owner against failure of the work to perform as required, and against deficient, defective and faulty materials and workmanship, regardless of sources. Except as otherwise indicated, specific warranties do not cover failures in the work which results from: 1) Unusual and abnormal phenomena of the elements, 2) The Owner's misuse, maltreatment or improper maintenance of the work, 3) Vandalism after time of substantial completion, or 4) Insurrection or acts of aggression including war.

D. Related Damages and Losses: In connection with Contractor's correction of warranted work which has failed, remove and replace other work of project which has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted work.

E. Consequential Damages: Except as otherwise indicated or required by governing regulations, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as a result of failure of warranted work.

F. Reinstatement of Warranty Period: Except as otherwise indicated, when work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement for the following time period, starting on date of acceptance of replaced or restored work.

A period of time ending upon date of original warranty would have expired if there had been no failure.

G. Replacement Cost, Obligations: Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is Contractor's obligation, without regard for whether Owner has already benefited from use through a portion of anticipated useful service lives.

H. Rejection of Warranties: Owner reserves the right, at time of substantial completion or thereafter, to reject coincidental product warranties submitted by Contractor, which in opinion of Owner tend to detract from or confuse interpretation of requirements of contract documents.

I. Contractor's Procurement Obligations:Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for materials or units of work for project where a special project warranty, specified product warranty, certification or similar commitment is required, until it has beeen determined that entities required to countersign such commitments are willing to do so.

J. Specific Warranty Forms: Where a special project warranty (guarantee) or specific product warranty is required, prepare a written document to contain terms and approprate identification, ready for execution by required parties. Submit draft to Owner (through Architect) for approval prior to final executions.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT COMPLIANCES:

A. General: The compliance requirements, for individual products as indicated in contract documents, are multiple in nature and may include generic, descriptive, proprietary, performance, prescriptive, compliance with standards, compliance with codes, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with.Also "allowances" and similar provisions of contract documents will have a bearing on selection process.

B. Procedures for Selecting Products: Contractor's options for selecting products are limited by contract document requirements, and governing regulations, and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects. Required procedures include, but are not necessarily limited to, the following for various indicated methods of specifying.

(1) Single Product/Manufacturer Name: Provide product indicated, except advice Architect before proceeding, where known that named product is not a feasible or acceptable selection.

(2) Two or More Product/Manufacturer Names: Provide one of the named products, at Contractor's option; but excluding products which do not comply with requirements. Do not provide or offer to provide an unnamed product, except where none of named products comply with requirements or are a feasible selection; advise Architect before proceeding.

(3) "Named", except as otherwise indicated, is defined to mean manufacturer's name for product, as recorded in published product literature, of latest issue as of date of contract documents. Refer to requests to use products of a later (or earlier) model to Architect for acceptance before proceeding.

(4) Standards, Codes and Regulations: Where only compliance with an imposed standard, code or regulation is required, selection from among products which comply with requirements including those standards, codes and regulations, is Contractor's option.

(5) Performance Requirements: Provide products which comply with specific performances indicated, and which are recommended by manufacturer (in published product literature or by individual certification) for application indicated. Overall performance of a product is implied where product is specified with only certain specific performance requirements.

(6) Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements, using specified ingredients and components, and complying with specified requirements for mixing, fabricating, curing, finishing, testing and similar operations in manufacturing process.

(7) Visual Matching: Where matching with an extablished sample is required, final judgement of whether a product proposed by Contractor matches sample satisfactorily is Architect's judgement. Where no product within specified cost category is available, which matches sample satisfactorily and complies with requirements, comply with contract document provisions concerning, "substitutions" and "change orders" for selection of a matching product outside established cost category or of a product not complying with requirements.

(8) Visual Selection: Except as otherwise indicated, where specified product requirements include "... as selected from manufacturer's standard colors, patterns, textures..." or words of similar effect, the selection of manufacturer and basic product (complying with requirements) is Contractor's option, and subsequent selection of color, pattern and texture is Architect's selection. Where specified product requirements include "...as selected from standard colors, patterns, textures available within the industry...", or words to that effect, selection of product (complying with requirements, and within established cost category) is Architect's selection, including designation of manufacturer where necessary to obtain desired color, pattern or texture.

2.2 SUBSTITUTIONS:

A. Conditions: Contractor's request for substitution will be received and considered when extensive revisions to contract documents are not required and changes are in keeping with general intent of contract documents; when timely, fully documented and properly submitted; and when one or more of following conditions is satisfied, all as judged by Architect. Otherwise, request will be returned without action except to record non-compliance with these requirements.

(1) Where required product, material or method cannot be provided within Contract Time, but not as a result of Contractor's failure to pursue the work promptly to coordinate various activities properly.

(2) Where required product, material or method cannot be provided in a manner which is compatible with other materials of the work, or cannot be properly coordinated, therewith, or cannot be warranted as required, or cannot be used without adversely affecting Owner's insurance coverage on completed work, or will encounter other substantial non- compliances which are not possible to otherwise overcome except by making requested substitution, which Contractor thereby certifies to overcome such non-compatibility, non-coordination, non-warranty, non-insurability or other non-compliance as claimed.

(3) Where required product, material or method cannot receive required approval by a governing authority, and requested substitution can be so approved.

(4) Where substantial advantage is offered Owner, in terms of cost, time, energy conservation or other vauable considerations, after deducting offsetting responsibilities Owner may be required to bear, including additional compensation to Architect for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.

B. Work-Related Submittals: Contractor's submittal of, (and Architect's acceptance of) shop drawings, product data or samples which indicated work not complying with requirements of contract documents, does not consittute an acceptable and valid request for, nor approval of, a substitution.

2.3 GENERAL PRODUCT REQUIREMENTS:

A. General: Provide products which comply with requirements, and which are undamaged and unused at time of installation, and which are complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for intended use and effect.

(1) Standard Products: Where available, provide standard products of types which have been produced and used previously and successfully on other projects and in similar applications.

(2) Continued Availability: Where additional amounts of a product, by nature of its application, are likely to be needed by Owner at a later date for maintenance and repair or replacement work, provide a standard, domestically produced product which is likely to be available to Owner at such later date.

B. Nameplates: Except as otherwise indicated for required approval labels, and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or tradesmarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior of the work.

(1) Labels: Locate required labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.

(2) Equipment Nameplates: Provide permanent nameplate on each item of service-connected or power operated equipment. Indicate manufacturer, product name, model number, serial number, capacity, speed, ratings and similar essential operating data. Locate nameplates on an easily accessed surface which, in occupied spaces, is not conspicuous.

PART 3 - EXECUTION (not applicable)

END OF SECTION 01605

SECTION 01705- PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF REQUIREMENTS:

Definitions: Closeout is hereby defined to include general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of Contract, occupancy by Owner and similar actions evidencing completion of the work.Specific requirements for individual units of work are specified in sections of Division 2 through 16. Time of closeout is directly related to "Substantial Completion", and therefore may be either a single time period for entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.

1.3 PREREQUISITES FOR SUBSTANTIAL COMPLETION:

A. General: Prior to requesting Architect's inspection for certification of substantial completion (for either entire work or portions thereof), complete the following and list known exceptions in request:

(1) In progress payment request, coincident with or first following date claimed, show either 100% completion for portion of work claimed as "substantially complete", or list incomplete items, value of incompletion, and reasons for being incomplete.

(2) Include supporting documentation for completion as indicated in these contract documents.

(3) Submit statement showing accounting of changes to the Contract Sum.

(4) Advise Owner of pending insurance change-over requirements.

(5) Submit special warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.

(6) Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including (where required) occupancy permits, operating certificate, and similar releases.

(7) Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.

(8) Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner.

(9) Make final change-over of locks and transmit keys to Owner, and advise Owner's personnel to change-over in security provisions.

(10) Complete start-up testing of systems, and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.

(11) Complete final cleaning up requirements, including touch-up painting of marred surfaces.

(12) Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: Upon receipt of Contractor's request, Architect will either proceed with inspection or advise Contractor of prerequisites not fulfilled. Following initial inspection, Architect will either prepare certificate of substantial completion, or advise Contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

1.4 PREREQUISITES FOR FINAL ACCEPTANCE:

A. General: Prior to requesting Architect's final inspection for certification of final acceptance and final payment, as required by General Conditions, complete the following and list known exceptions (if any) in request:

(1) Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

(2) Submit updated final statement, accounting for additional (final) changes to the Contract Sum.

(3) Submit certified copy of Architect's final punch- list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Architect.

(4) Submit final meter readings for utilities, measured record of stored fuel, and similar data as of time of substantial completion or when Owner took possession of and responsibility for corresponding elements of the work.

(5) Submit consent to surety

(6) Submit final liquidation damages settlement statement, acceptable to Owner.

(7) Revise and submit evidence of final continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: Upon receipt of Contractor's notice that the work has been completed, including punch-list items resulting from earlier inspections, and expecting incomplete items delayed because of acceptable circumstances, Architect will reinspect the work. Upon completion of reinspection, Architect will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS:

A. General: Specific requirements for record documents are indicated in individual sections of these specifications. Other requirements are indicated in General Conditions. General submittal requirements are indicated in "Submittals" sections. Do not use record documents for construction purposes; protect form deterioration and loss in a secure fire-resistive location; provide access to record documents for Architect's/Engineer's reference during normal working hours.

B. Record Drawings: Maintain a white-print set (blue-line or black- line) of contract drawings and shop drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at corresponding location on working drawings.Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Mark-up new information which is recognized to be of importance to Owner, but was for some reason not shown on either the contract drawings or shop drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later date. Note related change order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.

C. Record Specifications: Maintain one copy of specifications, including addenda, change orders and similar modifications issued in printed form during construction, and mark-up variation (of substance) in actual work in comparision with text of specificatons and modifications as issued. Give particular attention to substitutions, selections of options, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable. Upon completion of mark-up, submit to Architect for Owner's records.

D. Record Product Data: Maintain one copy of each product data submittal, and mark-up significant variations in actual work in comparison with submitted information. Include both variations in product as delivered to site, and variations from manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark- up of record drawings and specifications. Upon completion of mark-up, submit complete set to Architect for Owner's records.

E. Record Sample Submittal: Immediately prior to date(s) of substantial completion, Architect (and including Owner's personnel where desired) will meet with Contractor at site, and will determine which (if any) submitted samples maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes. Comply with Architect's instructions for packaging, identification marking, and delivery to Owner's sample storage space.

F. Miscellaneous Record Submittals: refer to other sections of these specifications for requirements of miscellaneous record- keeping and submittals in connection with actual performance of the work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to Architect for Owner's records.

G. Maintenance Manuals: Organize maintenance-and-operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and indexed (thumb- tabbed). Include emergency instructions, spare parts listing, copies of warranties, wiring diagrams, recommended "turn-around" cycles, inspection procedures, shop drawings, product data, and similar applicable information.Bind each manual of each set in a heavy- duty 2", 3-ring vinyl-covered binder, and include pocket folders for folded sheet information. Mark identification on both front and spine of each binder.

PART 2 PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES:

General Operating/Maintenance Instructions: Arrange for each installer of work requiring continuing maintenance or operation, to meet with Owner's personnel, at project site, to provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, indentification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up, shut-down,

emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, energy effectiveness, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds, and similar continuing committments.

A. General: Special cleaning for specific units of work is specified in sections of Division 2 through 16. General cleaning during progress of work is specified in General Conditions and as temporary services in "Temporary Facilities" section of this Division.Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturers' instructions for cleaning operations. The following are examples, but not by way of limitation, of cleaning levels required:

(1) Remove labels which are not required as permanent labels.

(2) Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticable as vision-obscuring materials. Replace broken glass and damaged transparent materials.

(3) Clean exposed exterior and interior hard-surfaced finishes, to a dirt-free condition, free of dust, stains, films and similar noticable distracting substances. Except as otherwise indicated; avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to orginal reflective condition.

(4) Wipe surfaces of mechanical and electrical equipment clean, including elevator equipment and similar equipment; remove excess lubrication and other substances.

(5) Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

(6) Clean concrete floors in non-occupied spaces broom clean.

(7) Vacuum clean carpeted surfaces and similar soft surfaces.

(8) Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

(9) Clean food service equipment to a condition of sanitation ready and acceptable for intended food service use.

(10) Clean light fixtures and lamps so as to function with full efficiency.

(11) Clean project site (yard and grounds), including landscape, development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro- chemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even- textured surface.

B. Pest Control: Engage an experienced exterminator to make a final inspection of project, and to rid project of rodents, insects, and other pests.

C. Removal of Protection: Except as otherwise indicated or requested by Architect, remove temporary protection devices and facilities which were installed during course of the work to protect previously completed work during remainder of construction period.

D. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site, or bury debris or excess materials on Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from site and dispose of in a lawful manner.

Where extra materials of value remaining after completion of the associated work have become Owner's property, dispose of these to Owner's best advantage as directed.

END OF SECTION 01705

SECTION 02110 - SITE PREPARATION

PART I - GENERAL:

1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Condtions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

Extent of site clearing is shown on drawings.

Site clearing work includes, but is not limited to:

Removal of trees and other vegetation
Topsoil stripping
Clearing and grubbing
Removing above-grade improvements
Removing below-grade improvements

1.03 JOB CONDITIONS:

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

1. Protect improvements on adjoining properties and on Owner's property.

2. Restore damaged improvements to their original condtion, as acceptable to parties having jurisdiction.

C. Improvements on Adjoining Property: Authority for performing removal and alteration work on property adjoining Owner's property will be obtained by Owner prior to award of contract.

1. Extent of work on adjacent property is indicated on Drawings.

D. Salvageable Improvements: Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

PART 2 -- PRODUCTS: not used.

PART 3 -- EXECUTION

3.01 SITE CLEARING:

A. General: Remove trees, shrubs, vines, grass and other vegetation, foundations, concrete, paving and other improvements, obstructions or debris interfering with installation of new construction. Remove such items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots.

1. As directed by Architect, carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.

B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

a. Remove heavy growths of grass and vines from areas before stripping.

b. Where trees are indicated to be left standing, perform no topsoil stripping within limits of area to be left undisturbed as shown on Drawings.

2. Stockpile topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust or water-born silt.

3. Dispose of unsuitable or excess topsoil same as waste material, herein specified.

C. Clearing and Grubbing: Clear site of trees, shrubs, vines and other vegetation, except for those indicated to remain.

1. Completely remove stumps, roots, and other debris protruding through ground surface.

2. Use only hand methods for grubbing within areas indicated to be left undisturbed. Strip grass and weeds to a maximum depth of 1" carefully till or scarify existing grade to a maximum depth of 1"

3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

a. Place fill material in horizontal layers not exceeding 6" loose depth, and thoroughly compact to a density equal to adjacent original ground.

D. Removal of Improvements: Remove existing above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

1. Abandonment or removal of certain underground pipe or conduits may be shown on mechanical or electrical drawings, and is included under work of those sections. Removal of abandoned underground piping, or conduit and foundations interfering with construction is included under this section.

3.02 DISPOSAL OF WASTE MATERIALS:

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable and excess topsoil from Owner's property and dispose of off site in legal manner.

END OF SECTION 02110

SECTION 02130 - EXISTING TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.01 CONTRACT CONDITIONS:

The Contractor is bound by the General Conditions, Supplementary Conditions, and Division-1 bound herewith in addition to this specification and accompanying drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Site Preparation, Section 02110.

B. Earthwork, Section 02200.

C. Planting, Section 02480.

D. Underground Sprinkler System, Section 02750.

1.03 COORDINATION:

A. Coordinate other trades affecting and affected by Work of this Section.

1.04 PROTECTION:

A. Except where indicated to be removed, protect against damage existing trees, shrubs, groundcover, grass, and other vegetation.

B. Provide necessary fencing and barricades. Erect prior to Work and unless otherwise instructed, remove after Work completion.

C. Prohibit earth stockpiling, material storage, and vehicle parking and traffic within drip line of trees.

D. Prohibit dumping of reuse, chemicals, and other materials, and puddling or running water which may injure plant growth including root systems.

E. Prohibit foot and vehicle traffic which may compact soil over root systems.

F. Prohibit unnecessary cutting, breaking, and skinning of branches and roots.

G. Prohibit fires, high heat and smoke adjacent to trees and plants.

PART 2 - PRODUCTS

2.01 TREE WOUND PAINT:

Flintkote "Treeheal", or approved equal.

2.02 FENCING:

Protective fencing shall be installed as indicated on drawings.

PART 3 - EXECUTION

3.01 WATERING:

Water remaining trees and plant growth as required to maintain health.

3.02 EXCAVATION AROUND TREES:

A. Excavate within drip-line of trees only where absolutely necessary.

B. Where utility trenching is required within drip-line of trees, tunnel under and around roots by hand digging. Do not cut main lateral roots or tap roots.

C. Where excavating for new construction is required within drip line of trees, hand excavate to minimize damage to root systems. Use narrow tine spading forks and comb soil to expose roots. Relocate roots back into backfill areas wherever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking.

D. If root relocation is not practical, cut roots approximately 3 inches back from new construction.

E. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover, or pack with wet peat moss.

F. Temporarily support and protect roots against damage until permanently relocated and covered with backfill.

3.03 PRUNING:

A. Where roots have been cut or lost engage approved Tree Surgeon to prune corresponding tree branches where directed by Architect.

B. Cut branches and roots with sharp pruning instruments; do not break or chop.

C. Paint cuts over 1/2 inch in size with Tree Wound Paint except coniferous evergreen trees.

3.04 GRADING AND FILLING AROUND TREES:

A. General:

Maintain existing grade within drip line of trees unless otherwise shown on drawings.

B. Lowering Grades:

1. Carefully hand excavate within drip line to new grade.

2. Cut roots exposed by excavation to approximately 3 inches below elevation off new finish grade.

C. Raising Grades:

1. Where existing grade is 6 inches or less below finish grade shown, use existing topsoil fill materials. Carefully place in single layer, do not compact. Hand grade to required finish elevations.

2. Where existing grade is more than 6 inches below finish grade shown, follow Architect's instructions.

3.05 REPAIR AND REPLACEMENT OF TREES:

A. Repair trees damaged by construction operations.

B. Engage approved Tree Surgeon to perform tree repair work.

C. Make repairs promptly after damage occurs to prevent progressive tree deterioration.

D. Remove and replace dead and damaged trees which are determined by Tree Surgeon to be incapable of restoration to normal growth pattern.

E. Unless otherwise approved, provide new trees of same size and species as those damaged and displaced which are indicated to remain. Plant and maintain as specified in Section 02800.

3.06 REPAIR AND REPLACEMENT OF SHRUBS AND GROUNDCOVERS:

A. Repair shrubs, groundcovers, and other vegetation damaged by construction operation in manner acceptable to Architect.

B. Make repairs promptly after damage occurs to prevent progressive plant deterioration.

C. Remove and replace dead and damaged plants which are determined by Architect incapable of restoration to normal growth pattern.

D. Unless otherwise approved, provide new shrubs and groundcovers of same size and species as those damaged and displaced which are indicated to remain.

E. Plant and maintain as specified in Section 02800.

END OF SECTION 02130

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of earthwork is indicated on drawings.

1. Preparation of subgrade for building slabs, walks, and pavements is included as part of this work.

2. Drainage fill course for support of building slabs is included as part of this work.

3. Backfilling of trenches within building lines is included as part of this work.

4. Excavation and grading for two lakes and related dam work.

B. Excavation for Mechanical/Electrical Work: Excavation and backfill required in conjunction with underground mechanical and electrical utilities, and buried mechanical and electrical appurtenances is included as work of this section.

C. Definition: "Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

1.03 QUALITY ASSURANCE:

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service: Employ, at Contractor's expense, testing laboratory to perform soil testing and inspection service for quality control testing during earth work operations.

1.04 SUBMITTALS:

A. Test Reports-Excavating: Submit following reports directly to Architect from the testing services, with copy to Contractor:

1. Test reports on borrow material.

2. Verification of each footing subgrade.

3. Field density test reports

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

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

1.05 JOB CONDITIONS:

A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil bearings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data are made available for convenience of Contractor.

1. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

B. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

2. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

a. Provide minimum of 48-hour notice to Architect, and receive written notice to proceed before interrupting any utility.

3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

C. Use of Explosives: The use of explosives is not permitted.

D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

a. Perform excavation within drip-line of large trees to remain by hand under direction of Architect. Protect the root system from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

A. Definitions:

Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH and PT.

C. Subbase Materials: Naturally or artifically graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.

D. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100% passing a 1-1/2" sieve and not more than 5% passing a No. 4 sieve.

E. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. Excavation Classifications: The following classifications of excavation will be made when rock excavation is encountered in work:

1. Earth excavation: includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

2. Rock excavation in trenches and pits: includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42" wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90HP flywheel power and 30,000 lb. drawbar pull. Trenches in excess of 10'-0" in width and pits in excess of 30'-0" in either length or width are classified as open excavation.

3. Rock excavation in open excavations: includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted heavy-duty excavating equipment without drilling or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170HP flywheel power and developing 40,000 lb. break-out force (measured in accordance with SAE J732C).

4. Typical of materials classified as rock are boulders 1/2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

5. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

6. Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by Architect. Such excavation will be paid on basis of contract conditions relative to changes in work.

B. Rock payment lines are limited to the following:

1. Two feet outside of concrete work for which forms are required, except footings.

2. One foot outside perimeter of footings.

3. In pipe trenches, 6" below invert elevation of pipe and 2 ft. wider than inside diameter of pipe, but not less than 3 ft. minimum trench width.

4. Neat outside dimensions of concrete work where no forms are required.

5. Under slabs on grade, 6" below bottom of concrete slab.

C. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work directed by Landscape Arhchitect shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.

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

D. Additional Excavation: When excavation has reached required sub-grade elevations, notify Architect who will make an inspection of conditions.

1. If unsuitable bearing materials are encountered at required sub-grade elevations, carry excavations deeper and replace excavated material as directed by Architect.

2. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

E. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

1. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

F. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.

1. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

G. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

H. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

2. Dispose of excess soil material and waste materials as herein specified.

I. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

1. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

J. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.

K. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit.

1. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.

2. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installation of pipe.

3. For pipes or conduit 5" or less in nominal size and for flat-bottomed multiple-duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

4. For pipes or conduit 6" or larger in nominal size, tanks and other mechanicali/electrical work indicated to receive subbase, excavate to subbase depth indicated, or, if not otherwise indicated, to 6" below bottom of work to be supported.

5. Except as otherwise indicated, excavate for exterior water-bearing piping so top of piping is not less than 3'-6" below finished grade.

6. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

7. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.

a. Concrete is specified in Division 3.

8. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect. Use care in backfilling to avoid damage or displacement of pipe systems.

9. For piping of conduit less than 2'-6" below surface of roadways, provide 4" thick concrete base slab support. After installation and testing of piping or conduit, provide minimum 4" thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.

L. Lake and dam construction: Coordinate work affecting and affected by work of this section including lake overflow system, lake waterwell supply system and mechanical and electrical work related to Japanese Garden.

M. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).

3.02 COMPACTION:

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classifiction indicated below.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined mositure density relationship (cohesive soils) determined in accordance with ASTM D 1557; and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

1. Structures, Building Slabs, Steps, Pavements and Lake Dams: Compact top 12" of subgrade and each layer of backfill or fill material at 90% maximum density for cohesive material or 95% relative density for cohesionless material.

2. Lawn or Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material at 85% maximum density for cohesive soils and 90% relative density for cohesionless soils.

3. Walkways: Compact top 6" of subgrade and each layer of backfill or fill material at 90% maximum density for cohesive material or 95% relative density for cohesionless material.

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prvent free water appearing on surface during or subsequent to compaction operations.

1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

a. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.03 BACKFILL AND FILL:

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

1. In excavations and at lake and dam construction use satisfactory excavated or borrow material.

2. Under grassed areas, use satisfactory excavated or borrow material.

3. Under walks and pavements, use subbase material, or satisfactory excavated or borrow material, or combination of both.

4. Under steps, use subbase material.

5. Under building slabs, use drainage fill material.

6. Under piping and conduit, use subbase material where subbase is indicated under piping or conduit; shape to fit bottom 90 degrees of cylinder.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

2. Inspection, testing, approval, and recording locations of underground utilities.

3. Removal of concrete formwork.

4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

5. Removal of trash and debris.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

D. Placement and Compaction: Place backfill and fill materials in layers not more than 6" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.

1. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material and uniformly around structure, piping or conduit to approximately same elevation in each lift.

3.04 GRADING:

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

1. Finish surfaces free from irregular surface changes, and as follows:

a. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.

b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10' above or below required subgrade elevation.

c. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10' straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.05 PAVEMENT SUBBASE COURSE:

A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

1. See other Division-2 sections for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12" width of shoulder simultaneously with compacting and rolling of each layer of subbase course.

D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

1. When a compacted subbase course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.06 BUILDING SLAB DRAINAGE COURSE:

A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

1. When a compacted drainage course is shown to be 6" thick or less, place material in single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.07 FIELD QUALITY CONTROL:

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.

2. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when accpetable to Architect.

3. Paved Areas and Building Slab Surface: Make at least one field density test of subgrade for every 2000 sq. ft. of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests.

4. Foundation Wall Backfill: Take at least 2 field density tests, at locations and elevations as directed.

B. If in opinion of Architect, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

3.08 MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operatons or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.09 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash and debris, and dispose of it off Owner's property.

END OF SECTION 02200

SECTION 02281 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Provide soil treatment for termite control, as herein specified.

1.3 QUALITY ASSURANCE:

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

B. Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.

1.4 JOB CONDITIONS:

A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

B. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.5 SUBMITTALS:

Product Data: Submit manufacturer's technical data and application instructions.

1.6 SPECIFIC PRODUCT WARRANTY:

A. Furnish written warranty certifying that applied soil poisoning treatment will prevent infestation of subterranean termites and, that if subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.

B. Provide warranty for a period of 5 years from date of treatment, signed by Applicator and Contractor.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION:

A. Use an emulsible concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a working solution of one of following chemical elements and concentrations:

(1) Aldrin, 0.5% in water emulsion.

(2) Dieldrin, 0.5% in water emulsion.

(3) Heptachlor, 0.5% in water emulsion.

B. Other solutions may be used as recommended by Applicator and if acceptable to Architect and local governing authorities. Use only soil treatment solutions which are not injurious to planting.

PART 3 - EXECUTION

3.1 APPLICATION:

A. Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

B. Application Rates: Apply soil treatment solution as follows:

C. Under slab-on-grade structures, treat soil before concrete slabs are placed using either power sprayer or tank-type garden sprayer.

(1) Apply 4 gallons of chemical solution per 10 lin. ft. to soil in critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.

(2) Apply one gallon of chemical solution per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.

(3) Apply 4 gallons of chemical solution per 10 lin. ft. of trench, for each foot of depth from grade to footing, along outside edge of building. Dig a trench 6" to 8" wide along outside of foundation to a depth of not less than 12". Punch holes to top of footing at not more than 12" o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in trench.

D. Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities.

E. Post signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

F. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

END OF SECTION 02281

SECTION 02411 - FOUNDATION DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this Section.

1.2 DESCRIPTION OF WORK:

Extent of foundation drainage system work is shown on drawings.

Foundation drainage work includes footing drainage system.

1.3 QUALITY ASSURANCE:

Codes and Standards: Perform foundation drainage work in compliance with applicable requirements of governing authorities having jurisdiction.

1.4 SUBMITTALS:

Certification: Submit Certification signed by Contractor and foundation drainage system Installer that installed materials conform to specified requirements and system was successfully checked and tested prior to covering with filtering and drainage fill.

PART 2 - PRODUCTS

2.1 DRAINAGE PIPE AND FITTINGS:

A. Provide drainage pipe complete with bends, reducers, adapters, couplings, collars, and joint materials.

B. Perforated Polyvinyl Chloride Pipe: ANSI/ASTM D 2729.

2.2 SOIL MATERIALS:

A. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense composite.

B. Drainage Fill: Evenly graded mixture of natural or crushed gravel, crushed stone, and natural sand with 100% passing a 1/2" sieve and 0-5% passing a No. 50 sieve.

C. Filtering Material: Evenly graded mixture of natural or crushed gravel, crushed stone, and natural sand, with 100% passing a 1-1/2" sieve and 0-5% passing a No. 50 sieve.

2.3 SOIL SEPERATOR

Manufacturer: Subject to compliance with requirements, provide products of one of the following: International Paper Co.; Confil 689H (3.6 oz/yd black polyester), Phillips Fibers Co.; Rufon P3B (3.0 oz/yd black polypropylene)

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Impervious Fill at Footings: After concrete footings have been cured and forms removed, place impervious fill material on subgrade adjacent to bottom of footing. Place and compact impervious fill to dimensions indicated or, if not indicated, not less than 6" deep and 12" wide.

B. Filtering Material: Place supporting layer of filtering material over compacted subgrade where drainage pipe is to be laid to depth indicated or, if not indicated, to a compacted depth of not less than 4".

After testing drain lines, place additional filtering material to a 4" depth around sides and top of drains.

C. Laying Drain Pipe: Lay drain pipe solidly bedded in filtering material.Provide fullbearing for each pipe section throughout its length, to true grades and alignment, and continuous slope in the direction of flow.

Lay perforated pipe with perforations down and joints tightly closed in accordance with pipe manufacturers recommendations. Provide collars and couplings as required.

D. Testing Drain Lines: Test or check lines before backfilling to assure free flow. Remove obstructions, replace damaged components, and retest system until satisfactory.

E. Drainage Fill: Place drainage fill over drain lines after satisfactory testing and covering of drain lines with filtering material.Completely cover drain lines to a width of at least 6" on each side and 12" above top of pipe to within 12" of finish grade. Place fill material in layers not exceeding 3" in loose depth and compact each layer placed.

F. Fill to Grade: Apply impervious fill material over compacted drainage fill at footing drains, placing material in layers not exceeding 6" in loose depth and thoroughly compacting each layer. Carry impervious fill to indicated finish elevations and slope away from building perimeter.

G. Soil Separator: Install soil separator fabric where indicated to prevent siltation from soil.

END OF SECTION 02411

SECTION 02441 - UNDERGROUND SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Condtions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

Extent of underground sprinkler system is shown on drawings.

Refer to Division-16 sections for electrical service for automatic control system.

1.03 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Provide underground sprinkler system as a complete unit produced by acceptable manufacturers, including heads, valves, piping circuits, controls and accessories.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's techniical data and installation instructions for underground sprinkler system.

B. Shop Drawings: Submit shop drawings for landscape irrigation system including plan layout and details illustrating location and type of heads, valves, piping circuits, controls, and accessories.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Rain Bird Sprinkler Mfg. Corp.
The TORO Co., Irrigation Div.
Weather-Matic Div./Telsco Industries

2.02 MATERIALS:

A. Pressure Pipe: Comply with following:

1. 3" and Larger: PVC plastic pipe ANSI/ASTM D 1785, Schedule 40.

2. Under 3": PVC plastic pipe ANSI/ASTM D 1785, Schedule 40.

B. Circuit Pipe (downstream from circuit valves): Comply with following:

1. PVC plastic pipe: ANSI/ASTM D 1785, Class 200.

C. Pipe Fittings: Comply with following:

1. For PVC plastic pipe: ANSI/ASTM D 2466 socket fittings with ASTM D 2564 solvent cement.

D. Valves: Manufacturer's standard, of type and size indicated, and as follows

1. Furnish cast bronze bodies, unless otherwise indicated.

2. Manual Circuit Valves: Glove valves

3. Key Operated Valves: Manual valves, fitted for key operation.

   Furnish 2 valve keys, 3-feet long with tee handles and key end to fit valves.

4. Automatic Circuit Valves: Globe valves operated by low-power solenoid, normally closed, manual flow adjustment.

5. Automatic Drain Valves: Designed to open for drainage when line pressure drops below 3 psi.

E. Backflow Preventer: Manufacturer's standard, to suit sprinkler system. Type schedule on Drawings.

F. Sprinkler Heads: Manufacturer's standard unit designed to provide uniform coverage over entire area of spray shown on drawings at available water pressure. Type scheduled on Drawings.

G. Valve Box: Plastic, pit type; green w/locking lid. Ametek, Brooks or approved.

H. Drainage Backfill: Cleaned gravel or crushed stone, graded from 1-1/2" maximum to 3/4" minimum.

2.03 AUTOMATIC CONTROLLER:

A. General: Furnish low voltage system manufactured expressly for control of automatic cricuit valves of underground sprinkler systems. Provide unit of capacity to suit number of circuits as indicated.

B. Exterior Control Enclosure: Manufacturer's standard weatherproof enclosure with locking cover, complaying with NFPA 70.

C. Transformer: To convert building service voltage to control voltage of 24 bolts.

D. Circuit Control: Each circuit variable from approximately 5 to 60 minutes. Include switch for manual or automatic operation of each circuit.

E. Timing Device: Adjustable, 24-hour and 7 or 14 day clocks to operate any time of day and skip any day in a 7 or 14 day period.

1. Allow for manual or semi-automatic operation without disturbing preset automatic operation.

PART 3 - EXECUTION

3.01 SYSTEM DESIGN:

A. Design Pressures: As indicated on drawings, at connection to building system and at last head in circuit.

B. Location of Heads: Design location is approximate. Make minor adjustments as necessary to avoid plantings and other obstructions and to obtain adequate water coverage to all plant materials.

3.02 TRENCHING AND BACKFILLING:

A. General: Excavate straight and true with bottom uniformly sloped to low points.

B. Trench Depth: Excavate trenches to a depth of 3" below invert of pipe, unless otherwise indicated.

C. Minimum Cover: Provide the following minimum cover over top of installed piping:

PVC Pressure Main Lines: 24"

PVC Lateral Lines: 18"

D. Backfill: Backfill with clean material from excavation. Remove organic material as well as rocks and debris larger than 1" diameter. Place acceptable backfill material in 6" lifts, compacting each lift.

3.03 INSTALLATION:

A. General: Unless otherwise indicated, comply with requirements of the Uniform Plumbing Code.

B. Connection to Main: Connect to existing stub provided by others. Install new valve and union.

1. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shut-off with Architect.

Backflow Preventer: Provide union on downstream side. Install 28 shown on Drawings.

C. Circuit Valves: Install in valve box, arranged for easy adjustment and removal.

1. Provide union on downstream side.

2. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

D. Piping: Lay pipe on solid subbase, uniformly sloped without humps or depressions.

1. For circuit piping, slope to drain valve at minimum 1%.

2. At wall penetrations, pack the opening around pipe with non-shrink grout. At exterior face, leave a perimeter slot approximately 1/2" wide by 3/4" deep. Fill this lot with backer rod and an acceptable elasomeric sealant. Repair below grade waterproofing disturbed by this work and make penetration watertight.

3. Install PVC pipe in dry weather when temperature is above 40 degrees F (4 degrees C) in strict accordance with manufacturer's instructions. Allow joints to cure at least 24 hours at temperature above 40 degrees F (4 degrees C) before testing, unless otherwise recommended by manufacturer.

E. Drain Pockets: Excavate to sizes indicated. Backfill with acceptable drain material to 12" below grade. Cover drain material with a sheet of 30-lb. asphalt saturated felt and backfill remainder with excavated material.

F. Sprinkler Heads: Flush circuit lines with full head of water and install heads after hydrostatic test is completed.

1. Install lawn heads as shown on Drawings.

2. Install shrub heads as shown on Drawings.

3. Locate heads to maintain a minimum distance of 4" from walls and 2" from other boundaries, unless otherwise indicated.

3.04 TESTING:

A. General: Notify Architect in writing when testing will be conducted. Conduct tests in presence of Architect.

B. Hydrostatic Test: Test water piping and valves, before backfilling trenches, to a hydrostatic pressure of not less than 100 psi for a minimum one hour. Piping may be tested in sections to expedite work. Remove and repair piping, connections, valves which do not pass hydrostatic testing.

C. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinkler heads adjusted to final position.

1. Demonstrate to Architect that system meets coverage requirements and that automatic controls function properly.

2. Coverage requirements are based on operation of one circuit at a time.]

After completion of grading, seeding or sodding, and rolling of grass areas, carefully adjust lawn sprinkler heads so they will be flush with finish grade.

END OF SECTION 02441

SECTION 02443 - FOUNTAIN MECHANICAL AND ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the contract including the General and Supplementary Conditions and Division I Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK:

A. Provide all fountain work as shown and specified including but not limited to:

1. Provide all necessary mechanical and electrical equipment labor required to complete the fountains specified and shown and to create the proper hydraulic design and water effects desired. Contractor shall provide inspection of finished installation by a trained engineer from the fountain equipment manufacturer.

2. Provide carpentry and metalwork required to accomplish work of this Section.

3. Provide concrete work required for work required for work in this Section and not specifically shown under another section.

4. Pumps, filters, water treatment, piping, valves, equipment in fountains, water supply, electronic and electrical components and connections, and other required components.

5. Provide necessary work for connection of drains to storm sewer, and coordinate water supply provided by mechanical contractors.

6. Trenching, excavation, backfill, grading and compaction as required.

7. Coordinate electrical service provided by others.

B. Related work:

1. Section 02110: Site Preparation.

2. Section 02200: Earthwork.

3. Section 02515: Concrete Paving.

4. Section 02719: Water Service.

5. Section 02720: Sewer Collection System.

6. Section 02730: Water Well.

7. Section 02812: Lighting, Electrical and Telecommunications.

1.03 QUALITY ASSURANCE:

A. Comply with Section 02000 requirements.

B. Coordinate layout of work with other trades affecting or affected by work of this section. Make minor adjustments in location required for coordination. Obtain Architect's acceptance of significant deviations before proceeding with the work.

C. Obtain and pay for all required inspections, permits, and fees. Provide notices required by governmental authorities. File drawings necessary to obtain permits. Schedule necessary inspections and tests. Submit certificates of inspection and approval upon completion of the work.

D. Materials for which underwriters examination service is provided shall bear UL labels or be UL listed.

E. Drawings are schematic and show approximate locations. Exact locations of fixtures, equipment, and other components shall be established in the field at time of installation.

F. Excavating, backfilling, and compacting operations: Comply with Section 02200 requirements and as specified.

G. Concrete: Comply with Section 03300 requirements and as specified.

H. Electrical Equipment and Materials: Comply with Section 02812 requirements and as specified.

I. All equipment specified under paragraph 2.02, regardless of referenced manufacturer, shall be supplied by one manufacturer/supplier who shall be responsible for proper fountain operation, hydraulic design and water effects per design intent.

J. Subject manufacturer/supplier shall submit evidence of supplying equipment and retaining operational responsibility for at least 5 fountains of similar magnitude and complexity within the last 5 years.

K. Contractor shall provide for inspection of finished installation by a trained engineer from the fountain equipment manufacturer/supplier.

1.04 SUBMITTALS:

A. Product data:

1. Submit complete materials list of items proposed for the work.

2. Submit manufacturer's product data for all mechanical and electrical equipment including pumps, filters, storage tanks, drains, timer clocks, etc.

B. Submit the following material samples.

1. All electrical materials and equipment inlcuding light fixtures, time control clocks, panels and connectors.

2. Mechanical equipment materials including filters, drains valves.

3. Three (3) copies of installation drawings including schematic pump room and pool layout and component details indicating correct installation of all mechanical and electrical equipment for complete fountain system.

C. Three (3) copies of complete operation and maintenance instructions for fountain system. Include manufacturers specifications and product "cut-sheets" for all mechanical and electrical equipment and materials.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver electrical equipment and materials in manufacturer's original undamaged and unopened containers with labels intact and legible.

B. Store and handle electrical equipment and materials to prevent damage and deterioration.

C. Provide secure, locked storage for lighting fixtures, controls, and similar components that cannot be immediately replaced, to prevent installation delays.

1.06 JOB CONDITIONS:

A. Known underground and surface utility lines are indicated on the drawings.

B. Protect existing trees, plants, lawns, and other features designated to remain as part of the final landscape work.

C. Promptly repair damage to adjacent facilities caused by electrical work operations. Cost of repairs at Contractor's expense.

D. Promptly notify the Architect of unexpected sub-surface conditions.

1.07 WORKMANSHIP AND MATERIALS

A. Employ only experienced, competent and properly-equipped workmen on the job. Workmanship shall be first class in all respects. Replace work of lesser quality as directed by the Architect.

B. Materials shall be new and in perfect condition. Inspect all materials and immediately remove defective items from job site.

PART 2 - PRODUCT

2.01 GENERAL

It is the intent of these specifications that a single, qualified fountain equipment manufacturer provide a fountain system with a single source of responsibility for all inte-related components.

2.02 SCOPE

A. The contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to, the provision for and installation of the fountain mechanical and electrical systems, fittings and accessories listed.

1. Wm. Hobbs, LTD. SERIES #100 Spray Effects

2. Wm. Hobbs, LTD. SERIES #200 Pool Equipment

3. Wm. Hobbs, LTD. SERIES #400 Electrical Equipment

4. Wm. Hobbs, LTD. SERIES #500 Maintenance Kit

5. Wm. Hobbs, LTD. SERIES #600 Pump Station

a. Fiberglass enclosure

b. Factory engineered recirculating pumps

c. Water circulation system

d. Filtration systems

e. Fountain control panel

B. All equipment and products shall be new and conform with applicable standards listed in but not limited to these specifications.

C. Equipment manufactured and distributed by Wm. Hobbs, LTD., 2075 Monroe Drive NE, Atlanta, Georgia 30324; is specified to establish the standards of desired quality and performance.

2.03 HOBBS SERIES #100 SPRAY FEATURES:

A. Wm. Hobbs, LTD. #111-1150 - Adjustable Geyser Jet: case bronze; adjustable to 15 degrees off vertical; 1-1/2" solder connection.

2.04 HOBBS SERIES #200 POOL FITTINGS:

A. Wm. Hobbs, LTD. #217-262 - Drain Fitting: spanner wrench type; 6" diameter, smoother, polished-bronze cover; sediment plate; adjustable height on duco cast iron body with membrane clamp/waterstop flange; 4" bottom I.P.S. connection; with backwater valve. Supplied complete with one spanner wrench per project.

B. Wm. Hobbs, LTD. #231-221 - 8" Diameter Anti-Vortex Plate and Suction Sump: sump-injection molded, white cycolas plastic with integral water-stop flange; 2" female double tapered pipe thread (N.P.T.) bottom and side connection; one 2" plug; anti-vortex plate and ring - case brass; natural finish; grout ring mounted on the sump, with bonding connection; anti-vortex plate attached to the grout ring with two brass screws.

C. Wm. Hobbs, LTD. #231-2214 - 8" Diameter Anti-Vortex Plate and Suction Sump: sump-injection molded, white cycolac plastic with integral waterstop flange; 2" female double tapered pipe thread (N.P.T.) bottom and side connection; one 2" plug; anti-vortex plate and ring - case brass; natural finish; grout ring mounted on the sump, with bonding connection; anti-vortex plate-attached to the grout ring with two brass screws.

D. Wm. Hobbs, LTD. #235-1141 - Anti-Vortex/Suction Sump: removable cast bronze tile set anti-vortex plate; 4" PVC bottom connection; 1-1/2/2" threaded botton connection; fiberglass sump body with integral waterstop flange.

E. Wm. Hobbs, LTD. #252-220 - Niche Mount Overflow Fitting: non-adjustable; cast brass; natural finish; 3" x 6" rectangular face with 5.18 square inch open area, slotted grate; 2" female tapered pipe thread connection (N.P.T.); bonding screw.

F. Wm. Hobbs, LTD. #255-144180 - Overflow/Drain Standpipe Assembly: case bronze; natural finish; brass trash screen; neoprene o-ring; 4" brushed copper standpipe, 18" tall; 4" N.P.S. fixture base.

G. Wm. Hobbs, LTD. #260-120 - Casting Body: cast brass; natural finish; 2" female straight pipe thread (N.P.S.) connection; waterstop flange; bonding screw; installation plug.

H. Wm. Hobbs, LTD. #261-115 - Vacuum Fitting: cast brass; natural finish; female straight pipe thread (N.P.S.) connection; includes - flanged body assembly with removable plug, casting body with waterstop flange and bonding screw; installation plug.

I. Wm. Hobbs, LTD. #263-110 - Adjustable Eyeball Return Fitting: cast brass; natural finish; 2" female straight pipe thread (N.P.S.) connection; includes flanged body assembly with 17 degree adjustable 1" orifice ball, locking ring and guide bushing; casting body with waterstop flange and bonding screw; installation plug.

J. Wm. Hobbs, LTD. #265-120 - Adjustable Inlet Fitting: cast brass; natural finish; flanged body assembly with adjustable, 1-1/4" square inch maximum open area; slotted deflection plate, adjustment handle; casting body with water stop flange, bonding screw and 2" female straight pipe thread (N.P.S.) connection; installation plug.

K. Wm. Hobbs, LTD. #268-115 - Front Access Surface Skimmer: injection-molded, white cycolac plastic body, integral waterstop flange, floating weir, faceplate throttling plate and removable basket; 1-1/2" female tapered pipe thread (N.P.T.) connection.

L. Wm. Hobbs, ITD. #273-1518 - Slab Penetration: 18" long, heavyduty, type "K", 1-1/2" copper pipe; cast bronze waterstop flange with bonding screw.

2.05 HOBBS SERIES #400 ELECTRICAL:

A. Wm. Hobbs, LTD. #441-11 - "Wet Niche-Type" Submersible Light Fixture: U.L. Listed; 100 watt, 120 volt, medium base reflector lamp provided; die cast brass, natural finish body and face ring; tempered, clear glass lens; single piece; u-shaped molded gasket; 40 feet of 16/3 underwater cable; integral low-water protection.

B. Wm. Hobbs, LTD. #411-51 - Fixture Housing: stainless steel; brass mounting/grout ring; 3/4" N.P.T. back conduit hub; ground and bond screws.

C. Wm. Hobbs, LTD. #416-6 - Submersible Light Fixture for Quartz (150W-250W-400W-500W) T4 Mini-Candelabra Lamps (lamp not included): cast bronze; brass and stainless steel fitted; tempered, clear glass lens; single piece; u-shaped neoprene gasket; 8'-3" of 16/3 cable with swivel yoke and tripod stand and with cast bronze rock guard.

D. Wm. Hobbs, LTD. #418-6 - Submersible, Free Standing Light Fixture for Par 56 Lamps (lamp not included): cast bronze; brass and stainless steel fitted; single piece, u-shaped neoprene gasket; 120 volt, 500 watt maximum, U.L. approved; bronze swivel yoke and tripod stand; bronze rock guard; clear tempered glass lens; eight foot, 3 inches of 16/3 cable.

E. Wm. Hobbs, LTD. #422-21 - Submersible Junction Box: cast bronze; neoprene cover gasket; stainless steel fasteners; and internal ground screws; 18 cubic inch internal volume; one 3/4" N.P.T. bottom conduit tap; one 1/2" side cord seal taps.

F. Wm. Hobbs, LTD. #422-23 Submersible Junction Box: cast bronze; neocover gasket stainless steel fasteners; and internal ground screws; 18 cubic inch internal volume; one 3/4" N.P.T. bottom conduit tap; three 1/2" side cord seal taps.

G. Wm. Hobbs, LTD. #431-411 - Submersible Junction Box: cast bronze; neoprene gasket; stainless steel/bronze fasteners; 60 cubic inch interior volume; #10-#16 internal fixture ground screws; #8 internal niche bond screws; #8 external bond screw; one 3/4" N.P.T. side tap; one 3/4" N.P.T. bottom fixture conduit tap with internal strain relief/cord seals.

H. Wm. Hobbs, LTD. #451-425 - Cord Seal: Machined brass; neoprene compression type gland; slip washer; 1/2" N.P.T. connection; for 0.42" diameter; 16/3 type s.o. underwater cable.

I. Wm. Hobbs, LTD. #461-07 Into-Pool Conduit: 10" long red brass 3/4" N.P.T. threaded pipe; cast bronze waterstop flange with bonding screw.

J. Wm. Hobbs, LTD. #482-111 - Two Probe Wall/Niche Mounted Water Level and Low-Water Cut-Off Sensor: U.LL listed; self-heating thermistor probes; cast bronze housing; neoprene gasket; stainless steel fasteners; 3/4" N.P.T. bottom connection.

2.06 HOBBS SERIES #500 MAINTENANCE KIT:

A. Maintenance Kit is assembled to provide tool kit for cleaning fountain basins. Kit consists of:

1. 18" cast brass chrome plated vacuum head with adjustable rubber wheels, nylon brush and scraping edges and equipped with 1-1/2" swivel hose adapter. 1-1/2" x 4'0" floating vacuum hose and three section, 12'-0", cam-lock aluminum pole.

2. 18" curved, nylon bristle brush with non-ferrous bracket connection and three section, 12'-0" cam-lock aluminum pole.

3. Leaf/debris skimmer with aluminum frame and non-ferrous bracket connection with three section, 12'-0" cam-lock aluminum pole.

2.07 HOBBS SERIES #600 PUMP PAD:

A. Fiberglass equipment enclosure:

1. Enclosure shall be 1/4" fiber reinforced plastic construction with white gelcoat interior finish, textured floor surface and sump pit.

2. The enclosure shall be equipped with an access hatch; single leaf steel construction with 3/4" tile set or diamond plate cover. Modes #39-563 2'-6" x 3'-0".

3. The enclosure shall be equipped with an access ladder. The ladder shall be aluminum construction and shall conform to applicable O.S.H.A. standards.

4. The enclosure shall be equipped with 387 C.F.M. ventilation fan. Fan shall be die cast zinc construction and shall operate on 115 volts, 1 phase, 60 cycles.

5. The enclosure shall be equipped with a water level control manifold; copper construction with a 1" solenoid operated fill valve, 2, 1" isolation valves and 1, 1/2" quick-fill valve. Manifold shall be protected with a water hammer arrestor; stainless steel construction.

   a. 1-1/2" incoming water supply shall be protected by double check backflow preventer.

6. The enclosure shall be equipped with a 100 watt service light and duplex outlet; 115 volts, 1 phase, 60 cycles.

B. Factory engineering recirculating pumps:

1. Pump construction:

   a. Pumps with gallons per minute ratings at 3450 RPM shall be self-priming, end suction centrifugal type. The pump shall be bronze construction with integral suction strainer and removable debris basket.

   b. Pump casing with suction inlets 3" and less shall be supplied with N.P.T. connections.

   c. Casings with suction inlets 4" and above shall be supplied with 125# flanged connections.

2. Motor construction:

a. Pumps shall be close-coupled to a H.I./NEMA frame and NEMA C-face JM, open drip-proof electric motor rated for operation at 40 degrees C Ambient.

1) Motors horsepower rated at 1-1/2" horsepower and below shall be operated at 115 Volt, 1 phase, 60 cycles.

2) Motors horsepower rated at 2 horsepower and above shall be operated at 230 volt or 460 volt, 3 phase, 60 cycles.

b. Motor shafts shall be carbon steel construction and of a size and design to limit shaft deflection at the stuffing box to no more than 0.002".

c. Motor bearings shall be grease lubricated by a lithium soap base grease meeting National Lubricating Grease Institute grade 2 specifiations. The bearings shall be replaceable.

C. Water circulation system:

1. Main discharge manifold, 3" diameter and above, shall be scheduled 40 weld steel construction with flanged pump attachment.

a. Design velocities for discharge and suction sizing.

1) Maximum suction velocity: 6 feet per second

2) Maximum discharge velocities:

a) Discharge manifold: 10 feet per second

b) Discharge piping: 60 feet per second

3) Maximum discharge velocity; discharge piping: 6 feet per second.

b. Threaded or flanged outlets shall be welded into profile cuts in the manifold to provide the appropriate discharge arrangement.

c) Prior to completion, the discharge manifold shall be pressure tested for leaks. All cracks shall be repaired in accordance with industry standards. Completed manifold shall be finished to remove all corrosion and painted.

2. Inline strainers shall be provided for all suction return piping.

   a. Suction strainers not integral with pump construction shall be basket type 125# flanged cast iron construction with clamp and side or bottom N.P.T. drain fitting.

   b. Debris basket shall be stainless steel construction with perforations sized in accordance with smallest jet orifice size.

   c. Debris basket shall provide a free suction area of 5 x cross sectional area of suction piping.

3. Pipe and fitting materials:

   a. Piping 2" and under shall be type M hard copper.

   b. Piping 2.1/2" and under shall be scheduled 40 PVC.

   c. Rigid electrical conduit shall be scheduled 40 PVC.

   d. Flexible electrical conduit shall be liquid-tight copper construction with PVC coating; smallest size; 1/2".

   e. Fittings 2" and under shall be wrot copper or cast brass pressure fittings with connection methods to be determined by compatibility with other materials.

   f. Fitting 2.1/2" and above shall be schedule 40 PVC.

      1) Slip connections shall be made using PVC guide and manufacturer's recommendations.

      2) Flanged connections shall be made using stainless steel studs.

   g. Suction reducers and increasers 4" and above shall be eccentric design, 125# flanged, cast iron construction with connections to be made with stainless steel bolts.

   h. Discharge reducers and increasers 4" and over shall be concentric design, 125# flanged, cast iron construction with connections to be made with stainless steel studs and nuts.

4. Control valve selection: by size and function.

   a. On-off operation: 3" and under shall be gate valves: 150# cast bronze construction with solid wedge disc and non-rising stem; connection method shall be detemined by compatibility with other components.

b. On-off operation: 4" and above shall be butterfly valves with 150# cast iron body; electroless nickel-plated disc, stainless steel stem, buna-n seat and 10 position level lock handle.

c. For throttling operation: 2" and under shall be ball valves; 150# cast bronze body; chrome plated bronze ball, teflon seal and seats; zinc dichromate plated steel handle with memory stop and vinyl grip.

d. For throttling operation: 2.1/2" and above shall be butterfly valves; 150# cast iron body with electroless nickel-plated steel disc, stainless steel stem, buna-n seat and infinite position handle.

e. Check valves 2" and under shall be swing type check valve, cast bronze construction with bronze disc, neoprene seal and threaded clean-out plug.

f. Check valves 2.1/2" and under shall be swing type check valve; cast bronze construction with bronze disc, neoprene seal and threaded clean-out plug.

g. Solenoid valve shall be #150 brass construction, pilot controls, and molded epoxy coils rated at 115V., 10, 60 cycles, N.P.T. connections provided through 3".

D. Filtration Systems:

1. The filtration system shall be a pressure sand filter and shall consist of a filtering unit, face piping, bronze backwash valve, injection molded upper distribution head, schedule 40 PVC under drain laterials, guage/air relief assembly, and support pedestal.

a. Filter tank shall be constructed of type 304, 18 guage stainless steel (62 GPM maximum flow) of fiberwound reinforced plastic resin (99 GPM maximum flow).

b. Filter tank shall be supported by integral collars constructed of type 304 stainless steel 18 gauge, or injection molded plastic (ABS).

c. All piping shall be through the side of the filter to insure access to media without piping disassembly.

2. Filtration media shall consist of uniformly graded silica sand; free of limestone and clay. Filtration media shall be grade #20, effective size 0.45 millimeter with a uniformity coefficient of 1.5 maximum. Maximum flow through media; 20 gallons per minute/square foot of media surface area.

3. Filter tank and backwash valve assembly shall be designed to permit reverse backwash flow for maintaining filter media.

E. Fountain Control Panel:

1. The fountain control panel shall consist of an enclosure, control devies, circuit breakers, switches, relays, terminal strips and interconnection wiring as required to provide design functions.

2. Panel enclosure: The fountain control panel enclosure shall be water-proof, NEMA 1A corrosion resistant construction, (I.E.C. 1P55). The base of the enclosure shall be fiberglass reinforced soluble carbonate thermoplast or textile reinforced phenolic resin duroplast with transparent soluble carbonate cover.

3. HOA switches shall be provided and installed integral to the enclosure. The HOA switches shall be horsepower rated non-testing heavy duty cam switches with the required number of contacts. These HOA switches shall be U.L. listed (I.E.C. 1P55).

4. Pilot lights shall be full voltage, U.L. Listed, (I.E.C. 1P55).

5. Combination motor starters shall consist of the following:

   a. The motor disconnect shall have three adjustable magnetic short circuit protection strips and one adjustable overload (the adjustment sets three individual Bi-metallic overloads) and trip indicating handle. Short circuit rating will be as required, up to 42KA (symmetrical) at 600 VAC.

   b. Contactors shall be horsepower rated as required (per international codes (I.E.C.) with a minimum of two normally open and two normally closed auxiliary contacts. Contactors shall have a guaranteed technical life span of one million operations or more as per (I.E.C.).

6. All control relays shall be horsepower rated and have contacts that are rated at 200 amps continuous operation and shall have a minimum of two normally open and two normally closed contacts.

7. All control panel components shall be prewired to a master terminal located at the top or bottom of the control center.

8. Water level monitor shall be a solid state module and sensor with no moving parts. The module shall have four, solid state output switches rated for 1 amp at 120V., (Two normally open, two normally closed). The sensor voltage of the module shall meet Article 680, National Electric Code (N.E.C.) requirements (less than 15 VDC) and shall have isolated transformer with a metal grounded barrier between the primary and secondary windings. The module shall be equipped with green and red, light emitting diodes to indicate water level status. The module shall be Wm. Hobbs, Ltd. #481-1, #482-2, or #482-3.

9. The following controls and pilot lights shall be mounted on the front of the control panel enclosure and shall indicate and perform specific operations.

   a. Recirculating pump hand-off-automatic switch, blue pilot light.

      1) Hand position: power to pump, pilot light illuminated time devices.

      2) Auto position: pump operation and pilot light inter-locked with time devices.

      3) Off position: pump shall not operate.

   b. Filter pump hand-off-automatic switch, green pilot light.

      1) hand position: power to pump, pilot light illuminated time devices overridden.

      2) Auto position: pump operation and pilot light inter-l;ocked with timing devices.

      3) Off position: pump shall not operate.

   c. Water level monitor module pilot lights (one red and green pilot light for each operation model).

      1) Water level control mode:

         a) Green pilot light illuminated:

            * Indicates normal operating water level.

            * Automatic time clock operation

         b) Red pilot light illuminated:

            * Indicates low operating water level

            * Automatic solenoid fill valve energized to restore normal operating water level.

            * Automatic time clock operation

      2) Low water protection mode:

         a) Green pilot light illuminated:

            * Indicates normal operating water level

* Automatic time clock control

b) Red pilot light illuminated

* Indicates low operating water level; failure automatic

* Total system shut down.

2.08 DESIGN OPERATION: ENTRANCE FOUNTAIN

A. The fountain effects for this single level pool shall consist of six geyser jets equally spaced on the center line of the semi-circular pool. The spray height of the jets shall be 4'-0". Each jet shall be illuminated from below by one par 56 500 watt submersible light fixture.

B. SERIES #600 MODULAR FIBERGLASS PUMP STATION INCLUDES:

1. 2'-6" x 3'-0" access hatch, outdoor landscape type: aluminum construction with interior light switch.

2. Access ladder.

3. 387 CFM vent fan: complete with 2 grademounted cast iron vent caps (interconnecting piping not included).

4. 100 watt light fixture with duplex 120 V., 1 phase outlet.

5. 1.5" fill/level control manifold: copper construction with 1", 120 V., 1 phase outlet solenoid valve, 1.5" quick-fill valve and 0.5" water hammer arrester, backflow preventer, and 3/4" hose bibb.

6. Simplex sump pump assembly cast iron construction with magnetic float switch control; 1/4 horsepower, 1725 RPM, 120 V., 1 phase.

7. Centrifugal pump 5 horsepower: 5" x 6"; 3450 RPM; 230 volts, 3 phase; 60 cycles; bronze fitted cast iron construction with 6" x 4", eccentric reducer, 6" suction strainer, and 4" on-off valve. Supplied complete with flange gaskets and stainless steel studs.

8. 4" x 5" flanged discharge manifold with check valve and 3 outlet and discharge assemblies.

   a. 3,2" screwed discharge assembly with check valve; to geyser jets.

9. Filtration system includes:

   a. 36 GPM Sand filter; stainless steel canister with bronze backwash valve; filter media included/filter pump, 3/4 horsepower; 2" x 1-1/2"; 3450 RPM; 115V., 1 phase; 60 cycles; bronze fitted cast iron construction with suction and discharge assemblies.

10. Control panel shall be U/L listed and consist of:

    a. NEMA 1A polycarbonate enclosure.

    b. Main disconnect(s) for power supplies.

    c. 120/208 V., 3 phase, 4 wire + ground (5 wire).

    d. Panel board for (12) circuit breakers (1 pole only), and main lugs connection.

11. Magnetic motor starter rated at 5 horsepower with full load amperage overload protection; adjustable + 15% supplied with H-O-A selector switch with blue pilot light.

12. GFCI circuit breaker for: pump station components. 1 submersible pump.

13. Magnetic motor starter rated at 3/4 horsepowerr for pump with internal thermal overload protection; supplied complete with H-O-A selector switch with green pilot light.

14. Magnetic lighting contactor(s) and GFCI breaker (s) 16 amps maximum; for light switching system; supplied complete with H-O-A selector switch with white pilot light.

15. H-O-A selector switch for electric ventilation fan.

16. Water level monitor relay with:

    a. Green pilot light (2), normal operating level
    b. Red pilot light, filling
    c. Red pilot light, low water

17. 24-hour timer with skip-a-day feature for pump operation.

18. 24-hour timer with skip-a-day feature for light operation.

19. All components prewired to coded terminal strips and supplied complete with current flow schematics.

2.09 DESIGN OPERATION: GARDEN FOUNTAIN

A. The water effects for this multi-level fountain consists of: a pedestal located in the upper pool containing 4 weirs with .41" of flow over the weir. The next lower basin contains a single weir with 3/4" deep maximum flow. The water then runs down a trough into the next lower "meandering stream" and into the next lower pool which contains another pedestal. The

pedestal produces a 1"-0" high clearstream of water. The resultant water flows into a trough and down into an additional trough and down into another "meandering stream" which terminates at a lilly pond. The water then flows over a final weir (12'-6" long) and into the suction reservoir. From there it is returned to the fountain pump. The upper most water effect will be illuminated from inside the pedestral by a 500 watt light fixture. Each of the three trough waterfalls will be illuminated from below 1, 100 watt light fixture. Weir depths produced will be resultant from the pedestal water effect GPM requirements.

B. Series #600 Modular Fiberglass Pump Station Includes:

1. 2"-6" x 3'-0" access hatch, with 1.5" drain connection: aluminum construction with integral 0.75" tile set cover with interior light switch.

2. Access ladder.

3. 387 CFM vent fan: complete with 2 grademounted cast iron vent caps (interconnecting piping not included).

4. 100 watt light fixture with duplex 120V, 1 phase outlet.

5. 1.5" fill/level control manifold: copper construction with 1", 120 V, 1 phase, outlet solenoid valve, 1.5" quick-fill valve and 0.5" water hammer arrester, backflow preventer and 3/4" hose bibb.

6. Simplex sump pump assembly: cast iron construction with mangetic float switch control: 1/4 horsepower, 1725 RPM, 120V, 1 phase.

7. Centrifugal pump, 11/2 horsepower: 2" x 1-1/2:, 3450 RPM, 230 volts, 3 phase, 60 cycle; bronze fitted cast iron construction with 2" suction strainer and 2" on-off valve. Supplied complete with flange gaskets and stainless steel studs.

8. 1-1/2" x 2" screwed discharge manifold and 3 outlet and discharge assemblies.

   a. 1, 2" screwed discahrge assembly with check valve; to inlet fitting *upper basin). Also serves as upper basin drain.

   b. 1, 1-1/2" screwed dischage assembly with check; to slab penetration (middle basin).

   c. 1, 1-1/2" screwed discharge assembly to filter.

9. Filtration system includes:

   a. 36 GPM sand filter: stainless steel cannister with bronze backwash valve; filter median included.

10. Control panel shall be U/L listed and consist of:

    a. NEMA 1A polycarbonate enclosure.

11. Main disconnect(s) for power supplies:

    a. 120/208 V, 3 phase, 4 wire + ground (5 wire).

12. Panel board for (12) circuit breakers (1 pole only), and main lugs connection.

13. GFCI circuit breaker(s) for: pump station components, 1 submersible pump.

14. Magnetic motor starter rated at 1-1/2 horsepower with full load amperage overload protection; adjustable +/- 15% supplied with H-O-A selector switch with blue pilot light.

15. Magnetic lighting contractor(s) and GFCI breaker(s) 16 amps maximum; for light switching system; supplied complete with H-O-A selector switch with white pilot light.

16. H-O-A selector switch for electric ventilation fan.

17. Water level monitor relay with:

    a. Green pilot light (2), normal operating level
    b. Red pilot light, filling
    c. Red pilot light, low water

18. 24-hour timer with skip-a-day feature for pump operation

19. 24-hour timer with skip-a-day feature for light operation

20. All components prewired to coded terminial strips and supplied complete with current flow schematics.

PART 3 - EXECUTION

3.01 GENERAL:

A. Move equipment into space through available opening. Dismantle equipment where necessary to accomplish this. After reassembly, test equipment to verify its satisfactory operating condition.

B. Follow manufacturer's instructions on items not specifically covered in drawings and specifications. Report descrepancies to Architect for clarification before starting work. Manufacturer shall provide start-up service on major pieces of equipment.

C. Thoroughly lubricate equipment before operating. Repair of damage resulting from failure to comply with this requirement shall be the Contractor's responsibility.

D. Provide guards to enclose exposed moving equipment components. Provide removable sheet metal guards at shafts and couplings and removable framed wire mesh guards at openings in mechanical system.

3.02 COMPLETED FOUNTAIN SYSTEMS:

A. After installation is complete, a qualified representative of the manufacturer/supplier per paragraph 1.03 shall check, make adjustments, balance distribution of flow and place systems in operation, all satisfactory to the Architect.

B. All systems shall be thoroughly cleaned and free of foreign matter before placing systems in operation.

3.03 MATERIAL SUBMITTAL:

Furnish data on the following in accordance with paragraph 1.04:

A. Fountain pump and performance curve.

B. All valves and strainers.

C. Electronic water level control.

D. Fittings, gratings and frames to be fitted into bottoms and sides of fountains.

3.04 SERIVCE:

The Contractor shall inform himself of the locations of the service point for water and drain, the voltage to be supplied, and other pertinent data.

3.05 EXCAVATION AND BACK FILL:

A. Provide excavation and backfill required to accommodate work of this Section. Excavate with particular care near buried utilities. Comply with Section 02200.

B. Excavation shall be of sufficient size to allow proper installation and testing of work. Provide necessary sharing, pumping, warning signs and barricades.

C. Install buried piping to maintain a minimum dimension between top of pipe and finish grade of 2'-0".

D. Coordinate trenching and installation of piping with other trades.

E. After tests and observations are successfully completed backfill with sand or fine pea gravel rodded in place to 12" above piping. Complete backfill with 6" layers of topsoil in planting areas and structural backfill under paving and structures properly moistened and mechanically compacted to at least 90% in accordance with ASTM D1566-64 (1268). Backfill shall be free of rocks, debris or organic material. Do not use water to compact backfill unless specifically called for.

3.06 PAINTING AND FINISHING:

Furnish equipment with factory finish, unless otherwise specified. Restore damaged finishes to match original.

3.07 ELECTRICAL WORK OF THIS SECTION:

A. Coordinate fountain equipment room electrical service provided by Electrical contractor.

B. Furnish equipment designed to operate on available electrical voltage and frequency. This requirement supersedes conflicting requirements in drawings and specifications.

C. Equipment shall be manufactured in accordance with NEMA standards and be UL listed where applicable.

3.08 TESTS:

A. Tests shall be conducted throughout the installation as are considered necessary by the Architect to determine conformity with the specifications.

B. Provide labor, equipment and materials required to successfully perform specified tests. Test system in accordance with following schedule or with system specification. Perform tests in presence of job inspector for two hours with no detectable leaks or pressure loss. Dissassemble defective joints and reassemble using new materials; caulking will not be permitted.

C. Do not include valves or equipment in tests. If systems are tested in sections, include connection to previously-tested section in test.

	Test Pressure	Test Medium
1. Fountain pump discharge and cold water makeup	100 psig	Water
2. Drains	10 psig	Water

3.09 PROTECTION AND CLEANING:

A. Keep site clear of debris originating from work of this Section. Upon completion, remove all trash and surplus materials. Work of this Section shall be clean prior to acceptance.

B. Protect equipment from dirt, moisture and mechanical damage during construction. Restore damanged equipment to original condition.

C. Keep interior of piping free of foreign material during construction. Flush piping systems with test medium specified under paragraph 3.08. "Tests", before installing appurtenances or making final connections.

3.10 CLOSING-IN OF UNINSPECTED WORK:

Do not conceal or cover work before tests and observations are completed. Uncover work prematurely closed-in and repair resulting damage to all work.

3.11 LEAKS AND OVERFLOW:

Repair or replace items damaged by leaks or overflow from work provided under this Section.

3.12 OPERATION AND ADJUSTMENT:

A. Operate completed portions of work prior to job completion. Check operational status of systems and notify Architect if equipment is not ready for operation. Contractor shall be responsible for damage to system during start-up and operation prior to final acceptance.

B. Upon completion of work, place entire system in operation. Open balancing devices and adjust controls for normal operating conditions.

3.13 OPERATING AND MAINTENANCE INSTRUCTIONS:

A. Furnish three sets of installation, operating and maintenance instructions for all equipment and devices furnished under this Section. Bind in hard cover, loose leaf binders. Provide typed index. Provide typed supplemental data where manufacturer's literature is inadequate.

B. Instruct Owner's personnel in proper operation and maintenance of systems furnished under this Section.

3.14 AS-BUILT DRAWINGS:

Provide three (3) copies as required in paragraph 1.04. Record stubout locations, concealed items and deviations from Contract Drawings neatly on duplicate tracings obtained from the Architect at Contractor's expense. Show actual dimensions and elevations of all piping.

3.15 FINAL REVIEW:

After completion of work and acceptance of operating and maintenance instructions and as-built drawings, the Architect will conduct a final review of the job. Unacceptable items will be noted on a punch list. Project will not be given final acceptance until all items on punch list have been corrected.

3.16 GUARANTEE:

All mechanical work shall be guaranteed from defects of workmanship and materials for a period of one year from date of final acceptance of the work; and, upon notice, any defects developing during the guarantee period shall be promptly remedied without expense to Owner.

3.17 CLEANUP:

Upon completion of the work under this Section, Contractor shall remove from the premises all surplus materials, tools, equipment, rubbish and debris resulting from his work at his own expense and leave the installation in clean, neat and workmanlike condition satisfactory to the Architect.

END OF SECTION

SECTION 02480 - PLANTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

Extent of landscape development work is shown on drawings and in schedules.

A. Subgrade Elevations: Excavation, filling and grading required to establish elevations shown on drawings are not specified in this section. Refer to earthwork sections.

1.03 QUALITY ASSURANCE:

Subcontract landscape work to a single firm specializing in landscape work.

A. Source Quality Control:

1. General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.

2. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Architect together with proposal for use of equivalent material.

3. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

B. Topsoil: Before delivery of topsoil, furnish Architect with written statement giving location of properties from which topsoil is to be obtained, names and addresses of owners, depth to be stripped, and crops grown during past 2 years.

C. Trees, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticulture practice and free of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.

1. Label each tree and shrub with securely attached waterproof tag bearing legible designation of botanical and common name.

2. Where formal arrangements or consecutive order of trees or shrubs are shown, select stock for uniform height and spread, and label with number to assure symmetry in planting.

3. Inspection: The Architect may inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for genus, species, variety, size and quality. Architect retains right to further inspect trees and shrubs for size and condition of balls and root systems, insects, or injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from project site.

1.04 SUBMITTALS:

A. Certification: Submit certificates of inspection as required by governmental authorities. Submit manufacturer's or vendors certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.

1. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.

B. Planting Schedule: Submit proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

C. Maintenance Instructions: Submit typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

1.05 DELIVERY, STORAGE AND HANDLING:

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Sod: Time delivery so that sod will be placed within 24 hours after stripping. Protect sod against drying and breaking of rolled strips.

C. Trees and Shrubs: Provide freshly dug trees and shrubs. Do not prune prior to delivery unless otherwise approved by Architect. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery. Do not drop balled and burlapped stock during delivery.

D. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.

1. Do not remove container grown stock from containers until planting time.

1.06 JOB CONDITIONS:

Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

C. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

D. Coordination with Lawns: Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to Architect. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

1.07 PROJECT WARRANTY:

A. Lawns: Warranty through specified lawn maintenance period, and until final acceptance.

B. Trees and Shrubs: Warranty through specified maintenance period, and until final acceptance.

C. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period. Replace trees and shrubs which are in doubtful condition at end of warranty period; unless, in opinion of Architect, it is advisable to extend warranty period for a full growing season.

1. Another inspection will be conducted at end of extended warranty period, if any, to determine acceptance or rejection. Only one replacement (per tree, shrub or plant) will be required at end of warranty period, except for losses or replacements due to failure to comply with specified requirements.

PART 2 - PRODUCTS

2.01 TOPSOIL:

A. Topsoil has been stockpiled for re-use in landscape work. If quantity of stockpiled topsoil is insufficient, provide additional topsoil as required to complete landscape work.

1. Provide new topsoil as required, which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay, lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 2" in any dimension, and other extraneous or toxic matter harmful to plant growth.

2. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4"; do not obtain from bogs or marshes.

2.02 SOIL AMENDMENTS:

A. Lime: Natural dolomitic limestone containing not less than 85% of total carbonates with a minimum of 30% magnesium carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100-mesh sieve.

B. Aluminum Sulfate: Commercial grade.

C. Peat Humus: FS Q-P-166 decomposed peat with no identifiable fibers and with ph range suitable for intended use.

D. Superphosphate: Soluble mixture of treated minerals; 20% available phosphoric acid.

E. Sand: Clean, washed sand, free of toxic materials.

F. Perlite: Conforming to National Bureau of Standards PS 23.

G. Vermiculite: Horticulture grade, free of toxic substances.

H. Sawdust: Rotted sawdust, free of chips, stones, sticks, soil or toxic substances and with 7.5 lbs nitrogen uniformly mixed into each cubic yard of sawdust.

I. Mulch: Organic mulch free from deleterious materials and suitable for top dressing of trees, shrubs or plants and consisting of one of the following:

Ground or shredded pine bark

J. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

1. For trees and shrubs, provide fertilizer with not less than 5% total nitrogen, 10% available phosphoric acid and 5% soluble potash.

2. For lawns, provide fertilizer with percentage of nitrogen required to provide not less than 1 lb. of actual nitrogen per 100 sq. ft. of lawn area and not less than 4% phosphoric acid and 2% potassium. Provide nitrogen in a form that will be available to lawn during initial period of growth; at least 50% of nitrogen to be organic form.

2.03 PLANT MATERIALS:

A. Quality: Provide trees, shrubs, and other plants of size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".

B. Deciduous Trees: Provide trees of height and caliper scheduled or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.

1. Provide balled and burlapped (B&B) deciduous trees.

2. Container grown deciduous trees will be acceptable in lieu of balled and burlapped deciduous trees subject to specified limitations or ANSI Z60.1 for container stock.

C. Deciduous Shrubs: Provide shrubs of the height shown or listed and with not less than minimum number of canes required by ANSI Z60.1 for type and height of shrub required.

1. Provide balled and burlapped (B&B) deciduous shrubs.

2. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to specified limitations for container grown stock.

D. Coniferous and Broadleafed Evergreens: Provide evergreens of sizes shown or listed. Dimensions indicate minimum spread for spreading and semi-spreading type evergreens and height for other types, such as globe, dwarf, cone, pyramidal, broad up-right, and columnar. Provide normal quality evergreens with well-balanced form complying with requirements for other size relationships to the primary dimension shown.

1. Provide balled and burlapped (B&B) evergreens.

2. Container grown evergreens will be acceptable subject to specified limitations for container grown stock.

2.04 GRASS MATERIALS:

A. Grass Seed: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide seed mixture composed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.

1. "Schedule of Grass Seed Requirements" is attached at end of this section.

B. Sod: Provide strongly rooted sod, not less than 2 years old, free of weeds and undesirable native grasses and machine cut to pad thickness of 3/4" (± 1/4"), excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).

1. Provide sod of uniform pad sizes with maximum 5% deviation in either length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10% of pad will be rejected.

2. Provide sod composed principally of following:

Bermuda grass (Cynodon dactylon).

Kentucky Bluegrass (Poa pratensis).

2.05 GROUND COVER:

Provide plants established and well-rooted in removable containers or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the pot size shown or listed.

2.06 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Wood Headers and Edging: Of sizes shown and following wood species.

1. All Heart Redwood.

2. Southern Pine, pressure treated with water-borne preservative for ground contact use complying with AWPB LP-22.

3. Provide wood stakes of the same species and treatment, 2" x 2" x 24" long and galvanized nails for anchoring headers and edging.

B. Steel Edging: Commercial steel edging 3-1/2" high by 1/4" thick where shown on drawings. Fabricate in sections with loops pressed from or welded to face of sections at 2' - 6" o.c. to receive stakes. Provide tapered steel stakes 16" long. Finish edging sections and stakes with manufacturer's standard green-black paint.

C. Gravel: Water-worn, hard, durable gravel, washed free of loam, sand, clay and other foreign substances, and of following size range and color:

Type A: 3" maximum, 1-1/2" minimum.

Type B: 1-1/2" maximum, 3/4" minimum.

Type C: 3/8" maximum, 1/8" minimum (pea gravel).

Color: Readily-available natural gravel color range. Provide samples to Architect for approval.

D. Anit-Dessicant: Emulsion type, film-forming agent designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.

E. Filtration/Separation Fabric: Water permeable filtration fabric of fiberglass of polypropylene fabric.

F. Wrapping: Tree-wrap tape not less than 4" wide, designed to prevent bore damage and winter freezing.

G. Stakes and Guys: Provide stakes and deadmen of sound new hardwood, treated softwood, or redwood, free of knot holes and other defects. Provide wire ties and guys of 2-strand, twisted, pliable galvanized iron wire not lighter than 12 ga. with zinc-coated turnbuckles. Provide not less than 1/2" diamter rubber or plastic hose, cut to required lengths and of uniform color, material and size to protect tree trunks from damage by wires.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Stake individual tree and shrub locations and areas of multiple plantings. Stake locations and outline areas and secure Architect's acceptance before start of planting work. Make minor adjustments as may be requested.

B. Preparation of Planting Soil:

1. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.

2. Mix specified soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing or planting soil within a few days.

"Schedule of Planting Soil Mixture Requirements" is attached at end of this section.

3. For pit and trench type backfill, mix planting soil prior to backfilling, and stockpile at site.

4. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

a. Mix lime with dry soil prior to mixing of fertilizer.

b. Prevent lime from contacting roots of acid-loving plants.

c. Apply phosphoric acid fertilizer (other than that constituting a portion of complete fertilizers) directly to subgrade before applying planting soil and tilling.

C. Preparation for Planting Lawns:

1. Loosen subgrade of lawn areas to a minimum depth of 4". Remove stones over 1-1/2" in any dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.

2. Spread top soil to minimum depth required to meet lines, grades and elevations shown, after light rolling and natural settlement. Add specified soil amendments and mix thoroughly into upper 4" of topsoil.

3. Place approximately 1/2 of total amount of topsoil required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil. Add specified soil amendments and mix thoroughly into upper 4" of topsoil.

4. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately.

5. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.

6. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

D. Preparation of Unchanged Grades: Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: Till to a depth of not less than 6"; apply soil amendments and initial fertilizers as specified, remove high areas and fill in depressions; till soil to a homogenous mixture of fine texture, free of lumps, clods, stone, roots and other extraneous matter.

1. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of Owner's property; do not turn over into soil being prepared for lawns.

2. Apply specified commercial fertilizer at rates specified and thoroughly mix into upper 2" of topsoil. Delay application of fertilizer if lawn planting will not follow within four days.

   "Schedule of Planting Soil Mixture Requirements", indicating required rate of fertilizer application, is attached at end of this section.

E. Preparation of Planting Beds:

1. Loosen subgrade of planting bed areas to a minimum depth of 6" using a cultimulcher or similar equipment. Remove stones over 1-1/2" in any dimension, and sticks, stones, rubbish and other extraneous matter.

2. Spread planting soil mixture to minimum depth required to meet lines, grades and elevations shown, after light rolling and natural settlement. Place approximately 1/2 of total amount of planting soil required. Work into top of loosened subgrade to create a transition layer, then place remainder of the planting soil.

F. Planters: Place not less than 4" layer of gravel in bottom of planters, install filtration/separation fabric and fill with planting soil mixture consisting of 1 part topsoil, 1 part coarse sand, 1 part peat humus, and 3 lbs. dolomitic limestone per cubic yard of mix. Place soil in lightly compacted layers to an elevation 1-1/2" below top of planter allowing for natural settlement.

B. Excavation for Trees and Shrubs:

1. Excavate pits, beds and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.

2. For balled and burlapped (B&B trees and shrubs), make excavations at least twice as wide as the ball diameter and equal to the ball depth, plus following allowance for setting of ball on a layer of compacted backfill:

   Allow for 6" setting layer of planting soil mixture.

3. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth.

   Dispose of subsoil removed from planting excavations. Dot not mix with planting soil or use as backfill.

   Fill excavations for trees and shrubs with water and allow to percolate out before planting.

3.02 PLANTING:

A. Planting Trees, Shrubs and Groundcover:

1. Balled and Burlapped (B&B) stock: Set on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball 1" above adjacent finished landscape grades after settlement. Remove burlap from sides of balls; retain on bottoms. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3-full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

2. Container grown stock: as specified for balled and burlapped stock, except cut cans on 2 sides with an approved can cutter and remove. Remove bottoms of wooden boxes after partial backfilling so as not to damage root balls.

3. Dish top of backfill to allow for mulching.

4. Mulch pits, trenches and planted areas. Provide not less than 2" thickness of mulch and work into top of backfill and finish level with adjacent finish grades.

5. Apply anti-dessicant using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage.

   a. If deciduous trees or shrubs are moved in full-leaf, spray with anti-dessicant at nursery before moving and again 2 weeks after planting.

6. Prune, thin out and shape trees and shrubs in accordance with standard horticulture practice. Prune trees to retain required height and spread. Unless otherwise directed by Architect, do not cut tree leaders, and remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character.

7. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

8. Wrap tree trunks of 1-1/2" caliper and larger. Start at ground and cover trunk to height of first branches and securely attach. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures before wrapping.

9. Guy and stake trees immediately after planting, as indicated.

3.03 SEEDING NEW LAWNS:

A. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.

B. Sow seed using a spreader or seeding machine. Do not seed when wind velocity exceeds 5 mi per hr. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.

C. Sow not less than the quantity of seed specified or scheduled.

D. Rake seed lightly into top 1/8" of soil, roll lightly, and water with a fine spray.

E. Protect seeded slopes exceeding 6:1 against erosion with erosion neeting or other methods acceptable to the Architect.

F. Protect seeded areas against erosion by spreading specified lawn mulch after completion of seeding operations. Spread uniformly to form a continuous blanket 1/8-1/4" thick over seeded areas.

3.04 HYDROSEEDING NEW LAWNS:

A. Mix specified seed, fertilizer and pulverized mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

B. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate.

3.05 SODDING NEW LAWNS:

A. Lay sod within 24 hours from time of stripping. Do not plant dormant sod or if ground is frozen.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.

C. Water sod thoroughly with a fine spray immediately after planting.

3.06 MISCELLANEOUS LANDSCAPE WORK:

A. Install wood headers and edgings where shown. Anchor with wood stakes spaced not more than 3' o.c., and driven at least 1" below top elevation of header or edging. Use 2 galvanized nails per stake to fasten headers and edging, and clinch point of each nail.

B. Install steel edging where shown. Anchor with steel stakes spaced not more than 2' - 6" o.c., and driven at least 1" below top elevation of edging.

Place gravel beds where shown. Compact soil subgrades before placing gravel.

3.07 MAINTENANCE:

A. Begin maintenance immediately after planting.

B. Maintain trees, shrubs and other plants until final acceptance but in no case less than following period:

One full year after date of substantial completion.

C. Maintain trees, shrubs and other plants by pruning, cultivating and weeding as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease.

C. Maintain lawns for not less than one full year after substantial acceptance and longer as required to establish an acceptable lawn.

D. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

3.08 CLEANUP AND PROTECTION:

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

3.09 INSPECTION AND ACCEPTANCE:

A. When landscape work is completed, including maintenance, Architect will, upon written request, make an inspection to determine acceptability.

B. Landscape work may be inspected for acceptance in parts agreeable to Architect, provided work offered for inspection is complete, including maintenance.

C. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

END OF SECTION 02480

SECTION 02495 - LANDSCAPE ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Provide landscape accessories as shown and specified. The work includes:

1. Benches.

2. Trash Receptacles.

3. Decorative stone and stepping stones.

4. Edging.

5. Tree grates.

B. Coordinate the work of other trades affecting work of this Section, to provide proper location of all anchors, fasteners and connectors.

C. Related work:

1. Section 02200: Earthwork.

2. Section 02485: Seeding.

3. Section 02487: Sodding.

4. Section 02490: Trees, Plants, and Ground Covers.

5. Section 02515: Concrete Curbs, Walks, and Paving.

6. Section 02518: Interlocking Concrete Unit Paving.

7. Section 03300: Cast-In-Place Concrete.

8. Section 04400: Stone Masonry.

9. Section 05500: Metal Fabrications.

10. Section 09900: Painting.

1.03 QUALITY ASSURANCE:

A. Comply with Section 02000 requirements.

1.04 SUBMITTALS:

A. Submit manufacturer's product data for each type of factory fabricated accessory required, including finish.

B. Submit complete shop drawings for total installation of all manufactured items, including benches, trash receptacles, edging, tree grates.

C. Submit the following material samples.

1. Decorative stone.

2. Edging.

3. Stepping stones.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, and handle landscape accessories to prevent damage and deterioration.

1.06 PROJECT CONDITIONS:

A. Do not begin landscape accessory work before completion of final grading or surfacing.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Decorative stone: Clean natural water worn river gravel 3/4" diameter.

B. Stepping stones: Nor-Carla Bluestone; 24" x 24" x 1 5/8" thick; natural-cleft top face and sawed edges. Color range, finish and texture to match Architect's samples.

C. Steel edging: Painted steel 3/16" thick x 4" depth, with interlocking joints and steel stakes.

D. Tree grates: Cast iron manufactured by Urban Accessories. Type shown on drawings.

AVAILABLE MANUFACTURERS:

URBAN ACCESSORIES PRODUCT AND FOUNDRY,
SNOHOMISH, WA

2.02 ACCESSORIES:

A. Shims: Galvanized steel plates, thickness as required.

B. Filter Fabric: Poly-Filter X; manufactured by Carthage Mills.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine subgrades, finished surfaces, and installation conditions. Do not start landscape accessories work until unsatisfactory conditions are corrected.

3.02 PREPARATION:

A. Remove loose material and debris from base surface before placing landscape accessories.

B. Locate and layout all landscape accessory items. Obtain Architect's acceptance of layout prior to installation.

3.03 INSTALLATION:

A. Decorative stone:

1. Install filter fabric barrier over drainage structure as detailed prior to installing stone.

2. Place stone without damaging filter fabric barrier.

3. Arrange stones for best appearance as directed by Architect.

B. Stepping stones:

1. Set units on 3" deep compacted leveling sand.

2. Adjust units to evenly fill space.

3. Adjust units as directed by Architect.

4. Set units flush with adjoining pavement surfaces.

C. Steel edging:

1. Assemble to the lines and elevations indicated.

2. Assemble, align, bend, and adjust the sections before stakes are set.

3. Set top flush with adjoing surfaces and turf.

4. Clean and touch-up paint all abraded, welded, and scratched surfaces with matching rust inhibitive paint.

D. Benches:

Install per manufacturers recommendations and as shown on drawings.

E. Trash receptacles:

Install per manufacturers recommendations and as shown on drawings.

3.04 CLEANING:

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from landscape accessories work.

END OF SECTION

SECTION 02513 - ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

Extent of asphalt concrete paving work is shown on drawings.

Prepared aggregate subbase is specified in earthwork sections.

1.03 SUBMITTALS:

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.04 JOB CONDITIONS:

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 degrees F (10 degrees C), and when temperature has not been below 35 degrees F (1 degree C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

Construct asphalt concrete surface course when atmospheric temperature is above 40 degrees F (4 degrees C), and when base is dry. Base course may be placed when air temperature is above 30 degrees F (-1 degree C) and rising.

B. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

B. Base Course Aggregate: Sound, angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings.

C. Surface Course Aggregate: Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M 17 (ASTM D 242).

E. Asphalt Cement: Comply with AASHTO M 226 (ASTM D 3381).

F. Prime Coat: Cut-back asphalt type; AASHTO M 82 (ASTM D 2027) MC-30, MC-70 or MC-250.

G. Tack Coat: Emulsified asphalt; AASHTO M 140 (ASTM D 997) or M 208 (D 2397), SS-1, SS-1h, CSS-1 or CSS-1h, diluted with one part water to one part emulsified asphalt.

H. Herbicide Treatment: Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.

I. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Allied Chemical Corp.
Achem Products, Inc.
Ciba-Geigy Corp.
Dow Chemical U.S.A.
E.I. DuPont De Nemours & Co., Inc.
FMC Corp.
Thompson-Hayward Chemical Co.
U.S. Borax and Chemical Corp.

J. Lane Marking Paint: Chlorinated rubber-alkyd type, FS TT-P-115, Type III.

2.02 ASPHALT-AGGREGATE MIXTURE:

Provide asphalt-aggregate mixture as recommended by local paving authorities to suit project conditions.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

A. General:

1. Remove loose material from compacted subbase surface immediately before applying herbicide treatment or prime coat.

2. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

3. Notify Contractor of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

B. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.

C. Prime Coat: Apply at rate of 0.20 to 0.50 gal. per sq. yd., over compacted subgrade. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

D. Tack Coat: Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.

Allow to dry until at proper condition to receive paving.

3.02 PLACING MIX:

A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 degrees F (107 degrees C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

B. Paver Placing: Place in strips not less than 10' wide, unless otherwise acceptable to Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

3.03 ROLLING:

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

C. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

D. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

E. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.04 TRAFFIC AND LANE MARKINGS:

A. Cleaning: Sweep and clean surface to eliminate loose material and dust.

B. Striping: Use chlorinated-rubber base traffic lane-marking paint, factory-mixed, quick-drying, and non-bleeding.

Color: White.

Apply paint with mechanical equipment to produce uniform straight edges. Apply in 2 coats at manufacturer's recommended rates.

3.05 FIELD QUALITY CONTROL:

A. General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Architect.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

Base Course: 1/2", plus or minus.

Surface Course: 1/4", plus or minus.

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10' straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

Base Course Surface: 1/4".

Wearing Course Surface: 3/16".

Check surface areas at intervals as directed by Architect.

END OF SECTION 02513

SECTION 02515 - PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.02 DESCRIPTION OF WORK:

A. General:

1. Extent of portland cement concrete paving is shown on drawings, including curbs, gutters, walks and paving.

2. Prepared subbase is specified in "Earthwork" section.

3. Concrete and related materials are specified in Division 3.

4. Joint fillers and sealers are specified in Division 7.

1.03 QUALITY ASSURANCE:

A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

1.04 SUBMITTALS:

Furnish samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers and sealers.

1.05 JOB CONDITIONS:

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.01 A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

1. Use flexible spring steel forms or laminated boards to form radius bends as required.

2. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect.

C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.

D. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 40. Cut bars true to length with ends square and free of burrs.

E. Metal Expansion Caps: Furnish for one end of each dowel bar in expansion joints. Design caps with one end closed and a minimum length of 3" to allow bars movement of not less than 1", unless otherwise indicated.

F. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bold joint assembly to hold coupling against pavement form and in position during concreteing operations, and to permit removal without damage to concrete or hook bolt.

G. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

H. Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for preformed expansion joint fillers and sealers.

J. Curing and Sealing Compound: Conform to TT-C-800, with 30% solids content minimum.

K. Epoxy Resin Grout: FS MMM-G-650.

2.02 CONCRETE MIX, DESIGN AND TESTING:

Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control, and as herein specified.

Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture and water to produce the following properties:

Compressive Strength: 4000 psi, minimum at 28 days.

Slump Range: 8" for concrete containing HRWR admisture (super-plasticizer); 3" for other concrete.

Air Content: 5% to 8%.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

Remove loose material from compacted subbase surface immediately before placing concrete.

Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

3.02 FORM CONSTRUCTION:

A. General:

1. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

2. Check completed formwork for grade and alignment to following tolerances:

   Top of forms not more than 1/8" in 10'.

   Vertical face on longitudinal axis, not more than 1/4" in 10'.

3. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.03 REINFORCEMENT:

Locate, place and support reinforcement as specified in Division-3 sections, unless otherwise indicated.

3.04 CONCRETE PLACEMENT:

A. General: Comply with requirements of Division 3 sections for mixing and placing concrete, and as herein specified.

1. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

2. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

3. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

B. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.05 JOINTS:

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.

1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.

2. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.

D. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.

1. Locate expansion joints at 30' o.c. for each pavement lane, unless otherwise indicated.

2. Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If not joint sealer, place top of joint filler flush with finished concrete surface.

3. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

4. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

E. Fillers and Sealants: Comply with the requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

3.06 CONCRETE FINISHING:

A. General:

1. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

2. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

3. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

4. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

   Broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.

5. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

3.07 CURING:

A. General:

1. Protect and cure finished concrete paving, complying with applicable requirements of Division 3 sections. Use curing and sealing compound or approved moist-curing methods.

2. Do not use liquid membrane-forming materials where anti-spalling treatment will be applied.

B. Anti-Spalling Treatment: Apply compound to concrete surfaces no sooner than 28 days after placement. Apply to clean, dry concrete free of oil, dirt, and other foreign materials, in 2 sprayed applications. First application at rate of 40 sq. yds. per gal.; second application, 60 sq. yds. per gal. Allow complete drying between applications.

C. Repairs and Protections:

1. Repair or replace broken or defective concrete, as directed by Architect.

2. Drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy resin grout.

3. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

4. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION 02515

SECTION 02517 - MASONRY PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. General:

1. The extent of masonry paving is indicated on drawings and in schedules. Types of masonry paving include the following:

   a. Ungrouted mortarless concrete masonry paving.

   b. Ungrouted mortarless stone masonry paving.

   c. Impervious asphalt block paving.

   d. Stone paving set in portland cement mortar.

1.3 QUALITY ASSURANCE:

A. Installer: Subcontract masonry paving work to a firm with not less than 5 years of successful experience in the required types of paving application.

B. Sample Installation: Prior to installation of masonry paving work, fabricate sample panel using materials, pattern and joint treatment indicated for project work, including special features for expansion joints and contiguous work. Build panel at the site, as directed, of full thickness and approximately 4' X 3', unless otherwise indicated. Provide range of color, texture and workmanship to be expected in the completed work. Obtain Landscape Architect's acceptance of visual qualities of the panel before start of masonry paving work. Retain panel during construction as a standard for judging completed masonry paving work. Do not move or destroy sample panel until work is completed.

1. Provide sample panel for each type of paving required.

2. Do not change source of brands for masonry units, setting materials, or grout during progress of work.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data for each manufactured product, including certification that each product complies with specified requirements.

B. Samples:

1. For initial selection of color and texture submit the following:

a. Masonry paving unit samples showing full range of colors and textures available in products complying with specified requirements. Furnish samples made up of actual units or sections of units. Following preliminary selection of colors and textures, submit samples consisting of 5 individual units for each color and texture under consideration. Include in each set the maximum variation to be expected in finished work.

b. Submit cured samples of each type of colored grout and mortar, showing the range of color which can be expected in the finished work.

2. For verification purposes submit the following:

a. Masonry paving unit samples for each type of masonry paving required. Include in each set the full range of exposed color and texture to be expected in the completed work.

b. Colored masonry mortar samples for each color required showing the full range of color which can be expected in the finished work. Label samples to indicate type and amount of colorant used.

1.05 PRODUCT HANDLING:

Protect masonry materials during storage and construction against wetting by rain, snow or ground water and against soilage or intermixture with earth or other types of materials.

Protect grout and mortar materials from deterioration by moisture and temperature. Store in a dry location or in waterproof container. Keep containers tightly closed and away from open flame. Protect liquid components from freezing.

1.06 JOB CONDITIONS:

A. Cold Weather Protection:

1. Frozen Materials: Do not use frozen materials or materials mixed or coated with ice or frost.

2. Frozen Work: Do not build on frozen subgrade or setting beds. Remove and replace masonry work damaged by frost or freezing.

B. Weather Limitations: Protect masonry against freezing when atmospheric temperature is 40 degrees F (4 degrees C) and falling. Heat materials and provide temporary protection of completed portions of masonry work. Comply with requirements of BIA Technical Notes No. 1A, "Cold Weather Masonry Construction - Construction and Protection Recommendations".

C. Hot Weather Requirements: Protect masonry in hot weather to prevent excessive evaporation of setting beds and grout. Provide artificial shade, wind breaks and use cooled materials, as required.

PART 2 - PRODUCTS

2.01 MASONRY PAVING UNITS:

A. Concrete Masonry Paving Units (CMPU): Solid units of interlocking design, in sizes and shapes indicated, complying with NCMA A-10, and made from normal weight aggregate, unless otherwise indicated.

Color and Texture: Selected by Architect from manufacturer's standard colors and textures.

2.02 SETTING MATERIALS:

A. Setting Materials for Ungrouted Mortarless Concrete Masonry Paving:

1. Aggregate for Compacted Base: Washed, graded crushed limestone, crushed stone, or crushed gravel, size No. 57 or 68 complying with AASHTO M 43 or ASTM D 448.

2. Aggregate for Leveling Base: Concrete sand complying with ASTM C 33 requirements for fine aggregate, or limestone screenings.

3. Aggregate for Setting Bed: Fine aggregate complying with ANSI/ASTM C 136.

B. Mortar Applications:

1. Aggregate: ASTM C 144, except for joints less than 1/4", use aggregate graded with 100% passing No. 16 sieve.

2. Portland Cement: ASTM C 150, Type I, of natural color or white to produce required color.

3. Hydrated Lime: ASTM C 207, Type S.

4. Water: Clean, free of deleterious materials which would impair strength or bond.

C. Portland Cement Applications:

1. Aggregate: ASTM C 144 with a fineness module of 2.25 plus or minus 0.10.

2. Portland Cement: ASTM C 150, Type 1, of natural color of white, as required to produce required color of grout.

3. Liquid Admixture for Setting Bed and Grout: Liquid latex mortar additive with a comprehensive strength of 3000 psi, bond strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at an ozone concentration of 200 ppm and water absorption of 4% maximum.

   a. Product/Manufacturer: Subject to compliance with requirements, provide Laticrete 3701 manufactured by Laticrete International, Inc.

4. Bond Coat Admixture: High strength liquid latex mortar additive with a compressive strength of 5000 psi, bond strength of 500 psi, tensile strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at 200 pphm, and water absorption of 4% maximum.

   a. Product/Manufacturer: Subject to compliance with requirements, provide Latricrete 4237 manufactured by Latricrete International, Inc.

D. Setting Bed Reinforcing: 2" x 2", 16/16, welded wire fabric galvanized.

E. Water: Clean, free of deleterious materials which would impair strength or bond.

F. Pigments: Commercial iron oxide, manganese dioxide, ultramarine blue chromium oxide, or carbon black, suitably compounded for use in grout and mortar mixes. Do not exceed pigment-to-cement ratios, by weight, of 1-to-35 for carbon black and 1-to-7 for other pigments.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. General:

1. Do not use masonry units with excessive chips, cracks, voids, discolorations or other defects which might be visible or cause staining in finished work.

2. Cut masonry units with motor-driven saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern shown and to fit adjoining work neatly. Use full units without cutting.

3. Set masonry units in patterns shown and with uniform joints of 3/8" width.

4. Tolerances: Maintain surface plane for finished masonry paving not exceeding a tolerance of 1/8" in 10' when tested with a 10' straight edge.

5. Install joint filler where sealant type joints are shown. For joint filler and sealant materials and for their installation requirements, refer to Division-7 section on Joint Sealers.

6. Provide edging as indicated. Install edging prior to placing masonry paving units.

3.02 UNGROUTED MORTARLESS CONCRETE MASONRY PAVING:

A. General:

1. Place aggregate for compacted base over properly prepared and compacted subgrade. Provide compacted thickness of base indicated to allow for thickness of leveling bed and concrete masonry paving units. Compact base to 95% of maximum dry density as determined in accordance with ASTM D 1557.

2. Place aggregate for leveling base and screed loose to a thickness of 1-1/2" to 2", taking care to ensure it remains loose until paving units are set and compacted.

3. Treat leveling base with suitable soil sterilizer to prohibit growth of grass and weeds.

4. Set concrete masonry paving units hand tight, being careful not to disturb leveling base. Use string lines to keep straight lines. Use block splitter to cut edges when full-size units cannot be used. Select units from 4 or more cubes to blend color and texture variations.

5. Vibrate concrete masonry paving units into leveling base with a plate vibrator capable of a 3,500 to 5,000 lb. compaction force. Perform this operation on installed areas of paving at end of each day or before any rain.

6. Fill joints after vibration with limestone screening or sharp sand.

3.03 MORTAR APPLICATIONS:

Install masonry paving units in setting bed of Type "M" mortar with full joints of Type "M" mortar. Mix mortar to comply with ASTM C 270 proportion specifications, except limit materials to those specified under this section and with not more than 1/4 part lime per part of portland cement. Remove excess mortar promptly as work progresses. Lay unit in pattern shown with straight, uniform joints. Level surface to the elevation shown. Strike joints flush with top surface of brick and tool slightly concave. Cure mortar by maintaining in damp condition for 7 days.

3.04 PORTLAND CEMENT APPLICATIONS:

A. General:

1. Clean concrete subbase to remove dirt, dust, debris and loose particles.

2. Saturate-concrete subbase with clean water several hours before placing setting bed. Remove surface water about 1 hour before placing setting bed.

3. Apply slush coat of cement grout over surface of concrete subbase about 15 minutes prior to placing setting bed. Limit area of slush coat to avoid its drying out prior to placing setting bed. Mix slush coat to a consistency similar to that of thick cream and consisting of either neat cement and water or cement, sand and water. Do not exceed 1/16" thickness for cement slush coat.

4. Mix setting bed in proportions of one bad of portland cement to 3 parts sand (measured in damp loose condition) to quantity of liquid admixture recommended by admixture manufacturer and necessary to produce still mixture with a moist surface when setting bed is ready to receive masonry units.

5. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of masonry units to finished grades indicated. Mix and place only the amount which can be covered with masonry prior to initial set. Cut back, bevel edge, remove and discard setting bed material which has reached initial set prior to placing brick.

6. Place metal reinforcement approximately in center of setting bed.

7. Place masonry units before initial set of cement occurs. Immediately prior to placing brick on green or wet setting bed, apply uniform 1/16" thick slurry bond coat to bed with a flat trowel using mix of cement and liquid bond coat admixture proportional according to admixture manufacturer's recommendations. Apply skim coat of same material to back of each unit just prior to placing it on bed.

8. Tamp and beat units to obtain full contact with settling bed. Set and level each unit in single operation, prior to initial set of cement bed; do not return to areas already set and disturb masonry units for leveling purposes.

9. Grout joints as soon as possible after initial set of setting bed. Use grout consisting of a mixture of cement and liquid admixture proportioned to comply with admixture manufacturer's instructions. Force grout into joints, taking care not to smear grout on adjoining masonry units and other surfaces. After initial set of grout, finish joints by tooling to produce a very slightly concave polished joint, free from driving cracks.

B. Colored Cement Grout: Proportion pigments with other ingredients as follows:

1. Cure grout by maintaining in a damp condition for 7 days except as otherwise recommended by grout admixture manufacturer.

3.05 REPAIR, POINTING, CLEANING AND PROTECTION:

A. General:

1. Remove and replace masonry paving units which are loose, chipped, broken stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with mortar and grout. Point-up joints at sealant type joints to provide a neat, uniform appearance, properly prepared for aplication of sealant.

C. Cleaning: Remove excess mortar/grout from exposed masonry unit surfaces, wash and scrub clean.

1. Protect masonry paving installations from deterioration, discoloration or damage during subsequent construction and until acceptance of work, in compliance with recommendations of installer and paving unit manufacturer.

END OF SECTION 02517

SECTION 02717 - FIRE WATER SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. General: The extent of exterior fire water system work is shown on drawings.

1. Exterior fire water system work includes, but is not limited to, the following:

a. Yard piping.

b. Control valves.

c. Hydrants.

Comply with requirements of applicable Division-2 sections for excavation and backfilling required in connection with exterior fire water system.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of fire water system materials of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with at least 2 years of successful installation experience on exterior fire water system projects similar to this project.

C. NFPA Code: Comply with National Fire Protection Association (NFPA) Standard No. 24, "Standard for Outside Protection".

D. Local Fire Department/Marshall Regulations: Comply with governing regulations pertaining to hydrants, including hose unit threading and similar matching of connections.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's product data and installation instructions for pipe and fittings, valves, hydrants, and accessories.

PART 2 - PRODUCTS

2.01 PRESSURE PIPE:

A. General: Provide ells, tees, reducing tees, wyes, couplings, and other required piping accessories of same type and class of material as conduit, or of material having equal or superior physical and chemical properties as acceptable to Architect.

B. Asbestos-Cement Pipe (Asb-CP): ANSI/ASTM C 296 or AWWA C 400, with rubber rings complying with ANSI/ASTM D 1869.

C. Cast-Iron Pipe (CIP): AWWA C 106, with fittings complying with AWWA C 110 and rubber gaskets complying with AWWA C 111.

1. Provide cement mortar lining complying with AWWA C 104.

D. Ductile Iron Pipe (DIP): AWWA C 106, with fittings complying with AWWA C 110 and rubber gaskets complying with AWWA C 111.

1. Provide cement mortar lining complying with AWWA C 104.

E. Reinforced Concrete Pipe (RCP): AWWA C 300.

F. Steel Pipe (StlP): AWWA C 200, with flanges complying with AWWA C 207.

1. Provide coal tar enamel protective coating complying with AWWA C 203.

2. Provide cement mortar protective lining and coating complying with AWWA C 205.

G. Glass Fiber Reinforced Plastic Pipe (GFRP): ANSI/ASTM D 3517 or AWWA C 900.

H. Plastic Coated Steel Pipe (PCSP): ASTM F 423.

2.02 HYDRANTS:

A. General: Provide cast-iron sidewalk fire hydrants with threaded male nozzle conforming to "American National Standard Fire Hose Connection Screw Threads" unless other hose connection required by local fire authorities. Furnish units which are FM approved and UL listed.

1. Provide dry-barrel fire hydrants (base valve type) complying with AWWA C 502 and as follows:

2. Working pressure, 150 psi unless otherwise indicated.

3. Valve opening direction, counter-clockwise, indicated by arrow and the work "Open" cast on dome.

4. Valve opening direction, clockwise, indicated by arrow and the word "Open" cast on dome.

5. Nozzles, two 2-1/2" hose connections with caps and chains, Nozzle cap nuts to match operating stem nuts.

2.03 CONTROL VALVES:

A. General: Provide valves and flow control devices which are approved by FM and listed by UL.

Minimum working pressure, 150 psi unless otherwise indicated.

B. Gate Valves: Standard shut-off valves with maximum working pressure cast into body, outside-screw-and-yoke type complying with AWWA C 500 unless otherwise required by governing authorities.

C. Check Valves: Gravity-operated, regular type, iron-bodied bronze fitted with metal-to-metal or rubber faced checks, complying with AWWA C 506 unless otherwise required by governing authorities.

D. Butterfly Valves: Rubber seated, equipped with gear or travelling nut accuator to minimize water hammer, complying with AWWA C 504 unless otherwise required by governing authorities.

E. Indicator Posts: Telescopic barrell type for use with underground gate valves.

2.04 ANCHORAGES:

A. General: Provide anchorages for tees, plugs, caps, bends and hydrants in accordance with NFPA No. 24.

After installation, apply a full coat of asphalt or other acceptable corrosion-retarding material to surface of rods and clamps.

B. Clamps, Straps and Washers: Steel, ANSI/ASTM A 506.

C. Rods: Steel, ANSI/ASTM A 575.

D. Rod Couplings: Malleable iron, ANSI/ASTM A 197.

E. Bolts: Steel, ANSI/ASTM A 307.

F. Cast-Iron Washers: ANSI/AASTM A 126, Class A.

G. Thrust Blocks: 2500 psi concrete.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. General: Install exterior fire water system in compliance with applicable provisions of NFPA No. 24 and as herein specified.

B. Asbestos-Cement Pipe: Install in accordance with AWWA C 603.

C. Cast-Iron Pipe: Install in accordance with AWWA C 600.

D. Ductile-Iron Pipe: Install in accordance with recommended procedures of the Cast-Iron Pipe Research Association.

E. Reinforced Concrete Pipe: Install in accordance with AWWA M 9.

F. Steel Pipe: Install in accordance with AWWA M 11.

G. Glass Fiber Reinforced Plastic Pipe: Install in accordance with ANSI/ASTM D 2774.

H. Hydrants: Install in accordance with AWWA M 17.

I. Control Valves: Install in accordance with manufacturer's instructions.

J. Joint Adaptors: Make joints between cast-iron pipe and other types of pipe with standard manufactured cast-iron adaptors and fittings.

1. Grout joints between cast-iron pipe and concrete pipes with cement mortar to make watertight joint.

K. Inspection: Inspect conduit to determine whether line displacement or other damage has occured.

1. If the inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects to satisfaction of Engineer.

L. Cleaning Conduit: Clear interior of conduit of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

1. Place plugs in end of uncompleted conduit at end of day or whenever work stops.

2. Flush lines to remove collected debris before connecting to other fire protection systems. Flush conduit at rates of flow recommended by NFPA No. 24 unless higher rates required by local authorities.

3.02 TESTING:

Perform hydrostatic testing of completed conduit lines in accordance with NFPA No. 24 unless more stringent test required by local authorities having jurisdiction.

Perform operational testing of hydrants and valves by opening and closing under water pressure to insure proper operation.

3.03 BACKFILLING:

Conduct backfilling operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed.

To minimize local area traffic interruptions, allow no more than 100 feet between pipe laying and point of complete backfilling.

END OF SECTION 02717

SECTION 02719 - WATER SERVICE PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

Extent of water service piping work is shown on drawings.

A. General:

1. Exterior water service piping work includes, but is not limited to, the following:

a. Yard piping

b. Control valves.

c. Water meter.

2. Excavation and backfilling for exterior water service piping is specified in Division 15.

3. Concrete for exterior water service piping is specified in Division 15.

1.03 QUALITY ASSURANCE:

A. General:

1. Installer: A firm with at least 2 years of successful installation experience on exterior water service piping projects similar to this project.

2. Code Compliance: Comply with applicable portions of National Standard Plumbing Code and local plumbing codes where more stringent.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's product data and installation instructions for each product specified for water service piping.

PART 2 - PRODUCTS

2.01 PRESSURE PIPE:

A. General: Provide ells, tees, reducing tees, wyes, couplings, and other required piping accessories of same type and class of material as conduit, or of material having equal of superior physical and chemical properties as acceptable to Engineer.

1. Asbestos-Cement Pressure Pipe (Asb-CPp): ANSI/ASTM C 296 or AWWA C 400, with rubber rings complying with ANSI/ASTM D 1869; couplings, ANSI/ASTM C 296; cast-iron fittings, ANSI/ASTM A 126.

2. Cast-Iron Pressure Pipe (CIPrPp): AWWA C 106, with fittings complying with AWWA C 110 and rubber gaskets complying with AWWA C 111; cast-iron fittings, ASTM A 126.

3. Ductile Iron Pipe (DIPp): AWWA C 106, with fittings complying with AWWA C 110 and rubber gaskets complying with AWWA C 111.

4. Steel Pipe (StlPp): AWWA C 200, with flanges complying with AWWA C 207.

a. Provide coal tar enamel protective coating complying with AWWA C 203.

2.02 CONTROL VALVES:

A. General: Provide valves and flow control devices as indicated.

1. Minimum working pressure, 150 psi unless otherwise indicated.

B. Gate Valves: Standard shut-off valves with maximum working pressure cast into body, outside-screw-and-yoke type complying with AWWA C 500.

C. Check Valves: Gravity-operated, regular type, iron-bodied bronze fitted with metal-to-metal or rubber faced checks, complying with AWWA C 506.

D. Butterfly Valves: Rubber seated, equipped with gear or travelling nut accuator to minimize water hammer, complying with AWWA C 504.

2.03 WATER METER:

A. General: Provide water meter and related piping conforming to applicable local Utility Company regulations and AWWA standards.

1. Water Meter: Provide by local Utility Company. Provide roughing-in and bypass for meter in accordance with Utility Company requirements. Provided of size and capacity indicated.

2.04 ACCESSORIES:

A. General: Provide anchorages for tees, plugs, caps and bends. After installation, apply a full coat of asphalt or other acceptable corrosion-retarding material to surfaces of rods and clamps.

B. Clamps, Straps and Washers: Steel, ANSI/ASTM A 506.

C. Rods: Steel, ANSI/ASTM A 575.

D. Rod Couplings: Malleable iron, ANSI/ASTM A 197.

E. Bolts: Steel, ANSI/ASTM A 307.

F. Cast Iron Washers: ANSI/ASTM A 126, Class A.

G. Thrust Blocks: 2500 psi concrete.

H. Water Service Identification: Plastic line markers, nomenclature "Caution, Buried Water Line Below".

PART 3 - EXECUTION

3.01 A. General: Install exterior water service piping system in compliance with local governing regulations.

B. Street Main Connection: Cut into and install new tee for water service in existing water main, at location indicated, in accordance with local Water Utility Company requirements. Provide curb valve and curb box as required.

C. Water Service Piping: Extend water service piping of size and in location indicated to water service entrance at building. Provide sleeve in foundation wall for water service entry; make entry watertight. Provide gate valve at water service entry inside building; strainer, pressure gage, test tee with valve.

D. Water Meter: Install water meter in location and provide support as indicated. Provide 3 valve bypass around meter, full size of water service entry.

E. Asbestos-Cement Pipe: Install in accordance with AWWA C 603.

F. Cast-Iron Pipe: Install in accordance with AWWA C 600.

G. Ductile-Iron Pipe: Install in accordance with recommended procedures of the Cast Iron Pipe Research Association.

H. Steel Pipe: Install in accordance with AWWA M 11.

I. Control Valves: Install in accordance with manufacturer's instructions.

J. Joint Adaptors: Make joints between cast-iron pipe and other types of pipe with standard manufactured cast-iron adaptors and fittings. Grout joints between cast-iron pipe and concrete pipes with cement motar to make watertight joint.

K. Inspection: Inspect conduit to determine whether line displacement or other damage has occured. If the inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects to satisfaction of Engineer.

L. Cleaning Conduit: Clear interior of conduit of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in end of uncompleted conduit at end of day or whenever work stops.

M. Sterilization: At completion of water service line installation, flush and sterilize in conformance with AWWA C 601, to the satisfaction of local authorities having jurisdiction.

3.02 TESTING:

A. Perform hydrostatic testing of completed conduit lines in accordance with local authorities having jurisdiction.

B. Perform operational testing of valves by opening and closing under water pressure to insure proper operation.

3.03 BACKFILLING:

A. General: Conduct backfilling operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed.

END OF SECTION 02719

SECTION 02720 - SEWER COLLECTION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divison-1 Specifications sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. General: Extent of sewer collection system work is shown on drawings.

1. Sewer collection system work includes, but is not limited to, the following:

a. Sanitary sewer conduits.

b. Storm sewer conduits.

c. Manholes, frames and covers.

d. Catch basins, frames and gratings.

2. Excavation and backfilling for sewer collection system is specified in applicable Division-15 sections.

3. Concrete for storm sewer system is specified in applicable Division-15 sections.

1.03 QUALITY ASSURANCE:

A. Installer: A firm specializing and experienced in sewer collection system work for not less than 2 years.

PART 2 - PRODUCTS

2.01 CONDUIT MATERIALS:

A. General: Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of same type and class of material as conduit, or of material having equal or superior physical and chemical properties as acceptable to the Architect.

1. Cast-Iron Soil Pipe (CISPp): ANSI/ASTM A 74, bell and spigot type with neoprene rubber gaskets conforming to ANSI/ASTM C 564.

   a. Furnish service weight (CISPp-SW) class.

2. Reinforced Concrete Pipe (RCPp): ANSI/ASTM C 76, Class as indicated, with modified tongue-and-groove compression gasket joints complying with ANSI/ASTM C 443.

3. Concrete Pipe (CPp): ANSI/ASTM C 14, Class 2, unless otherwise indicated.

4. Vitrified Clay Pipe (VCPp): ANSI/ASTM C 700, Standard Strength (SS) except where Extra Strength (XS) indicated, with resilient gasket joints complying with ANSI/ASTM C 425.

5. Poly (Vinyl Chloride)O Pipe (PVCPp): ANSI/ASTM D 3033, Type PSP or ANSI/ASTM D 3034, Type PSM.

2.02 CONCRETE MANHOLES:

A. Concrete Base: Precast or cast-in-place, at Contractor's option. Use concrete which will attain a 28-day compressive strength of not less than 3000 psi.

B. Precast Concrete Manholes: ANSI/ASTM C 478, sized as indicated.

2.03 METAL ACCESSORIES:

A. Manhole Frames and Covers: Grey cast iron, ANSI/ASTM A 48, Class 30 B.

   1. Comply with requirements of FS RR-F-621 for type and style indicated.

   2. Furnish covers with cast-in lengend ("STORM" or "SANITARY" to suit installation) on roadway face.

B. Manhole Steps: Grey cast iron ANSI/ASTM A 48, Class 30 B, integrally cast into manhole sidewalls, unless otherwise indicated.

C. Catch Basin Frames and Gratings: Grey cast iron, ANSI/ASTM A 48, Class 30 B.

   Comply with requirements of FS RR-F-621, for type and style required.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUIT:

A. General:

1. Install conduit in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

2. Inspect conduit before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

3. Lay conduit beginning at low point of system, true to grades and alignment indicated with unbroken continuity of invert.

4. Place bell ends of clay conduit or groove end of cocrete conduit facing upstream.

5. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

B. Concrete Pipe: Install in accordance with applicable provisions of American Concrete Pipe Association "Concrete Pipe Field Manual", unless otherwise indicated.

Place circular concrete pipe with elliptical reinforcing so that reference lines indicating top of pipe are not more than 5 degrees from vertical plane through longitudinal axis of pipe.

C. Cast-Iron Soil Pipe: After inspection and at least 48 hours before installation, apply high-build bituminous coating to external surfaces. Apply single coat in accordance with manufacturer's recommendations to attain dry-film thickness of not less than 12 mils.

D. Plastic Pipe: Install plastic piping in accordance with pipe manufacturer's instructions. Use joint adhesives as recommended by manufacturer to suit basic pipe materials.

E. Cleaning Conduit: Clear interior of conduit of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

In large, accessible conduit, brushes and brooms may be used for cleaning.

Place plugs in ends of uncompleted conduit at end of day or whenever work stops.

Flush lines between manholes if required to remove collected debris.

F. Joint Adaptors: Make joints between cast iron pipe and other types of pipe with standard manufactured cast iron adapters and fittings.

G. Roof Drain Connections: Connect roof drains to storm drain.

Grout joints between cast iron pipe and concrete pipes thoroughly with cement mortar to make watertight joint.

H. Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydro-static or earth pressure which may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete or masonry utilities with no less than 8" thick brick masonry bulkheads.

2. Close open ends of conduit with threaded metal caps, plastic plugs, or other accpetable methods suitable for size and type material being closed. Wood plugs are not acceptable.

I. Interior Inspection: Inspect conduit to determine whether line displacement or other damage has occured.

Make inspections after lines between manholes, or manhole locations, have been installed and approximately two feet of backfill is in place and at completion of project.

If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects to satisfaction of Engineer.

3.02 UNDERGROUND STRUCTURES:

A. General:

1. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

2. Use an epoxy bonding compound where manhole steps are mortared into masonry walls.

B. Precast Concrete Manholes: Place precast concrete sections as shown on drawings. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

1. Use epoxy bonding compound where manhole steps are mortared into manhole walls.

2. Provide rubber joint gasket complying with ASTM C 443.

C. Catch Basins: Construct catch basins to the sizes and shapes indicated.

1. Use concrete which will attain a 28-day compressive strength of not less than 3000 psi.

2. Set cast-iron frames and gratings to elevations indicated.

3.03 TAP CONNECTIONS:

A. Make connections to existing conduits and underground structures, so that finished work will conform as nearly as practicable to requirements specified for new work.

1. Use commercially manufactured wyes for branch connections. Field cutting into conduit will not be permitted. Spring wyes into existing line and encase entire wye, plus 6" overlap, with not less than 6" of 3000 psi 28-day compressive strength concrete

2. For branch connections from side into existing 24" or larger conduit or to underground structures, cut opening into unit sufficiently large to allow 3" of concrete to be packed around entering connection. Cut ends of connection passing through conduit or structure wall to conform to shape of and be flush with inside wall, encase entering connection in 6" of concrete for a minimum length of 12" to provide additional support or collar from connection to undisturbed ground.

a. Provide concrete which will attain a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

b. Use an epoxy bonding compound as interface between new and existing concrete and conduit materials.

3. Take care while making tap connections to prevent concrete or debris from entering existing conduit or structure. Remove debris, conrete, or other extraneous material which may accumulate.

3.04 BACKFILLING:

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed.

1. To minimize local area traffic interruptions, allow no more than 100 feet between pipe laying and point of complete backfilling.

3.05 TESTING:

A. General: Perform testing of completed conduit lines in accordance with local authorities having jurisdiction.

END OF SECTION 02720

SECTION 02730 - WATER WELL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. General: Provide well with producing capacity of gallons of water per minute as derived from results of water well supply testing.

1. Extent of water well work is shown on drawings.

2. Water well work includes the following:

Applications and permits for drilling and developing well.
Drilling pilot hole.
Drilling for final water well depth.
Placing and grouting well casing
Development of well.
Testing and disinfection.

1.03 QUALITY ASSURANCE:

A. Protecting Water Quality: Take precautions to prevent contaminated water or water having undesirable physical or chemical characteristics from entering stratum from which well is to draw its supply. Prevent contaminated water, gasoline, etc., from entering well either through opening or by seepage through ground surface.

If well becomes contaminated or water having undesirable physical or chemical characteristics enters well due to neglect, provide casings, seals, sterilizng agents or other materials to eliminate contamination or shut off undesirable water. Provide remedial work at no cost to the Owner.

Exercise care in performance of work to prevent breakdown or caving in of strata overlaying that from which water is to be drawn. Develop, pump or bail well until water pumped from well is substantially free from sand.

Protect work to prevent either tampering with well or entrance of foreign matter. Upon completion, provide temporary well cap.

B. Driller's Requirements: Experienced foreman or driller to be constantly in control of well site and who has authority to take orders from Architect and, upon request furnish well drilling information desired by Architect.

1.04 ABANDONMENT OF DRILLING:

A. General:

If it becomes necessary to abandon drilling operation before completion of water producing well, follow regulations for abandonment of well as required by local authorities having jurisdiction.

Should abandonment of drilling be necessary due to poor workmanship or negligence on part of Contractor, no compensation will be allowed.

Should abandonment of drilling be necessary due to inadequate supply of good quality water, or for such other reason that Architect deems to be no fault of Contractor, compensation for work will be based on unit prices in contract.

1.05 SUBMITTALS:

A. Samples, Records and Reports: Take samples of sub-strata formation at ten foot intervals and at changes in formation throughout entire depth of well. Carefully preserve samples at site in glass jars properly labeled for identification.

Furnish samples of water-bearing formation to qualified testing laboratory and well screen manufacturer for mechanical sieve analysis.

B. Provide Landscape Architect following information for record purposes:

1. Casings -- diameter, thickness, weight per foot of length, depth below grade.

2. Screen -- diameter, opening size.

3. Pumping test -- static water level, maximum safe yield, drawdown at maximum yield.

4. Log -- formation log indicating strata encountered.

5. Alignment -- certification that well is aligned and plumb within specified tolerances.

C. Provide Architect bacteriological, physical and chemical analysis of water from finished well. Make analysis, certified by an approved testing laboratory, in accordance with local authority requirements, including the following:

1. Bacteriological evaluation:

2. Coliform:

Provide testing and report results for either multitube fermentation technique or membrane filter technique.

3. Physical and Chemical:

Color	pH	
Odor	Alk. to pH 4	Sulfate (as SO 4)
Turbidity	Nitrate (as NO 3)	CO2
Total Solids	Fluoride	Iron
Chloride	Total Hardness	Manganese

PART 2 - PRODUCTS

2.01 CASING:

A. General:

Provide permanent seamless and welded carbon steel pipe casing for well complying with ANSI/ASTM A 589, Type IV; size, wall thickness and weight per lineal foot as indicated.

1. Joints may be welded or threaded coupling.

2. Provide galvanized pipe complying with ANSI/ASTM A 120.

2.02 GROUT:

A. Cement: ANSI/ASTM C 150, Type to suit project conditions.

B. Water: Potable

2.03 WELL SCREEN:

Construct screen of AISI type 302/304 stainless steel, continuous slot type, fabricated by welding. Provide V-shaped openings, widening inwardly. For joints connecting screen sections, use butt-type stainless steel coupling rings. Provide screen with necessary fittings to close bottom and to provide tight seal between top of screen and well casing.

PART 3 - EXECUTION

3.01 WELL CONSTRUCTION:

A. Drill a pilot hole, minimum 4" diameter, to design depth and collect samples of formation for record and for analysis to select final screen and well depth. Provide information to Architect on static level of ground water, level of water for various pumping rates, and depth to water bearing strata. Architect will advise as to final well casing and grouting depth.

B. Mix grout with proportions of one cubic foot of cement (94 lb. sack) with 5 to 6 gallons of water. Bentonite clay may be added in amounts of 3 to 5 pounds per cubic foot of cement. If bentonite clay is added, water may be increased to 6.5 gallons per cu. ft. of cement.

Place grout continuously to insure entire filling of annular space in one operation. Drilling operations or other work in well will not be permitted within 72 hours after grouting of casing. If quick-setting cement is used this period may be reduced to 24 hours.

3.02 DEVELOPMENT:

Develop well by such methods as will effectively extract from water-bearing formation maximum practical quantity of sand, drilling mud and other fine materials in order to bring well to a maximum yield per foot of drawdown and to a sand-free condition. Perform work in a manner that does not cause settlement and disturbance of strata above water bearing formation nor disturb seal effected around well casing, reducing sanitary protection otherwise afforded by such seal.

Continue development of well until water pumped from well at maximum testing pumping rate is clear and free from sand. Water shall be considered sand-free when no samples, taken during test pumping, contain more than 2 parts per million of sand by weight.

3.03 TESTING FOR PLUMBNESS AND ALIGNMENT:

A. Set casing and liners round, plumb and true to line. Tests for plumbness and alignment must be made after construction of well and before its acceptance. Additional tests, however, may be made during performance of work.

B. Test plumbness and alignment by lowering into well, to depth of lowest anticipated pump setting, a section of pipe 40 feet long. Provide outer diameter of plumb not less than 1/2" smaller than diameter of that part of casing or hole being tested.

3.04 TESTING FOR YIELD AND DRAWDOWN:

A. After well has been constructed and cleaned out and depth of well accurately measured, conduct final pumping test.

B. Provide a Bailer of air ejection test as a preliminary determination of expected yield. Make preliminary tests at depths where evidence is found of sufficient quantity of water to satisfy desired yield. Provide two preliminary tests as part of this work.

C. Provide a variable capacity test pump with minimum capacity of maximum expected yield at a total head equal to drawdown in well, plus head loss in pump column and discharge pipe.

D. Provide necessary discharge piping for pumping unit to conduct water to a point of disposal so as to avoid a nuisance or endanger adjacent property. Provide and maintain equipment of adequate size and type for measuring flow of water, such as a weir box, orifice or water meter. Measure elevation to water level in well.

E. Provide labor, motive power, and other necessary materials, equipment and supplies required to operate pumping unit. Final testing shall consist of 8 hours of continuous pumping after maximum drawdown has been reached. After completion of final test, remove by bailing, sand pumping or other methods, sand, stones or other foreign materials that may become deposited in well.

F. After test pump and auxiliary equipment have been installed, make arrangements for conducting pumping test and notify Architect 3 days prior to starting test. Note water level elevations, referred to an assigned datum in well, test pump started and adjusted to required pumping rate. Record readings of water level in well and pumping rate at 30 minute intervals. When drawdown in well is 5 feet above top of suction screen after designated time, record maximum yield of well. Upon completion of pumping test, record returning water levels in well for a sufficient period, at time intervals so that a curve of recovery rate of well may be plotted.

3.05 DISINFECTION:

A. Use disinfection procedures as required by governing authorities. Clean the completed, tested and developed well of foreign substances. Swab casing thoroughly using alkalis, if necessary, to remove foreign substances.

B. Disinfect well with chlorine solution of sufficient strength to provide a minimum of 100 parts per million chlorine to water within well. Introduce solution into well using gravity, pump or drop feeder. Allow a contact period of 24 hours and then pump well until chlorine residual is less than 0.2 parts per million.

3.06 UNIT PRICES:

A. General:

1. Following unit price items shall govern additions to or deductions from quantities included in lump sum Base Bid for work under this section and quantities actually incorporated in project. Insert unit prices on Proposed Form, in spaces provided.

a. Cost of drilling, developing and testing (per foot).

b. Cost per foot of each size casing (in place).

c. Cost per foot of grouting (in place).

d. Cost per foot of well screen (as specified in place).

END OF SECTION 02730

SECTION 02812 - LIGHTING, ELECTRICAL AND TELECOMMUNICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Provide electrical work as shown and specified. The work includes:

1. Electrical service for irrigation system.

2. Electrical service and dsitribution system for site lighting.

3. Electrical service fo Lake water supply well.

4. Electrical service and disbribution system for Japanese Garden pump and recirrculating system.

5. Lighting fixtures, poles, and controls.

6. Electrical service for Entry Garden Fountain system.

7. Pole bases and equipment pads.

8. Excavating and backfilling electrical work.

9. Electrical service stub for future Chapel.

B. Related work:

1. Section 02200: Earthwork.

2. Section 02431: Irrigation System.

3. Section 02443: Fountain Mechanical and Electrical.

4. Section 02730: Water Well.

5. Section 03300: Cast-In-Place Concrete.

1.03 QUALITY ASSURANCE:

A. Materials, equipment, and methods of installation shall comply with applicable codes and requirements of all governing authorities having jurisdiction including but not limited to the following:

1. Georgia Power Company requirements.

2. National Fire Protection Association, (NFPA): National Electrical Code.

3. American Society for Testing and Materials, (ASTM).

4. National Electrical Contractors Association, (NECA): NECA Standard of Installation.

5. National Electrical Code, current edition.

6. Southern Bell requirements

7. City of Atlanta Electrical Code.

B. Obtain and pay for all required inspections, permits, and fees. Provide notices required by governmental authorities. File drawings necessary to obtain permits. Schedule necessary inspections and tests. Submit certificates of inspection and approval upon completion of the work.

C. Materials for which underwriters examination service is provided shall bear UL labels or be UL listed.

D. Coordinate layout of work with other trades including Utility Companies. Make minor adjustments in location required for coordination. Obtain Architect's acceptance of significant deviations before proceeding with the work.

E. Drawings are schematic and show approximate locations. Exact locations of fixtures, equipment, and other components shall be established in the field at time of installation.

F. Excavating, backfilling, and compacting operations: Comply with Section 02200 requirements and as specified.

G. Concrete: Comply with Section 03300 requirements and as specified.

1.04 SUBMITTALS:

A. Product data:

1. Submit complete materials list of items proposed for the work.

2. Submit manufacturer's product data for all electrical equipment.

B. Submit the following material samples:

1. Wiring and connectors.

2. Conduit.

3. Boxes and receptacles.

C. Submit the following equipment samples:

1. Lighting fixtures (one per each fixture type).

2. Poles.

3. Panels and enclosures.

4. Controls.

D. Approved equipment samples will be returned to Conractor and may be used in the work.

E. Upon electrical work acceptance, submit written operating and maintenance data. Provide format and contents as directed by the Architect.

F. Provide electrical record drawings:

1. Ligibly mark to record actual construction.

2. Indicate horizontal and vertical locations, referenced to permanent surface improvements.

3. Identify field changes of dimension and detail and changes made by Change Orders.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver electrical equipment and materials in manufacturer's original undamaged and unopened containers with labels intact and legible.

B. Store and handle electrical equipment and materials to prevent damage and deterioration.

C. Provide secure, locked storage for lighting fixtures, controls, and similar components that cannot be immediately replaced, to prevent installation delays.

1.06 PROJECT CONDITIONS:

A. Known underground and surface utility lines are indicated on the drawings.

B. Protect existing trees, plants, lawns, and other features designated to remain as part of the final landscape work.

C. Promptly repair damage to adjacent facilities caused by electrical work operations. Cost of repairs at Contractor's expense.

D. Promptly notify the Architect of unexpected sub-surface conditions.

E. Cutting and patching:

1. Avoid cutting of concrete, masonry, and other owrk by using inserts and sleeves. When necessary perform cutting and patching with tools and methods to avoid damage to surrounding materials and equipment.

2. Cut through concrete and masonry with core drills. Jack hammers not permitted.

3. Materials and finishes for patching shall match existing cut surface materials and finish. Exercise special care to provide patching at openings in exterior walls water tight.

4. Methods and materials used for cutting and patching shall be acceptable to the Architect.

F. Provide all electircal work and accessories necessary to provide a complete lighting, distribution, and control system.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Above grade conduit: Rigid heavy wall steel, minimum 3/4", galvanized with manufacturer's name and UL label attached to or stamped on each piece. Size as indicated.

1. Fittings: Steel only, die cast fittings not acceptable.

B. Below grade conduit: Polyvinyl chloride (PVC) schedule 40, minimum 3/4" with manufacturer's name and UL stamped on each piece.

1. Fittings: Schedule 40 PVC molded fittings suitable for solvent welding as recommended by pipe manufacturer.

2. Provide flexible neoprene-clad galvanized steel conduit for makeup connections to pumps, using liquid tight flexible metallic fittings.

3. Sleeves at Telecommunications lines: PVC schedule 40 minimum; 4" diameter.

B. Boxes: Provide pull boxes and junction boxes UL labeled and complying with code requirements.

1. Boxes for flush work shall be pressed steel galvanized or sheardized, or PVC, minimum 4" square or octagonal. Boxes cast-in concrete shall be designed for concrete installation.

2. Boxes for exterior areas shall be water-tight and dust-tight with gasket covers.

C. Conductors: Stranded and of the AWG wire size and type required by code. Provide only copper conductors with 600 volt wet location rated insulation, UL labeled and of American manufacturer.

1. No wire used for lighting or power shall be smaller than #12 AWG.

2. No wire used for control circuits shall be smaller than #14 AWG.

3. Wire color code: Provide color code acceptable to the Architect and consistent throughout the installation. Use colored wire insulation or colored tape to delinate between phase, neutral, and ground.

4. Connectors: Pressure-type mechanical connectors.

D. Wiring devices: Types and sizes as scheduled on drawings.

1. Provide all required receptacles and switches.

E. Lighting fixtures:

1. Types scheduled on drawings.

2. Lamps: Install lighting fixtures complete with new lamps; sizes and types indicated on the fixture schedule.

F. Poles: Manufacturer and model: as scheduled on drawiangs.

G. Panels: Provide panels for operation on 277/480 volt and 120/208 volt 3 phase, 4 wire service.

1. Manufacturer and model: GE, Square-D. Westinghouse

2. Cabinets: Commercial galvanized steel, code gage, and size, surface mounted as indicated. Provide chrome plated lock and catch. Tub size 20" wide minimum.

3. Directory card and frame inside panel door.

4. Branch breakers: Molded case, temperature compensated, quick-make, quick-break, with thermal-magnetic trip and permanently bolted to bus bars.

5. Each panel connected with a feeder as sized on the drawings.

H. Time clock:

1. Manufacturer and model: as scheduled on drawings.

I. Photo cells:

1. Manufactuer and model: as scheduled on drawings.

J. Manual bypass control:

1. Manufacturer and model: as scheduled on drawings.

K. Contactor:

1. Manufacturer and model: as scheduled on drawings.

L. Pump starters:

1. Manufacturer and model: as scheduled on drawings.

M. Enclosures: Provide equipment enclosures for control equipment as indicated:

1. Manufacturer and model: as scheduled on drawings.

2. Exterior enclosures: NEMA type 4, size required.

3. Interior enclosures: NEMA type 1, size required.

N. Telephone cable and equipment: Provided by Southern Bell Telephone Company. Contractor to provide necessary sleeving as shown on drawings.

O. Television antenna cable and equipment: Provided by local TV cable company. Contractor to provide necessary sleeving as shown on drawings.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Do not cover or enclose work of this section before obtaining required inspections, tests, approvals, and location recording.

B. Place sleeves and inserts as indicated for the installation of conduit and wiring. Provide painted white 2" x 2" x 18" stakes at each sleeve end to permit future sleeve location.

C. Verify and coordinate extent of work performed by electric utility companies. Profide adequate notice before proceeding with the work.

3.02 EXISTING UTILITIES:

A. Locate and identify existing underground and overhead services and utilities within contract limit work areas. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations at Contractor's expense.

B. Arrange for disconnection and disconnect all electrical utilities and services designated to be removed before start of work operations. Perform all work in accordance with the requirements of the applicable utility company or agency involved.

C. When uncharted or incorrectly charted underground piping or other untilities and services are encountered during work operations, notify the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utilitiy company in maintaining active services in operation.

3.03 TEMPORARY ELECTRICITY:

A. Provide nedessary temporary electrical service as required to meet project electrical requirements at the start of the work, as work progresses, and until final acceptance.

B. Extend temporary service from existing public utility service. Provide meter and extend service with panel and disconnect as required.

1. Installation, maintenance, operation, and supervision for temporary electric service, including cost of current consumed, paid by the Contractor.

C. Provide and pay for portable electric generators to meet temporary electrical needs during construction operations.

D. Extension of service from temporary panel shall be the responsibility of each trade requiring service.

E. Completely remove temporary service when permanent service and system are available for use. No temporary systems shall form a part of the permanent systems.

3.04 INSTALLATION:

A. Perform excavating and backfilling as required to install electrical work.

1. Excavate to dimensions and depths indicated or as required for proper installation and completion of the work.

2. Backfill and compact trenches in accordance with Section 02200 requirements.

3. Fill, compact, and restore to original level and condition all settlement.

4. Replace paving, lawn, and finished surfaces removed to install electrical work, except where new surfaces are provided as part of the work.

5. Remove surplus excavated materials and debris from the site.

B. Install conduit, boxes, and fittings.

1. Secure conduit entering cabinets, pull boxes, junction boxes, or outlet boxes with double lock nuts with ends bushed.

2. Maximum of four 90-degree bends allowed in any one conduit run. Where more bends are necessary, provide a pull box. No out of plumb or diagonal lines will be accepted.

3. Support conduit by using pipe straps or suitable clamps or hangers attached to structural elements. Do not attach or support conduit from adjoining pipe or install in such a manner as to prevent the ready removal of other pipe for repairs.

4. Provide UL approved junction and pull boxes as necessary to install the required conduit and wiring. Location and size of pull boxes and junction boxes shall be in accordance with code requirements. Close all unused and open knockouts with plugs of proper size.

5. Support boxes from building or sturcture independent of the conduit system. Boxes cast-in concrete or built in masonry are considered to be rigidly supported.

6. Provide FS type boxes for exposed work with threaded hubs with rigid conduit riser.

7. Swab conduits free of moisture, dirt, and grease before pulling wire.

C. Wire and wiring:

1. Provide all wiring required to provide a complete lighting control and power system as shown on the drawings.

2. Provide conductors continuous from box to box. No joints permitted in the circuit other than in junction boxes.

3. Make joints using pressure-type mechanical connectors applied after wires are cleaned and then insulate using two layers of electrical insulation putty covered with two half-lapped layers of vinyl plastic electrical tape.

4. Exercise care when installing wire in conduit to prevent damage to conductor insulation. No oils, grease, or compounds other than UL approved wire pulling lubricants shall be used for pulling wires in any conductors.

5. Identify each circuit with a wire marker where branch circuits enter panel boards. Install wire markers when wire is pulled.

6. Apply colored tape, minimum 1/2" size, for #8 AWG or larger wire. Wrap twice around wire at the following points.

   a. At each terminal.

   b. At each conduit entrance.

   c. At intervals not more than 12" apart in all boxes, panel tubs, and switchboards.

7. Install green insulated grounding conductors in all PVC wiring runs.

D. Wiring devices.

1. Install wiring devices where indicated.

2. Ground all receptacles in accordance with the National Electric Code requirements.

E. Lighting fixtures:

1. Install lighting fixtures, lamps, and poles as indicated on the drawings.

2. All ballasts shall be voltage stabilized type and shall have fused primaries.

3. Coordinate and provide appropriate wiring connections of ballast and luminaire before securing luminaire to the pole. Provide adequate leads on all wires to permit making splices outside of the pole and then inserting back into wiring compartments.

4. Provide anchor bolts, setting templates, and conduit as required for the light bases indicated.

5. Provide pole bases: Concrete materials and installation shall comply with Section 03300 requirements.

6. All lamps shall be in working order at time of final acceptance.

F. Panels:

1. Mount with top of panel at 6'-0" above floor.

2. Provide directory cards filled in by typewriter for circuits as installed.

G. Install lighting controls and enclosures as indicated.

H. Extend electrical service to irrigation system control panel.

I. Extend electrical service to Lake water supply pumps and fountain systems control panels as shown on drawings.

J. Identification nameplates:

1. Identify each piece of new service equipment on the front cover or time with its name or designation number of letter as shown on the drawings as indicated by the following example:

Entry Garden
Time Clock

2. Provide laminated plastic nameplates, black face, with the letters engraved into the white background, minimum 1/4" high. Secure plates to each piece of equipment with screws. "Dymo" or similar tape type labels are not acceptable.

K. Grounding:

1. Ground all enclosures and non-current carrying metals to equipment ground conductor. Conduit system is to be electrically continuous. All lock nuts shall be cut through enameled or painted surfaces on enclosures. Where enclosures and non-current carrying metals are isolated from the conduit system, use bonding jumpers with approved clamps.

2. Running a separate grounding conductor in the conduit, bond the conductor to the fixture terminal box and to the over-current device enclosure or ground bus.

3. Bond all receptacles to the pole base using a bonding jumper between the pole base and the receptacle grounding terminal. Metal to metal contact between the device yoke and the outlet box is not acceptable as a bond for either surface mounted boxes or flush type boxes.

4. Ground pole base by running a #10 bare wire from the pole grounding stud to grounding rod as indicated.

5. All flexible conduit shall be jumpered with a green ground conductor.

3.05 TESTING AND ACCEPTANCE:

A. Upon completion of the work, the Architect will make final inspection of electrical work. Contractor shall perform tests as necessary to verify system performance, including operation of lights and equipment, continuity of conduit system, grounding resistances, and insulation resistances.

B. Provide necessary personnel and testing instruments as required to assist in testing.

C. Submit data taken during tests to the Architect.

D. Correct unacceptable work.

3.06 CLEANING:

A. Clean finished surfaces of equipment and touch-up scratched or damaged surfaces with matching materials. Repairs of dents and marred finishes shall be acceptable to the Architect.

B. Brush clean, prime, and paint rust spots on any part of the work.

C. Clean interiors of all enclosures. Remove dirt and debris before installing trim or covers.

D. Provide identification on all equipment.

E. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris and equipment. Repair damage resulting from electrical system installation.

END OF SECTION

SECTION 03010 - CONCRETE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. The extent of concrete work shown on drawings.

B. Concrete paving and walks are specified in Division 2.

C. Precast concrete is specified in other Division-3 sections.

D. Post-tensioned concrete is specified in other Division-3 sections.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified.

(1) ACI 301 "Specifications for Structural Concrete for Buildings".

(2) ACI 318 "Building Code Requirements for Reinforced Concrete".

(3) Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

B. Materials and installed work may require testing and retesting, as directed by Architect, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contrctor's expense.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

B. Shop Drawings - Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures.

C. Shop Drawings - Pan Joist Formwork: Submit shop drawings indicating layout of pans and drop beams.

D. Shop Drawings - Formwork: Submit shop drawings for fabrication and erection of specific finished vertical concrete surfaces as indicated. Show general construction of forms including jointing, special form joint or reveals, location and pattern of form tie placement, and other items which affect exposed concrete visually.

(1) Architect's review is for general architectural applications and features only. Design of form work for structural stability and efficiency is Contractor's responsibility.

E. Laboratory Test Reports: Submit laboratory test reports to architect for concrete materials and mix design test as specified.

F. Material Certificates: Provide material certificates in lieu of materials laboratory test reports when permitted by architect. Material certificates shall be signed by manufacturer and contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

2.1 FORMWORK:

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical

sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Cylindirical Columns and Supports: Form round-section members with paper or fiber tubes, constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.

D. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS:

A. Reinforcing Bars (Rebar): ANSI/ASTM A 615, Grade 60, deformed.

B. Steel Wire: ANSI/ASTM A 82, plain, cold-drawn, steel.

C. Welded Wire Fabric (WWF): ANSI/ASTM A 185, welded steel wire fabric.

D. Welded Deformed Steel Wire Fabric (WDSWF): ANSI/ASTM A 497.

E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unlesss otherwise acceptable.

(1) For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

(2) For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

F. Mechanical Rebar Splicing Systems: Mechanical splicing of rebars will be permitted upon approval of selected system by Architect. Submit complete details of proposed system and locations of use for approval. Architect shall be sole judge as to acceptability of the system.

2.3 CONCRETE MATERIALS:

A. Portland Cement: ANSI/ASTM C 150, Type I, unless otherwise acceptable to Architect.

Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Normal Weight Aggregates: ANSI/ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

(1) Local aggregates not complying with ANSI/ASTM C 33, but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Architect.

C. Lightweight Aggregates: ASTM/ANSI C 330.

D. Water: Potable.

E. Air-Entraining Admixture: ANSI/ASTM C 260.

F. Water-Reducing Admixture: ASNI/ASTM C 494, Type A, and contain not more than 1% chloride ions.

(1) Products: Subject to compliance with requirements, provide one of the following:

"Eucon WR-75"; Euclid Chemical Co.
"Pozzolith 322N"; Master Builders
"Plastocrete 160"; Sika Chemical Corp.
"Chemtard"; Chem-Masters Corp.

G. High-Range, Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G and contain not more than 1% chloride ions.

(1) Products: Subject to compliance with requirements, provide one of the following:

"WRDA 19"; W.R. Grace
"PSP"; Protex Industries, Inc.
"Super P"; Anti-Hydro.
"Sikament"; Sika Chemical Corp.
"Mighty 150"; ICI Americas Corp.
"Eucon Super 37"; Euclid Chemical Co.
"PSI Super"; Gifford-Hill
"LA-8"; Master Builders

H. Water-Reducing, Accelerator Admixture: ASTM C 494, Type C or E.

(1) Products: Subject to compliance with requirements, provide one of the following:

(a) "Accelguard HE"; Euclid Chemical Co.
(b) "Pozzolith 122-HE"; Master Builders
(c) "Darex"; W.R. Grace
(d) "Sikacrete"; Sika Chemical Co.

I. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and contain not more than 1% chloride ions.

(1) Products: Subject to compliance with requirements,

(a) "Pozzolith 300-R"; Master Builders
(b) "Eucon Retarder 75"; Euclid Chemical Co.
(c) "Daratard"; W.R. Grace
(d) "Plastiment"; Sika Chemical Co.

J. Calcium Chloride not permitted.

2.4 RELATED MATERIALS:

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

(1) Rubber waterstops: Corps of Engineers CRD-C 513.

(2) Polyvinyl chloride (PVC) waterstops: Corps of Engineers CRD-C 572.

B. Vapor Barrier: Provide vapor barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ANSI/ASTM E 154, as follows:

(1) Polyethyelene Sheet not less than 4 mils thick.

C. Non-Shrink Grout: CRD-C 588, factory pre-mixed grout.

(1) Products: Subject to compliance with requirements, provide one of the following:

(a) Type D, Non-metallic

"Masterflow 713"; Master Builders
"Sonogrout"; Sonneborn-Contech
"Euco-NS"; Euclid Chemical Co.
"Duragrout"; L & M Const. Chemical Co.

D. Chemical Hardener : Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicates per gal.

E. Non-slip Aggregate Finish : Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 40% aluminum oxide and not less than 25% ferric oxide. Use material that is factory-graded, packaged, rustproof and non-glazing, and is unaffected by freezing, moisture and cleaning materials.

F. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sp. yd., complying with AASHTO M 182, Class 2.

G. Bonding Compound: Polyvinyl acetate, rewettable type.

(1) Products: Subject to compliance with requirements, provide one of the following:

"Weldcrete"; Larson Products
"Everbond"; L & M Construction Chemicals
"EucoWeld"; Euclid Chemical Co.
"Duraweld C": W.R. Grace
"Sonocrete"; Sonneborn-Contech

H. Epoxy Adhesive: 100% solids, two component material suitable for use on dry or damp surfaces.

(1) Products: Subject to compliance with requirements, provide one of the following:

Thiopoxy"; W.R. Grace
"Sikadur Hi-Mod"; Sika Chemical Co.
"Euco Epoxy"; Euclid Chemical Co.

2.5 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. Mix designs shall include any admixtures to be used in the concrete, with the approval of the architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Provide reports indicating that proposed mix design will yield the required strength. Do not begin concrete production until mixes have been reviewed by Architect.

C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

(1) 4000 psi 28-day compressive strength; 560 lbs. cement per cu. yd. minimum; W/C ratio, 0.44 maximum.

(2) 3000 psi 28-day compressive strength; 480 lbs. cement per cu. yd. minimum; W/C ratio, 0.58 maximum.

D. Lightweight Concrete: Proportion mix as herein specified. Design mix to produce strength and modulus of elasticity as noted on drawings, with a split-cylinder strength factor (Fsp) of not less than 5.5 and a dry weight of not less than 95 lbs. or more than 110 lbs. after 28 days. Limit shrinkage to 0.03% at 28 days.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at not additional cost to Owner and as accepted by Architect before using in work.

F. Admixtures:

(1) Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 F. (10 C.).

(2) Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescried rate to result in concrete at point of placement having air content within the following limits:

(a) Concrete structures and slabs exposed to freezing and thawing or subjected to hydraulic pressure:

3% to 5% for maximum 2" aggregate
3% to 7% for maximum 3/4" aggregate
6% to 8% for maximum 1/2" aggregate

(b) Other concrete: 2% to 4% air.

(3) Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

(4) Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

(a) Ramps and sloping surfaces: Not more than 3"

(b) Reinforced foundation systems: Not less than 1" and not more than 3".

(c) Concrete containing HRWR admixture (super plasticizer): Not more than 8".

(d) Other concrete: Not less than 1" and not more than 4".

2.6 CONCRETE MIXES:

A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any art of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.

Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

B. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C 94, and as specified.

(1) Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.

(2) During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ANSI/ASTM C 94 may be required.

(3) When air temperature is between 85 F. (30 C.) and 90 F. (32 C.), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 F. (32 C.) reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMS

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricatred to produce uniform smooth lines and tight edge joints.

G. Forms Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

(1) Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2" inside concrete.

(2) Unless otherwise shown, provide form ties which will not leave holes larger than 1" diameter in concrete surface.

(3) Provide regular spaced pattern of form ties for exposed concrete. Submit locations to architect for approval.

H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.2 PLACING REINFORCEMENT:

A. Comply with Concrete Reinforcing Steel Institute's recommended practive for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangars, as required.

D. Place reinforcement to obtain minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.3 JOINTS:

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

D. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous dia-

phragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.

E. Isolation Joints in Slabs-on-Ground: Construction isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals.

(1) Joint filler and sealant materials are specified in Division-7 sections of these specifications.

F. Contration (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use inserts 1/4" wide X 1/4" of slab depth, unless otherwise indicated.

G. Form contraction joints by inserting premolded hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.

(1) Contraction joints may be formed by saw cuts as soon after slab finishing without dislodging aggregate.

(2) Joint sealant material is specified in Division-7 sections of these specifications.

3.4 INSTALLATION OF EMBEDDED ITEMS:

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting-type screeds.

3.5 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

C. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.6 CONCRETE PLACEMENT:

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work;cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General: Comply with ACI 304, and as herein specified.

D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

I. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

J. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

K. Maintain reinforcing in proper position during concrete placement operations.

L. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306, and as herein specified.

M. When air temperature has fallen to or is expected to fall below 40 F. (4 C.), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 F. (10 C.), and notmore than 80 F. (27 C.) at point of placement.

N. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

O. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

P. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 as herein specified.

Q. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 F. (32 C.). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

R. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

S. Wet forms thoroughly before placing concrete.

T. Use water-reducing, retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.7 FINISH OF FORMED SURFACES:

A. Rough Form Finish (RfFm-Fn): For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surfce having texture imparted by form-facing material used, used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed-down or chipped off.

B. Smooth Form Finish (SmFm-Fn): For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, such as waterproofing dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Smooth Rubbed Finish (SmRbd-Fn): Provide smooth rubbed finish (SmRbd-Fn) to scheduled concrete surfaces, which have received smooth form finish (SmFm-Fn) treatment, not later than one day after form removal.

Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Abrasive Blast Concrete Finish: Apply abrasive-blasted finish to concrete surfaces where indicated.

(1) Surface Continuity: Perform abrasive blast finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish on each surface or area of work. Maintain patters of variances in depths of blast as shown on drawings.

(2) Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match Architect's samples, as follows:

(a) Brush: Remove cement matrix to expose fine aggregate - no reveal.

(b) Light: Expose fine aggregate with occasional exposure of coarse aggregate - 1/16" reveal

(c) Medium: Generally expose coarse aggregate - 1/4" reveal.

(d) Heavy: Expose and reveal coarse aggregate to a maximum projection of 1/3 of the diameter - 3/8" to 1/2" reveal.

(3) Abrasive Blasting: Abrasive blast corners and edge of patterns carefully, using back-up boards, to maintain uniform corner of edge line. Determine type of nozzle,

nozzle pressure, and blasting techniques required to match Architect's samples.

(4) Acid Cleaning: After abrasive blasting to required depth is completed, apply a weak acid wash to clean abrasive-blasted surfaces to match Architect's sample. Thoroughly neutralize and flush acid from surfaces with water under pressure.

E. Related Uniformed Surfaces: At tops of walls, horizontal offsets surfaces occuring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adja-

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

3.8 MONOLITHIC SLAB FINISHES:

A. Scratch Finish (Scr-Fn): Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar settings beds for tile, Portland Cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

B. After placing slabs, plane surface to a tolerance not exceeding 1/2" in 10' when tested with a 10' straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

C. Float Finish (Flt-Fn): Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating, if area is small or inaccessible to power units. Check and level surface plen to a tolerance not exceeding 1/4" in 10' when tested with a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

D. Trowel Finish (Tr-Fn): Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient floring, paint or other thinfilm finish coating system.

After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling opera-

tion, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

D. Non-Slip Broom Finish (NSBrm-Fn): Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Chemical Hardener Finish (ChHd-Fn): Apply chamical-hardener finish to interior concrete floors where indicated. Apply liquid chemcial-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water, and apply in 3 coats; first coat, 1/3-strength; second coat, 1/2-strength; third coat, 2/3-strength. Evenly apply each coat, and allow 24 hours for drying between coats.

Apply proprietary chemical hardeners, in accordance with manufacturer°s printed instructions.

Afte final coat of chemical-hardener solution is applied and

and dried, remove surplus hardener by scrubbing and mopping with water.

G. Non-slip Aggregate Finish (NSAg-Fn): Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, and elsewhere as indicated.

After completion of float finishing, and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as herein specified.

After curing, lightly work surface with a steel wire brush, or an abrasive stone, and water to expose non-slip aggregate.

3.9 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature dyring and excessive cold or hot temperatures.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

C. Provide moisture curing by following methods:

(1) Keep concrete surface continuously wet by covering with water.

(2) Continous water-fog spray.

(3) Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

D. Provide moisture cover curing as follows:

(1) Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

E. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

F. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by appropriate method.

Final cure concrete surfaces to receive liquid floor hardener or finish floorig by use of moisture-retaining cover, unless otherwise directed.

3.10 SHORES AND SUPPORTS:

A. Comply with ACI 347 for shoring and reshoring in multistory construction, and as herein specified.

B. Extend shoring from ground to roof for structures 4 stories or less.

C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Location and provide adequate reshoring to safely support work without excessive stress or deflection.

Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.11 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 F. (10 C.) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength of inplace concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.12 RE-USE OF FORMS:

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.13 MISCELLANEOUS CONCRETE ITEMS:

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with inplace construction. Provide other miscellaneous concrete filling shown or required to complete work.

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

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces as scheduled.

E. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.14 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, downto solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surfae. Thoroughly clean, dampen with waer and brush-coat the area to be patched with specified bonding agent. Place patching mor mortar after bonding compound has dried.

B. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

F. Repair finished unformed surfaces that contain defect which affect durability of concrete. Surface defects, as such, nclude crazing, cracks in excess of 0.01" wide or which penetrate to reinforcemetn or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

G. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

H. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finsih repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

I. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

J. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 15 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place, and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

Use epoxy-based mortar for structural repairs, where directed by Architect.

K. Repair methods not specified above may be used, subject to acceptance by Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. The owner will employ a testing laboratory to perform tests and to submit test reports.

Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.

(1) Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

(a) Slump: ASTM C 143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

(b) Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure for normal weight concrete; one for each set of compressive strength test specimens.

(c) Concrete Temperature: Test hourly when air temper perature is 40 F. (4 C.) and below, and when 80 F. (27 C.) and above; and each time a set of compression tests specimens made.

(d) Compression Test Specimen: ASTM C 31; one set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

(e) Compressive Strength Tests: ASTM C 39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

B. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each bath, if fewer than 5 are used.

When total quantity of a given class of concrete is less tha than 50 cu. yds., strength test may be waived by Architect if, in his judgement, adequate evidence of satisfactory strength is provided.

When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting andcuring the in-place concrete.

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

C. Test results will be reported in writing on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, dateof concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests. Reports shall be distributed as follows: architect (2), owner (1), engineer (1), contractor (1).

D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the architect tect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42,or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 03350 - POST-TENSIONED CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DESCRIPTION OF WORK:

A. The extent of post-tensioned concrete work shown on drawings

1.3 RELATED WORK:

A. Cast-in-place concrete is specified in another Division-3 Section.

1.4 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

1) ACI 301 "Specifications for Structural Concrete for Buildings"

2) ACI 318 "Building Code Requirements for Reinforced Concrete"

3) Concrete Reinforcing Steel Institute, "Manual of Standard Practice"

4) Post-Tensioning Institute, "Post-Tensioning Manual"

B. Contractor Qualifications: All post-tensioning tendons shall be placed in forms and stressed by an experienced contractor that has satisfactorily completed projects similar to this project with design requirements as discussed in this specification. Contractor shall have a minimum of three years consecutive experience on projects of a similar nature.

1.5 SUBMITTALS:

A. Shop Drawings: Fabrication and placement drawings shall be submitted for review by the architect. They shall show complete details of prestressing tendons including the arrangement of the tendons in the members, tendon profile, tendon designation, types of post-tensioned enclosures, end anchorage details and stressing data. Clearance requirements for hydraulic stressing equipment and procedures for removal of the excess tendon after anchorage, if appropriate, and/or procedures for sealing and protecting the tendon end anchorage after completion of stressing, shall also be shown. Shop drawings shall bear the seal of a Professional Engineer registered in the State of Georgia.

B. Design Calculations: Submit calculations showing the design computations for all post-tensioned members using the loadings required by the Code and as shown on structural drawings and submit such calculations to the Architect or his representative for review. This submission shall contain the complete calculations for the design of all post-tensioned units including deflections at all loading conditions, calculations of friction loss and other incidental features. The calculations shall be indexed and presented in a neat and orderly manner, and shall bear the seal and signature of a Georgia Professional Engineer. The shop drawings for the units involved shall not be started until the Architect or his representative has reviewed the design calculations. In addition, submit all material used, manufacturer's specifications and installation procedure to the Architect or his representative for approval.

C. Mill Reports: Supply certified mill reports of the prestressing steel used showing ultimate strength, percent of elongation at rupture, and modulus of elasticity.

D. Stressing Records: Records of elongation and anchor force of each tendon shall be kept by the inspector and shall be submitted promptly, in duplicate, to the Architect, upon the completion of the post-tensioning of each member or slab.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS:

A. Post-Tensioning Tendons: Strand used in post-tensioning tendons shall conform to ASTM A-416, "Specifications for Uncoated Seven-Wire Stress-Relieved Strand for Prestressed

Concrete." Strands shall be high strength cold-drawn stress relieved wire with a minimum guaranteed ultimate strength of 270,000 psi.

B. Coated Tendons: Fabricated coated tendons shall be shop coated with an approved coating compound to prevent bond, reduce friction and resist corrosion. The tendon shall be enclosed in slippage sheathing to further assure prevention of bond.

(1) Tendon elements shall be completely shop coated with a non-volatile, low friction mineral oil base greased with a rust preventing additive. This coating material shall have a relatively uniform viscosity under temperature ranges of 20 F. to 120 F.

(2) Slippage sheathing shall be provided which shall consist of a durable waterproof material capable of maintaining the tendon tightly bundled, prevent penetration of cement paste, and which will contain the coating compound during shipment, placing, and concreting. All tears or holes in the slippage sheathing of more than 12" in length shall be repaired by resheathing before concreting begins.

C. Anchoring Hardware shall meet the minimum requirements set forth in the ACI Standard Building Code requirements for Reinforced Concrete (ACI 318) or Prestressed Concrete Institute's "PCI Standard Buildig Code for Prestressed Concrete", latest revision. Anchorage device shall maintain the tendon without more than 1/8" slip at a load equal to the load applied at time of stressing.

D. Reinforcing Steel: ASTM A615, Grade 60, deformed

2.2 FABRICATION:

A. Wire Tendons for post-tensioning concrete shall consist of the required number of 1/4" diameter parallel lay high-tensile, cold-drawn, stress relieved wires. Positive end anchorage shall be provided by means of 3/8" button-head cold-formed on each end of each wire after threading through the tendon end anchorages. All tendons shall be furnished in continuous lengths without splices and shall be delivered fabricated to proper length, and enclosed in suitable slippage sheathing ready for immediate placement in the forms. Tendon coupling shall be used only when specified and only

where indicated on the contract drawings. Tendons shall be coiled and sufficiently tied in order to prevent premature uncoiling.

B. Strand Tendons shall consist of the required number of .5" parallel lay uncoated stress relieved seven wire strand. Strand shall be cut to length, allowing sufficient length for attachment of stressing equipment. Tendons shall be furnished in continuous length, without splices, and enclosed in suitable slippage sheathing ready for immediate placement in the forms. Tendons shall be coiled and sufficiently tied to prevent premature uncoiling.

(1) Strand tendons may be cut to length at fabricating plant coiled for shipment to jobsite, and tagged for proper location in the member, to allow strand to be pulled through anchorage and duct previously positioned in the concrete member at the jobsite.

(2) Strand may be shipped to job in reels, cut to length at the jobsite, and pulled through as stated above.

PART 3 - EXECUTION

3.1 PLACING TENDONS:

A. Supports for horizontal tendons shall be such as to insure their remaining in proper position during the placing of the concrete. Unless otherwise indicated, supports for tendons shall be located at high and low points of profile and at control points located as follows:

.5" strand	4' centers
2-5 wire	4' centers
6-12 wire	6' centers
14 wire & up	8-10' centers

B. Vertical tendon dimensions shall not vary form the dimensions shown on drawings more than 1/8" in members up to 12" deep, and 1/4" in members over 12" deep. The maximum vertical or horizontal departure from a tangent line shall not exceed 1,000 element diameters, 1/4" in 12", or be less than a radius of curvature of 12"-0". The clear horizontal spacing between the tendons shall not be less than 1-1/2 times the maximum size of aggregate, but in no case shall they be closer than 1-1/4 inches. Horizontal spacing in slabs shall not exceed five times the slab thickness for

3'-6", whichever is least, without approval of the Architect.

C. Minimum clear concrete coverage for tendons shall not be less than 1-1/2" for beams or girders, and 3/4" for joists and slabs for structure not exposed to weather or earth, and shall be in accordance with the ACI Building Code, or the Prestressed Concrete Institute s Standard Recommendations for Prestressed Concrete, latest revision.

D. Jobsite instruction of personnel in placing, stressing, and grouting (where required) of the tendons shall be provided by an experienced technician of the post-tensioning supplier.

E. Secure stressing assemblies at terminal ends to the formwork.

F. Perform placing of the post-tensioning tendons by or under the supervision of experienced personnel that have successfully performed previous installations of a similar nature.

G. Securely fasten bearing plates or anchorages to the end forms and perpendicular to the longitudinal axis of the tendon.

H. Slabs:

(1) Support tendons at the vertical location as shown on the plans by means of steel wire chairs with plastic-tipped legs of correct height. Locate at the column lines and at points between column lines as required. Tendons follow an approximate parabolic curve between the support points. Supply additional chairs at intermediate points as required to maintain the required vertical curve. Tie all chairs to the tendon to prevent dislodging during concreting operations.

(2) Tendons may be displaced no more than 1'-3" laterally to miss openings in the slab, as long as this occurs no more than twice on any single tendon, and as long as the angular offset does not exceed 1 in 12. If a displacement of more than 1'-3" is required, the bearing plates shall be shifted so that the tendon misses the opening at the direction of the Architect.

I. Beams and Joists: Place support steel in primary members to maintain tendon profile and horizontal alignment.

3.2 INSPECTION

A. No concreting of post-tensioned members shall begin until placement of tendons and conventional reinforcement have been inspected and approved by the Architect or his representative.

3.3 PLACING CONCRETE

A. Concrete shall be placed in such a manner as to insure that alignment of post-tensioning tendons and conventional reinforcement remains unchanged. Care shall be exercised to insure uniform compaction of concrete, especially around tendon anchorages. In addition, the requirements of Section 03010 shall apply.

3.4 STRESSING EQUIPMENT

A. Initial jobsite instruction of technical personnel in the stressing operation and necessary stressing equipment with certified hydraulic gauge shall be provided by the supplier of the post-tensioning tendons. In order to insure that proper calibration is maintained, care shall be exercised in the handling of all stressing equipment. Adequate power should be available to avoid power drop of the equipment.

3.5 PRESTRESSING

A. Concrete Strength: Tensioning operation shall not begin until tests of the concrete cylinders, manufactured and cured under the same conditions as the members to be prestressed, indicate that the concrete in the members has attained a compressive strength of not less than 75% of the 28-day strength or as otherwise specified on the contract drawings. A minimum of three cylinders shall be tested and at least two must have reached the specified strength. The average strength of the three tests shall not be less than that specified.

B. Stressing Operation:

(1) After tests indicate that the concrete has reached sufficient strength, the tendons shall be stressed by means of hydraulic jacks equipped with calibrated pressure gauges with an accuracy of 1% of the scale range to permit the stress in the prestressing steel to be computed at any time. The stressing operation shall

be conducted in a safe manner and as recommended by the manufacturer of the prestressing materials, and then only in the presence of the Architect or his representative.

(2) Stressing shall be performed by experienced personnel who have successfully performed similar stressing operations.

(3) The cause of any difference between the calculated and measured elongation which exceeds 5% shall be ascertained and corrected.

(4) Anchor prestressing at an initial anchor force or stress that will result in the ultimate retention of the working or effective force shown on the plans. In no case may the steel be tensioned above 80% of the specified ultimate strength. Verify anchor forces when necessary by lift-off readings.

(5) The final average working stress in the tendon shall not exceed 60% of the specified ultimate strength of the prestressing steel. In arriving at the final average working stress, the loss in prestress due to creep and shrinkage of concrete, creep of steel and elastic shortening from sequence stressing shall be 10% of the specified ultimate strength of the prestressing steel unless there is data to prove otherwise.

3.6 ANCHORING

A. The prestressing steel shall be anchored at an initial or "Transfer Stress" that will result in the retention of working forces or stresses of not less than those shown on the contract drawings as the final prestress force after all losses.

B. Upon completion of the stressing operation and burning off of excess strand in the strand tendon application, stressing assemblies should be coated with an approved rust-preventitive material, and pockets for stressing terminals filled with a non-shrinking grout.

C. Ends of tendons shall not be cut off until records of elongation and anchor forces have been reviewed by the Architect or his representative.

3.7 STRESS TRANSFER

A. Buttonheads or wire tendons shall be 0.375" diameter cold-formed after being threaded through the tendon and anchorages. In no case shall the buttonhead be less than 0.360" in diameter. If one should be found less than this diameter, the entire lot shall be inspected and all those failing to meet the minimum size shall be rejected.

B. Stress transfer on strand tendons shall be such as to prevent undue scraping of the strand by the wedge grippers during seating.

3.8 STRESS RETENTION

A. Shims for maintaining elongation of wire tendon after stressing shall be precut to the required dimensions, bundled, and marked for each tendon. Shim bearing surfaces shall be machine cut. Sheared or burned bearing surfaces shall not be allowed.

B. Wedge grippers on strand tendons shall be properly aligned before and after stressing to insure proper stress retention

END SECTION

SECTION 03450 - ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent of architectural precast concrete (ArPC-Conc) work is shown on drawings and in schedules.

B. Architectural precast concrete includes the following:

(1) Exposed aggregate units (integral, not surface applied aggregate).

(2) Special formed and textured units.

C. Caulking sealants, and gaskets are specified in Division 7.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except as otherwise indicated.

(1) ACI 318 "Building Code Requirements for Reinforced Concrete".

(2) Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

(3) Prestressed Concrete Institute MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products".

B. Fabricator Qualifications: Firms which have a minimum of 2-to-5 years successful experience in the fabrication of architectural precast concrete units, similar to units required for this project, will be acceptable. Fabricator must have sufficient production capacity to produce, transport, and deliver required units without causing delay in the work.

C. Fabrication Qualifications: Produce precast concrete units at fabricating plant engaged primarily in manufacturing of similar units, unless plant fabrication or delivery to site is impractical.

(1) If units are produced at locations other than precast concrete fabricating plants, maintain procedures and conditions for quality control equivalent to plant production.

(2) Design modifications may be made only as necessary to meet field conditions and to ensure proper fitting of the work, and only as acceptable to Architect. Maintain general design concept shown without increasing or decreasing sizes to members or altering profiles and alignment shown. Provide complete design calculations and drawings prepared by a registered professional engineer, if requested by Architect, if design modifications are anticipated.

D. Qualifications of Erector: Firms which have a minimum of 2 years successful experience in the erection of architectural precast concrete units, similar to units required for this project, will be acceptable.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, design calculations, data and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required.

B. Shop Drawings:

(1) Submit shop drawings showing complete information for fabrication and installation of precast concrete units. Indicate member dimensions and cross-section; location, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection.

(2) Include erection procedure for precast units, sequence of erection, and required handling equipment.

(3) Show layout, dimensions, and identification of each precast unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols. Detail inserts, connections, and joints, including accessories and construction at openings in precast units.

C. Samples:

(1) Submit 3 sets of precast samples approximately 12" x 12" x 2" to illustrate quality, color, and texture of surface finish.

(2) Submit samples of cast-in gaskets, anchorages, and other attachments and accessories as requested by Architect.

(3) Prepare full-size sample of each required architectural precast concrete unit for Architect's inspection at production plant or on site prior to start of installation work, and after Architects review of finish samples. Acceptable full-size samples may be incorporated in job installation.

(4) Architect's review of samples will be for color, texture and general condition only. Compliance with other requirements is the exclusive responsibility of the Contractor.

1.5 DELIVERY, STORAGE AND HANDLING:

Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation. Store units at project site to prevent cracking, distortion, warping, staining, or other physical damage and so that markings are visible. Lift and support units only at designated lifting or supporting points as shown on final shop drawings.

PART 2- PRODUCTS

2.1 FORMWORK:

A. Provide forms and, where required, form facing materials of metal, plastic, wood, or other acceptable material that is non-reactive with concrete and will produce required finish surfaces.

B. Accurately construct forms, mortar-tight, and of sufficient strength to withstand pressures due to concrete placing operations, temperature changes and, when prestressed pretensioning and detensioning operations. Maintain frame work to provide completed precast concrete units of shapes, lines and dimensions indicated, within specified fabrication tolerances.

C. Unless forms for plant-manufactured prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or to movement during detensioning.

2.2 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.

B. Low-Alloy Steel Reinforcing Bars: ASTM A 706.

C. Steel Wire: ASTM A 82, plain, cold-drawn, steel.

D. Welded Wire Fabric: ASTM A 185.

E. Welded Deformed Steel Wire Fabric: ASTM A 497.

F. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing.

G. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are hot-dip galvanized, plastic protected or stainless steel protected.

2.3 PRESTRESSING TENDONS:

A. Uncoated. 7-wire stress-relieved strand complying with ASTM A 416. Use Grade 250 unless Grade 270 indicated.

B. Strand similar to above, but having size and ultimate strength of wires increased so that ultimate strength of the strand is increased approximately 15%, or strand with increased strength but with fewer number of wire per strand, may be used at manufacturer's option.

2.4 CONCRETE MATERIALS:

A. Portland Cement: ASTM C 150, Type I or Type III.

(1) Use only one brand and type of cement throughout the project, unless otherwise acceptable to Architect.

(2) Use "buff" color portland cement for facing concrete mix to match Architect's control sample.

(3) Standard "Gray" portland cement may be used for non-exposed back-up concrete.

B. Coarse Aggregate for Facing Mixes: ASTM C 33; hard, durable, carefully selected and graded; free of material causing staining or reacting with cement.

Use grey "Stone Mountain aggregate from same source as those used in Architect's control sample.

C. Fine Aggregate for Facing Mixes: ASTM C 33; manufactured "white" sand of same source as that used in Architect's control sample.

D. Water: Potable or free from foreign materials in amounts harmful to concrete and embeded steel.

E. Air-Entraining Admixture: ASTM C 260.

F. Water-Reducing Admixture: ASTM C 494, Type A.

G. Calcium Chloride: Do not use calcium chloride in precast prestressed concrete.

2.5 CONNECTION MATERIALS:

A. Steel Plates: Structural quality, hot-rolled carbon steel, ASTM A 283, Grade C.

B. Steel Shapes: ASTM A 36.

C. Anchor Bolts: ASTM A 307, low-carbon steel bolts, regular hexagon nuts and carbon steel washers.

D. Finish of Steel Units: Exposed units galvanized per ASTM A 153; others painted with rust-ihibitive primer.

2.6 GROUT MATERIALS:

A. Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 404. Mix at ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.

B. Non-Metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with Corps of Engineers CRD-C621, Type A.

2.7 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type of concrete required.

B. Design mixes may be prepared by an independent testing facility or by qualified precast manufacturing plant personnel, at precast manufacturer's option.

C. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the project for each type of concrete required, complying with ACI 318.

D. Mix: Standard-weight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:

(1) Compressive Strength: 5,000 psi minimum at 28 days.

(2) Total Air Content: Not less than 4% nor more than 6%.

(3) Submit written reports to Architect of proposed mix for each type of concrete at least 15 days prior to start of precast unit production. Do not begin concrete production until mixes and evaluations have been reviewed by Architect.

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by Architect before using in the work.

G. Admixtures: Use air-entraining admixture in strict compliance with manufacturer's directions. Admixture to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Architect's acceptance.

Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

2.8 FABRICATION:

A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-117, unless otherwise indicated.

(1) Fabricate units straight, smooth, and true to size and shape, with exposed edges and corners precise and square unless otherwise indicated.

(2) Precast units which are warped, cracked, broken, spalled, stained, or otherwise defective will not be acceptable.

B. Built-In Items: Provide reglets, slots, holes, and other accessories in units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

C. Anchorages: Provide loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other miscellaneous steel shapes not provided by other trades, necessary for securing precast units to supporting and adjacent members.

D. Surface Finish: Fabricate precast units and provide exposed surface finishes as follows:

(1) Abrasive blast finish, using abrasive grit, equipment, application techniques and cleaning to expose aggregate and surrounding matrix surfaces, to match Architect's control samples for light and medium abrasive blasted finish.

(2) As-cast or float finish for unexposed surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Deliver anchorage items which are to be embedded in other construction before start of such work. Provide setting diagrams, templates, instructions and directions as required for installation.

(1) Do not install precast units until concrete has attained its design compressive strength.

(2) Install precast concrete members plumb, level, and in alignment within PCI MNL-17 specified limits of erection tolerances. Provide temporary supports and bracing as required to maintain position, stability and alignment as members are being permanently connected.

(4) Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

B. Accessories: Install clips, hangers, and other accessories required for erection of precast units to supporting members and back-up materials.

(1) Anchor units in final position by bolting, welding, grouting, or as otherwise indicated. Remove temporary shims, wedges, and spacers as soon as possible after anchoring is completed.

(2) At bolted connections use lock washers or other acceptable means to prevent loosening of nuts.

(3) At welded connections apply rust-inhibitive coating on damaged areas, same as shop-applied material. Use galvanizing repair coating on galvanized surfaces.

C. Cleaning: Clean exposed facings to remove dirt and stains which may be on units after erection and completion of joint treatments. Wash and rinse in accordance with precast manufacturer's recommendations. Protect other work from damage due to cleaning operations. Do not use cleaning materials or processes which could change the character of exposed concrete finishes.

3.2 PERFORMANCE REQUIREMENTS:

A. Conduct inspections, perform testing, and make repairs or replace unsatisfactory precast units as required.

Limitations as to the amount of patching which will be permitted is subject to acceptance of Architect.

B. In addition to above, in-place precast units may be rejected for any one of the following:

(1) Exceeding the specified installation tolerances.

(2) Damaged during construction operations.

(3) Exposed-to-view surfaces which develop surface finish deficiencies.

(4) Other defects as listed in PCI MNL-117.

END OF SECTION 03450

SECTION 04200- UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of each type of masonry work is indicated on drawings and in schedules.

1.3 QUALITY ASSURANCE

Fire Performance Characteristics: Where fire-resistance ratings are indicated for unit masonry work, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.

1.4 SUBMITTALS:

Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certification that each type complies with specified requirements.

1.5 JOB CONDITIONS:

A. Protection of Work: During erection, cover top of walls with waterproof sheeting at end of each days' work. Cover partially completed structures when work is not in progress.

B. Extend cover a minimum of 24 inches down both sides and hold cover sequrely in place.

C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

F. Protect sills, ledges and projections from droppings of mortar.

G. Cold Weather Protection:

(1) Do not lay masonry units which are wet or frozen.

(2) Remove ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.

(3) Remove all masonry determined to be damaged by freezing conditions.

(4) Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 degrees F (6 degrees C).

40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):

Mortar: Heat mixing water to produce mortar temperature between 40 degrees F (4 degrees C and 120 degrees F (49 degrees C).

Grout: Follow normal masonry procedures.

32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):

Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.

Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in-place grout temperature of 70 degrees F (21 degrees C) at end of work day.

25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):

Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.

Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in-place grout temperature of 70 degrees F (21 degrees C) at end of work day.

Heat both sides of walls under construction using salamanders or other heat sources.

Use windbreaks or enclosures when wind is excess of 15 mph.

20 degrees F (-7 degrees C) and below:

Mortar: heat mixing water an sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).

Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in-place grout temperature of 70 degrees F (21 degrees C) at end of work day.

Masonry Units: Heat masonry units so that they are above 20 degrees F (-7 degrees C) at time of laying.

Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 degrees F (4 degrees C) for 24 hours after laying units.

Do not heat water for mortar and grout to above 160 degrees F (71 degrees C).

(5) Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry temperature ranges apply to anticipated minimum night temperatures.

40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):

Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

32 degrees F (0 degrees C) to 20 degrees F (-7 degrees C):

Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.

20 degrees F (-7 degrees C) and below:

Except as otherwise indicated, maintain masonry temperature above 32 degrees F (0 degrees C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 degrees F (4 degrees C) for 48 hours.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL:

A. Manufacturer: Obtain masonry units from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas.

B. Masonry Unit Characteristics: Provide units complying with standards referenced and requirements indicated.

2.2 CONCRETE MASONRY UNITS (CMU):

A. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" (15-5/8" x 7-5/8" actual), unless otherwise indicated.

B. Special Shapes: Provide where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

C. Hollow Load-Bearing (HL) CMU: ASTM C 90 where shown as "HL-CMU" and as follows:

Grade N except Grade S may be used above grade in exterior walls with weather-protective coatings and in walls not exposed to the weather.

D. Weight Classification: Lighweight units unless otherwise indicated. (Less than 105 lbs. per cu. ft., oven dry weight of concrete).

E. Cure units in a moisture-controlled atmosphere or in an autoclave at normal pressure and temperature to comply with ASTM C 90, Type I. Limit moisture absorption during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U. S. Weather Bureau Station nearest the project site.

F. Exposed Faces: Provide manufacturer's standard color and texture, unless otherwise indicated.

2.2 MORTAR MATERIALS:

A. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregates for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.

D. Aggregate for Grout: ASTM C 404.

E. Water: Clean and potable.

2.3 MASONRY ACCESSORIES:

A. Horizontal Joint Reinforcing and Ties for Masonry:

(1) Provide welded wire units prefabricated in straight lengths of not less than 10', with matching corner ("L") and intersecting ("T") units. Fabricate from cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross-rods, into units with widths of approximately 2" less than nominal width of walls and partitions as required to position side rods for full embedment in mortar with mortar coverage of not less than 5/8" on joint faces exposed to exterior and not less than 1/2" elsewhere. Provide the following type of joint reinforcing unless otherwise indicated.

(2) Truss type with diagonal cross rods spaced not more than 16" o.c. or ladder type with perpendicular cross rods spaced not more than 16" o.c.

(3) Number of Side Rods: Single pair for single wythe masonry and as indicated for multi-wythe masonry, or if not otherwise indicated, one side rod for each face shell of each concrete masonry wythe.

(4) Wire Sizes: Fabricate with 9-gage side and cross rods, unless otherwise indicated.

(5) Wire Finish: Provide manufacturer's standard mill galvanized finish except as otherwise indicated.

B. Individual Wire Ties for Masonry:

(1) Fabricate from 3/16" cold-drawn steel wire, ASTM A 82, unless otherwise indicated, of the length required for proper embedment in wythes of masonry.

(2) For use with hollow masonry units laid cells vertical, provide rectangular shaped ties.

(3) Where spacing and back-up joints do not align, provide either offset or adjustable 2-piece ties.

(4) For interior walls, fabricate from steel wire with mill galvanized finish.

C. Anchors and Ties:

(1) Provide straps, bars, bolts and rods fabricated from not less than 16 ga. sheet metal or 3/8" diameter rod stock, unless otherwise indicated.

(2) Flexible Anchors: Where masonry is indicated to be anchored to structural framework with flexible anchors, provide 2-piece anchors which will permit horizontal and vertical movement of masonry but will provide lateral restraint.

D. Concrete Inserts for Masonry:

(1) Unit Type: Furnish cast iron or malleable iron inserts of the type and size shown, hot-dip galvanized after fabrication with 1.5 oz. zinc coating, ASTM A 153, Class B-2.

(2) Dovetail Slots: Furnish dovetail slots with filler strips, where shown.

Fabricate from 24 ga. galvanized steel unless otherwise indicated.

Provide hot-dip galvanized steel dovetail anchors of size and type to suit construction requirements.

(3) For installation of concrete inserts, see concrete sections of these specifications. Advise Concrete Installer of specific requirements regarding his placement of inserts which are to be used by the masonry Installer for anchoring of masonry work.

E. Miscellaneous Masonry Accessories:

(1) Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60 for bars No. 3 to No. 18.

(2) Non-Metallic Expansion Joint Strips: Provide premolded, compressible, elastic fillers of foam rubber, neoprene, or extruded plastic.

(3) Bond Breaker Strips: 15-lb. asphalt roofing felt complying with ASTM D 226, or 15-lb, coal-tar roofing felt complying with ASTM D 227.

(4) Premolded Control Joint Strips: Solid rubber strips with a Shore A durometer hardness of 60 to 80, designed to fit standard sash block and maintain lateral stability in masonry wall, size and configuration as indicated.

2.4 MORTAR AND GROUT MIXES:

A. Do not lower the freezing point of mortar by use of admixtures or anti-freeze agents.

B. Do not use calcium chloride in mortar or grout.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specifications, for types of mortar required, unless otherwise indicated.

(1) Limit cementitious materials in mortar to portland cement- lime.

(2) Use Type S mortar for reinforced masonry and where indicated.

(3) Use Type N mortar for exterior, above grade loadbearing and non-loadbearing walls; for interior loadbearing walls; and for other applications where another type is not indicated.

D. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and nonreinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

A. Thickness: Build masonry construction to the full thickness shown, except, build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

(1) Build chases and recesses as shown and as required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

(2) Cut masonry units with motor-driven saw designed to cut masonry with clean sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Use dry cutting saws to cut concrete masonry units.

(3) Do not wet concrete masonry units.

B Pattern Bond: Lay exposed masonry in the bond pattern shown, or if not shown, lay in running bond vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners, unless otherwise shown.

(1) Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths and to properly locate openings, movement type joints, returns and offsets. Avoid the use of less-than-half size units at corners, jambs and wherever possible at other locations.

(2) Lay-up walls plumb and with courses level, accurately spaced and coordinated with other work.

(3) Stopping and Resuming Work: Rack back 1/2-masonry unit length in each course; do not tooth. Clean surfaces of set masonry, wet units lightly (if specified to be wetted), and remove loose masonry units and mortar prior to laying fresh masonry.

C. Built-in Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

(1) Fill space between hollow metal frames and masonry solidly with mortar.

(2) Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

(3) Fill CMU cores with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar conditions unless otherwise indicated.

D. Non-Bearing Interior Partition Walls: Build full height of story to underside of solid structure above, unless otherwise indicated. Provide a sealant joint between topcourse and underside of solid structure above.

3.2 MORTAR BEDDING AND JOINTING:

A. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns an pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout. For starting courses on footings where cells are not grouted, spread out full mortar bed including areas under cells.

B. Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not otherwise indicated, lay walls with 3/8" Joints. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials. Tool exposed joints slightly concave using a jointer larger than joint thickness. Rake out mortar in preparation for application of calking or sealants where shown.

C. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar, and reset in fresh mortar.

3.3 HORIZONTAL JOINT REINFORCING:

A. Provide continuous horizontal joint reinforcing as shown and specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls and 1/2" at other locations. Lap reinforcement a minimum of 6". Do not bridge control and expansion joints with reinforcing, unless otherwise indicated. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

B. For single-wythe walls, space reinforcing at 16" o.c. vertically, unless otherwise indicated.

C. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcing placed in 2 horizontal joints approximately 8" apart, both immediately above lintels and below sills. Extend reinforcing a minimum of 2'0" beyond jambs of the openings, bridging control joints where provided.

3.4 ANCHORING MASONRY WORK:

A. Provide anchoring devices of the type indicated. If not indicated, provide standard type for facing and back-up involved.

B. Anchor masonry to structural members where masonry abuts or faces such members to comply with the following:

(1) Provide an open space not less than 1" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.

(2) Anchor masonry to structural members with metal ties embedded in masonry joints and attached to structure. Provide anchors with flexible tie sections, unless otherwise indicated.

(3) Space anchors as shown, but not more than 24" o.c. vertically and 36" o.c. horizontally.

3.5 LINTELS:

A. Install loose lintels of steel and other materials where shown.

B. Provide masonry lintels where shown and where openings of more than 1'-0" are shown without structural steel or other supporting lintels. Thoroughly cure precast lintels before handling and installation.

C Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

3.6 CONTROL AND EXPANSION JOINTS:

A. Provide vertical expansion, control and isolation joints in masonry at 30'-0" maximum o.c. Build-in related masonry accessory items as the masonry work progresses.

(1) See Division-7 sections for "Joint Sealers".

(2) Build flanges of metal expansion strips into masonry. Lap each joint 4" in direction of flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.

(3) Build-in flanges of factory-fabricated expansion joint units, specified in a Division-7 section.

(4) Build-in joint fillers where shown, specified in a Division-7 section "Joint Sealers". Joint width for sealants; 3/8" unless otherwise indicated.

3.7 REPAIR, POINTING AND CLEANING:

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.

C. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings. Comply with recommendations in NCMA TEK Bulletin No. 28.

END OF SECTION 04200

SECTION 04230 - REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Requirements of Section "Unit Masonry, General" apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of each type of reinforced unit masonry work is indicated on drawings and in schedules.

1.3 SUBMITTALS:

A. Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel required for project.

B. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures." Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

PART 2 - PRODUCTS

2.1 General: Refer to Section "Unit Masonry" for masonry materials and accessories not included in this section.

2.2 Reinforcement Bars: Provide deformed bars of following grades complying with ASTM A 615, except as otherwise indicated.

A. Provide Grade 60 for bars No. 3 to No. 18, except as otherwise indicated.

B. Shop-fabricate reinforcing bars which are shown to be bent or hooked.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT:

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross- section due to excessive rusting or other causes.

B. Position reinforcement accurately at the spacing shown. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (whichever is greater).

C. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise shown. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

D. Provide not less than minimum lap shown, or if not shown, as required by governing code.

E. Embed prefabricated horizontal joint reinforcing as the work progresses, with a minimum cover of 5/8" on exterior face of walls and 1/2" at other locations. Lap units not less than 6" at ends.Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

F. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.

G. At intersections of reinforced masonry walls with non- reinforced masonry, provide anchorage as shown.

3.2 INSTALLATION, GENERAL:

Refer to Section "Unit Masonry" for general installation requirements of unit masonry.

3.3 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY:

A. General:

(1) Do not wet concrete masonry units (CMU).

(2) Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8" joints.

(3) Where solid CMU units are shown, lay with full mortar head and bed joints.

B. Walls:

(1) Pattern Bond: Lay CMU wall units in 1/2 running bond with vertical joints in each course centered on units in courses above and below, unless otherwise shown. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.

(2) Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimensions indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.

(3) Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

(4) Option: Where all vertical cores are not shown to be grouted, Contractor may elect to fill all vertical cores with grout. In which case, requirements for mortar bedding of cross-webs and closing of core spaces below bond beams do not apply.

C. Grouting:

(1) Use "Fine Grout"for filling spaces less than 4" in both horizontal directions.

(2) Use "Coarse Grout" for filling 4" spaces or larger in both horizontal directions.

(3) Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements which follow.

D. Low-Lift Grouting:

(1) Provide minimum clear dimension of 2" and clear area of 8 sq. in. in vertical cores to be grouted.

(2) Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required to allow for splicing.Support in position at vertical intervals not exceeding 192 bars diameters nor 10 ft.

(3) Lay CMU to maximum pour height. Do not excees 5' height or if bond beam occurs below 5' height, stop pour at course below bond beam.

(4) Pour grout using container with spout or by chute. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2" below top course of pour.

(5) Bond Beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcing in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

E. High-Lift Grouting:

(1) Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3" and 10 sq. in., respectively.

(2) Provide cleanout holes in first course at all vertical cells which are to be filled with grout.

(3) Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.

(4) Construct masonry to full height of maximum grout pour specified, prior to placing grout.

(5) Limit grout lifts to a maximum height of 5' and grout pour to a maximum height of 24', for single wythe hollow concrete masonry walls, unless otherwise indicated.

(6) Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bars diameters nor 10'.

(7) Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.

(8) Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of size and spacing shown.

(9) Place horizontal beam reinforcement as the masonry units are laid.

(10) Embed lateral tie reinforcement in mortar joints where shown. Place as masonry units are laid, at the vertical spacing shown.

(11) Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than No. 2 bars or 8 gage wire ties spaced 16" o.c. for members with 20" or less side dimensions, and 8" o.c. for members with side dimensions exceeding 20".

F. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcing and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond.After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.

(1) Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

(2) Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.

(3) Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 5'. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

(4) Place grout in lintels or beams over openings in one continuous pour.

(5) Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry.

(6) When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing.Pour grout to within 1-1/2" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section grouting. Repeat sequence if more pours are required.

END OF SECTION 04230

SECTION 04400 - STONEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of stonework is shown on drawings and in schedules.

B. Rubble Stone Masonry Units are specified in another Division-4 section.

C. Joint Sealers are specified in Division 7

D. Work Furnished but Installed by Others: Furnish inserts and reglets in time to be installed in concrete or masonry.

1.3 QUALITY ASSURANCE:

A. Source Quality Control:

(1) Provide stone which complies with recommendations of the National Building Granite Quarries Association, Inc. (NBGQA).

(2) Obtain stone from quarry with consistent color range and texture throughout the work. Stone for exterior application shall be from same quarry as that used for interior application.

(3) Subcontract fabrication of stone to a firm which has successfully fabricated stone similar to the quality specified for a period of not less than 5 years and is equipped to provide the quantity shown.

(4) Job Mock-Up: Prior to installation of stonework, provide sample panels of stonework indicated with proposed range of color, texture and workmanship to be expected in completed work. Build mock-up at site, as directed, using stone, anchors and jointing, as shown and specified in accordance with final shop drawings.

Obtain Architect's acceptance of visual qualities of sample panels before start of stonework. Replace unsatisfactory mock-up work, as directed, until acceptable to Architect. Retain sample panels during construction as a standard for judging completed stonework. Do not alter, move or destroy mock-up until work is completed. At Contractor's option, mock-up may be incorporated into final work.

If sealant primers, sealants, resin-adhesives, water repellents and other compounds are required in the finished stonework, build mock-up and apply compounds in sufficient time to allow for final test for staining or other deleterious effects from such applications.

1.4 SUBMITTALS:

A. Product Data: Submit specifications and other data for each type of stonework required, including certification that each type complies with specified requirements.Include instructions for handling, storage, installation and protection of each type.

B. Samples: Submit sets of samples not less than 12" x 12" in size of each different color, grade and finish of stonework required. Include in each set full range of exposed color and texture to be expected in completed work. Submit mortar colors for review.

C. Shop Drawings: Submit cutting and setting drawings showing sizes, dimensions, sections and profiles of stonework units, arrangement and provisions for jointing, anchoring, and fastening, supports and other necessary details for lifting devices and reception of other work. Indicate location of each stonework unit on setting drawings with number designation corresponding to number marked on each unit.

Show location of inserts (for stone anchors and supports) which are to be built into concrete or masonry.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect stone during storage and construction against moisture, soiling, staining and physical damage.

B. Handle stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of stone with wood or other rigid materials. Lift with wide-belt type slings wherever possible; do not use wire rope or ropes containing tar or other substances which might cause staining.If required, use wood rollers and provide cushion at end of wood slides.

Store stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones. Protect stored stone from weather with waterproof, non- staining covers or enclosures, but allow air to circulate around stones.

C. Protect mortar materials and stonework accessories from weather, moisture and contamination with earth and other foreign materials.

1.6 JOB CONDITIONS:

A. Installer must review installation procedures and coordination with other work, with Contractor, and other contractors and subcontractors whose work will be effected by stonework.

B. Cold Weather Protection:

(1) Remove ice or snow formed on stonework bed by carefully applying heat until top surface is dry to touch.

(2) Remove stonework determined to be damaged by freezing conditions.

(3) Protect completed stonework and partially completed stonework not being worked on as follows:

When mean daily air temperature is from 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C), protect stonework from rain or snow for at least 24 hours by covering with weather-resistive membrane.

When mean daily air temperature is from 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C), completely cover stonework with weather-resistive membrane for at least 24 hours.

When mean daily air temperature is from 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C), completely cover stonework with insulation blankets or similar protection for at least 24 hours. When mean daily temperature is 20 degrees F (-7 degrees C) and below, maintain stonework temperature above 32 degrees F (0 degrees C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps, or other acceptable methods.

(4) Do not use frozen materials or materials mixed or coated with ice or frost. Do not use salt to thaw ice in anchor holes or slots. Do not lower the freezing point of mortar by use of admixtures or anti-freeze agents, and do not use calcium chloride in mortar or grout.

(5) Do not build on frozen work; remove and replace stonework damaged by frost or freezing.

(6) During all seasons, protect partially completed stonework against weather when work is not in progress.Cover top of walls with strong waterproof, non-staining membrane extending at least 2' down both sides of walls and anchor securely in place.

C. Temperature Limits: For interior work using plaster, do not set stone when air temperature or temperature of materials is below 50 degrees F. (10 degrees C).

PART 2 - PRODUCTS

2.1 GRANITE

A. Furnish granite of color and finish indicated for each area of use. Comply with requirements of ASTM C 615, Architectural Grade, and National Building Granite Quarries Association, Inc., (NBGQA) for color and finish qualities.

B. Walls (Exterior and Interior): Granite shall be "Berkeley" (Grey) by Georgia Granite with thermal finish.

C. Lintels: Granite as follows:

1. "Cherokee" (Red) by Georgia Granite with polished finished.
2. "Berkeley" (Grey) by Georgia Granite with thermal finish.

See drawings for specific locations.

D. Floors: Granite as follows:

1. "Berkeley" (Grey) by Georgia Granite with thermal finish.
2. "Cherokee" (Red) by Georgia Granite with thermal finish.
3. "Cherokee" (Red) by Georgia Granite with polished finish.

See drawings for specific locations.

E. Stair Treads: Granite shall be "Cherokee" (Red) by Georgia Granite with thermal finish.

F. Caps: Granite shall be "Cherokee" (Red) by Georgia Granite with polished finish.

2.2 MORTOR AND GROUT:

A. Portland Cement: ASTM C 150, except complying with the staining requirements of ASTM C 91 for not more than 0.03% water soluble alkali. Furnish Type I, except Type III may be used for setting stonework in cold weather.

B. Hydrated Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144, except graded with 100% passing the No. 16 sieve for 1/4" and narrower joints.

(1) For colored pointing mortar and grout furnish granite or other sound stone, meeting specified grading requirements for sand, of color required to match Architect's sample.

(2) Pigment for Colored Pointing Mortar and Grout: Commercial iron oxide, manganese dioxide, uldtramarine blude, chromium oxide or carbon black, suitably compounded for use in mortar and to match architect's sample. Do not exceed pigment-to-cement ratio (by weight) of 1-to-35 for carbon black and 1-to-7 of other pigments.

D. Additive for Moisture Resistance: Ammonium stearate, aluminum tristearate or calcium stearate.

E. Water: Clean and potable.

F. Molding Plaster: ANSI/ASTM C59.

G. Cleavage Membrane: 4 mil thick polyethylene film.

2.3 STONEWORK ACCESSORIES:

A. Adjustable Inserts: Malleable iron of type and size indicated or, if not indicated, as required to support loading involved.

B. Dovetail Slots: Fabricate from not less than 24 gage galvanized steel, unless otherwise indicated. Provide with filler strips.

C. Expansion Anchors: Type, size, and load capacity shown or, if not shown, as required to support loading involved.

(1) For anchoring into concrete, fabricate from cadmium-plated or hot-dipped galvanized steel.

(2) For anchoring into stone, fabricate from AISI Type 302/304 stainless steel.

D. Anchor Bolts, Nuts and Washers: Fabricate from AISI Type 302/204 stainless steel if in contact with stone; otherwise, provide regular low carbon steel bolts and nuts (ASTM A 307) hot-dip galvanized, complying with ASTM A 153.

E. Stone Anchors: Type and size indicated or, if not indicated, as required to securely anchor and fasten stonework in place. Fabricate anchors and dowels from AISI Type 302/304 stainless steel.

F. Setting Buttons: Lead or plastic buttons of the thickness required for the joint size indicated, and of the size required to maintain uniform joint width.

G. Stonework Flashing: Furnish concealed flashing, shown to be built into stonework, of AISI Type 302/304 stainless steel, 2D finish, fully annealed or dead-soft temper, 0.012" thick, unless otherwise indicated.

2.4 MIXES:

Mortar: Non-staining, cement/lime mortar, complying with ASTM C 270, Proportion Specification, using specified materials. Use Type S unless otherwise indicated. Mortar color shall match granite.

2.5 FABRICATION:

A. General: Fabricate as shown and as detailed on final shop drawings and in compliance with recommendations of applicable stone association. Provide holes and sinkages cut or drilled for anchors, fasteners, supports and lifting devices, as shown and as necessary to secure stonework in place. Cut and back-check as required for proper fit and clearance. Shape beds to fit supports.

B. Matching Areas of Wall Paneling: Fabricate from one block or contiguous blocks, where shown or delineated as a continuous area of sequence matched veining.

(1) Provide uniform (overall blend) pattern at thermal finish grey walls and floors. Keep color variation to a minimum.

(2) Provide bookmatch pattern at polished lintels to simulate one large block of stone.

C. Contiguous Work: Provide chases, reveals, reglets, openings and similar spaces and features as required for contiguous work. Coordinate with drawings and final shop drawings showing contiguous work.

D. Cut accurately to shape and dimensions shown on final shop drawings, maintaining fabrication tolerances of applicable stone associations.

(1) Dress joints (bed and vertical) straight and at 90 degree angle to face, unless otherwise indicated.

(2) Provide eased corners, unless otherwise shown. Provide for cramp anchorage in top and bottom bed joints of corner units, unless otherwise shown.

(3) Joint Width: Cut to provide joint widths as indicated or, if not shown, cut to allow for uniform 1/4" wide joints.

E. Thickness: Provide stone of thickness indicated. Saw-cut back surfaces which will be concealed in finished work.

Allow not less than 1" clearance between back face of units and structure framing (or fireproofing, if any).

F. Cut flashing reglets, 5/8" wide x 3/4" deep, unless otherwise indicated.

G. Fabricate saddles and thresholds and trim to profiles and dimensions shown.

H. Pattern Arrangement for Flooring: Fabricate stone flooring to form patterns indicated. Provide random match veining at polished borders.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Advise Installers of other work about specific requirements relating to his placement of inserts and flashing reglets which are to be used by stone mason for anchoring and supporting and flashing of stonework. Furnish Installers of other work with drawings or templates showing location of inserts for stone anchors and supports.

B. Clean stone before setting by thoroughly scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives. If not thoroughly wet at time of setting, drench or sponge stone. Do not wet expansion or control joint surfaces.

3.2 INSTALLATION:

A. Execute stonework by skilled mechanics, and employ skilled stone fitters at the site to do necessary field cutting as stone is set.

B. Contiguous Work: Provide chases, reveals, reglets, openings and other spaces as shown or required for contiguous work. Close-up openings in stonework after other work is in place. Use materials and set to match surrounding stonework.

C. Ferrous Metal: Where stonework will contact ferrous metal surfaces which will be concealed in back-up construction (anchors, supports, structural framing and similar surfaces), apply a heavy coat of bituminous paint on metal surfaces, prior to setting of stone. Do not extend coating onto portions of ferrous metal which will be exposed in finished work. Do not apply coating to stainless or non-ferrous metals.

D. Provide expansion joints where shown. Do not fill with mortar. Install continuous strips of preformed joint filler to allow for installation of backer rod and sealant, specified in Division 7.

E. Set stone in accordance with drawings and final shop drawings for stonework. Provide anchors, supports, fasteners and other attachments shown or necessary to secure stonework in place. Shim and adjust accessories for proper setting of stone. Completely fill holes, slots and other sinkages for anchors, dowels, fasteners and supports with mortar during setting of stones.

F. Allowable Tolerances:

(1) Variation from Plumb: For lines and surfaces of columns, walls and arises, do not exceed 1/4" in 10', 3/8" in a story height or 20' maximum, nor 1/2" in 40' or more. For external corners, expansion joints and other conspicious lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more.

(2) Variation from Level: For grades shown for exposed lintels, sills, parapets, horizontal grooves and other conspicious lines, do not exceed 1/4" in any bay or 20' maximum, nor 3/4" in 40' or more.

(3) Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.

(4) Variation in Cross-Sectional Dimensions: For columns and thickness of walls from dimensions shown, do not exceed minus 1/4", no plus 1/2".

(5) Variation in Surface Plane of Flooring: Do not exceed 1/8" in 10'-0" from level or slope indicated when tested with a 10'-0" straight edge.

G. Exterior Walls: Erect walls plumb and true with joints uniform in width and accurately aligned. Set in full bed of mortar, unless otherwise indicated. Provide setting buttons as required to prevent extrusion of mortar. Do not set units above until mortar in courses below is set sufficiently to maintain alignment and prevent extrusion.

H. Installation of Interior Wall Facing and Trim:

(1) Erect interior wall facing and trim and plumb and true with joints uniform in width and accurately aligned. Provide setting buttons as required to maintain joint width.

(2) Set Interior stone units firmly against plaster spots located at or near the anchors and spaced not further than 18" apart over the back of the piece, unless otherwise indicated.

(3) For interior stone units applied to inside face of exterior walls and similar locations where stone units or setting cavity will be exposed to moisture from condensation, moisture migration, high humidities of other causes, use mortar in lieu of plaster for setting spots.

(4) Butter vertical joints for full width before setting and set units in full bed of mortar, unless otherwise indicated. Rake out joints before mortar is set to allow for sealant pointing as shown. Refer to Division 7 sections for backer rod and sealant.

Where joints are shown to be set on shims without mortar, provide quantity for shims required to maintain uniform joint width and alignment of stone units. Sealing joints is specified under Division 7, Section "Joint Sealers".

I. Stone Flooring Set in Portland Cement Mortar Bed:

1. Saturate concrete subfloor with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

2. Apply slush coat of cement grout over surface of concrete subfloor about 15 minutes prior to placing setting bed. Limit area to avoid its drying out prior to placing setting bed. Mix slush coat to a consistency similar to that of thick cream and consisting of either neat cement and water or cement, sand and water. Do not exceed 1/16" thickness for cement slush coat.

3. Cover subfloor with cleavage membrane, lapping joints ot less than 3".

4. Mix setting bed in proportions of one bag of portland cement to 3 parts sand (measured in damp loose condition) to quantity of water to produce a stiff mixture with a moist surface when setting bed is ready to receive stone flooring.

5. Spread and screen setting bed to uniform thickness indicated to produce subgrade elevations required for accurage setting of stone to finished floor elevations shown. Mix and place only the amount which can be covered with stone prior to initial set. Cut back, bevel edge, remove and discard setting bed material which has reached initial set prior to placing stone.

6. Place metal reinforcement approximately in center of setting bed.

7. Butter backs of stone flooring units with skim coat of neat cement and water just prior to placing it on bed.

8. Tamp stone flooring units until firmly bedded to proper finished floor elevation indicated. Set and level each stone unit in single operation, prior to initial set of cement bed; do not return to areas already set and disturb stone for leveling purposes.

   Joint width shall be 1/16".

J. Grouting Stone Flooring:

1. Fill joints in stone flooring units with grout of color indicated, except at expansion and control joints indicated to be filled with sealant. Finish grout flush with finished surface of stone. Fill all gaps and skips to produce a finished joint which is uniform in color, smooth and without voids, pinholes, or low spots.

2. Remove grout spillage from face of stone as work progresses.

3. Cure grout by maintaining in a moist condition for 7 days.

4. Do not permit traffic on stone flooring during setting of units or for at least 24 hous after final grouting of joints.

K. Cavity Construction: Where open space between back of stone units and back-up or framing is shown, keep cavity open; do not fill with mortar or grout. Paint back-up wall with non-staining, asphalt emulsion dampproofing, or cement-base masonry dampproofing compound. Wherever possible, apply compound to back of stone units and joints after setting.

3.3 ADJUST AND CLEAN:

A. Remove and replace stone units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining stonework. Provide new matching units, install as specified and point-up joints to eliminate evidence of replacement. Repoint defective and unsatisfactory joints as required to provide a neat, uniform appearance.

B. Clean stonework not less than 6 days after completion of work, using clean water and stiff-bristle brushes. Do not use wire brushes, acid type cleaning agents or other cleaning compounds with caustic or harsh fillers.

C. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures stonework being without damage, discolorations, or deterioration during subsequent construction and until time of substantial completion.

END SECTION

SECTION 04424 - RUBBLE STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to work of this section.

B. Installation of stone masonry units is specified in Section 04200 "Unit Masonry".

1.2 DESCRIPTION OF WORK:

Extent of rubble stone masonry unit work is shown on drawings.

1.3 QUALITY ASSURANCE:

A. Obtain stone masonry units from one producer, of uniform texture and color (or uniform blend in the variation thereof) for each continuous area and for visually related areas.

B. Job Mock-Up

(1) Prior to installation of stonework, provide sample panels of stonework indicated with proposed range of color, texture and workmanship to be expected in completed work. Build mock-up at site, as directed, using stone, anchors and jointing, as shown and specified in accordance with final shop drawings. Mock-up may be incorporated into final work (Contractor's option).

(2) Obtain Architect's acceptance of visual qualities of sample panels before start of stonework. Replace unsatisfactory mock-up work, as directed, until acceptable to Architect. Retain sample panels during construction as a standard for judging completed stonework. Do not alter, move or destroy mock-up until work is completed.

(3) If sealant primers, sealants, resin-adhesives, water repellents and other compounds are required in the finished stonework, build mock-up and apply compounds in sufficient time to allow for final test for staining or other deleterious effects from such application.

1.4 SUBMITTALS:

A. Product Data:

Submit stone producers data for each type of stone masonry unit required. Include instructions for handling, storage, installation and protection.

B. Samples:

Submit 5 samples of each type of stone masonry unit. Include in each set full range of exposed color and texture to be expected in completed work. Architect's review will be for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 RUBBLE STONE MASONRY:

Provide stone masonry units of the size and shape indicated and as follows:

A. Granite SMU, "Berkeley" by Georgia Granite.

B. Pattern, random rubble (web wall). Pattern shall match east end of wall on north side of 10th street between Spring Street and W. Peachtree St. in Atlanta.

C. Rubble stone sizes: 1/4 sq. ft. to 2 sq. ft.

PART 3 - EXECUTION

3.1 INSTALLATION:

Install stone masonry units as specified in Section 04200, "Unit Masonry".

END OF SECTION 04424

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of structural steel is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.

C. Miscellaneous Metal fabrications are specified elsewhere in Division 5.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

AISC "Code of Standard Practice for Steel Buildings and Bridges"

(2) AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.

(3) AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

(4) AWS D1.1 "Structural Welding Code".

(5) ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

(1) If recertification of welders is required, retesting will be Contractor s responsibility.

1.4 SUBMITTALS:

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

(1) Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

(2) High-strength bolts (each type), including nuts and washers.

(3) Structural steel primer paint.

(4) Shrinkage-resistant grout.

B. Shop Drawings: Submit shop drawings prepared under supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members procedures and diagrams.

Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.

(1) Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.

C. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time as not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Structural Steel Shapes, Plates and Bars: ASTM A 36

C. Cold-Formed Steel Tubing: ASTM A 500, Grade B, FY = 46KSI

D. Steel Pipe: ASTM A 53, Type E, Grade B, FY = 35KSI

E. Steel Castings: ASTM A 27, Grade 65-35, medium-strength carbon steel.

F. Anchor Bolts: ASTM A 325, nonheaded type unless otherwise indicated.

G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

(1) Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.

(2) Quenched and tempered alloy steel bolts, nuts and washers, complying with ASTM A 490.

H. Direct tension indicator washers may be used at Contractor's option.

I. Electrodes for Welding: Comply with AWS Code

J. Structural Steel Primer Paint: Fabricator's standard rust-inhibiting primer, subject to architect's approval, or red lead and oil, TT-P-86, Type I.

K. Non-Metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

(a) Products: Subject to compliance with requirements, provide one of the following:

Euco N.S.; Euclid Chemical Co.
Crystex; L&M Construction Chemicals
Masterflow 713; Master Builders
Five Star Grout; U.S. Grout Corp.
Upcon; Upco Chemical Div., USM Corp.
Propak; Protex Industries, Inc.

2.2 FABRICATION:

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections: All connections not detailed on the drawings shall be designed to conform to the requirements of the AISC Standards previously cited in this Section. Where connections are indicated on the contract drawings, no deviation from the type and method thereof shall be made without the approval of the Architect. One-sided or other types of eccentric connections will not be permitted without the approval of the Architect. Standard connections shall be used wherever possible. Connections shall be designed to provide for the reaction due to the maximum uniformly distributed load that the member is capable of carrying for its span, based upon allowable unit stresses for the construction or the reactions indicated on the drawings, whichever is greater, unless otherwise noted. In addition, such connections shall be designed to transmit properly the total reactions, moments, and stresses that are indicated on the contract drawings or can be reasonably inferred from the information given on the drawings without exceeding the allowable unit stresses. Provide web stiffeners in all girders and beams at points of concentrated loads. Shop connections shall be high-strength bolted, or welded except as noted on the drawings.

(1) Bolt field connections, except where welded connections or other connections are indicated.

C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 (RCRDSJ). Connections shall be friction type - 3/4" minimum.

D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

(1) Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

E. Steel Wall Framing: Select members which are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square and true members in completed wall framing.

Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth.

Plug weld steel bar stops to frames, except where shown removable. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10" o.c., unless otherwise indicated.

F. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

(1) Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

(2) Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING:

A. General: Shop paint structural steel.

(1) Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.

(2) Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

(1) SP-2 "Hand Tool Cleaning" for steel to be shop painted only

(2) SP-7 "Brush-Off Blast Cleaning" for steel to receive finish paint

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods which result in full coverage of joints, edges and exposed surfaces.

PART 3 - EXECUTION

3.1 ERECTION:

A. Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

(1) Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

(2) Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

E. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

F. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protuding, cut off flush with edge of base or bearing plate prior to packing with grout.

G. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

(1) For proprietary grout materials, comply with manufacturer's instructions.

H. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustements to compensate for discrepancies in elevations and alignment.

Level and plumb individual members of structure within specified AISC tolerances.

Splice members only where indicated and accepted on shop drawings.

I. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

J. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

(1) Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

K. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

L. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

(1) Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

3.2 QUALITY CONTROL:

A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

(1) Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations thereform. Reports shall be distributed as follows: Architect (2), Owner (1), Engineer (1), Contractor (1).

(2) Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

(3) Testing agency may inspect structural steel at plant before shipment; however, Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

B. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

C. Shop Bolted Connections: Inspect in accordance with AISC specifications.

D. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:

(1) Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

(2) Perform visual inspection of all welds.

(3) Perform tests of welds as follows. Inspection procedures listed are to be used at testing agency's option.

(a) Fillet Welds:

- Liquid Penetrant Inspection - ASTM E 165

- Magnetic Particle Inspection - ASTM E 109; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

(b) Full Penetration Welds:

- Radiographic Inspection - ASTM E 94 and ASTM E 142; minimum quality level "2-2T".

- Ultrasonic Inspection - ASTM E 164.

E. Field Bolted Connections: Inspect in accordance with AISC specifications.

F. Field Welding: Inspect and test during erection of structural steel as follows:

(1) Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

(2) Perform visual inspection of all welds.

(3) Perform tests of welds as follows. Inspection procedures listed are to be used at testing agency's option.

(a) Fillet Welds:

- Liquid Penetrant Inspection - ASTM E 165

- Magnetic Particle Inspection- ASTM E 109; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

(b) Full Penetration Welds:

- Radiographic Inspection - ASTM E 94 and ASTM E 142, minimum quality level "2-2T".

- Ultrasonic Inspection - ASTM E 164

END OF SECTION

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of steel joists is shown on drawings, including basic layout and type of joists required.

1.3 QUALITY ASSURANCE:

A. Provide joists fabricated in compliance with the following, and as herein specified.

(1) Steel Joist Institute (SJI) Standard Specifications, Load Tables and Weight Tables for:

(a) H-Series Open Web Steel Joists
(b) VH-Series Open Web Steel Joists
(c) LH-Series Open Web Steel Joists

B. Bar joists shall be designed to resist a gross uplift force of 30 PSF.

C. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society (AWS) "Standard Qualification Procedure".

Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of steel joists for testing purposes will be born by Owner if welds are found to be satisfactory. Remove and replace work found to be defective and provide new acceptable work.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI "Specifications".

B. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, jointing and accessories. Include mark, number, type, location and spacing of joists and bridging.

(1) Provide templates or location drawings for installation of anchor bolts.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver, store and handle steel joists as recommended in SJI "Specifications". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Steel: Comply with SJI "Specifications".

B. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.

C. Steel Prime Paint: Comply with SJI "Specifications".

D. Bedding Mortar: For joist ends bearing on concrete or masonry, provide mortar as follows:

(1) Portland cement and sand, mixed at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with enough water for placement and hydration.

(2) Non-metallic shrinkage-resistant mortar; premixed, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

(a) Products offered by manufacturers to comply with requirements for non-metallic, non-shrink mortar include the following:

Euco N.S.; Euclid Chemical Co.
Crystex; L & M Construction Chemicals
Masterflow 713; Master Builders
Five Star Grout; U.S. Grout Corp.
Upcon; Upco Chem.Div., USM Corp.
Propak; Protex Industries, Inc.

2.2 FABRICATION:

A. General: Fabricate steel joists in accordance with SJI "Specification".

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however deduct area of holes from the area of chord when calculating strength of member.

C. Extended Ends: Provide extended ends on joists where shown; complying with manufacturer's standards and requirements of applicable SJI "Specifications" and load tables.

D. Ceiling Extensions: Provide ceiling extensions in areas having ceiling attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2" of finished wall surface unless otherwise indicated.

E. Bridging: Provide diagonal bype bridging for "open web" joists, complying with SJI "Specifications". Use minimum angle size of 1-1/2" X 1-1/2" X 1/8".

Provide bridging anchors for ends of bridging lines terminating at walls or beams.

F. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI "Specifications", unless otherwise idnicated.

G. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.

H. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.

Apply one shop coat of primer paint to steel joists and accessories, by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 0.50 mil.

PART 3 - EXECUTION

3.1 ERECTION:

A. Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.

B. Anchors: Furnish anchor bolts and other devices to be built into concrete and masonry construction.

(1) Furnish unfinished threaded fasteners for anchor bolts, unless otherwise indicated.

(2) Refer to Division-3 sections for installation of anchors set in concrete.

(3) Refer to Division-4 sections for installation of anchors set in masonry.

C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.

(1) Where "open web" joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.

D. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

E. Fastening Joists:

(1) Field weld joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.

(2) Bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used.

(a) Provide unfinished threaded fasteners for bolted connections (if required), unless otherwise indicated.

F. Touch-Up Painting: After joist installation, paint field bolt head and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use same type of paint as used for shop painting.

END OF SECTION

SECTION 05300 - METAL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of metal decking is indicated on drawings, including basic layout and type of deck units required.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated or specified:

(1) AISI "Specification for the Design of Cold-Formed Steel Structural Members".

(2) AWS "Structural Welding Code".

(3) SDI "Design Manual for Floor Decks and Roof Decks".

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

Welding decking in place is subject to inspection and testing. Expense of removing and replacing portions of decking for testing purposes will be borne by Owner if welds are found to be satisfactory. Remove work to be defective and replace with new acceptable work.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these specifications.

B. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

(1) Metal Roof Deck Units:

Bowman/E.G. Smith, Div. Cyclops Corp.
Consolidated Systems, Inc.
Epic Metals Corp.
Mac-Fab Products, Inc.
Roll Form Products, Inc.
United Steel Deck, Inc.
Vulcraft/Div. Nucor Corp.
Wheeling Corrugating Co.
Wolverine Deck Co.

(2) Composite Metal Floor Deck Units:

Bowman/E.G. Smith, Div. Cyclops Corp.
Consolidated Systems, Inc.
Epic Metals Corp.
Mac-Fab Products, Inc.
Roll Form Products, Inc.
United Steel Deck, Inc.
Vulcraft/Div. Nucor Corp.
Wheeling Corrugating Co.

2.2 MATERIALS:

A. Steel for Galvanized Metal Deck Units: ASTM A 446, Grade A

B. Miscellaneous Steel Shapes: ASTM A 36.

C. Sheet Metal Accessories: ASTM A 526, commecial quality, galvanized

D. Galvanizing: ASTM A 525, G60

E. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Military Specifications MIL-P-21035 (Ships).

F. Flexible Closure Strips: Manufacturer's standard vulcanized closed-cell, synthetic rubber.

G. Acoustic Sound Barrier Closures: Manufacturer's standard mineral fiber closures.

2.3 FABRICATION:

A. General: Form deck units in lengths to span 3 or more supports, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated.

B. Roof Deck Units: Provide deck configurations complying with SDI "Roof Deck Specifications", of metal thickness, depth and width as shown.

C. Open-Beam Metal Floor Deck Units: Provide fluted sections of metal thickness, depth and width as shown.

D. Open-Beam Composite Units: Fabricate deck units with integral embossing or raised pattern to furnish mechanical bond with concrete slabs. Fabricate open-beam deck units with fluted section having interlocking side laps; of metal thickness, depth and width as shown.

E. Metal-Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6" wide.

F. Roof Sump Pans: Fabricate from single piece of 0.071" min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1-1/2" below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.

Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.

Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.

Do not place deck units on concrete supporting structure until concrete has cured and is dry.

Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

Do not use floor deck units for storage or working platforms until permanently secured.

B. Fastening Deck Units:

(1) Fasten floor deck units to steel supporting members by not less than 3/4" diameter fusion welds or elongated welds of equal strength, spaced not more than 12" o.c. with a minimum of 2 welds per unit at each support.

Tack weld or use self-tapping No. 8 or larger machine screws at 4'-0" o.c. for fastening end closures.

(2) Fasten roof deck units to steel supporting members by not less than 1/2" diameter fusion welds or elongated welds of equal strength, spaced not more than 12" o.c. at every support, and at closer spacing where required for lateral force resistance. In addition, secure deck to each supporting member in ribs where side laps occur

(3) Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

(a) Use welding washers where recommended by deck manufacturer.

(4) Mechanically fasten side laps of adjacent deck units between supports, at intervals not exceeding 36" o.c., using self-tapping No. 8 or larger machine screws.

(5) Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 50 lbs. per sq. ft. at eave overhang and 30 lbs. per sq. ft. for other roof areas.

(6) Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.

(7) Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

(8) Hanger Slots or Clips: Provide UL approved punched hanger slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.

(a) Hanger clips designed to clip over male side lap joints of floor deck units may be used instead of hanger slots.

(b) Locate slots or clips at not more than 14" o.c. in both directions, not over 9" from walls at ends ends, and not more than 12" from walls at sides, unless otherwise shown.

(c) Provide manufacturer's standard hanger attachment devices.

(9) Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.

(10) Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12" o.c. with at least one weld at each corner. Cut opening in roof sump bottom to accommodate drain size indicated.

(11) Cant Strips: Weld to top surface of roof decking, and secure to wood nailers with galvanized nails, and to steel framing with welds at 12" o.c. Lap end joints not less than 3", and secure with galvanized sheet metal screws.

(12) Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

(13) Touch-Up Painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

(a) Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer°s instructions.

END OF SECTION

SECTION 05400 - LIGHTGAGE METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of lightgage framing is shown on drawings.

B. Types of lightgage metal framing units include the following:

(1) Load bearing punched studs

(2) "C" shaped steel joists

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Compute structural properties of studs and joists in accordance with AISC "Specification for Design of Cold-Formed Steel Structural Members".

B. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units which have been approved by governing authorities having jurisdiction.

C. Qualifications: The light gauge steel framing contractor shall have experience in the fabrication and erection of Light Gauge Steel Systems of scope and design similar to the required work. Contractor shall have a minimum of three years consecutive experience on projects of a similar nature.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product information and installation instructions for each item of lightgage framing and accessories.

B. Shop Drawings: Submit shop drawings detailing both fabrication and erection procedures.

(1) Include placing drawings for framing members showing size and gage designations, number, type, location and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installations.

1.5 DELIVERY AND STORAGE:

A. Protect metal framing units from rusting and damage. Deliver to project site in manufacturer s unopened containers or bundles, fully identified with name, brand, type and grade. Store off ground in a dry ventilated space or protect with suitable waterproof coverings.

PART 2 - PRODUCTS

2.1 METAL FRAMING:

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

B. Materials and Finishes:

(1) For 16-gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.

(2) For 18-gage and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.

(3) Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating.

(4) Punched "C" Shape Studs: Manufacturer's standard, factory punched, load-bearing steel studs of size, shape, and gage indicated, with 1.625" flange and flange return lip.

(a) Manufacturer: Subject to compliance with requirements, provide punched "C" shape, load-bearing steel studs of one of the following:

- Alabama Metal Industries Corp.
- Allied Structural Industries
- Bostwick Steel Framing Co.
- Ceco Corp.
- Dale Industries, Inc.
- Inryco/Milcor
- Monex Corp.
- U.S. Gypsum
- Wheeling Corrugating Co.

(5) Joists: Manufacturer's standard C-shape sections of size, shape and gage indicated.

(a) Manufacturer: Subject to compliance with requirements, provide "C"-shaped steel joists of one of the following:

- Alabama Metal Industries Corp.
- Allied Structural Industries
- Ceco Corp.
- Dale Industries,Inc.
- Inryco/Milcor
- Marino Industries Corp.
- Monex Corp.
- U.S. Gypsum
- Wheeling Corrugating Co.

2.2 FABRICATION:

A. General: Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion.

B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.

Wire tying of framing components is not permitted.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Manufacturer's Instructions: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.

B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or power-driven fasteners, or 16" o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.

E. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendatins and industry standards in each case, considering weight or loading resulting from item supported.

F. Installation of Wall Stud System: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.

G. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer s instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

H. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.

I. Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 4'-6" o.c. Weld at each intersection.

J. Installation of Joists: Install level and plumb, complete with bracing and reinforcing as indicated on drawings. Provide not less than 1-1/2" end bearing.

Reinforce ends with end clips, steel hangers, steel angle clips, steel stud section, end grain wood block, or as otherwise recommended by joist manufacturer.

Where required, reinforce joists at interior supports with single short length of joist section located directly over interior support, snap-on shoe, 30% side-piece lapped reinforcement, or other method recommended by joist manufacturer.

Secure joists to interior support systems to prevent lateral movement of bottom flange.

K. Field Painting: Touch-up shop-applied protective coatings damaged during handling and installation. Use galanizing repair paint for galvanized surfaces.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Definition: Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

Types of work in this section include metal fabrications for:

Rough hardware.

Ladders.

Ladder safety cages.

Nosings.

Loose bearing and leveling plates.

Loose steel lintels.

Miscellaneous framing and supports.

Miscellaneous steel trim.

Shelf angles.

Trench Drains.

Steel pipe railings.

Metal Stairs.

Pipe Bollards.

Metal Gates

Expanded Metal

C. Structural steel is specified in another section within Division 5.

1.3 QUALITY ASSURANCE:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Dissasemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

Where materials or fabrications are indicated to comply with certain requirements for design loadings include structural computations, material properties and other information needed for structural analysis.

C. Samples: Submit 2 sets of representative samples of materials and finished products as may be requested by Architect.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Metals:

(1) Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

(2) Steel Plates, Shapes and Bars: ASTM A 36.

(3) Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

(4) Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1, of grade required for design loading.

(5) Galvanized Structural Steel Sheet: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.

(6) Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.

(7) Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

(8) Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

(9) Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B. Grout:

Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD- C588. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

C. Fasteners:

(1) General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

(2) Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

(3) Lag Bolts: Square head type, FS FF-B-561.

(4) Machine Screws: Cadmium plated steel, FS FF-S-92.

(5) Wood Screws: Flat head carbon steel, FS FF-S-111.

(6) Plain Washers: Round, carbon steel, FS FF-W-92.

(7) Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

(8) Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

(9) Lock Washers: Helical spring type carbon steel, FS FF-W-84.

D. Paint:

(1) Metal Primer Paint: Red lead mixed pigment, alkyd varnish, linseed oil paint, FS TT-P-86, Type II, or red lead iron oxide, raw linseed oil, alkyd paint, Steel Structures Painting Council (SSPC) Paint 2-64; or basic lead silico chromate base iron oxide, linseed oil, alkyd paint, FS TT-P-615, Type II.

(2) Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.

(3) Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships).

2.2 FABRICATION, GENERAL:

A. Workmanship:

Use materials of size and thickness indicated or, if not indicated as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.

(1) Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown.Form bent- metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

(2) Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

(3) Form exposed connection with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts.

Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

B. Galvanizing:

(1) Provide a zinc coating for those items shown or specified to be galvanized, as follows:

ASTM A 153 for galvanizing iron and steel hardware.

ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.

ASTM A 386 for galvanizing assembled steel products.

(2) Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

C. Shop Painting:

(1) Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.

(2) Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC-SP-2 "Hand Tool Cleaning", or SSPC SP-3 "Power Tool Cleaning", or SSPC SP-7 "Bruch-Off Blast Cleaning".

(3) Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".

(4) Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.

(5) Apply one shop coat to fabricated metal items, except apply 2 coats of paint to surfaces inaccessible after assembly or erection.Change color of second coat to distinguish it from the first.

2.3 MISCELLANEOUS METAL FABRICATIONS:

A. Rough Hardware:

Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Ladders:

(1) Fabricate ladders for the locations shown, with dimensions, spacings, and details as indicated. Comply with the requirements of ANSI A14.3, except as otherwise indicated.

Unless otherwise shown, provide 1/2" x 2-1/2" continuous structural steel flat bar side rails with eased edges, spaced 18" apart.

Provide 3/4" diameter solid structural steel bar rungs, spaced 12" o.c.

(2) Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

(3) Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder clear of the wall surface with a minimum of 7" clearance from wall to centerline of rungs. Extend rails 42" above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.

(4) Provide non-slip surface on the top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

(5) Provide sloping ladders (ship's ladders) where indicated. Fabricate of open type construction with structural steel channel or steel plate stringers, pipe handrails, and open steel grating treads, unless otherwise indicated. Provide all necessary brackets and fittings for installation.

C. Ladder Safety Cages:

Fabricate ladder safety cages from structural steel flat bars, assembled by welding or riveting. Unless otherwise shown, provide 5/16" x 4" top and bottom hoops and intermediate hoops spaced not more than 20'-0" o.c.; 5/16" x 2" hoops at 4"-0" o.c. between the 4" wide hoops; and 5/16" x 2" vertical bars, secured to each hoop. Space vertical bars approximately 9" o.c. Fasten assembled safety cage to ladder rails and adjacent construction as indicated.

D. Nosings:

(1) Provide curb nosings fabricated of structural steel shapes as shown, of all welded construction with mitered corner and continuously welded joints. Provide anchors welded to nosings for embedding in concrete or masonry construction, spaced not more than 6" from each curb end, 6" from corners and 24" o.c., unless otherwise shown.

(2) Galvanize exterior nosings.

E. Loose Bearing and Leveling Plates:

Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

F. Loose Steel Lintels:

(1) Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 8" bearing at each side of openings, unless otherwise indicated.

(2) Galvanize loose steel lintels to be installed in exterior walls.

G. Miscellaneous Framing and Supports:

(1) Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.

(2) Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing.Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

(3) Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

Except as otherwise shown, space anchors 24" o.c. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.

(4) Galvanize exterior miscellaneous frames and supports.

H. Miscellaneous Steel Trim:

(1) Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

(2) Galvanize exterior miscellaneous steel trim.

I. Shelf Angles:

(1) Provide structural steel shelf angles of sizes shown for attachment to concrete framing. Provide slotted holes to receive 3/4" bolts, spaced not more than 6" from ends and not more than 24" o.c., unless otherwise indicated.

(2) Galvanize shelf angles to be installed on exterior concrete framing.

(3) Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in-place concrete.

J. Trench Drains:

Provide manufacturer's standard cast-iron trench with grated cover and end outlet:

Acceptable: Neenah R-4996-A3.

K. Steel Pipe Railings and Handrails:

Fabricate steel pipe railings and handrails to design, dimensions, and details indicated. Provide railings and handrail members formed of pipe of sizes and wall thickness indicated, or if not shown, as required to support design loading.

(1) Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless as otherwise indicated.

a). At tee and cross intersections provide coped joints.

b). At bends interconnect pipe by means of prefabricated elbow fittings or flush radius bends, as applicable, of radiuses indicated.

(2) Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of pipe.

(3) Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.

(4) Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated welding fittings.

(5) Brackets, Flanges, Fittings and Anchors: Provide malleable iron wall brackets, and formed end closures, flanges, miscellaneous fittings and anchors for interconnection of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

(6) For railing posts set in concrete provide sleeves of galvanized steel pipe not less than 6" long and with an inside diameter not less than 1/2" greater than the outside diameter of pipe. Provide steel plate closure welded to bottom of sleeve and of width and length not less than 1" greater than outside diameter of sleeve.

L. Cast Treads and Thresholds:

(1) Fabricate cast tread nosings of material type, sizes and configurations as shown. If not shown, provide cast iron units with integral abrasive finish. Furnish in lengths as required to accurately fit each opening or conditions.

Cast units with a removable abrasive grit insert consisting of aluminum oxide, silicone carbide, or a combination of both.

(2) Provide a fluted surface texture in thresholds.

(3) Provide anchors for embedding units in concrete, either integral or applied to units, as standard with the manufacturer.

(4) Apply black asphaltic coating to concealed bottoms, sides, and edges of cast iron units set into concrete.

M. Steel Framed Stairs:

(1) General: Construct stairs to conform to sizes and arrangements shown; joint pieces together by welding unless otherwise indicated. Provide complete stair assemblies including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure.

(2) Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as shown. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as shown. Bolt or weld headers to stringers and newels and framing members to stringers and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

Where masonry walls support steel stairs, provide temporary supporting struts designed for erection of steel stair components before installation of masonry.

(3) Metal Pan Risers, Subtreads, and Subplatforms: Shape metal pans for risers and subtreads to conform to configuration shown. Provide thicknesses of structural steel sheet for metal pans indicated but not less than that required to support total design loading.

(4) Form metal pans of hot-rolled or cold-rolled carbon steel sheet, unless otherwise indicated.

(5) Attach risers and subtreads to stringers by means of brackets made of steel angles or bars. Weld brackets to strings and attach metal pans to brackets by welding, riveting or bolting.

(6) Provide subplatforms of configuration and construction indicated, or if not indicated, of same metal as risers and subtreads and in thicknesses required to support design loading. Attach subplatform to platform framing members with welds.

(7) Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this section for steel pipe railings and handrails, and as follows:

(8) Expanded Metal for security protection shall be: USB 3.4 lbs. diamond mesh lath.

Connect railing posts to stair framing by direct welding, unless as otherwise indicated.

N. Pipe Bollards: Provide galvanized steel pipe bollards as detailed. Fill with concrete and round top so water will drain.

O. Expansed Metal: Used behind spandrel panels and other areas as security protection shall be 1/2"-16 gauge Flattened Carbon Steel

P. Metal Gates: Fabricate gates of metals recommended by fabricator. Comply with details on Drawings. Provide paint finish specified in Section 0990 for steel railings.

PART 3 - EXECUTION

3.1 PREPARATION:

Coordinate and furnish anchorages, setting drawings, diagrams, templated, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION:

A. General:

(1) Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

(2) Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

(3) Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

(4) Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

B. Setting Loose Plates:

(1) Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

(2) Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

(3) Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

C. Steel Pipe Railings and Handrails:

(1) Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

(2) Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.

(3) Leave anchorage joint exposed; wipe off excess grout and leave 1/8" build-up, sloped away from post. For installation exposed on exterior or to flow of water, seal grout to comply with grout manufacturer's directions.

(4) Anchor posts to steel with welds. Grind smooth.

(5) Anchor rail ends into concrete and masonry with steel round flanges welded to rail end and anchored into wall construction with lead expansion shields and bolts or toggle bolts.

(6) Anchor rail ends to steel with welds. Grind Smooth.

(7) Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows:

a. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

b. For concrete and solid masonry anchorage, use drilled-in expansion shield or concealed hanger bolt lag bolt, as applicable.

c. For hollow masonry anchorage, use toggle bolts having square heads.

d. For stud partitions use lag bolts set into wood backing between studs. Coordinate with stud installations for accurate location of backing members.

3.3 ADJUST AND CLEAN:

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry fil thickness of 2.0 mils.

B. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 of these specifications.

C. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply 2 coats of galvanizing repair paint.

END OF SECTION 05500

SECTION 05520 - HANDRAILS AND GUARDRAIL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of handrails and guardrails is indicated on drawings and includes miscellaneous handrails and guardrails not included in other sections of these specifications.

B. Types of handrails and guardrails required include the following:

(1) Polished bronze pipe handrails, 1 1/2" outside diameter.

(2) Polished 2 1/2" outside diameter ornamental bronze and painted steel guardrails.

C. Steel pipe handrails and railings are specified in another Division-5 section, "Metal Fabrication".

1.3 SYSTEM PERFORMANCES:

A. Structural Performances: Provide railing and handrail assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

(1) Handrails and Toprails: Capable of withstanding a concentrated load of 200 lbf appied at any point in any direction.

(2) Guards: Intermediate rails, capable of withstanding a uniform load of 25 lbf per sq. ft. of gross area of guard, including any open areas, of which they are a part.

1.4 QUALITY ASSURANCE:

Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications and installation instructions for products and processes used in handrails and railings, including finishes and grout.

B. Shop Drawings: Submit shop drawings for fabrication and erection of handrails and railings. Include plans, elevations and details of fittings, connections and anchorages to other work. Provide templates for anchor and bolt installation by others.

Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis.

C. Samples: Submit samples for each type of metal finish indicated. Prepare samples on metal on same gage and alloy to be used in work. Where normal color and texture variations are to be expected, provide "range" samples showing limits of such variations.

Include 6" long samples of distinctly different railing members including handrails, toprails, and posts. Include samples of fittings and brackets if requested by Architect.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Subject to compliance with requirements, provide products of one of the following:

Julius Blum & Co., Inc.
J. G. Braun Co.
Livers Bronze Company.
Newman Brothers, Inc.
Stain-Rail Systems, Inc.
Tube Specialties Company, Inc.
York Metal Fabricators, Inc.
Zephyr Metalcraft.

2.2 MATERIALS:

A. Metals: Comply with standards indicated for forms and types of metals indicated or required for handrail and railing components.

(1) Bronze:

Alloy and Temper: Provide alloy and temper recommended by producer or finisher for type of use and finish indicated.

a. Finish: #8 polished.

b. Size: 1 1/2" outside diameter handrails; 125" wall thickness.

2 1/2" outside diameter guard toprails; 125" wall thickness.

See drawings for specific locations.

(2) Steel:

a. Tubing: Cold-formed, ASTM A 500; or hot-rolled, ASTM A 501.

b. Steel Plates, Shapes and Bars: ASTM A 36.

c. Malleable Iron Castings: ASTM A 47, grade as recommended by fabricator for type of use indicated.

B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, and as required for color match, strength and compatibility in fabricated items.

C. Fasteners: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.

(1) Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.

(2) Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Anchors and Inserts: Provide anchors of proper type, size, and material for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use non-ferrous metal of hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

E. Primer Paint for Ferrous Metals: Manufacturer's standard rust-inhibiting primer; compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.

2.3 FABRICATION:

A. General: Fabricate handrails and guardrails to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to support the design loadings indicated.

B. Nonwelded Connections: Fabricate polished bronze toprail for interconnection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

C. Welded Connections: Fabricate steel railings for interconnections of members by welding. Preassemble railing units to maximum extent practicable and consistent with shipping and handling limitations. Perform welding to comply with applicable AWS specifications, using method appropriate for metal and finish indicated. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

D. Form bends by use of prefabricated elbow fittings and radius bends, as appilcable, of radiuses indicated, except where configuration indicated requires bending of railing members.

E. At elbow bends provide mitered joints.

F. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of handrail and railing components.

G. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings and anchors for interconnections of handrail and railing members to other work, unless otherwise indicated. Furnish inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate and space anchorage devices as indicated and as required to provide adequate support. Coordinate anchorage devices with supporting structure.

Provide slip-fit metal sockets to receive railing posts. Secure posts with set screws.

2.4 METAL FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

B. Polished Bronze Finish:

AISI No. 8 Finish: (Mirror-like, reflective, non-directional polish).

C. Ferrous Metal Paint Finish:

(1) Preparation: Clean surfaces of dirt, grease and loose rust or mill scale, including items fabricated from galvanized steel, if any, followed by a conversion coating of type suited to organic coating applied over it.

(2) Factory Primed Finish: Apply air-dried primer immediately following cleaning and pretreatment, to provide a minimum dry film thickness of 2.0 mils per applied coat, to surfaces which will be exposed after assembly and installation, and to concealed, non-galvanized surfaces.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts amd miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.

B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for adjustments during installation where taking field measurements before fabrication might delay work.

3.2 INSTALLATION:

A. General:

(1) Fit exposed connections accurately together to form tight, hairline joints.

(2) Perform cutting, drilling and fitting required for installation of handrails and railings. Set work accurately in location, alignment and elevations, plumb, level, true and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of handrails and railing components which have been coated or finished after fabrication, and are intended for field connection by mechanical means without further cutting or fitting.

B. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality, of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat.

C. Adjust handrails and railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated.

D. Railing Connections:

Permanently connect railing components together using manufacturer's standard mechanical or method and fittings, unless otherwise indicated. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railings.

E. Anchoring Handrail Ends:

Anchor railing ends into concrete or masonry with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.

Anchor railing ends to metal surfaces with manufacturer's standard fittings using concealed fasteners, unless otherwise indicated.

Attachment of Handrails to Walls:

General: Secure handrails to walls with manufacturer's standard wall brackets and end fittings, unless otherwise indicated.

For concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.

For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.

For stud partitions use lag bolts fastened to wood blocking between studs. Coordinate with spacing of studs for accurate location of blocking members.

3.3 ADJUST AND CLEAN:

Protect finishes of railings and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at project completion or when directed by Architect. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items, which cannot be refinished in the field, to the shop; make required alterations and refinish entire unit, or provide new units as required.

Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

END OF SECTION 05520

SECTION 05800 - EXPANSION JOINT CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of stone masonry unit work is shown on drawings and in schedules.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type system indicating all proposed joints and intersections.

B. Samples: Submit samples, 6" long of each joint system.

PART 2 - PRODUCTS

2.1 EXPANSION JOINT IN WALL

Manufacturers offering products complying with requirements include:

MM Systems; UX-K200
Construction Specialties; ELVF-200

2.2 EXPANSION JOINT IN FLOOR

Manuacturers offering products complying with requirements include:

MM Systems; UX-NN-200
Construction Specialties; ELY-200

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Manufacturer's Instructions:

In addition to the requirements of these specifications, comply with manufacturer's instructions and recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.

B. Cutting, Fitting and Placement:

(1) Perform all cutting, drilling and fitting required for the installation of the items. Set the work accurately in location, alignment and elevation, plumb, level, true, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

(2) Install joint cover assemblies in true alignment. Set floor covers at elevations to be flush with adjacent finished floor materials. Locate wall, ceiling, and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with all required accessories. Locate anchors approximately 3" from each end, 12" o.c. between ends for set screws, and 18" o.c. between ends for other fasteners, unless closer spacing is recommended by the manufacturer.

(3) Hold end joints to the minimum: make end joint with strong, rigid, mechanical splice plate in true alignment, with hairline joints.

3.2 CLEANING AND PROTECTION:

Do not remove strippable protective material unitl finish work in adjacent areas is complete. When protective material is removed, clean exposed metal surfaces in accordance with manufacturer's instructions.

END OF SECTION 05800

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Definition: Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated. Types of work in this section include rough carpentry for:

(1) Wood grounds, nailers, blocking and sleepers.

(2) Wood furring.

B. Finish Carpentry is specified in another section within Division 6.

C. Architectural Woodwork is specified in another section within Division 6.

1.3 REFERENCES:

A. Lumber Standards: Comply with PS 20 and with applicable rules of the respective grading and inspecting agencies for species and products indicated.

B. Plywood Products Standards: Comply with PS 1 (ANSI A 199.1) or, for products not manufacturerd under PS 1 provisions, with applicable APA Performance standard for type of panel indicated.

1.4 SUBMITTALS:

Wood Treatment Data: Submit treatment manufacturer's instructions for proper use of each type of treated material.

A. Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards.

B. For water-borne preservatives, include statement that moisture content of treated materials was reduced to a maximum of 15% prior to shipment to project site.

C. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.

1.5 PRODUCT HANDLING:

Delivery and Storage: Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces.Stack lumber and plywood, and provide air circulation within stacks.

1.6 JOB CONDITIONS:

Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Lumber, General:

(1) Factory-mark each piece of lumber with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.

(2) Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

(3) Provide dressed lumber, S4S, unless otherwise indicated.

(4) Provide seasoned lumber with 15% maximum moisture content at time of dressing.

B. Miscellaneous Lumber:

(1) Provide wood for support or attachment of other work including cant strips, bucks, nails, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:

(2) Grade: Construction Grade light framing size lumber of any species or board size lumber as required. Provide construction grade boards (RIS or WCLB) or No. 2 boards (SPIB or WWPA).

C. Plywood:

(1) Trademark: Identify each plywood panel with appropriate APA trademark.

(2) Concealed performance-Rated Plywood: Where plywood panels will be used for the following concealed types of applications, provide APA Performance-Rated complying with requirements indicated for grade designations, span rating, exposure durability classification, edge detail (where applicable) and thickness.

(3) Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated, or, if not otherwise indicated, not less than 1/2".

D. Miscellaneous Materials:

(1) Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommending nails.

(2) Where rough carpentry work is in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).

2.2 WOOD TREATMENT:

A. Preservative Treatment:Where lumber or plywood is indicated as "Treated", or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB standard listed below. Mark each treated item with the AWPB Quality Mark Requirements.

(1) Pressure-treat above-ground items with water-borne preservative complying with AWPB LP-2. After treatment, kiln- dry to a maximum moisture content of 15%. Treat indicated items and the following:

(2) Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

(3) Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

(4) Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

B. Fire-Retardant Treatment: Where fire retardant treated lumber or plywood is specified or otherwise indicated provide materials which comply with AWPA standards for pressure impregnation with fire-retardant chemicals, and which have a flame spread rating of not more than 25 when tested in accordance with UL Test 723 or ASTM E 84, and show no increase in flame spread and significant progressive combustion upon continuation of test for additional 20 minutes.

(1) Where treated items are exposed on exterior or to high humidities or are to have a transparent finish in form of stain or sealer, provide materials which show no change in fire-hazard classification when subjected to standard rain test (UL 790 or ASTM B 2898).

(2) Use fire-retardant treatment which will not bleed through or adversely affect type of finish indicated and which does not require brush treatment of field made end cuts to maintain fire-hazard classification.

(3) Kiln-dry treated items to maximum moisture content of 19%.

(4) Provide UL label on each piece of fire-retardant lumber or plywood.

C. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General:

(1) Discard units of material with defects which might impair quality of work, and units which are too small to fabricate work with minimum joints or optimum joint arrangement.

(2) Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

(3) Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.

(4) Use common wire nails, except as otherwise indicated.Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

B. Wood Grounds, Nailers, Blocking and Sleepers:

(1) Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

(2) Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

(3) Provide permanent grounds of dressed, preservative treated, key-beveled lumber not less than 101/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

C. Wood Furring:

(1) Install plumb and level with closure strips at edges and openings. Shim with wood as required tolerance of finished work.

(2) Firestop furred spaces on walls at each floor level, with wood blocking or incombustible materials, accurately fitted to close furred spaces.

(3) Furring to Receive Gypsum Drywall: Unless otherwise shown, provide 1" x 2" furring at 16" o.c., vertically.

D. Installation of Plywood:

(1) General: Comply with applicable recommendations contained in Form No. E 304, "APA Design/Construction Guide - Residential & Commercial", for types of plywood products and applications indicated.

(2) Fastening Methods: Fasten plywood backing panels by railing to supports.

END OF SECTION 06100

SECTION 06180 - GLUED LAMINATED WOOD DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of glued laminated wood decking is shown on drawings.

1.3 QUALITY ASSURANCE:

A. Standards: Except as otherwise indicated, comply with PS 56 "Structural Glued Laminated Timber".

For laminated decking, form units from lumber graded by a recognized agency, complying with requirements of American Lumber Standards Committee and PS 20.

B. Manufacturer Qualification: Provide factory-glued structural units, produced by an AITC-licensed firm, qualified to apply the AITC "Quality Inspected" mark.

C. Factory mark each piece of glued laminated structural units with AITC Quality Inspected mark.

Placed AITC mark on timber surfaces which will not be exposed in completed work.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's data, specifications and installation instructions covering lumber, adhesives, fabrication process, preservative treatment, accessories and protection.

B. Samples: Submit samples, 24" long x full width x depth of 3 laminations, showing range of variation expected in appearance of glued laminated structural units, including specified treatment, if any. Samples will be reviewed by Architect for color, pattern and texture only. Compliance with other requirements is exclusive responsibility of Contractor.

Apply specified factory finish to 3 sides of half-length of each sample.

C. Shop Drawings: Submit shop drawing showing full dimensions of each member and layout of entire structural system. Show large scale details of connections, connectors and other accessories. Indicate species and stress grade of lumber, type of glue, and other variables in required work.

1.5 DELIVERY, STORAGE, HANDLING

A. Keep glued laminated structural units dry during delivery, storage, handling, and erection, by maintaining factory-applied protective covering in weather-tight and light-proof condition, or by applying other weathertight protection. Maintain protective covering until final finishing of exterior work is ready to proceed. Do not store in areas of either excessively high or excessively low relative humidity; comply with manufacturer's instructions.

B. Time delivery and installation of glued laminated work to avoid extended on-site storage, and to avoid delaying work of other trades whose work must follow erection of glued laminated work.

PART 2 - PRODUCTS

2.1 GLUED LAMINATED STRUCTURAL UNITS:

A. Lumber: Comply with PS 56 and applicable lumber association standards cited therein for grades required to achieve requirements for allowable stress, appearance, fabrication limitations and species (if any).

B. Stress Values: Provide glued laminated timber members sized as shown on drawings that meet or exceed following stress values:

Bending (Fc), 1850 psi.

Horizontal shear (Fv), 150 psi.

Modulus of Elasticity (E), 1,500,000 psi.

C. Lumber Species: Idaho White Pine.

D. Adhesive: Comply with PS 56, using wet-use (waterproof) adhesive, unless otherwise indicated.

E. End Sealer: Manufacturer's standard transparent, colorless wood sealer, effective in retarding transmission of moisture at cross-grain cuts.

F. Penetrating Sealer: Manufacturer's standard translucent penetrating wood sealer, which will not interfere with application of wood stain and transparent finish, or paint finish, as indicated.

G. Connectors, Anchors, Accessories: Provide fabricated steel (ANSI/ASTM A 36) shapes, plates and bars, welded into assemblies of types and sizes indicated or, if not indicated, manufacturer's standard units for timber sizes indicated, with steel bolts (ANSI/ASTM A 307), lag bolts (FS FF-B-561), nails (FS FF-N-105), and other standard fasteners as required.

Wet-Use Finish: Finish fabricated assemblies with hot-dip zinc coating (ANSI/ASTM A 153), including bolts and other fasteners.

2.2 FABRICATION

A. General: Comply with PS 56 in providing units indicated; where dimensions are not completely documented, provide manufacturer's standard sizes and shapes required to fulfill indicated performances.

B. Glued Laminated Decking: Provide glued laminated wood decking with the following features:

(1) Face Species: Idaho White Pine.

(2) Face Grade: Decorative/Architectural.

(3) Face Surface: Smooth

(4) Pattern: Edge Vee

(5) Depth: Nominal 3" STX.

(6) Width: Nominal 8".

C. End-Cut Sealing: Immediately after end-cutting each member to final length, and after wood treatment (if any), apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces "flood-coated" for not less than 10 minutes.

D. Seal Coat: After fabrication and sanding of each unit, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit, except for treated wood where treatment has included a water repellent.

2.3 FACTORY FINISHING:

A. Wiped Stain Finish: Manufacturer's standard "dry-appearance" penetrating acrylic stain-and-sealer, oven dried and resistant to mildew and fungus.

B. Provide color matching Architect's sample.

2.4 FACTORY APPLIED PROTECTION:

Before shipping or exposing to outdoor conditions, bundle wrap members of uniform size with manufacturer's standard, opaque, durable, water-resistant, plastic-coated paper covering, with water-resistant seams. Provide protective slip-sheets between finished surfaces where factory-finishes have been provided.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with AITC 108 "Standard for Heavy Timber Construction" and manufacturer's instructions.

Install miscellaneous steel connectors, anchors, and accessories as indicated.

B. Cutting: Avoid cutting members during erection, to greatest extent possible. Except for fastener drilling and other minor cutting, coat cuts with end sealer as specified for "Fabrication".

C. Handle and temporarily support members to prevent visible surface damage.

D. Do not remove wrapping on wrapped members until it will serve no useful purpose, including protection from weather, soiling and damage from work of other trades.

E. Maintain expansion spaces as shown, and as required by applicable AITC standards, and as recommended by decking manufacturer.

F. Install glued laminated decking with a bead of structural joint adhesive in each tongue-and-groove joint. Install in manner certified by manufacturer to qualify deck construction for diaphragm action, as required by governing regulations and industry standards.

G. Nail decking as indicated, or if not otherwise indicated, comply with manufacturer's instructions and with AITC recommendations for nailing wood decking. Comply with governing regulations.

H. Repair damaged surfaces and finishes after completion of erection and removal of wrappings, or replace damaged members as directed where damage is beyond satisfactory repair.

3.2 PROTECTION:

Advise Contractor of necessary limitations on heating, ventilating and air conditioning in building, in order to avoid damage or deterioration of laminated work.

END OF SECTION 06180

SECTION 06400 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of each type of architectural woodwork (A-WdWk) is shown on drawings and in schedules.

B. Types of architectural woodwork include the following:

(1) Standing and running trim including:

Trim for exterior and interior openings.
Wood base.
Interior frames for doors.

(2) Casework.

(3) Plastic laminate countertops.

(4) Flush Paneling.

(5) Wood shelving.

(6) Stile and rail raised panel wood doors.

(7) Acrylic plastic.

C. Finish carpentry is specified in another Division 6 section.

D. Flush panel wood doors are specified within Division 8.

E. Wood flooring is specified within Division 8.

1.3 QUALITY ASSURANCE:

A. AWI Quality Marking: Mark each assembled unit of architectural woodwork with manufacturer's identification and grade mark evidencing compliance with indicated AWI quality grade. Locate grade mark on surfaces which will not be exposed after installation. For other items requiring field assembly, a certification of compliance may be substituted for marking of individual pieces.

B. Arrange for architectural woodwork, with sequence matched wood veneers to be produced by a single firm.

Include the veneering of wood doors in the single-firm production, where veneer matching extends across wood doors.

1.4 REFERENCES:

AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI), except as otherwise indicated.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each item of factory-fabricated woodwork.

B. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components. Submit shop drawings for the following:

(1) Standing and running trim.

(2) Casework.

(3) Countertops.

(4) Flush paneling.

(5) Shelving.

(6) Stile and rail doors.

C. Samples: Submit the following samples for each species and cut or pattern of architectural woodwork:

(1) Solid wood with or for transparent finish; set of 3 pieces, 6" x 3/4" x 18", for each species, finished on one side and one edge.

(2) Plywood or veneer with or for transparent finish, 3 finished samples, 12" square, for each species and cut.

(3) Solid wood, plywood or particleboard with factory-applied opaque finish, 12" square, for each finish system and color.

(4) Exposed cabinet hardware, one unit of each type and finish.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.7 JOB CONDITIONS:

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for woodwork installation areas. Do not install woodwork until required temperature and relative humidity have been stablized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity condition.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS AND FABRICATION METHODS:

A. General: Except as otherwise indicated, comply with following requirements for architectural woodwork not specifically indicated as prefabricated or prefinished standard products.

B. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of 9% to 13% for exterior work and 6% to 11% for interior work. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for woodwork at time of installation do not exceed the following:

C. Interior Wood for Transparent Finish:

(1) Solid Wood: Plain sawn Mahogany.

Stock used for molding shall be free of splits or open defects, knots, sap, or other defects. Select lumber so that the straight grain (quarter sections) are exposed on the larger areas to minimize the "cathedral" character.

(2) Plywood:

(a) Veneer Characteristics: Match Architect's samples for grain character, quality and color, as demonstrated by prefinished samples showing range to be expected from stock proposed for actual use.

(b) Veneers shall be Mahogany selected by the Architect at the veneer supplier's warehouse. Approval of veneer shall be made after inspections of full and open flitch and observation of each leaf.

(c) Provide an allowance of $.40/s.f. for veneer wood.

(d) Ratio (yield) of total raw flitch footage to net plywood footage shall be 3 to 1.

D. Interior Wood for Opaque Finish:

(1) Solid Wood: Any closed-grain hardwood complying with requirements for specified woodwork grade.

(2) Plywood: Any closed-grain hardwood plywood with exterior glue complying with requirements for specified woodwork grade.

E. Veneer Matching: Where matched veneer treatment is shown, match and assemble for continuous sequential use of veneer sheets from each flitch across each separate expanse of matched work as indicated (panels, doors and similar units).

(1) Match: Slip match.

(2) Assembly: Balance each assembly (use equal-width peices to make up panel width).

F. Plastic Laminate: Comply with NEMA LD-3 for type, thickness, color, pattern and finish as indicated for each application, or if not indicated, as selected by Architect from manufacturer's standard products.

G. Acrylic Plastic: Colorless, equal to "Plexiglass G", thickness as shown on drawings.

H. Quality Standards: For following types of architectural woodwork; comply with indicated standards as applicable:

(1) Standing and Running Trim: AWI Section 300.

(2) Casework and Countertops: AWI Section 400.

(3) Shelving: AWI Section 600.

(4) Miscellaneous Work: AWI Section 700.

(5) Exterior Frames: AWI Section 900.

(6) Stile and Rail Doors: AWI Section 1400.

I. Design and Construction Features: Comply with details shown for profile and construction of architectural woodwork; and, where not otherwise shown, comply with applicable Quality Standards, with alternate details as Fabricator's option.

J. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items.Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.

K. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain measurements and verify dimensions and shop drawing details as required for accurate fit.

L. Preservative Treatment: Following basic fabrication (or semi-fabrication where full treatment prior to fabrication is not possible), provide 3-minute dip treatment of architectural woodwork in a 5 percent solution of pentachlorlophenol, with vehicle which will not interfere with finish application and will produce the minimum effect upon appearance. Apply brush coat on surfaces cut after treatment.

Provide preservative treatment for wood members in contact with concrete or masonry at "wet" areas.

2.2 INTERIOR ARCHITECTURAL WOODWORK:

A. Standing and Running Trim:

(1) Grade: Premium

(2) Construction: Flush overlay.

B. Wood Casework, Transparent Finish:

(1) Grade: Premium.

(2) Construction: Flush Overlay

C. Wood Casework, Opaque Finish:

(1) Grade: Custom

(2) Construction: Flush overlay.

D. Plastic Laminate Finished Casework:

(1) Grade: Custom.

(2) Construction: Flush overlay.

(3) Exposed Surfaces: Provide high pressure laminate in grades indicated for the following types of surfaces:

Horizontal Surfaces: GP-50 (0.050" nominal thickness).

Vertical Surfaces: GP-28 (0.028" nominal thickness).

(4) Semi-Exposed Surfaces: Finish semi-exposed surfaces as follows, unless otherwise indicated.

(5) Fabricate exposed edges of casework, including edges of doors and drawers when open, with matching plastic laminate, except as otherwise indicated.

E. Plastic Laminate Countertops:

(1) General: Except as otherwise indicated, provide separate plastic laminate countertops (installed on other casework or other support system as indicated) to comply with requirements for casework for plastic laminate finish.

Grade: Same as casework, where casework is architectural woodwork.

Plastic Laminate Type: Fire-rated type, 0.050" thick; UL tested and labeled ratings of 25 for flame spread, 25 for fuel contributed and 100 for smoke developed when bonded to wood particle board.

F. Flush Paneling, Transparent Finish:

(1) General: Provide Mahogany veneer flush paneling. Mount veneer on 3/4" plywood or particleboard. Slip match veneer pieces. Sequence match panels. Use solid stock Mahogany where shown.

(2) Grade: Premium.

G. Wood Storage Shelving, Opaque Finish:

(1) General: These requirements do not apply to shelving which is either integral with or indicated as "Casework"; comply with casework requirements for those units of shelving.

(2) Grade: Custom

H. Stile and Rail Wood Doors, Transparent Finish:

(1) General: These requirements do not apply to shelving which is either integral with or indicated as "casework"; comply with casework requirements for those units of shelving.

(2) Grade: Premium.

2.3 FINISH FOR ARCHITECTURAL WOODWORK:

A. General: The entire finish of architectural woodwork is work of this section, regardless of whether shop applied or applied after installation.

Shop Finishing: To the greatest extent possible, finish architectural woodwork at shop or factory. Defer only final touch-up, cleaning and polishing for time after delivery and installation.

B. Preparations for Finishing: Comply with AWI Quality Standards, Section 1500, for sanding, filling countersunk fasteners, back priming and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

C. Transparent Finish:

Finish Mahogany as Follows:

Step One.

Stain with Dayco Blond-It Wood Finish Stain, Spiced Walnut Manuf. James B. Day & Co.
Carpentersville, Illinois

Step Two:

1 Coat Sanding Wood Sealer, CO-Loidal-AC #40-380 Manuf.
American Lacquer & Solvents Co.
Hialeah, Florida

Step Three:

1 Coat American Lacquer #40-924 High Solids Semi-Gloss Clear Lacquer Manuf.
American Lacquer & Solvents Co.
Hialeah, Florida

D. Opaque Finish:

General Finish Standard: AWI Finish System No. 6, Custom Grade, closed grain finish.

Shop Application: Sealer.

Final Finish: Sanding, followed by topcoat of semi-gloss opaque catalyzed vinyl coating, color selected by Architect.

2.4 CABINET HARDWARE AND ACCESSORY MATERIALS:

A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for units which are specified as "door hardware" in other sections of these specifications.

B. Hardware Standards: Except as otherwise indicated, comply with ANSI A156.9 "American National Standard for Cabinet Hardware".

C. Cabinet Hardware Schedule: Refer to schedule included as last pages of this section for specific hardware and accessory items required for architectural woodwork.

D. Cabinet Door Hardware: Provide hinges, catches and pulls of types indicated, to accommodate each door size and style.

E. Drawer Hardware: Provide slides and pulls of types indicated, to accommodate each drawer size and style.

Equip each drawer with side-mounted, full-extension, ball- bearing nylon roller drawer slides with load capacity of 75 lbs. per pair.

F. Locks: Where indicated, provide standard pin-type or disc-type (5 pins or discs) tumbler locks, keyed individually except as otherwise indicated.

G. Shelf Supports: Where shelving is indicated as "adjustable", provide slotted-type standards and brackets of type needed to support shelves with uniform 40-lb per sq. ft. loading.

H. Closet Bars: Telescoping steel or brass tubing, chrome plated, with forged end brackets; size and wall thickness as required to support full continuous hanging of clothing; equal to Knape & Vogt #770 with #734 brackets (flanges).

I. Door Hooks: Ironmonger #520.50.1 Medium Wall Hook; Color: #8 Black. Mount at 6'-0" above finished floor and centered on door unless noted otherwise.

J. TV Swivel: Häfele "Super Color TV" TW Swivel 421.91.104.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

B. Pre-Installation Meeting: Meet at project site prior to delivery of architectural woodwork and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor; Architect and other Owner Representatives (if any); installers of architectural woodwork, wet work such as plastering, other finishes, painting, mechanical work and electrical work; and firms or persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humdity conditions. Proceed with woodwork installation only when everyone concerned agrees that required ambient conditions can be properly maintained.

C. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of time substrates are to be built.

D. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION:

A. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims.Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops); and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.

B. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

C. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, and comply with Quality Standards for joinery.

D. Anchor woodwork to anchors or blocking built-in or directly attached to substrates.Secure to grounds, stripping and blocking with countertsunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.

E. Casework:Install without distortion so that doors and drawers will fit openings properly and be accurately aligned.Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of casework with transparent finish.

F. Countertops: Anchor securely to base units and other support systems as indicated.

G. Wood Storage Shelving: Complete the assembly of units and install in the areas indicated, including hardware and accessories as indicated.

H. Acrylic Plastic: Polish edges and surfaces. Remove all scratches. Join using clear adhesive recommended by manufacturer.

3.3 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

A. Repair damaged and defective woodwork wherever possible to eliminate effects functionally and visually; where not possible to repair properly, replace woodwork.Adjust joinery for uniform appearance.

B. Clean hardware, lubricate and make final adjustments for proper operation.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

D. Complete the finishing work specified as work of this section, to whatever extent not completed at shop or prior to installation of woodwork.

E. Protection: Installer of architectural woodwork shall advise Contractor of procedures required to protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

F. Cover completed work with 4-mil polyethylene film protective enclosure, applied in a manner which will allow easy removal and without damage to woodwork or adjoining work. Remove cover immediately before time of final acceptance.

END OF SECTION 06400

CABINET HARDWARE SCHEDULE LEGEND

Refer to plans and elevations for number and location of hardware items.

PULLS:

1. Stanley - #4484 Pull with #4487 Pull Bases
   - Polished Bronze Finish US9/US26 at Toilets

2. Epco - #DP-41 Aluminum Pull - Polished Bronze Finish.

HINGES:

A. Grass Co. - #1006 Self closing concealed hinge - Bright Nickel finish or - #1007 Self closing concealed hinge - Bright Nickel finish as required by cabinet construction type.

B. Grass Co. - #1017 Free swinging concealed hinge - Brass finish.

C. Stanley - #FBB179 P 4-1/2 x 4-1/2 AWS Butt hinges - Polished Bronze finish

SLIDES:

X. Knape & Vogt - #1395 Drawer Slide

Y. Knape & Vogt - #1400 Drawer Slide

CATCHES/LATCHES:

01. Sargent - #469 with turnknob and without cylinder; Polished Bronze finish.

LOCKS:

AA. Selby - Cam lock 2021, Polished Bronze finish.

BB. Knape & Vogt - #963 Ratchet Lock.

SHELF HARDWARE:

K. Recessed: Knape & Vogt #255 standards with #256 clips; painted.

L. Surface Mounted: Knape & Vogt #87 standards with #187 brackets and #210/211 shelf rests; satin anochrome finish.

M. Surface Mounted: Knape & Vogt #80 standards with #180 brackets; satin anochrome finish.

CABINET HARDWARE SCHEDULE

RM NO.	WALL	PULLS	HINGES	SLIDES	CATCHES	LOCKS	SHELF STDS.
A-42	S Base	1	A	X	--	--	--
	S Wall	-	-	-	--	--	L
A-50	NW Base	1	A	X	--	--	--
	NW Wall	1	A	-	--	--	--
A-54	N Wall	-	-	-	--	--	K
	S Wall	-	-	-	--	--	K
B-02	N Wall	-	-	-	--	--	K
B-11	N Base	1	A	X	--	AA	--
	N Wall	1	A	-	--	--	--
B-12	N Wall	--	--	--	--	--	K
B-22	N Wall	--	--	--	--	--	K
	S Wall	--	--	--	--	--	K
B-25	S Base	1	A	X	--	--	--
	S Wall	1	A	--	--	--	L
B-30	S Base	1	A	X	--	--	--
	S Wall	--	--	--	--	--	L
C-21	NE Base	1	A	--	--	--	--
C-29	N Base	1	A	--	--	--	--
	N Wall	--	--	--	--	--	L/M
	E Base	1	A	--	--	AA	--
	E Wall	--	--	--	--	--	L/M
	S Base	1	A	X	--	AA	--
	S Wall	--	--	--	--	--	L/M
	W Base	1	A	--	--	AA	--
	W Wall	--	--	--	--	--	L/M
C-59	S Base	1	A	X	--	--	--
C-65	E Base	1	A	X	--	--	--
C-72	SW Base	1	A	X	--	--	--
	SW Wall	1	A	--	--	--	--
C-86	NE Base	1	A	X	--	--	--
	NE Wall	1	A	--	--	--	K
	SW Base	--	--	--	--	--	--
	SW Wall	1	A	--	--	--	--
	W Base	1	A	--	--	--	--
	W Wall	1	A	--	--	--	--

CABINET HARDWARE SCHEDULE

RM NO.	WALL	PULLS	HINGES	SLIDES	CATCHES	LOCKS	SHELF STDS.
	NW Base	1	A	X	--	AA	--
	NW Wall	1	A	--	--	--	--
C-88	N Base	1	A	X	--	--	--
C-89	W Base	2	--	X	--	--	--
C-91	E Base	2	A	X	--	--	--
C-96	NE Wall	--	--	--	--	--	L
C-97	TV Cabinet	2	A/B at fold-back door	--	--	--	K
C-100	NW Base	1	A	--	--	--	--
	SE Base	1	A	--	--	--	--
	S Base	1	A	--	--	--	--
	SW Base	1	A	--	--	--	--
D-02	Entry Desk	--	C	X/Y	01	AA	K
D-12	SE Base	1	A	--	--	--	--
D-13	N Base	1	A	--	--	--	--
E-01	Checkout Counter	2	A	--	--	AA/BB	K
E-01	Display Case 'A'	--	A	--	--	AA	K
E-01	Display Case 'B'	--	A	--	--	AA	--
E-01	Display Case 'C'	--	A	--	--	AA	--
E-01	Display Case 'D'	--	A	--	--	AA	K
F-59	Super-visor's Desk	2	C	X/Y	--	AA	--
F-60	SW Wall	1	A	--	--	AA	--
F-87	S Base	1	A	X	--	--	K
F-88	N Base	1	A	X	--	--	K
	N Wall	1	A	--	--	--	K

CABINET HARDWARE SCHEDULE

RM NO.	WALL	PULLS	HINGES	SLIDES	CATCHES	LOCKS	SHELF STDS.
F-89	N Base	1	A	--	--	--	--
	S Base	1	A	X	--	--	K
F-91	N Base	1	A	X	--	--	K

SECTION 06602 - SYNTHETIC MARBLE COUNTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

Provide synthetic marble counter tops, splashes and skirts as shown on drawings.

1.3 SUBMITTALS

Submit manufactuerer's product data, installation and maintenance instructions. Submit shop drawings for all synthetic marble components and supports. Submit 6" x 6" samples of synthetic marble in color specified.

PART 2 - PRODUCTS

2.1 Synthetic marble shall be "Corian" methyl methacrylate sheet as manufactured by E.I. DuPont De Nemours & Co., Inc. Counter tops shall be 3/4" thick. Splash pieces shall be 3/4" thick, skirt and apron pieces shall be 1/2" thick. Color of synthetic marble shall be "Cameo White".

2.2 Sealant for joints shall be Corian SCS-1752 sealant.

2.3 Concealed framing shall be primed steel construction as shown and in accordance with SECTION 05500 MISCELLANEOUS METAL.

PART 3 - EXECUTION

3.1 Fabricate and install framing and synthetic marble according to the manufactaurer's printed instructions and the approved shop drawings.

3.2 Surfaces of synthetic marble shall be smooth, clean and uniform. Edges not shown to receive radius cuts shall be slightly eased.

3.3 Cutouts for plumbing fittings shall be coordinated with the requirements of the plumbing drawings and specifications.

3.4 Install synthetic marble plumb, level, true and straight with no distortions. Shim as required using concealed shims. Utilize fasteners, adhesives and sealants recommended by the manufacturer.

3.5 Clean surfaces and protect from damage.

END OF SECTION 06602

SECTION 07115 - SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of each type of sheet waterproofing work (S-WP) is shown on drawings and is hereby defined to include all sheet materials applied with sealed joints and flashings as needed to form concealed waterproof membranes.

1.3 QUALITY ASSURANCE:

A. Manufacturer: Obtain primary waterproofing materials of each type required from a single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Installer: Firm with not less than 3 years of successful experience in installation of waterproofing sheets similar to requirements for this project and which is acceptable to or licensed by manufacturer of primary waterproofing materials.

As applicable, assign work closely associated with waterproofing, including (but not limited to) insulation, metal flashing and counterflashing, expansion joints, and joint sealers, to installer of sheet waterproofing, for individual responsibility.

1.4 SUBMITTALS:

Product Data: Submit specifications, installation instructions, and general recommendations from waterproofing materials manufacturer, for types of waterproofing required. Include data substantiating that materials comply with requirements.

1.5 JOB CONDITIONS:

A. Substrate: Proceed with work of this section only after substrate construction, openings, and penetrating work have been completed.

B. Weather: Proceed with waterproofing and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.6 SPECIAL PROJECT WARRANTY:

A. Provide written warranty, signed by Contractor, Installer, and Manufacturer of primary waterproofing materials, agreeing to replace/repair defective materials and workmanship, including significant leakage of water, abnormal aging or deterioration of materials, and other failures of sheet waterproofing to perform as required within warranty period. Warranty includes responsibility for removal and replacement of other work which conceals sheet waterproofing. During warranty period, repairs and replacements required because of acts of God and other events beyond Contractor's/Installer's/Manufacturer's control (and which exceed performance requirements) shall be completed by Contractor/Installer and paid for by Owner at prevailing rates.

B. Warranty period is 10 years after date of substantial completion.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Asphalt/Polyethylene Sheet Waterproofing:

Self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting, formed into uniform flexible sheets of thickness shown, or not less than 56 mils if no thickness is shown, in widths of not less than 36", and complying with the following:

(1) Tensile Strength (ASTM D 412): 250 psi min.

(2) Ultimate Elongation (ASTM D 412): 200% min.

(3) Brittleness Temperature (ASTM D 746): -25 degrees F (-32 degrees C).

(4) Hydrostatic Head Resistance: 75 feet min.

(5) Water Absorption (ASTM D 570): Not more than 0.5% weight gain for 48 hours of immersion at 70 degrees F (21 degrees C).

(6) Products offered by manufacturers to comply with requirements include the following:

Bituthene; W. R. Grace & Co.
Hey' DI SK 2000; Hey'Di American Corp.
Polyguard No. 650; Polyguard Products, Inc.
Plastiwrap; Progress Unlimited, Inc.

B. Miscellaneous Materials:

(1) Adhesives: Provide types of adhesive compound and tapes commended by waterproofing sheet manufacturer, for bonding to substrate (if required), for waterproof sealing of seams in membrane, and for waterproof sealing of joints between membrane and flashings, adjoining surfaces and projections through membrane.

(2) Primers: Provide type of concrete primer recommended by manufacturer of sheet waterproofing material for applications required.

(3) Flashing Materials: Except as otherwise indicated, provide types of flexible sheet material recommended by waterproofing sheet manufacturer for flashing.

(4) Horizontal Protection Course: Composition Protection Board: 1/4" thick semi-rigid asphalt saturated and coated laminations of felts, as recommended by primary materials manufacturer for protection of membrane under concrete or mortar.

Products/Manufacturers: Provide one of the following:

Backerboard #501-A; J & P Petroleum Prod.
PC-3 Protection Course; W. R. Meadows.
Elastibord; Celotex Corp.

(5) Vertical Protection Course: Fiberglass board approximately 1/16" thick.

Provide the following:

Insul-Guard by Trend Products, Inc.

(6) Insulation:

(a) Extruded Polystyrene Board Insulation: Rigid, closed-cell, expanded polystyrene insulation board with integral high-density skin; complying with FS HH-I-524, Type IV, min. 20 psi compressive strength; k-value of 0.20; 0.3% maximum water absorption; 1.1 perm-inch max. water vapor transmission; manufacturer's standard lengths and widths.

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Dow Chemical Co.; Midland, MI
UC Industries/U.S. Gypsum; Chicago, IL

(b) Molded Polystyrene Board Insulation: Closed-cell, expanded polystyrene beads molded into rigid boards, complying with FS HH-524, Type I, 10 psi compressive strength; 4.0% maximum water absorption; k-value of 0.278; 5.0 perm-inch max. water vapor transmission; manufacturer's standard lengths and widths.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are limited to, the following:

Allied Foam Products, Inc.; Gainesville, GA
Grace Const. Products Div.; Cambridg, MA
United States Mineral Prod. Co.; Stanhope, NJ

PART 3 - EXECUTION

3.1 INSPECTION:

Installer must examine substrate and conditions under which waterproofing work is to be performed and must nofity Contractor in writing of unsatisfactory conditions. Do not proceed until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 PREPARATION:

A. Prior to installation of waterproofing and associated work, meet at project site with Installer of each component of associated work, inspection and testing agency representatives (if any), and installers of work requiring coordination with waterproofing work, for purpose of reviewing material selections and procedures to be followed in performing work.

B. Apply primer to concrete and masonry surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area which will be covered by WP membrane in same working day; reprime areas not covered by WP membrane within 24 hours.

3.3 INSTALLATION:

A. Comply with manufacturer's instructions for handling and installation of sheet waterproofing materials except where more stringent requirements are shown or specified.

B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of manufacturers and installers involved in work. Schedule installation to minimize period of exposure of sheet waterproofing materials.

C. Extend waterproofing sheet and flashings as shown to provide complete membrane over area indicated to be waterproofed. Seal to projections through membrane and seal seams. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal surfaces.

D. Install insulation and protection course of type indicated over completed membrane complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.

(1) Install extruded polystyrene board over horizontal surfaces.

(2) Install molded Polystyrene board over vertical surfaces.

(3) Install horizontal protection course over horizontal surfaces.

(4) Install vertical protection course over vertical exposed surfaces using styrofoam mastic number.

3.4 PERFORMANCE REQUIREMENTS:

A. It is required that waterproof membrane be watertight and not deteriorate in excess of limitations published by manufacturer.

B. In-place testing: Before completed membranes on horizontal surfaces are covered by insulation and protection course or other work, test for leaks with 2" depth of water maintained for 24 hours. Repair leaks revealed by examination of substructure and repeat test until no leakage is observed.

3.5 PROTECTION:

Institute all required procedures for protection of completed membrane during installation of work over membrane and throughout remainder of construction period. Do not allow traffic of any type on unprotected membrane.

END OF SECTION 07115

SECTION 07160 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of each type of dampproofing work is indicated on drawings. Similar work used as exposed finish is excluded by definition and, if required, is specified as waterproofing, vapor barrier, roofing, flooring, special coating or other appropriate category.

B. Following types and applications of work are specified in this section: Cold-applied asphalt cut-back dampproofing.

1.3 QUALITY ASSURANCE:

A. General: For each type of work, obtain primary materials from single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Installer Qualifications: A firm which has specialized for not less than three years in installation of types of dampproofing required for project and which is acceptable to manufacturer of primary materials.

1.4 SUBMITTALS:

Submit manufacturer's technical product data, installation instructions, and recommendations for each dampproofing material required. Include data substantiating that materials comply with requirements.

1.5 JOB CONDITIONS:

A. Substrate: Proceed with dampproofing work only after substrate construction and penetrating work have been completed.

B. Weather: Proceed with dampproofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS:

2.1 BITUMINOUS DAMPPROOFING MATERIALS:

A. General: Provide bituminous dampproofing materials which comply with the following requirements, or provide other similar products which are certified in writing by manufacturer of primary dampproofing materials to be superior in performance for application indicated.

B. Cold Asphalt Dampproofing: Manufacturer's standard asphalt and solvent compound, recommended for dry below-grade exterior and for above-grade interior applications, compounded to penetrate substrate and build to moisture-resistant, vapor-resistant, firm, elastic coating.

Provide semi-fibrated type semi-mastic compound except where otherwise indicated; FS SS-A-694.

C. Manufacturer: Subject to compliance with requirements, provide asphalt cut-back products of one of the following:

W. R. Meadows, Inc.: Sealmastic
Sonneborne Bldg. Products Div./Contech, Inc.: Hydrocide Semi-mastic

D. Miscellaneous Materials:

Glass Fiber Mat: Manufacturer's standard nonwoven fabric of continuous filament or jack-straw filament/yarn pattern of glass fiber, impregnated and bound together with type of organic/synthetic binder which is compatible with type of bituminous compound indicated to be reinforced, weighing 1.0 to 1.5 lbs. per 100 sq. ft., 36" wide rolls.

PART 3 - EXECUTION

3.1 INSPECTION:

Examine Substrate and conditions under which dampproofing work is to be performed and notify Contractor in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PREPARATION OF SUBSTRATE:

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Fill voids, seal joints, and apply bond breakers (if any) as recommended by prime materials manufacturer, with particular attention at construction joints.

C. Install separate flashings and corner protection stripping as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and manufacturer's recommendations. Give particular attention to requirements at building expansion joints, if any.

D. Prime substrate as recommended by prime materials manufacturer.

E. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

3.3 INSTALLATION:

A. General: Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

B. Bituminous Dampproofing Installation:

General: Except as otherwise indicated, and whether or not shown on drawings, apply dampproofing to all back-up walls at stonework above grade.

C. Reinforcement: Install lapped course of glass fiber mat in first coat of dampproofing compound before it thickens at all corners and junctions.

D. Cold Bitumen on Wall Cavity Surfaces:

Apply coat of cold, semi-fibrated, semi-mastic asphalt dampproofing material, by brushing or spraying at rate of 5.0 gal. per 100 sq. ft., to produce uniform dry film thickness of not less than 30 mils.

END OF SECTION 07160

SECTION 07175 - WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of surfaces to receive water repellent (WR) is indicated on drawings and by provisions of this section.

B. Following applications of water repellent are required, but excluding associated areas of floors, stairs and pavings:

(1) Exposed exterior concrete surfaces.

(2) Exterior stonework surfaces.

1.3 QUALITY ASSURANCE:

A. Installer: A firm with not less than 3 years of successful experience in application of water repellents of types required on substrates similar to those of this project.

B. Project Mock-Up: Apply water repellent to mock-up, either partial or full coverage as directed, before proceeding with installation. Comply with installation requirements of this section.

Verify that substrate is treated to effectively repel moisture from surface by flooding treated test areas with fresh water or by using a suitable water absorption measuring device, five days after field test applications on the designated test areas. The test areas shall be representative of water repellent's effect.

1.4 SUBMITTALS:

Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for water repellents. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

1.5 JOB CONDITIONS:

A. Environmental Requirements

(1) Do not proceed with application of materials if ambient temperature is below - 10 degrees F or if ice or frost is covering the substrate.

(2) Do not proceed with application if ambient temperature or surface temperature exceeds 100 degrees F.

(3) Do not proceed with application of materials in rainy conditions or if heavy rain is anticipated within 2 hours after application. Material may be applied to damp but absorbent substrates, but not over standing water. The surface should be sufficiently dry to observe the spray pattern during application.

(4) Provide adequate ventilation during and after application such that water repellant treatment odors are not evident.

B. Protection:

(1) Protect plants and vegetation from over-spray.

(2) Window glass and frames need not be protected.

(3) Protect asphalt-based materials such as roofing, caulking and joint fillers from treatment.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. 40% (wt/wt) alkly trialkoxy silane, 60% (wt/wt) ethyl alcohol, a water miscible, colorless liquid. Viscosity at 20 degrees C 1.00 mPA-s max.

B. Manufacturer: Subject to compliance with requirements, provide the following:

CHEM-TRETE BSM;
Dynamit Nobel of American, Inc.
10 Link Drive
Rockleigh, NJ 07647

PART 3 EXECUTION

3.1 PREPARATION

A. Examine surfaces to receive water repellent treatment to assure conditions are satisfactory for application of materials.

B. Verify that masonry joints found to be unsound, hollow, or otherwise defective, have been raked out to a depth of 1/2 inch and pointed with mortar. Allow mortar to cure according to the manufacturer's instructions.

C. Verify that cracks which exceed 4.0 mils wide have been filled with pointing mortar. Allow mortar to cure according to the manufacturer's instructions.

D. Verify that new concrete and masonry have reached a 28-day cure strength.

E. Clean surfaces to remove dust, dirt, oil, wax, other coatings, efflorescence and other foreign materials utilizing high pressure water, sandblasting or other suitable methods.

3.2 APPLICATION

A. The water repellent treatment shall be applied as supplied by the manufacturer without dilution or alteration in any way.

B. Apply water repellent with low pressure airless fan spray coarse nozzle, flooding surface to obtain uniform coverage according to manufacturer's recommendation.

C. Apply water repellent materials at a coverage rate according to manufacturer's recommendation.

END OF SECTION 07175

SECTION 07200 - INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of insulation work is shown on drawings and indicated by provisions of this section.

B. Applications of insulation specified in this section includes the following:

Insulation under slabs-on-grade.
Safing insulation.
Thermal batt or blanket insulation.

C. Related insulation specified in other sections:

Insulation against waterproofing - Section 07115 Sheet Waterproofing.

1.3 QUALITY ASSURANCE:

A. Thermal Conductivity: Thicknesses indicated are for thermal conductivity (k-value at 75 degrees F or 24 degrees C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide thickness required to achieve indicated value.

B. Fire and Insurance Ratings: Comply with fire resistance, flammability and insurance ratings indicated, and Comply with regulations as interpreted by governing authorities.

C. Federal Specifications: Where compliance with FS standard is indicated, specified requirements for marking individual boards/batts/blankets are waived, provided packages of units are labeled to show compliances.

1.4 SUBMITTALS:

Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.

1.5 PRODUCT HANDLING:

A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

B. Protection for plastic insulation:

(1) Do not expose to sunlight, except to extent necessary for period of installation and concealment.

(2) Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Insuration under slabs on-grade:

(1) Extruded Polystyrene Board Insulation Rigid Insulation. Rigid, closed-cell, expanded polystyrene insulation board with integral high-density skin; complying with FS HH-I-524, Type IV, min. 20 psi compressive strength; k-value of 0.20; 0.3% maximum water absorption; 1.1 perm-inch max. water vapor transmission; manufacturer's standard lengths and widths.

(2) Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Dow Chemical Co.; Midland, MI
UC Industries/U.S. Gypsum; Chicago, IL

B. Safing insulation:

(1) 4 pcf density mineral-fiber material.

(2) Manufacturer: U. S. Gypsum Thermafiber safing insulation.

C. Thermal Batt or Blanket Insulation: FS HH-I-251, Type I; semi-rigid mineral fiber blanket without membrane; Class 25 flame spread, K value of 0.25; designed for use with Z-furring members, of thickness and width to completely fill void formed by Z-furring members; density between 4.0 and 6.0 lbs. per cu. ft. depending on thickness.

D. Mineral/Glass Fiber Blanket/Batt Insulation:

(1) Inorganic (nonasbestos) fibers formed with binders into resilient flexible blankets or semi-rigid batts; FS HH-I-521, Type as indicated, densities of not less than 0.5 lb. per cu. ft. for glass fiber units and not less than 2.5 lb. per cu. ft. for mineral wool units, k-value of 0.27; manufacturer's standard lengths and widths as required to coordinate with spaces to be insulated; types as follows:

(2) Provide Type III reflective vapor barrier faced units where indicated, with integral nailing flanges; aluminum foil barrier with rating of 0.5 perms, other face (if any) with rating greater than 5.0 perms.

(3) Flame-Spread Rating: Provide units with rating of 25, ASTM E 84.

(4) Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Certain-Teed Products Corp.; Valley Forge, PA
Clecon Inc.; Cleveland, OH
Manville Bldg. Materials Corp.; Denver, CO
Mizell Bros. Co.; Atlanta, GA
Owens-Corning Fiberglas Corp.; Toledo, OH

2.2 AUXILARY INSULATING MATERIALS:

A. Laminated Plastic/Paper Vapor Barrier: Kraft paper sheets laminated together with asphalt and glass fiber reinforcing, and with laminated carbonated polyethylene protection films both sides; laboratory-tested vapor transmission rating of 0.15 perms.

B. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with fire-resistance requirements.

C. Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application and condition of substrate.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

A. Installer must examine substrate and conditions under which insulation work is to be performed, and must notify Contractor in writing of unsatisfactory conditions.Do not proceed with insulation work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor barriers.

3.2 INSTALLATION:

A. General:

(1) Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

(2) Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

(3) Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

B. Perimeter and Under-slab Insulation:

(1) On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type adhesive recommended by manufacturer of insulation.

(2) Protect insulation on vertical surfaces (from damage during backfilling) by application of protection board. Set in adhesive in accordance with recommendations of manufacturer of insulation.

(3) Protect top surface of horizontal insulation (from damage during concrete work) by application of protection board.

C. General Building Insulation:

(1) Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent support of units.

(2) Seal joints between closed-cell (non-breathing) insulation units by applying mastic or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with mastic or sealant.

D. Blanket/Batt Insulation:

(1) Set vapor barrier faced units with vapor barrier to warm side of construction, except as otherwise shown. Do not obstruct ventilation spaces, except for firestopping.

(2) Set reflective foil-faced units accurately with air space in front of foil as shown. Provide not less than 0.75" air space where possible.

E. Vapor Barrier Installations:

(1) General: Extend vapor barriers to extremeties of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor barriers to cover miscellaneous voids in insulated substrates.

(2) Seal joints/seams in vapor barriers, seal to objects penetrating barriers, and seal to other surfaces at extremeties of coverage by lapping with adhesive or taping to form a continuous barrier.

(3) Lap edges of sheets of vapor barrier not less than 4" so as to provide complete coverage of protected areas.

(4) Repair punctures and tears in vapor barriers, immediately before concealment by other work. Cover with adhesively applied vapor barrier material or with self-adhesive vapor barrier tape.

F. Safing: Install in accordance with manufacturer's instructions to provide 2 hour rating at slab edge and expansion joint conditions and 2 hour rating at utility cable, conduit, pipe and duct penetrations.

G. Install safing insulation in cavities of all closures to exterior walls. Secure using manufacturer's standard clips, if necessary.

3.3 PROTECTION:

General: Protect installed insulation and vapor barriers from harmful weather exposures and from possible physical abuses, where possible by nondelayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Installer shall advise Contractor of exposure hazards, including possible sources of deterioration and fire hazards.

END OF SECTION 07200

SECTION 07256 - SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. The extent of each type of sprayed-on fireproofing is indicated by drawings and by provisions of this section.

B. Refer to Division-9 sections hereof for plaster type and gypsum board type fireproofing, and painted intumescent coatings; not work of this section.

C. Refer to Division-3 sections hereof for cast-in-place and precast concrete type fireproofing, including pneumatic concrete; not work of this section.

1.3 QUALITY ASSURANCE:

A. Installer of Sprayed-On Fireproofing: A firm licensed or otherwise approved by manufacturer of primary fireproofing materials, including qualified factory training where recommended by manufacturer.

B. Fire-Endurance Ratings: Provide products which have been tested in accordance with ASTM E 119 (or UL 263, ANSI A2.1 or NFPA 251) for fire-resistance, and rated by UL or other industry-recognized agency for the required resistances.

C. Fire-Spread Ratings: Provide products which have been tested and listed by UL for required surface burning characteristics (flame-spread, fuel contributed, smoke developed) in accordance with ASTM E 84.

D. General Rating: Except as otherwise indicated, provide completed installations including coatings (if any), rated at a maximum flame-spread of 25.

E. Roof Deck Rating: Where applied on underside of metal roof decking, provide fireproofing approved by FM for Class I construction.

F. Mock-Up: After processing of initial submittals and before delivery and installation of fireproofing materials, prepare a sample installation of fireproofing work, approximately 100 sq. ft. in area; providing an example of each type required, applied on each different

substrate, to produce each different rating as required, and reasonably representative of entire sprayed-on fireproofing work. When nominally cured, examine mock-up for general qualities and compliance with requirements, and review specified visual qualities (if any) with Architect. Demonstrate durability of work to Architect. Make minor adjustments in materials and installation procedures to comply with requirements. Mock-up work which remains in compliance with requirements and is in undamaged and acceptable condition may be retained as final work in place.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications and installation instructions for each type of material and application method required.

B. Certified Tests: With product data submit certified test reports of performance including (as applicable) burning characteristics, densities, compressive strengths, bond strengths, hardness, water absorption, thermal insulating values, acoustical ratings (NRC), and corrosion resistance.

1.5 SEQUENCING AND COORDINATION:

General: Integrate the scheduling/coordination of fireproofing work with other units of work so that it will not be exposed to weather and other damaging ambient conditions, will not be unnecessarily exposed to abrasion and other damage likely to occur during subsequent work, will be installed prior to installation or concealing work will provide time allowance for inspection/testing and subsequent correction of defective fireproofing, and will minimize time other work to be protected by fireproofing is exposed to possible fire hazards.

1.6 WARRANTY:

A. Special Project Warranty: Submit written warranty, executed by Contractor and consigned by Installer, agreeing to repair/replace fireproofing work of this section, which has cracked, flaked, dusted excessivly, peeled or fallen from substrate, or otherwise deteriorated to a condition where it would not perform effectively as intended for fireproofing purposes; due substantially to defective materials or workmanship and not due to abuse by occupants, improper maintenance, nonforseeable ambient exposures, or other causes beyond anticipated conditions and Contractor's/Installer's control.

B. Warranty period is 10 years after date of substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

C-E Refractories Div.; Valley Forge, PA
Grace Const. Products Div.; Cambridge, MA
Grefco Inc.; Los Angeles, CA
Johns-Manville Corp.; Denver, CO
Ocean Chemicals Inc.; Savannah, GA
United States Mineral Products Co.; Stanhope, NJ

2.2 MATERIALS:

A. Fireproofing Materials:

(1) Sprayed-On Cementitious Aggregate Fireproofing: Perlite or vemiculite aggregate, inorganic cement, and manufacturer's standard asbestos-free fiber reinforcement, fillers and additives; for spray-on application, mixing with water and with air at spray nozzle; for forming a rigid, porous, noncombustible (passes ASTM E 136 test) covering of uniform density and thickness as indicated, applied in one or more courses; to provide fire-endurance ratings as indicated.

(2) Dry Density: Within range of 15 to 35 lb. per cu. ft. (ASTM E 605).

(3) Compressive Strength: 10 psi for 10% deflection (ASTM E 761).

(4) Corrosion Resistance: No evidence of corrosion, from Military Specification test method ML E-527, for metal surfaces to be covered.

(5) Bond Strength: 2 psi minimum (ASTM E 736) for each application substrate.

B. Auxiliary Fireproofing Materials:

(1) Substrate Primers: Provide type which is compatible with condition of each substrate to be fireproofed, including shop primers applied by metal fabricators/erectors, and which is recommended by fireproofing materials manufacturers for (in each case) compatibility with bonding adhesives and fireproofing materials.

(2) Adhesive for Bonding Fireproofing: Type recommended by fireproofing manufacturer, and complying with selection requirements of applicable fire-endurance tests.

(3) Metal Lath: Except as otherwise indicated, provide 3.4 lb (per sq. yd.) expanded diamond steel lath, with reinforcing members and clips and other anchorage devices as appropriate for substrate, and complying with selection requirements of applicable fire-endurance tests. Provide corner beads and other lathing accessories where indicated, of standard design and weight.

Lath Finish: Standard galvanized finish.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

A. Installer must examine substrates and conditions under which fireproofing work is to be performed, and must notify Contractor in writing of unsatsifactory conditions. Do no proceed with fireproofing work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Clean substrate of substances which might be imcompatible with or interfere with bond of fireproofing, including oil, dirt, scale, rust and noncompatible shop primer. Remove ill-timed work which might interfere with installation of fireproofing.

C. Prime substrates where recommended by fireproofing manufacturer, covering surfaces to receive direct-bonded application of fire-proofing, except where acceptable shop primer (specified as work of another section) is in satisfactory condition to receive fire-proofing, as determined by Installer.

D. Cover other work which might be damaged by fall-out or over- spray of fireproofing materials during spraying operations. Provide temporary enclosure as may be required to confine operations, protect the environment, and ensure adequate ambient conditions including temperature minimum of 55 degrees F (13 degrees C). Maintain substrate temperatures of at least 40 degrees F (4 degrees C).

3.2 INSTALLATION:

A. General:

(1) Comply with manufacturer's instructions for particular conditions of installation in each case. Consult with manufacturer's technical representative for conditions not covered by printed instructions.

(2) Coat substrate with bonding adhesive where direct bonding of fireproofing is indicated and where use of adhesive is required or recommended by manufacturer.

(3) Install metal lath reinforcements and substrates to receive fire-proofing, as indicated, as recommended by fireproofing manufacturer, and as required to comply with fire-endurance ratings. Anchor securely to substrates in a manner which will support fireproofing through fire exposures of periods indicated.

(4) Install lath accessories including corner beads and other stripping to be used as screeds for or reinforcement of fire- proofing. Anchor to substrate, or set in a strip-bed of fire- proofing material, which must then set or harden before proceeding with fireproofing installation.

(5) Provide sprayed-in-place installation of fireproofing materials to the greatest extent possible. Following spraying operation in each area, complete the coverage by trowels installation or other appropriate placement method recommended by manufacturer.

(6) Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying. Protect from exposure to sun.

(7) Refer to Division-9 sections, except as otherwise indicated herein, for decorative and protective painting of completed fire-proofing work; not work of this section.

3.3 FIELD QUALITY CONTROL:

A. Engage an independent test agency to sample and test completed fireproofing work for density and thickness, and to submit certified test reports with interpretation of results related to requirements. Patch voids where test samples are removed. Test in accordance with procedures of ASTM E 605.

B. Repair or replace fireproofing found (by field tests) to be below compliance requirements. Add extra course of fireproofing materials where feasible to achieve compliance; otherwise remove course and replace with newly installed complying work.

3.4 CLEANING, PATCHING, PROTECTION:

A. Cleaning: Immediately upon completion of spraying operations in each containable area of project, remove over-spray and fall-out of materials from surfaces of the work, and clean surfaces to remove evidence of soiling. Repair or replace damaged work to restore surfaces to acceptable condition.

B. Coordinate installation of fireproofing with other work so as to minimize the need for other trades to cut into or remove installed fireproofing. As other trades successively complete installations of other work, patch fireproofing installations which have been cut away to facilitate such installations; so as to maintain complete coverages of full thickness on substrates to be protected with fireproofing. Trowel-applied fireproofing materials are acceptable for patching of work. Do not allow work requiring patchings to be covered over or otherwise concealed before patching is completed.

C. Protection: Installer of sprayed-on fireproofing shall advise Contractor of protection requirements for fireproofing work, which will ensure that fireproofing will be substantially without damage or deterioration at time of substantial completion of project. Provide protection from reasonably predicatable harmful exposures. Repair or replace work which has not been successfully protected.

END OF SECTION 07256

SECTION 07510 - BUILT-UP ROOFING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Alternate roofing system is specified in Section 07530 and in 07550.

1.2 DESCRIPTION OF WORK:

A. Extent of built-up roofing (BUR) system work is indicated on drawings and by provisions of this section, and is defined to include roofing, insulation immediately over roofing protection sheet immediately over roof insulation, composition flashing and stripping, and roofing accessories integrally related to roof installation.

B. Types of BUR required for project include:

Asphalt/glass-fiber felt roofing membrane with aggregate surface.

C. Roof insulation is specified in this section.

D. Protection sheet over roof insulation is specified in this section.

E. Roof drains are specified in a Division-15 (Plumbing) section of this specification.

F. Wood Nailers/Curbs/Cants are specified in a Division-6 section of this specification.

G. Metal counter flashings are specified in section, "Flashing and Sheet Metal".

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide primary products, including each type of roofing sheet (felt), bitumen, composition flashings, and vapor barrier (if any), produced by a single manufacturer, which has produced that type product successfully for not less than 3 years. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.

B. Installer Qualifications: A single Installer ("Roofer") shall perform the work of this section; and shall be a firm with not less than 5 years of successful experience in installation of built-up roofing systems similar to those required for this project and which is acceptable to or licensed by manufacturer of primary roofing materials.

C. Installer Certification: Obtain written certification from manufacturer of BUR system certifying that Installer is approved by manufacturer for installation of specified roofing system. Provide copy of certification to Architect prior to award of roofing work.

D. Installer's Field Supervision: Installer must maintain full-time supervisor/foreman of jobsite during times that roofing work is in progress. Supervisor must have minimum of 5 years experience in roofing work similar to nature and scope to specified roofing.

E. Preliminary Roofing Conference: As soon as possible after award of built-up roofing work, meet with Installer (Roofer), installers of substrate construction (decks) and other work adjoining roof system including penetrating work and roof-top units, Architect, Owner and representatives of other entities directly concerned with performance of roofing system including (as applicable) Owner's insurers, and test agencies. Review requirements (contract documents), submittals, status of coordinating work, availability of materials and installation facilities and establish preliminary installation schedule. Review requirements for inspections, testing, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures. Record discussion including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant. Discuss roofing system protection requirements for construction period extending beyond roofing installation. Discuss possible need for temporary roofing. If meeting ends with substantial disagreements, determine how disagreements will be resolved and set date for reconvened meeting.

F. Pre-Application Roofing Conference: Approximately two weeks prior to scheduled commencement of built-up roofing installation and associated work, meet at project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of roof-top units and other work in and around roofing which must precede or follow roofing work (including mechanical work if any), Architect, Owner, roofing system manufacturer's representative and other representatives directly concerned with performance of the work including (where applicable) Owner's insurers, test agencies, and governing authorities. Record agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

(1) Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by other trades.

(2) Review structural loading limitations of steel deck and inspect deck for loss of flatness and for required mechanical fastening.

(3) Review roofing system requirements (drawings, specifications and other contract documents).

(4) Review required submittals, both completed and yet to be completed.

(5) Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.

(6) Review required inspection, testing, certifying and material usage accounting procedures.

(7) Review weather and forecasted weather conditions, and procedures of coping with unfavorble conditions, including possibility of temporary roofing (if not a mandatory requirement).

G. FM Listing: Provide built-up roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind up-lift, and hail damage and are listed in "Factory Mutual Approval Guide" for class I-90 construction.

Provide roof covering materials bearing FM approval marking on bundle, package or container, indicating that material has been subjected to FM's examination and follow-up inspection service.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements.

For asphalt bitumen, provide label on each container or certification with each load of bulk bitumen, indicating flash point (FP), finished blowing temperature (FBT), softening point (SP) and equiviscous temperature (EVT).

B. Manufacturer's Certification, Bulk Bitumen: Submit manufacturer's certification indicating that bulk bituminous materials (if any) delivered to project comply with required standards. Include quantity, statistical and descriptive data for each product. Submit certificate with each load before it is used.

Include continuous log showing time and temperature for each load of bulk bitumen, indicating date obtained from manufacturer, where held and how transported prior to final heating and application on roof.

C. Field Test Reports: Submit daily softening point test reports on samples of asphalt used on project, taken at beginning of each day's work and at 2-hour intervals during course of the work thereafter. Test by Ring and Ball Test, ASTM D 2398, or similar recognized test method. Submit samples to independent laboratory for testing or perform tests in field, at Contractor's option.

D. Samples, Aggregate Surfacing: Submit 3-lb. samples of aggregate surfacing material.

1.5 JOB CONDITIONS:

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

B. Temporary Roofing: When adverse job conditions or weather conditions prevent permanent roofing and associated work from being installed in accordance with requirements, and is determined by Contractor that roofing cannot be delayed because of need for job progress or protection of other work, proceed with installation of temporary roofing. Engage roofing Installer to provide temporary roofing, and to remove it prior to proceeding with permanent roofing work.

Record by way of Change Order the Owner's agreement to proceed with temporary roofing, along with additional costs and other changes (if any) to Contract Documents.

1.6 PRODUCT HANDLING:

Store and handle roofing sheets in a manner which will ensure that there is no possibility of significant moisture pick-up. Store in a dry, well ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.7 WARRANTIES:

A. Special Project Warranty: Submit 2 executed copies of standard 2-year "Roofing Guarantee" on form included at end of this section, covering work of this section including roofing membrane, composition flashing, roof insulation, vapor barriers (if any), and roofing accessories, signed and countersigned by installer (Roofer) and Contractor.

B. Manufacturer's Warranty: Submit executed copy of roofing manufacturer's standard "Limited Service Warranty" agreement including flashing endorsement, signed by an authorized representative of built-up roofing system manufacturer, on form which was published with product literature as of date of contract documents, for the following period of time:

10 years after date of substantial completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

Insurance and Code Requirements: Provide materials complying with governing regulations, and which can be installed to comply with Factory Mutual requirements for "Class I-90", 1 hour fire resistant construction.

2.2 ROOF INSULATION:

A. Roof insulation shall be Dow Chemical, Styrofoam RM., 2" thick.

B. Fabric: International Paper: Confil 689H (3.6 02/yd black polyester). Phillips Fibers Corp.; Rufon P3B (3.0 02/yd black polyethylene).

2.3 GYPSUM WALLBOARD

A. Gypsum wallboard shall be 5/8" Type "X" complying with ASTM C-36-76A.

B. The following fasteners are acceptable:

Lexsuco Clips and Discs
Berryfast Insulfast Overdrive Nails and Discs
Construction Fastener's Dekfast and Plate

2.4 BUILT-UP ROOF MEMBRANE

A. General: Provide built-up aggregate-surfaced roof system with asphalt bitumen and 3 plies glass-fiber mats for lay-up as indicated. System shall be "IRMA" by Dow Chemical Co.

(1) Ply Felts: 3 plies of asphalt-impregnated glass-fiber mats, complying with ASTM D 2178, Type IV.

(2) Bitumen: Roofing asphalt, complying with ASTM D 312-78, Type !!!, 185^{0} - 205^{0}F softening point.

B. Products: Subject to compliance with requirements, provide one of the following BUR systems:

Celotex Corp.; Celo-Glass
Certainteed Corp.; Certaglass
GAF Corp.; Gafglas
Manville Building Materials Corp.; Glasply
Owens-Corning Fiberglas Corp.; Perma Ply R
Tamko Asphalt Products, Inc.; Tam-glass

2.5 BUR EDGE/PENETRATION MATERIALS:

A. Roofing Cement: Asphaltic cement; comply with ASTM D 2822.

B. Reinforced Asbestos Flashing: 55-lb. sheet, of asphalt-laminated and coated asbestos felt and glass-fiber fabric, with mineral stabilizers and surfacers.

C. Glass Fiber Fabric: 1.5-lb. (min.) sheet, of woven glass fiber, impregnated with asphalt (ASTM D 1668).

D. Lead Flashing: 2-1/2 lb. to 4-lb. sheet of common desilverized pig lead.

E. Preformed Edge Strips: Rigid insulation units matching roof insulation, or asphalt-impregnated organic fiber insulation units, molded to form 3-1/2" x 3-1/2" x 45° cant strips and 1-5/8" x 18" tapered edge strips, as shown to receive roofing ply-sheet courses and lift edges above main roofing surface.

2.6 SHEET METAL ACCESSORY MATERIALS:

Aluminum: ASTM B 209, alloy 3003, temper H 14 unless harder temper required for forming and performance, AA-C22A41 clear anodized finish; 0.032" thick (20 gage), except as otherwise indicated.

2.7 MISCELLANEOUS MATERIALS:

A. Surfacing Aggregate: Clean, water-worn opaque gravel complying with ASTM D 1863.

B. Wood Members, Units: Comply with requirements of "Carpentry" sections of these specifications for nailers, walkway units and other wood members indicated as roofing system work. Provide wood pressure treated with water-borne preservatives for above ground use (AWPB LP-2).

C. Walkway Protection: Precast concrete pavers.

D. Splash Blocks: Precast Concrete

2.8 FABRICATION OF SHEET METAL ACCESSORIES:

A. SMACNA and NRCA Details: Conform work with details shown, and with applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMACNA. Comply with installation details of "Roofing and Waterproofing Manual" by NRCA.

B. Prefabricate units as indicated, or provide standard manufactured units complying with requirements; fabricate from sheet metal indicated or, if not otherwise indicated, from lead-coated copper.

C. Provide 4" wide flanges for setting on BUR membrane with concealment by composition stripping.

D. Fabricate work with flat-lock joints and seams filled with mastic sealant except where joint movement is necessary, provide 1" deep interlocking hooked flanges, filled with mastic sealant.

E. Fabricate Penetration sleeves with minimum 8" high stack, of diameter 1" larger than penetrating element. Counter flashing is specified as work of another section of these specifications.

PART 3 - EXECUTION

3.1 INSPECTION OF SUBSTRATE:

A. Examine substrate surfaces to receive built-up roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Verify that flatness and fastening of metal roof decks comply with the following:

(1) Top Flanges: No concavity or convexity in excess of 1/16" across any 3 adjacent flanges.

(2) Side Laps: Properly nested and mechanically fastened at max. spacing of 3'-0" o.c.

(3) End Laps: Minimum 2" laps located over and fastened to supports.

(4) Deck secured to each supporting member in every other rib (max. spacing 12" o.c.) with puddle welds or approved mechanical fasteners.

3.2 GENERAL INSTALLATION REQUIREMENTS:

A. Cooperate with inspection and test agencies engaged or required to perform services in connection with BUR system installation.

B. Protect other work from spillage of BUR materials, and prevent liquid materials from entering or clogging drains and conductors. Replace/restore other work damaged by installation of BUR system work.

C. Insurance/Code Compliance: Install BUR system for (and test where required to show) compliance with governing regulations and with Factory Mutual requirements for "Class I-90", 1 Hour Fire Resistant Construction.

D. Coordinate the installation of insulation, roofing sheets, flashing, stripping, coating and surfacing, so that insulation and felts are not exposed to precipitation nor exposed overnight. Provide cut-offs at end of each day's work, to cover exposed edges sealed with roofing cement. Remove cut-offs immediately before resuming work. Glaze coat installed ply-sheet courses at end of each day's work where final surfacing has not been installed.

E. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with equiviscous temperature method ("EVT Method") as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (+25°F or 14°C, at point of application) more than one hour prior to time of application. Discard bitumen which has been held at temperature exceeding finished blowing temperature (FBT) for a period exceeding 3 hours. Determine flash point, finished blowing temperature and EVT of bitumen, either by information from bitumen producer or by suitable tests, and determine maximum fire-safe handling temperature and do not exceed that temperature in heating bitumen; but in no case heat bitumen to a temperature higher than 25°F (14°C) below flash point. Keep kettle lid closed except when adding bitumen.

F. Bitumen Mopping Weights: For interply mopping, and for other moppings except as otherwise indicated, apply bitumen at the following rate:

Asphalt: 25-lbs. of asphalt (+25% on a total-job average basis) per roof square (100 sq. ft.) between plies for Certaglas, Glasply, Tam-glass. 30-lbs. of asphalt (+25% on a total-job average basis) per roof square (100 sq. ft.) between plies for Celo-Glass, Conply A-IV, Gafglas, Perma Ply-R.

G. Substrate Joint Penetrations: Do not allow bitumen to penetrate substrate joints and enter building or other construction. Where mopping is applied directly to a substrate, tape joints or, in the case of steep asphalt, hold mopping back 2" from both sides of each joint.

H. Cut-offs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of 2 plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work. Glaze-coat areas of completed organic ply sheets which cannot be flood-coated and aggregate-surfaced before end of each day's work.

3.3 INSTALLATION OF GYPSUM BOARD

A. Install gypsum board with side joints parallel to steel deck flutes.

B. Nailing pattern shall be one nail per 2 sq. ft. for Lexsuco and Berryfast fasteners. For Dekfast system provide one nail per 2 sq. ft. at perimeter and one nail per 4 sq. ft. in field of roof.

3.4 ROOF MEMBRANE INSTALLATION:

A. Shingling of Plies: Except as otherwise indicated, install membrane with ply sheets shingled uniformly to achieve required number of thickness of membrane throughout. Shingle in proper directoin to shed water on each large area of roofing, where slope is significant (over 1/2").

B. Cant Strips/Tapered Edge Strips: Except as otherwise shown, install preformed 45° insulation cant strips at junctures of BUR membrane with vertical surface. Provide preformed tapered edge strips at perimeter edges of roof which do not terminate at vertical surfaces.

C. Base Sheet: Install one lapped course of base sheet. Nail to nailable substrates and elsewhere as indicated. Mop to non-nailable substrate with steep asphalt, except use special adhesive where indicated.

D. Inter-Ply Sheets: Provide two ply sheets (felts), lapped (shingled) amount as required to form a continuous, uniform membrane with bitumen moppings between sheets so that ply sheet does not touch ply sheet. Except as otherwise indicated, glaze-coat top of ply-sheet membrane with 25-lb. (30 if required) mopping of same bitumen, integrally with operation of laying up membrane.

(1) Mop base of membrane to base sheet.

(2) Extend BUR membrane to 2" (nominal) above top edge of cant strip and terminate.

(3) Provide a folded-back envelope at edges and penetrations of BUR membrane where it is not turned up on a tapered strip, so as to provide positive protection against flow of bitumen into building or off the edge. Extend base sheet to form envelope or, where no base sheet is provided, install one ply of coated felt set in steep asphalt with joints sealed. Seal corners and other interruptions of envelope with large beads of roofing cement to provide positive protection against flow of bitumen.

(4) Nail edges of roofing membrane to wood blocking at perimeter edges of roof prior to installing metal gravel stops/fascias. Space nails at minimum 8" o.c.

E. Set-On Accessories: Where small roof accessories are set on BUR membrane, set metal flanges in a bed of roofing cement, and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.

F. Composition Flashing and Stripping:

(1) Provide composition flashing at cant strips and other sloping and vertical surfaces, and at roof edges, and at penetrations through roof. Provide one ply of No. 15 asphalt-impregnated glass fabric and one ply of reinforced asbestos flashing, each set in a continuous coating of roofing cement and extended onto deck 6" and 4" respectively. Nail or provide other forms of mechanical anchorage of composition flashing to vertical surfaces, as recommended by manufacturer of primary roofing materials. Except where concealed by elastic flashing, apply a heavy coating of roofing cement over composition flashing.

(2) Provide composition stripping where metal flanges are set on roofing. Provide not less than one ply of glass-fiber fabric and one ply of reinforced asbestos flashing; set each in a continuous coating of roofing cement and extended on the deck 6" and 4", respectively. Except where concealed by aggregate surfacing or elastic flashing, apply a heavy coating of roofing cement over composition stripping.

G. Roof Drains: Fill clamping ring base with a heavy coating of roofing cement. Set lead flashing sheet in a bed of roofing cement on completed BUR ply sheet courses, with lead sheet clamped in roof drain ring and extended 12" onto roofing. Cover 6" beyond edges of lead sheet. Provide composition stripping of gravel stop rings (if any).

H. Allow for expansion of running metal flashing and edge trim which adjoins roofing. Do not seal or bond BUR membrane or composition flashing and stripping to metal flanges over 3'-0" in length.

I. Counter Flashings: Counter flashings, cap flashings, expansion joints and similar work to be coordinated with BUR work, are specified in other sections of these specifications.

J. Roof Accessories: Miscellaneous sheet metal accessory items, including insulation vents and other devices, and major items of roof accessories (if any) to be coordinated with BUR work, are specified in other sections of these specifications.

K. Aggregate Surfacing: Promptly after completion of BUR membrane, edge treatment insulaton installation and set-on accessories in each substantial area of roofing, flood-coat surface as indicated and, while each small area is hot and fluid, cast the following approximate weight of aggregate in a uniform course.

(1) Flood Coat: 30-lbs. per square of Type III asphalt, except provide steep asphalt where slope exceeds 3/4" per ft.

(2) Aggregate: Gravel, averaging 1000-lbs. per square.

3.5 INSTALLATION OF INSULATION:

A. General: Comply with insulation manufacturer's instructons and recommendations for handling, installation and bonding or anchorage of insulation to substrate.

B. Set insulation units with long joints of insulation in continuous straight line, perpendicular to roof slope, with end joints staggered between rows.

3.6 ROOF WALKWAYS:

Provide precast concrete pavers where walkways are indicated.

3.7 SPLASH BLOCKS:

Provide precast concrete splash blocks where walkways are indicated.

3.8 PROTECTION OF ROOFING:

A. Upon completion of roofing work (including associated work), Installer shall advise Contractor of recommended procedures for surveillance and protection of roofing during remainder of construction period. At end of contruction period, or at a time when remaining construction work will in no way affect or endanger roofing (at Contractor's option), Installer shall make a final inspection of roofing and prepare a written report (to Contractor with copy to Owner) describing nature and extent of deterioration or damage found in the work.

B. Installer shall repair or replace (as required) deteriorated or defective work found at time of final inspection. Installer shall be engaged by Contractor to repair damages to roofing which occurred subsequent to roofing installation and prior to final inspection. Repair or replace the roofing and associated work to a condition free of damage and deterioration at time of substantial completion.

END OF SECTION 07510

SECTION 07530 - INSULATED ADHERED SHEET ROOFING

PART I GENERAL

1.1 GENERAL

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements apply to work of this section.

B. Definitions

1. Roofing System Manufacturer - GRM Roof System as manufactured by W. R. Grace & Co., as specified in Article 2.1.

2. GRM/PRMA - Protected Roof Membrane Assembly as specified in Article 2.1.

C. This section is an alternate to Section 07510. Contractor shall advise Architect if he intends to use this system.

1.2 DESCRIPTION

A. Work Includes:

1. Sheet metal work: Section 07600

2. Roof accessories: Section 07800

3. Roof drains and lead flashing for vent pipes: Division 15.

4. Concrete preparation and mortar cants: Division 3.

1.3 QUALITY ASSURANCE

A. All GRM shall be applied by a roofing contractor currently approved by W. R. Grace & Co. Roofing subcontractor shall also be approved by manufacturer of roof insulation material.

B. Applicable requirements of Underwriter Laboratories, Inc., and Factory Mutual Laboratories.

C. Tests for rubber properties in tension: ASTM D-412.

D. Testing asphalt insulating siding surfaced with mineral granules: ASTM D-1228 (water absorption).

E. Sealing Compound Elastomeric Type, multi-component (for caulking, sealing, and glazing in buildings and other structures): Federal Specification TT-S-00227E.

F. Sealing Compound: Elastomeric Type, single component (for caulking, sealing and glazing in building and other structures): Federal Specification TT-S-00230C.

G. Test for tear resistance of the waterproofing film: ASTM D-624.

H. Preliminary Roofing Conference: As soon as possible after award of roofing work, meet with Installer (roofer), installers of substrate construction (decks) and other work adjoining roof system including penetrating work and roof-top units, Architect, Owner and representatives of other entities directly concerned with performance of roofing system including (as applicable) Owner's insurers, and test agencies. Reivew requirements (contract documents), submittals, status of coordinating work, availability of materials and installation facilities and establish preliminary installation schedule. Review requirements for inspections, testing, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures. Record discussion including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant. Discuss roofing system protection requirements for construction period extending beyond roofing installation. Discuss possible need for temporary roofing. If meeting ends with substantial disagreements, determine how disagreements will be resolved and set date for reconvened meeting.

I. Pre-application Roofing Conference: Approximately two weeks prior to scheduled commencement of roofing installation and associated work, meet at project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of roof-top units and other work in and around roofing which must precede or follow roofing work (including mechanical work, if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the work including (where applicable) Owner's insurers, test agencies, and governing authorities. Record (Contractor) discussions of conference and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

(1) Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by other trades.

(2) Review structural loading limitations of steel deck and inspect deck for loss of flatness and for required mechanical fastening.

(3) Review roofing system requirements (drawings, specifications and other contract documents).

(4) Review required submittals, both completed and yet to be completed.

(5) Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.

(6) Review required inspection, testing, certifying and material usage accounting procedures.

(7) Review weather and forecasted weather conditions, and procedures of coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).

1.4 SUBMITTALS

A. Product Data: Submit technical data for all materials used on this project.

B. Submit copies of GRM and extruded polystyrene manufacturer's warranties.

1.5 WARRANTY

A. Roofing Contractor: two (2) years in accordance with the General Conditions.

B. Roofing system Manufacturers: W. R. Grace & Co, shall furnish written ten year inspection and service agreement. Extruded polystyrene manufacturer to furnish written ten year warranty on performance of extruded polystyrene. Either separately or jointly, warranties to state:

(1) Roof membrane and flashing will remain in a watertight condition.

(2) GRM roof materials and workmanship will be covered for duration of warranty.

(3) Extruded polystyrene will retain at least eight percent (80%) of its thermal resistance over a ten year period.

(4) Roof's top covering of insulation, fabric and ballast will remain in place.

(5) In event roof fails to so perform, respective manufacturer (either W. R. Grace or extruded polystyrene manufacturing company) shall, without additional cost to Owner, cause to be made repairs or modifications to roof necessary to enable roof to perform as warranted.

(6) Cost to restore roof and flashing membrane to a watertight condition shall not be limited to original cost of the installed roof.

(7) Above warranties are subject to obligations, exclusions and conditions of roofing assembly materials manufactuerer's warranty provisions.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened packaging with all labels intact.

B. When stored at job site, materials shall be protected from weather by proper use of raised platforms and waterproof coverings. Pallets of membrane shall not be double-stacked on job site. GRM materials shall not be stored at temperatures above 90 degrees F (32 degrees C) for prolonged periods of time. In addition, White Coating GRM-WC-200 shall be protected against freezing. Consult detailed precaution statements on product labels before use.

1.7 JOB CONDITIONS

A. Environmental Requirements:

All GRM components shall be applied at surface and ambient temperatures of 40 degrees F or above with dry weather conditions. Surface coatings and adhesives shall not be applied when rain is expected within three hours. White Coating GRM-WC-200 shall not be applied at surface or ambient temperatures below 60 degrees F.

B. Inspection:

Before installation of GRM begins, the roofing contractor shall inspect surface to receive GRM and assure that surface is clean, dry, sound, smooth, and free of dirt and debris. In addition, all preformed substrate joints such as insulation board joints, etc., shall be taped prior to GRM application. Refer to Part 3 - Execution (decks) for joint treatment details.

C. Temporary Water Cutoff:

At the end of each working day, water cut-offs shall be installed. When installing GRM over gypsum wallboard GRM shall be extended a minimum of 6" beyond the termination point of gypsum wallboard and sealed to substrate or deck; a troweling of GRM Mastic shall be then placed over membrane termination point. These temporary water cut-offs shall be cleanly removed before work is resumed to prevent entrapment of GRM Mastic between plies of membrane and to prevent blockage of moisture vapor movement.

PART II - PRODUCTS

2.1 MATERIALS

A. Roofing Membrane: GRM-350

B. Primer: GRM-P-200 or GRM-P-100

C. Mastic: GRM Mastic or LM-3000

D. Insulation Tape: GRM Insulation tape

E. Flashing Membrane: GRM-120 and GRM-WC-200 or GRM-WC-300 White Coating or GRM-500

F. Type X Gypsum Wallboard:

(1) Conform to ASTM C-36 1 5/8" thick.
(2) The following fasteners are acceptable.

Lexsuco Clips and Discs
Berryfast Insulfast Overdrive Nails and Discs
Construction Fastener's Dekfast and Plate.

G. Insulation: Dow Chemical; Styrofoam RM., 2" thick.

H. Fabric: International Paper; Confil 689H (3.6 02/yd black polyester). Phillips Fibers Corp.; Rufon P3B (3.0 02/yd black polyethylene).

I. Stone: Well screened and washed river gravel meeting ASTM gradation #57, with fines smaller than 1/2" not to exceed 10%. Stone shall be approved by insulation manufacturer.

J. Sheet Lead: Federal Specification QQ-K-201F, hard lead with not less than 4% nor more than 6% antimony; minimum 4 psf.

K. Cant Strips: Liquid Membrane LM-3000: For a 3/4" fillet of LM-3000 at inside corners of parapet or curb details before installation of the roof membrane.

L. Concrete Splash Blocks: Precast concrete.

M. Walkway Protection: Precast concrete pavers.

PART III - EXECUTION

3.1 INSPECTION - ROOFING CONTRACTOR

A. Examine all surfaces to receive roof membrane and flashings for a uniform surface, debris, inadequate attachment of deck components, moisture and all other conditions which would reduce the performance of the roofing system (all components).

B. Do not proceed with roof application until all defects are repaired to comply with this specification and specifications of roof component manufacturers.

3.2 ENVIRONMENTAL REQUIREMENTS

A. All GRM components shall be applied at surface and ambient temperatures of 40 degrees F or above with dry weather conditions.

B. Should installation become necessary during colder weather, obtain special instructions from manufacturer and approval of Architect before proceeding.

C. For application down to 25 degrees F, consult W. R. Grace & Company.

3.3 METAL DECKS

A. Roof insulation shall be Dow Chemical, Styrofoam RM., 2" thick.

B. Fabric: International Paper: Confil 689H (3.6 02/yd black polyester. Phillips Fibers Corp.; Rufon P3B (3.0 02/yd black polyethylene).

3.4 SURFACE PREPARATION

All surfaces to receive GRM shall be smooth, rigid, clean, frost-free and free of voids, dirt, debris, sharp projections, grease, oil, or other contaminants. Dust shall be removed from surface immediately before application of GRM Primer.

3.5 PRIMING

A. Prime all concrete to receive GRM-350 with GRM-P-200 Primer. Approximate coverage of GRM-P-200 Primer over concrete is 1/3 of a gallon per square. All other surface types other than concrete shall be primed with GRM-P-100 Primer. Coverage rate shall be 1/3 of a gallon per square, except on built-up roofs where coverage is 1/2 gallon per square.

B. Puddles of primer shall be evened out. Allow primer to dry to a tack-free finish (approximately one hour). Primer shall be dry before applying GRM.

C. Priming shall be limited to areas that can be completely covered in same day. Surfaces exposed overnight or to moisture shall be reprimed. Under exceptionally dusty conditions, repriming may be necessary.

3.6 MEMBRANE APPLICATION

A. Before applying GRM membrane the roof shall be chalked in the following manner.

(1) Chalk a straight line 36" from low point of roof or 18" from a drain line for first roll of membrane.

(2) Each succeeding line shall be spaced 32 1/2" from previous line in order to maintain 3 1/2" overlaps.

B. Starting at low point of roof or drain line, apply a full 36" width of GRM using chalk line as a guide. Next sheet of GRM shall overlap first a minimum of 3 1/2" on side lap and 6" on end laps. End laps shall be staggered during application of GRM. Cover entire surface of roof so that all laps shed water.

C. Rolling Membrane: Membrane shall be rolled firmly and completely immediately after each sheet is applied. Roller shall be a standard linoleum roller with an 8" maximum diameter, 16" maximum width and weigh a minimum of 150 lbs. Face of roller shall be wrapped with a single wrap of light indoor-outdoor carpet or similar resilient material such as GRM.

D. Water Cut-Offs: At end of each work day, water cut-offs shall be installed to protect deck and/or prevent possible water seepage under roof membrane. These temporary water cut-offs shall be cleanly removed before work is resumed.

E. Sealing End Laps: Seal all end laps and "T" joints with GRM Mastic or LM-3000 at end of each working day.

F. Inspection and Patching: Misaligned or inadequately lapped seams shall be repaired with a patch of GRM that extends at least 6" in every direction from deficiency. Fishmouths shall be slit, flaps overlapped, and repaired with a patch of GRM. Edges of patches shall be sealed with a troweling of GRM Mastic or LM-3000.

3.7 GRM FLASHING SYSTEM

A. Vertical Flashing

(1) Priming: Primer GRM-P-200 shall be used for concrete and masonry surfaces. Primer GRM-P-100 or GRM-P-200 shall be used for surfaces other than concrete and masonry. See Article 3.4.

(2) Preparation for flashing: Inspect previously installed GRM to make sure it extends up cant strip or fillet and that all fishmouths or other deficiencies are corrected. It shall be well adhered to substrate, and excess mastic that may have been used as a temporary water cut-off shall be removed.

(3) Membrane Installation: GRM flashing shall be applied from low point of roof to high point so that all laps shed water. Flashing may be installed in any length depending on applicator's ability to handle membrane. GRM flashing shall be cut to width so that when installed it extends a mimimum of 6" onto horizontal portion of roof and a minimum of 8" above grade line of roof onto vertical surface. Maximum vertical height of GRM flashing is 24". For any variation from height requirements of flashing, please consult your local Grace Field Advisor. As GRM flashing is being installed, it must be pressed firmly against substrate for maximum adhesion. Each additional piece of flashing shall overlap preceding piece a minimum of 6". Stagger flashing laps from roof membrane laps.

(4) Inspection and Patching: Repair fishmouths or other deficiencies that might have occurred during installation. Repairs shall be accomplished by slitting, overlapping and pressing down fishmouths or other deficiencies and patching them with a piece of GRM. Patch shall extend full width of flashing membrane (from top to bottom termination points), and extend a minimum of 6" in other directions from deficiency. Exposed edges of patches shall then be treated as vertical flashing laps.

(5) Fastening Devices: When GRM is used in vertical flashing, it shall be fastened to protrusion with proper mechanical fastener and discs (1" minimum diameter for discs) on 8" centers. Fastening device shall be positioned 3/4" down from top termination point of GRM flashing.

(6) Mastic-Laps and Terminations: All vertical side laps shall be sealed with a troweling of GRM Mastic reinforced with an unsaturated inorganic fabric (2" wide minimum). All top and bottom flashing laps shall be sealed with an 1/8" troweling of GRM Mastic or LM-3000.

(7) Surfacing: All exposed GRM-120 flashing shall be coated with GRM White Coating. If GRM-500 membrane is used in lieu of the GRM-120, no coating is required except where GRM Mastic or LM-3000 is used.

(8) Metal Counter Flashing: Install metal cap or counter flashing securely anchored and sealed to wall or curb above the finished top termination and extending down at least 4" onto GRM flashing.

B. Roof Drain

(1) Drain preparation: Remove drain ring clamp. Clean and prime drain area and allow primer to dry.

(2) Membrane Application: Install a 36" square reinforcing collar of GRM over drain and firmly press into place. GRM shall be cut so it extends down to top edge of drain bowl with holes notched out for clamping ring bolts. Install GRM over reinforcing collar and cut so it also extends down to top edge of drain bowl with holes notched out for clamping ring bolts.

(3) Clamping Ring Installation: Install clamping ring set in a troweling of GRM Mastic or LM-3000 and securely tighten bolts so that a sealed gasket is formed between drain housing and clamping ring.

3.8 INSTALLATION OF ROOF INSULATION AND STONE BALLAST

A. Install extruded polystyrene insulation as soon as possible after completion of roof and flashing membrane, not to exceed three days when weather is above 80 degrees F and sunny.

B. Install insulation board with channelled side down and with closed joints; stagger all end joints. Maximum acceptable opening on a random basis is 3/8". Install boards to within 3/4" of projections and cant strips.

C. Cover insulation board with a layer of water permeable fabric in accordance with extruded polystyrene insulation manufacturer's detailed recommendations.

D. Apply stone ballast at a rate of 10 lbs. per square foot immediately after insulation and fabric have been installed. At perimeter stone ballast shall be increased to 20 lbs. per square foot for a distance of four feet from perimeter of roof areas and around all penetrations through roof membrane.

3.9 FIELD QUALITY CONTROL

A. W. R. Grace shall provide on-the-job inspections, technical assistance and membrane application guidance as may be necessary to complete roofing membrane application.

B. Extruded polystyrene manufacturer shall provide on-the-job inspections, technical assistance, and insulation application guidance as may be necessary to complete application of insulation and ballast.

3.10 ROOF WALKWAYS

Provide precast concrete pavers where walkways are indicated.

3.11 SPLASH BLOCKS

Provide precast concrete splash blocks where walkways are indicated.

3.12 JOB COMPLETION

A. GRM roofing contractor shall inspect completed GRM/Protected Roof Membrane Assembly and correct all defects to meet this specification and those of W. R. Grace & Co. and extruded polystyrene manufacturer.

B. W. R. Grace & Co. and extruded polystyrene manufacturer shall inspect completed GRM roofing systems and notify Contractor of defects in GRM or extruded polystyrene application and oversee corrections.

C. Clean up all debris, excess materials and equipment and remove from site.

D. Drippage or spills of coatings, mastic or primers shall be cleaned.

E. Contractor shall restrict construction traffic and equipment movement on completed GRM Roofing System to only essential related trades. For trades continuing work on completed GRM roofs, appropriate protection shall be provided.

End of Section 07530

SECTION 07550 - INSULATED FLEXIBLE SHEET ROOFING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 General requirements apply to work of this section.

B. This section is an alternate to Section 07510. Contractor shall advise Architect if he intends to use this system.

1.2 DESCRIPTION OF WORK:

A. Extent of insulated flexible sheet roofing is indicated on drawings and is hereby defined to include non-traffic-bearing sheet membrane system intended for weather exposure as primary roofing. Similar membranes concealed by a wearing surface are excluded by definition and, if required, are specified elsewhere in Division 7 as waterproofing.

B. Roof insulation related to flexible sheet roofing is specified in this section.

1.3 QUALITY ASSURANCES:

A. Manufacturer: Obtain primary flexible sheet roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.

Manufacturer shall send qualified technical representative to project site for purposes of advising Installer of procedures and precautions for use of roofing materials.

B. Installer: A firm with not less than 3 years of successful experience in installation of roofing systems similar to those required for this project and which is acceptable to or licensed by manufacturer of primary roofing materials.

Assign work closely associated with flexible sheet roofing, including (but not limited to) insulation, flashing and counterflashing, expansion joints, and joint sealers, to Installer of flexible sheet roofing.

C. Preliminary Roofing Conference: As soon as possible after award of roofing work, meet with Installer (roofer), installers of substrate construction (decks) and other work adjoining roof system including penetrating work and roof-top units, Architect, Owner and representatives of other entities directly concerned with performance of roofing system including (as applicable) Owner's insurers, and test agencies. Review requirements (contract documents), submittals, status of coordinating work, availability of materials and installation facilities and establish preliminary installation schedule. Review requirements for inspections, testing certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation precedures. Record discussion including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant. Discuss roofing system protection requirements for construction period extending beyond roofing installation. Discuss possible need for temporary roofing. If meeting ends with substantial disagreements, determine how disagreements will be resolved and set date for reconvened meeting.

D. Pre-application Roofing Conference: Approximately two weeks prior to scheduled commencement of roofing installation and associated work, meet at project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work installers of roof-top units and other work in and around roofing which must precede or follow roofing work (including mechanical work, if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the work including (where applicable) Owner's insurers, test agencies, and governing authorities. Record (Contractor) discussions of conference and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

(1) Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work preformed by other trades.

(2) Review structural loading limitations of steel deck and inspect deck for loss of flatness and for required mechanical fastening.

(3) Review roofing system requirements (drawings, specifications and other contract documents).

(4) Review required submittals, both completed and yet to be completed.

(5) Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.

E. UL Listing: Provide labeled materials which have been tested and listed by UL for "Class A" rated materials/system.

1.4 WARRANTY

A. Roofing Contractor: two (2) years in accordance with the General Conditions.

B. Roofing system Manufacturers: Shall furnish written ten year inspection and service agreement. Extruded polystyrene manufacturer shall furnish written ten year warranty on performance of extruded polystyrene. Either separately or jointly, warranties shall state:

(1) Roof membrane and flashing shall remain in a watertight condition.

(2) Roof materials and workmanship shall be covered for duration of warranty.

(3) Extruded polystyrene shall retain at least eighty percent (80%) of its thermal resistance over a ten year period.

(4) Roof's top covering of insulation, fabric and ballast shall remain in place.

(5) In event roof fails to so perform, respective manufacturer (either roofing system manufacturer or extruded polystyrene manufacturing company) shall, without additional cost to Owner, cause to be made repairs or modifications to roof necessary to enable roof to perform as warranted.

(6) Cost to restore roof and flashing membrane to a watertight condition shall not be limited to original cost of the installed roof.

(7) Above warranties are subject to obligations, exclusions and conditions of roofing assembly materials manufacturer's warranty provisions.

1.5 SUBMITTALS:

A. Product Data: Submit specifications, installation instructions and general recommendations from manufacturers of materials, for type of roofing required. Include data substantiating that materials comply with requirements.

B. Samples: Submit 3-lb. samples of aggregate surfacing material (rock ballast).

C. Pre-Roofing Conference: Submit copies of pre-roofing conference records.

1.6 JOB CONDITIONS

Weather: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

PART 2 - PRODUCTS

2.1 GENERAL:

Compatibility: Provide products which are recommended by manufacturers to be fully compatible with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

2.2 LOOSE/BALLASTED SYSTEM:

A. Elastomeric sheet material, manufacturer's standard thickness but not less than 45 mils, 1400 psi minimum tensile strength (ASTM D 412), 250% elongation (ASTM D 412), vapor permeable, ultraviolet and ozone resistant, low temperature brittleness of -40 degrees F (-40 degrees C) (ASTM D 746), standard color.

B. Products: Subject to compliance with requirements, provide one of the following:

"Sure-Seal B"; Carlisle Tire & Rubber Co.

"Gacoflex System I"; Gates Engineering Co.

"Trocal SMA"; Dynamit Nobel of America.

C. Aggregate Surface Ballast: ASTM gradation number 57. Fines smaller than 1/2" shall not exceed 10%.

2.3 MISCELLANEOUS MATERIALS FOR FSR:

A. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by manufacturer of FSR system.

B. Cant Strips and Flashing Accessories: Types recommended by manufacturer of FSR Material, provided at locations indicated and at locations recommended by mfr., and including adhesive tapes, flashing cements, and sealants.

C. Slip Sheet: Type recommended by manufacturer of FSR material for protection of sheet from incompatible substrates.

2.4 INSULATION:

A. Insulation: Dow Chemical; Styrofoam RM, 2" thick.

B. Miscellaneous Insulation Materials: Fabric: International Paper; Confil 689H (3.6 oz/yd black polyester). Phillips Fibers Corp.; Rufon P3B (3.0 02/yd black polyethylene).

2.5 MISCELLANEOUS ROOFING ACCESSORES:

A. Flasing Materials: Manufacturer's standard system compatible with flexible sheet membrane.

B. Walkway Protection Boards: Prefabricated concrete pavers containing no asphalt or coal-tar derivatives, suitable for use without cracking or breaking.

C. Splash Blocks: Precast Concrete

PART 3 - EXECUTION

3.1 PREPARATION OF SUBSTRATE:

A. General: Comply with manufacturers' instructions for preparation of substrate to receive FSR sytem.

B. Clean substrate of dust, debris, and other substances detrimental to FSR system work. Remove sharp projections.

C. Install cant strips, flashings, and accessory items as shown, and as recommended by manufacturer even though not shown.

D. Prevent compounds from entering and clogging drains and conductors, and from spilling or migrating onto surfaces of other work.

3.2 INSTALLATION:

A. General: Comply with manufacturers' instructions, except where more stringent requiremetns are indicated.

B. FSR Membrane Installation:

(1) General: Start installation only in presence of manufactaurer's technical representative.

(2) Cut sheets to maximum size possible, in order to minimize seams and to accommodate contours of roof deck and proper drainage across shingled laps of sheets.

(3) Loose/Ballasted FSR: Install membrane by unrolling over prepared substrate, nailing only at perimeter and at roofing penetrations. Lap adjoining sheets as recommended by FSR manufacturer and bond as recommended by manufacturer, covering top edges of each sheet at seams with uniform fillet of sealant. Install flashings and counterflashing as shown and as recommended by manufacturer.

C. Installation of Roof Insulation and Stone Ballast

(1) Install extruded polystyrene insulation as soon as possible after completion of roof and flashing membrane, not to exceed three days when weather is above 80 degrees F and sunny.

(2) Install insulation board with channelled side down and with closed joints; stagger all end joints. Maximum acceptable opening on a random basis is 3/8". Install boards to within 3/4" of projections and cant strips.

(3) Cover insulation board with a layer of water permeable fabric in accordance with extruded polystyrene insulation manufacturer's detailed recommendations.

(4) Apply stone ballast at a rate of 10 lbs. per square foot immediately after insulation and fabric have been installed. At perimeter stone ballast shall be increased to 20 lbs. per square foot for a distance of four feet from perimeter of roof areas and around all penetrations through roof membrane.

(5) Walkway Protection Boards: Install boards at locations shown and where required for access to roof-mounted equipment. Place protection boards carefully to avoid damage to membrane, laying over an additional layer of roof membrane material, loosely applied, for additional protection.

END SECTION

SECTION 07570 - PENTHOUSE FLOOR ELASTOMERIC MEMBRANE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The general provisions of the Contract, including General and Supplementary Conditions apply to the work specifed in this section.

1.2 DESCRIPTION OF SYSTEM:

A. Deck coating shall be a complete system of compatible materials to create a seamless waterproofing membrane.

B. Deck coating shall be designated for application on the specific type of deck indicated on the drawings.

1.3 QUALITY ASSURANCE:

A. Manufacturer:

Neogard Corporation; Auto-Guard II
3 M Company; Scotch-Clad "System V"

B. Applicator Qualifications:

Applicators shall be approved by manufacturer as licensed applicators.

C. Requirements of Regulatory Agencies:

Deck coating system shall be rated Class A by Underwriters Laboratories (ASTM E108/UL 790). Containers shall bear Underwriters Laboratories labels.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product literature and installation instructions.

B. Samples: Submit samples of deck coating system. Samples shall be construed as examples of finished color and texture of traffic deck coating system only.

C. License Certificate: Submit a currently dated Applicator's License Certificate issued by manufacturer. Certificate shall verify applicator's qualifications to properly install system, and shall commit manufacturer to aceptance of applicator as a co-signer under joint responsibility provisions of warranty required by these specifications.

D. Warranty: Upon completion of installation of system, submit joint manufacturer/Applicator Warranty Certificate.

E. Warranty Requirements: Materials and workmanship involved in this application shall be warranted, on a single document, by manufacturer and licensed applicator for three years. In accordance with provisions of the warranty, ruptures caused by cracking of substrate up to 1/16" in width are covered; otherwise, no liability is assumed for defects in substrate. Liability for damage in any respect, to building or contents thereof is specifically excluded from warranty.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Delivery: Materials shall be delivered in original sealed containers, clearly marked with supplier's name, brand name, and type of material. Containers shall bear UL labels.

B. Storage and handling: Recommended material storage temperature is 75 degrees F. Handle products to avoid damage to container. Do not store for long periods in direct sunlight.

1.6 JOB CONDITIONS:

A. Environmental Conditions:

(1) Do not proceed with application of materials when deck temperature is less than 40 degress F.

(2) Do not apply materials unless surface to receive coating is clean and dry, or if precipitation is imminent.

B. Protection:

(1) Warn personnel against breathing of vapors and contact of material with skin or eyes.

(a) In confined areas, workmen shall wear approved chemical-cartridge type masks.

(b) Wear protective clothing.

(2) Keep products away from heat, sparks, and flame. Do not allow use of spark-producing equipment during application until vapors are gone. Post "No Smoking" signs.

(3) After completion of application, do not allow traffic on coated surfaces for a period of at least 48 hours at 75^{O}F and 50% R.H., or until completely cured.

(4) Protect plants, vegetation, and animals that might be affected by coating. Use drop cloths or masking as required.

PART II - PRODUCTS

2.1 MATERIALS:

A. Traffic Deck Coating Material:

(1) Primer: As recommended by manufacturer.

(2) Sheet Flashing: Elastomeric sheet flashing material having a minimum thickness of 60 mils. (Uncured neoprene sheet is preferred.)

(3) Liquid Flashing: Elastomeric liquid flashing material.

(4) Aggregate: Uniformly graded (20-40 mesh); hard aggregate having a minimun hardness of 6.5 + on Moh's scale.

(5) Elastomeric Coating Material: Polyurethane coating, gray in color.

(6) Sealant: Neogard 7991 Sealant, or as approved by manufacturer.

2.2 MATERIAL PERFORMANCE CRITERIA:

A. Minimum Performance Requirements: The minimum performance requirements for coating system are:

Physical Property	Results	ASTM Test Method If Applicable
Fire Resistance of system	U.L. 790 Class "A" over non-combustible deck	E108
Tensile Strength Min. At Break	2000 psi (14060 Kgf/m)	D412
Elongation at Break at 75°F (23.8°C.), % Min.	400%	D412
Permanent Set at Break, % Min.	10%	D412
Hardness	80 to 87 Shore A	D2240
Tear Resistance	250 lbs. per linear inch (446.3 Kgf/m)	D1004

Abrasion	15 mg. loss	C501 Taber. Abrasion 1000 Rev. with 1000 gm/wheel psig CS-17 Wheels
Weather Stability	Maintains Flexibility $-40^{o}F$ to $+ 180^{o}F$	Heat/Cold
Thermal Shock	No loss of Adhesion	Alternate Heat/Cold cycle
Weathering Resistance	Slight Chalking Weatherometer 350 hours	D822
Moisture Vapor Transmission at 30 mil	1.97 Perms (1.3 metric perma)	E96 Procedure E

PART III - EXECUTION

3.1 INSPECTION:

A. Concrete: Verify that work done under other sections meets the following requirements:

(1) That concrete deck surface is free of ridges or sharp projections. If metal forms or decks are used they should be ventilated to permit adequate drying of concrete on exterior exposed deck.

(2) That concrete was cured for a minimum of 28 days (Minimum of 4,000 psi compressive strength). Water-cured treatment of concrete is preferred. Others require prior written approval by manufacturer.

(3) That concrete was finished by a power or hand steel trowel followed by soft hair broom to obtain light texture or "sidewalk" finish.

3.2 PREPARATION:

A. Cleaning: Surfaces contaminated with oil or grease shall be vigorously scrubbed with a power broom and a strong non-sudsing detergent. Thoroughly wash, clean, and dry.

B. Etching: Treat concrete surfaces with 10% to 15% solution of muriatic acid to remove laitance and impurities. After acid has stopped foaming or boiling, immediately rinse thoroughly with water. Re-rinse as required to remove muriatic acid solution.

C. Cracks and cold joints: Visible hairline cracks in concrete and cold joints shall be cleaned, primed and treated with 3 liberal coats of polyurethane deck coating material. Large cracks shall be routed out and sealed with Neogard 7991 sealant or sealant approved by manufacturer. Sealant shall be applied to inside area of crack only, not applied to deck surface.

D. Control Joints: Seal secondary control joints with Neogard 7991 sealant or sealant approved by manufacturer.

E. Surface Condition: Surface shall be clean and dry prior to coating.

3.3 APPLICATION

A. Primer: Apply manufacturer's recommended rate. Within 8 hours of application of primer - base coat must be applied. If base coat cannot be applied within 8 hours, reprime.

B. Detail Work: Apply a 30 dry mil thickness of polyurethane coating material in 3 coats over cracks and a minimum distance of 2" on each side of cracks, control joints, and cold joints.

C. Sheet Flashing: Install sheet flashing where indicated on the drawings after prime coat has dried, and before base coats are applied.

D. Base Coat: Apply polyurethane coating material to deck surface in 2 coats to yield an average 20 dry mils. Extend base coat over cracks and control joints which have received treatment. Apply base coat same day as primer coat.

E. Wearing surface Coat: Apply in 1 coat, polyurethane coating material to yield an average of 8 dry mils and immediately broadcast properly graded, evenly distributed, hard (6.5+ Moh's scale) aggregate at rate of 15 pounds per 100 square feet.

F. Double-Texturing: After coat to receive aggregate (the first wearing surface coat) has dried and loose aggregate has been removed, apply material to yield an average of 12 dry mils and immediately broadcast additional aggregate at a rate of 10 pounds per 100 square feet. When dry, remove excess aggregate and recoat surface with coating material to yield an additional 12 dry mils. Double-textured areas shall yield an average of 52 dry mils, exclusive of aggregate.

3.4 PATCHING:

Restore damaged areas to match adjacent areas. Use 100% solids epoxy and sand for filling and leveling.

3.5 CLEANING:

Remove debris resulting from completion of coating operation from the project site.

END OF SECTION 07570

SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. The extent of each type of flashing and sheet metal work is indicated on drawings and by provisions of this section.

B. The types of work specified in this section include the following:

(1) Metal counter flashing; and base flashing (if any).

(2) Metal wall flashing and expansion joints.

(3) Built-in metal scuppers.

(4) Exposed metal trim/fascia units.

(5) Miscellaneous sheet metal accessories.

(6) Elastic roof/wall expansion joint systems.

(7) Downspouts.

C. Integral masonry flashings are specified as masonry work in sections of Division 4.

D. Roofing accessories (excluding roof accessories) are specified in roofing system sections as roofing work.

1.3 SUBMITTALS:

A. Product Data; Flashing, Sheet Metal, Accessories: Submit manufacturer's product specifications, installation instructions and general recommendations for each specified sheet material and fabricated product.

B. Samples; Flashing, Sheet Metal, Accessories: Submit 2, 8" square samples of specified sheet materials to be exposed as finished surfaces.

Submit 2, 12" long, completely finished units of specified factory-fabricated products exposed as finished work.

C. Shop Drawings; Flashing, Sheet Metal, Accessories: Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter flashings, trim/fascia units, gutters, downspouts, scuppers and expansion joint systems; layouts at 1/4" scale, details at 3" scale.

1.4 JOB CONDITIONS:

Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS:

A. Sheet Metal Flashing/Trim:

(1) Aluminum: ASTM B 209, alloy 3003, temper H14, AA-C22A41 clear anodized finish; 0.032" thick (20 gage) except as otherwise indicated.

(2) Copper: ASTM B-370, cold-rolled except where soft temper is required for forming; 16 oz. (0.0216" thick).

B. Miscellaneous Materials and Accessories:

(1) Fasteners: Same metal as flashing/sheet metal or, other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

(2) Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15- mil dry film thickness per coat.

(3) Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

(4) Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed; comply with FS TT-S-0027, TT-S-00230, or TT-S-001543.

(5) Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by manufacturer for exterior/interior nonmoving joints including riveted joints.

(6) Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.

(7) Paper Slip Sheet: 5-lb rosin-sized building paper.

(8) Polyethylene Underlayment: 6-mil carbonated polyethylene film; FS L-P-512.

(9) Reglets: Metal or plastic units of the type and profile indicated, compatible with flashing indicated, noncorrosive.

(10) Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

(11) Elastic Flashing Filler: Close-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

(12) Roofing Cement: ASTM D 2822, asphaltic.

2.1 FABRICATED UNITS:

A. General Metal Fabrication:

Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with industry standards.

E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

F. Elastic Expansion Joint Fabrication:

(1) General: Provide manufacturer's standard units of size and type indicated, complete with prefabricated corner and intersection units and splicing materials, with elastic sheet flashing forming the primary joint membrane, in a supported bellows arrangement to be secured to both sides of expansion joints; with bellows insulated from below with adhesively applied, flexible, closed-cell rubber or plastic not less than 3/8" thick.

(2) Type: Plain sheet or encapsulated metal flanged edges, for embedment in other construction or nailing to substrates, 4" minimum flange width.

(3) Type: Metal flanged edges, 3" - 4" wide, formed to profiles as indicated to fit curbs, for nailing to substrate.

Metal Flanges: 0.025" aluminum.

(4) Looped Bellows width: 5" to 6", exclusive of flanges.

G. Finish: Where flashing sheet metal and rain drainage items are exposed in finished work provide high performance fluorocarbon coating to match store front at downspojts at Pods A, B, C, and F except downspouts at Mechanical Penthouse at 'F' pavillion roof shall match adjacent metal.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS:

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a course of paper slip sheet and a course of polyethylene underlayment.

C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

D. Install reglets to receive counter flashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections.Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.

E. Install counterflashing in reglets, either by snap-in seal arrangement, or by wedging in place for anchorage and filling reglets with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

F. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6". Complete seams at joints between units, to form a continuous waterproof system.

3.2 CLEANING AND PROECTION:

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

END SECTION

SECTION 07662 - METAL FASCIA, METAL SIDING, AND COPINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. The extent of metal fascia, siding roofing and copings is indicated on drawings and provisions of this section. Types of work specified in this section include:

.040 Aluminum fascia panel systems with high performance coating.
.063 Aluminum copings with high performance coating.
.032 Aluminum corrugated siding with baked enamel finish.
24 gage galvanized, standing seam and flat seam sterel roofing with high performance coating.

B. Sheet metal and flashings not part of fascia and coping systems included in this section are specified in another Division 7 section.

1.3 QUALITY ASSURANCE:

A. Insurance Requirements: Provide fascia systems which comply with Factory Mutual requirements for roof perimeter flashing in either of the following categories and wind zones.

Accepted by Factory Mutual for use indicated.

Zone 2

B. Industry Standards: Provide products which comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual," except as otherwise indicated.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications, installation instructions and general recommendations for each fascia and coping product required. Include data substantiating that materials and performance comply with requirements.

B. Shop Drawings: Submit shop drawings indicating layout, joining, profiles, accessories, anchorage, flashing connections and relationship to supporting structure and to adjoining roof and wall construction.

C. Samples:

For verification purposes submit 2 completely finished samples for each type of fascia siding and coping and finish required. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations. Provide samples of the following sizes:

1. Fascia and siding: 12" long sections of each distinctly different fascia component, including extenders (if any), exposed as finish work.

2. Copings: 12" long.

1.5 JOB CONDITIONS:

Coordinate work of this section with adjoining work for proper sequencing of each installation to ensure best possible weather resistance and protection of materials and finishes against damage.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aluminum Materials:

1. Aluminum Extrusions: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

2. Aluminum Sheet: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but with not less than the strength and durability properties specified in ASTM B 204 for 5005-H15.

3. Galvanized Steel: Hot-dipped galvanized 24 gage steel.

B. Miscellaneous Materials:

1. Exposed Fasteners: Stainless steel, non-magnetic, of type and size standard with manufacturer for product and application indicated. Match finish of exposed heads with material being fastened.

2. Concealed Fasteners: Same metal as item fastened or other noncorrosive metal as recommended by manufacturer.

3. Mastic Sealant: Polyisobutylene; non-hardening, nonskinning, nondrying, nonmigrating sealant.

4. Elastic Sheet Flashing: Manufacturer's standard flexible, elastic sheet, of materials, indicated below:

   a. Reinforced EPDM synthetic rubber reinforced with polyester or nylon, 0.033" thick.

   b. Polyvinyl fluoride film with adhesive backing.

5. Foam Rubber Seal: Manufacturer's standard foam.

6. Adhesives: Type recommended by manufacturer for substrate and project conditions, and formulated to withstand min. 60 psf uplift force.

2.2 FABRICATION, GENERAL:

A. Provide fascia, siding and copings which are designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength, and uniform appearance.

B. Expansion provisions: Fabricate fascia siding and copings to allow controlled expansion in running lengths not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner which is sufficient to prevent water leakage, deformation or damage.

2.3 FASCIA PANEL SYSTEM:

Formed Aluminum Panels: Provide manufacturer's standard modular panels formed from aluminum sheet to shapes and sizes indicated for flat seam installation. Include trim, closer strips, and other accessories indicated or required for proper installation. Provide aluminum sheet of the following minimum thickness, unless otherwise indicated.

Thickness: 0.040"

2.4 CORRUGATED SIDING:

A. Formed Aluminum Panels: Provide manufacturer's standard system of formed panels of shapes and sizes selected by Contractor. Include trim, closer strips, gravel stop, and other accessories indicated or required for sheet of the following minimum thickness, unless otherwise indicated.

Thickness: 0.032"

B. Corrugated Metal Siding Support System: Provide manufacturer's standard metal support system consisting of horizontal girts and vertical framing members including special connectors; of proper type for, and by manufacturer of, system indicated. Provide components and spacing designed and tested to withstand the following loading:

Wind Pressure: 25 psf.

2.5 ALUMINUM COPINGS:

A. Interlocking Multi-Part Coping System: Provide manufacturer's standard system consisting of coping formed from aluminum sheet to profile and of thickness indicated, zinc-coated steel anchor plate or cleat located at coping joint, and formed aluminum gutter chair or gutter/splice plate or compression pad/gutter with prefabricated inside and outside corners, miters welded before finishing; without exposed fasteners.

Thickness of Coping: 0.063".

B. Products: Subject to compliance with requirements, provide one of the following:

C/S Snap-Lock Coping/Construction Specialties, Inc.

Permasnap Coping/W. P. Hickman Co.
Snap-Lok/MM Systems Corp.

2.6 GALVANIZED STEEL ROOFING

A. Roofing shall be standing seam at pavilion and walkway.

B. Fascia below standing seam at pavilion shall be flat seam system.

C. Panels shall be roll-formed in continuous lengths. Seam spacing shall be 12 3/4" on-center. Standing snap-on seam shall contain an extruded vinyl weather seal insert to prevent shphoning, flooding and air infiltration through the standing seam system.

D. All exposed adjacent flashing shall be of same material and finish as roofing system.

E. Material shall be galvanized steel finished with high performance coating to match store front.

F. Manufacturer: Subject to compliance with requirements, provide the following:

Berridge Mfg. Co.; Tee-Panel Standing Seam System

Berridge Mfg. Co.; Flush Seam Panel

2.7 ALUMINUM FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. For components which are assembled or welded in factory, apply finish after fabrication is completed.

Provide colors or color matches as indicated to match Architect's sample.

B. Baked Enamel Finish (for corrugated metal siding): AA-C12C42R1x (cleaned with inhibited chemicals, conversion coated with an acid-chromate fluoride-phosphate treatment, and painted with organic coating specified below). Apply baked enamel finish in strict compliance with paint manufacturer's specifications for cleaning, conversion coating and painting.

Organic Coating: Manufacturer's standard thermosetting acrylic enamel, 0.8 mil. min. dry film thickness.

C. High Performance Coating (for fascia panel system,and galanized steel roofing): AA-C12C42R1x (cleaned with inhibitive chemicals, conversion coated with an acid-chromate fluoride-phosphate treatment and painted with organic coating specified below). Apply in strict compliance with coating and resin manufacturer's instructions using a licensed applicator.

Fluorocarbon Coating: Inhibitive thermo-cured primer, 0.2 min. mil. dry film thickness, and thermo-cured fluorocarbon coating containing "Kynar 500" 1.0 mil. min. dry film thickness.

Where in conjunction with storefront system High Performance finish shall match storefront finish.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive work of this section, with vapor barriers, roof insulation, roofing, flashing, and wall construction; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor products included in this section securely to structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are to be installed in contact with dissimilar metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation as recommended by aluminum producer.

C. Fascia Panel System: Install with vertical joints and interlock as shown on drawing. Anchor panels on one side only to allow for thermal expansion. Provide concealed anchors. Curve panels on site to match curve of precast concrete panels.

D. Corrugated Metal Siding: Install with vertical joints. Provide concealed anchorage.

E. Aluminum Copings: At precast concrete panels, provide movable joint at mid-point of panel. Weld or solder mitered joint above joints in precast concrete panels.

3.2 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

B. Protection: Installer shall advise Contractor of protection and monitoring procedures, as required to ensure that work of this section will be without damage or deterioration at time of substantial completion.

END OF SECTION 07662

SECTION 07800 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent and locations of roof accessories is indicated on the drawings and by provisions of this section.

B. Types of units specified in this section include the following:

1. Roof hatches.

2. Prefabricated curb and support units.

Refer to roofing system sections of these specifications for roofing accessories (not work of this section).

C. Roof relief hoods (gravity ventilators), air intake hoods, heat and smoke vents, roof drains, overflow drains, and catch basins are specified in Division 15.

D. Prefabricated curb and support unit sizes must be verified with equipment sizes before ordering.

1.3 SUBMITTALS:

Product Data; Roof Accessories: Submit manufacturer's product specifications, rough-in diagrams, details, installation instructions and general product recommendations.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS:

Provide manufacturers' standard units, modified as necessary to comply with requirements. Shop fabricate each unit to greatest extent possible.

2.2 MATERIALS, GENERAL:

A. Aluminum Sheet: ASTM B 209, alloy 3003, temper as required for forming and performance.

B. Extruded Aluminum: Manufacturer's standard extrusion of sizes and general profiles indicated, alloy (6063-T52; 0.078" minimum thicknesses for primary framing and curb member legs, 0.062" for secondary legs.

C. Insulation: Manufacturer's standard rigid or semi-rigid board of glass fiber of thicknesses indicated.

D. Wood Nailers: Softwood lumber pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2; not less than 1-1/2" thick.

E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

Where removal of exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

F. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

G. Elastomeric Sealant: Generic type recommended by unit manufacturer, which is compatible with joint surfaces; comply with FS TT-S-0027, TT-S-00230, or TT-S-001543.

2.3 UNIT MATERIALS, FABRICATION:

A. Roof Hatches:

1. General: Fabricate units of sizes shown, single-leaf type unless otherwise indicated, for 40 lbs. per sq. ft. external loading and 20 lbs. per sq. ft. internal loading pressure. Frame with integral-curb double-wall construction with 1-1/2" insulation, cant strips and cap flashing (roofing counter flashing), with welded or sealed mechanical corner joints. Provide double-wall cover (lid) construction with 1" insulation core. Equip units with complete hardware set including hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Provide gasketing. Fabricate units of following materials.

Materials: Aluminum, sheets and extrusions.

2. Sloping Roofs: Where slope of roof deck exceeds 1/4" per ft., fabricate hatch curbs with height tapered to match slope, to result in level installation of tops of units.

3. Acceptable: Bilco Company Type "S" 2'-6" x 3'-0"
Inryco/Milcor RDS-1 2'6" x 3'-0"

B. Prefabricated Curbs/Equipment Supports:

1. General: Comply with loading and strength requirements as indicated where units support other work. Coordinate dimensions with rough-in sheets or shop drawings of equipment to be supported. Fabricate of structural quality sheet steel (ASTM A 570, Grade as required) which has been prepared for painting and factory primed and painted with 2-mil thickness of baked-on synthetic enamel, after fabrication. Fabricate with welded or sealed mechanical corner joints, and with cant strips and base profile coordinated with roof insulation thickness. Provide wood nailer at tops of curbs, coordinate with thickness of insulation and roof flashing as indicated, and tapered where necessary to compensate for roof deck slopes of 1/4" per ft. and less. Except as otherwise indicated or required for strength, fabricate units of minimum 14 gage (0.0747") metal, and to minimum height of 12".

Sloping Roofs: Where slope of roof deck exceeds 1/4" per ft., fabricate curb/support units with height tapered to match slope, to result in level installation of tops of units.

2. Acceptable: The Pate Company "ceb-5" 13 1/2" high

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, and with vapor barriers, roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are to be installed in contact with nomcompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces or provide other permanent separation.

C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of roofing cement, to form a seal.

D. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

E. Operational Units: Test operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 CLEANING AND PROTECTION:

A. Clean exposed metal and plastic surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

B. Installer shall advise Contractor of required procedures for surveillance and protection of roof accessories; so that units will be without damage or deterioration, other than normal weathering, at time of substantial completion.

END OF SECTION 07800

SECTION 07900 - JOINT SEALERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. The extent of each form and type of joint sealer is indicated on drawings and by provisions of this section.

B. The applications for joint sealers as work of this section include the following:

(1) Pavement and sidewalk joints.

(2) Concrete construction joints.

(3) Floor joints (interior).

(4) Wall joints (exterior).

C. Refer to Division-8 sections for glazing requirements, not work of this section.

D. Refer to sections of Division 15 and 16 for joint sealers in mechanical and electrical work; not work of this section.

E. General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent bases, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications, handling/installation/curing instructions, and performance tested data sheets for elastomeric product required.

B. Certified Tests: With product data submit certified test reports for elastomeric sealants on aged performances as specified, including hardness, stain resistance, adhesion, cohesion or tensile strength, elongation, low-temperature flexibility, compression set, modulus of elasticity, water absorption, and resistance (aging, weight loss, deterioration) to heat and exposures to ozone and ultraviolet.

1.4 JOB CONDITIONS:

Weather Conditions: Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer for installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. General: Manufacturers listed in this article include those known to produce the indicated category of prime joint sealer material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product.

B. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

(1) Manufacturers of Elastomeric Sealants (Liquid):

Dow Corning Corp.; Midland, MI
Euclid Chemical Co.; Cleveland, OH
General Electrical Co.; Waterford, NY
Gibson-Homans Co.; Cleveland, OH
Mameco International; Cleveland, OH
Pecora Corp.; Harleyville, PA
Sika Chemical Corp.; Lindhurst, NJ
Sonneborn/Contech, Inc.; Minneapolis, MN
Standard Dry Wall Products Co.; Miami, FL
Tremco, Inc.; Cleveland, OH
Toch/Carboline Co.; St. Louis, MO
Williams Products, Inc.; Troy, MI
Woodmont Products, Inc.; Huntingdon Valley, PA

(2) Mfrs. of Non-Elastomeric Sealants:

Gibson-Homans Co.; Cleveland, OH
Macco/Glidden/SMC; Wickliffe, OH
W. R. Meadows, Inc.; Elgin, IL
Parr, Inc.; Cleveland, OH
Pecora Corp.; Harleysville, PA
Sika Chemical Corp.; Lindhurst, NJ
Sonneboen/Contech, Inc.; Minneapolis, MN
Standard Dry Wall Products Co.; Miami, FL
Tremco,Inc.; Cleveland, OH
VIP Enterprises, Inc.; Miami, FL
Woodmont Products, Inc.; Huntingdon Valley, PA

(3) Mfrs. of Joint Fillers/Sealant Backers:

Dow Chemical Co.; Midland, MI
J&P Petroleum Products, Inc.; Dallas, TX
W. R. Meadows, Inc.; Elgin, IL
Rubatex Corp.; Bedford, VA
Sonneborn/Contech, Inc.; Minneapolis, MN
Williams Products, Inc.; Troy, MI
Woodmont Products, Inc.; Huntingdon Valley, PA

2.2 MATERIALS:

A. General Sealer Requirements: Provide colors indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors. Select materials for compatibility with joint surfaces and other indicated exppsures, and except as otherwise indicated select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated. Where exposed to foot traffic, select nontracking materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealer system.

B. Elastomeric Sealants:

(1) Multi-Component Polyurethane Sealant: For joints subject to traffic, provide manufacturer's standard, non-modified, 2-or-more-part, polyurethane-based, elastomeric sealant; complying with either ASTM C 920 Type M Class 25, or FS TT-S-00227E Class A; self-leveling grade.

Modulus and Hardness: Provide sealant with cured modulus of elasticity at 100% elongation of not more than 150 psi (ASTM D 412 test procedure), and Shore A hardness of not less than 55 (ASTM D 2240).

Tear Resistance: Not less than 50 lb. per in. (ASTM D 624).

(2) Single-Component Silicon Rubber Sealant: For exterior building joints and interior joints subject to dampness and movement, provide manufacturer's standard, non-modified, one-part, silicone-rubber-based, air-curing, nonsag, elastomeric sealant; complying with either ASTM C 920 Type S Class 25 Grade NS, or FS TT-S_001543A Class A Type Non-sag.

NonPorous-Bond Type: Where indicated and where sealant-bond surfaces are nonporous and compatible with acid-type sealant, provide manufacturer's acid type with "mid-to-high" fully-cured modulus of elasticity not exceeding 75 psi, Shore A hardness of 25 to 35, minimum elongation of 500% and minimum tensile strength of 150 psi (ASTM D 412); with adhesion in peel of 20 lb. per in. and 10% maximum loss of bond substrate (ASTM C 794), and tear resistance of not less than 30 lb. per in. (ASTM D 624).

Sanitary Interior Type: Where indicated and where applied in high-humidity or wet service, provide manufacturers mold/mildew-resistant, acid type sealant for application to nonporous sealant bond surfaces.

C. Non-Elastomeric Sealants and Calking Compounds:

Butyl Rubber Sealant: For interior joints not subject to dampness or movement, provide polymerized butyl rubber and inert fillers (pigments), solvent-based with minimum 75% solids, non- sag consistency, tack-free time of 24 hours or less, paintable, non-staining; complying with FS TT-S-001657.

D. Foam-Type Filler-Sealants:

Fire-Resistant Foamed-in-place Filler: Provide manufacturer's standard, 2-part, silicone-based, room- temperature-vulcanizing, foamed elastomer, recommended by mfr for filling joints and other openings in construction work; with cured density of 15 to 20 pcf, partially (50%) closed-cell structure, cohesive/tensile strength of 25 psi, 40% compression deflection of 10 psi, and flame-spread rating of 25 (ASTM E 84); tested and rated by UL for 3-hr. fire resistance for penetration seals (ASTM E 119).

E. Joint Fillers, Pavement Types:

Bituminous and Fiber Joint Filler: Provide resilient and non-extruding type premolded bituminous impregnated fiberboard units complying with ASTM D 1751; FS HH-F-341, Type I; or AASHTO M 213.

F. Precompressed foam Sealant:

(1) Provide precompressed foam sealant supplied in self-adhesive rolled tape form. It shall be composed of an open cell, high qualilty polyester polyurethane foam impregnated with neoprene rubber suspended in chlorinated hydrocharbons.

(2) Subject to compliance with requirements, provide products of one of the following: III Bruck/USA; Will-seal Tape Type 150. 1 1/2 or 2" x 1 1/2 depth.

G. Miscellaneous Materials:

(1) Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.

(2) Bond Breaker Tape: Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

(3) Sealant Backer Rod: Provide compressible rod stack of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant.

PART 3 EXECUTION

3.1 INSPECTION:

Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 JOINT PREPARATION:

A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances which could interfere with seal of gasket or bond of sealant or calking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.

B. Prime or seal joint surfaces where indicated, and where recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond: do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION:

A. Conply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.

C. Install sealant backer rod for liquid-applied sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.

D. Install bond breaker tape where indicated and where required by manufacturer's recommendations to ensure that liquid-applied sealants will perform as intended.

E. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

F. Install liquid-applied sealant to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of bead; (not applicable to sealants in lapped joints):

(1) For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.

(2) For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.

(3) For joints sealed with non-elastomeric sealants and calking compounds, fill joints to a depth in range of 75% to 125% of joint width.

G. Spillage: Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

H. Recess exposed edges of exposed joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will protrude from joints.

I. Install fire-resistant foamed-in-place filler in openings in rated walls and in floors at thicknesses indicated. Dam bottom of vertical openings and one side of horizontal openings with temporary containment forms or, where required to achieve fire-resistance ratings, provide permanent mineral composition board forms. On horizontal penetrations, provide partial face containment forms where required for form placment. Allow installed fillers to cure 24 hours; remove temporary forms, trim ragged edges with sharp knife; inspect and fill voids with additional filler to form uniform thickness of filler.

J. Install pre-compressed sealant gasket in precast concrete joints. Surfaces to be sealed shall be sand, dry, clean, and free of oil, grease, lartance, rust and other foreign material that would prevent proper adhesion. Comply with manufacturers printed installation procedures.

3.4 CURE AND PROTECTION:

Cure sealants and calking compounds in compliances with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Cure and protect sealants in a manner which will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorated during construction period.

END OF SECTION 07900

SECTION 08100 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of standard steel doors and frames is shown and scheduled on drawings.

B. Custom hollow metal work is specified in other Division 8 sections.

C. Builder's hardware is specified elsewhere in Division 8.

1.3 QUALITY ASSURANCE:

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100_ and as herein specified.

B. Manufacturer: Provide standard steel doors and frames by a single firm specializing in production of this type of work.

Provide steel doors and frames by one of the following:

Amweld Building Products Div.
Ceco Corp.
Dittco Products Div.
Fenestra.
Republic Builders Prod. Corp.
SteelCraft Mfg. Co.

C. Fire-Rated Assemblies: Provide fire-rated doors investigated and tested as fire door assemblies, complete with type of hardware to be used. Identify each fire door with recognized testing laboratory labels, indicating applicable fire rating of steel doors. Construct and install assemblies to comply with NFPA Standard No. 80, and as herein specified.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications for fabrication and installation, including data substantiating that products comply with requirements.

B. Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

C. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.

B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on wood sills at least 4" high, or otherwise store on floors in manner that will prevent rust and damage. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G90 zinc coating, mill phosphatized.

D. Supports and Anchors: Fabricate of not less than 18 gage galvanized sheet steel.

E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.

F. Shop Applied Paint:

Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.

2.2 FABRICATION, GENERAL:

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle, wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory- assembled before shipment, to assure assembly at project site.

B. Fabricate exposed faces of doors and panels from only cold-rolled steel.

C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).

D. Fabricate exterior doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition inverted steel channels.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

F. Sound-Rated (Acoustical) Assemblies:

Where shown or scheduled, provide door and frame assemblies which have been fabricated as sound-reducing type, tested in accordance with ASTM E 90, and classified in accordance with ASTM E 413.

Unless otherwise indicated, minimum sound rating for acoustical assemblies is STC 38.

G. Finish Hardware Preparation:

(1) Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.

(2) For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.

(3) Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.

(4) Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with "Recommended Locations for Builder's Hardware," published by Door and Hardware Institute.

(5) Shop Painting:

(a) Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

(b) Clean steel surfaces of mill scale, oil, dirt, and other foreign materials before application of paint.

(c) Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

2.3 STANDARD STEEL DOORS:

A. Provide metal doors of types and styles indicated on drawings or schedules. Doors shall be 20 gauge metal for interior doors, 18 gauge for exterior doors.

B. Door Louvers:

Provide sightproof stationary louvers for interior doors where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24 gage cold-rolled steel at set into 20 gage steel frame.

2.4 STANDARD STEEL FRAMES:

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Frames shall be 16 gauge metal. Fabricate frames with mitered and welded corners.

B. Form exterior frames of hot dip galvanized steel.

C. Door Silencers: Except on weatherstripped frames, drill stops to receive 2 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.

D. Plaster Guards: Provide 26 gage steel plaster gaurds or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation.

PART 3 - EXECUTION

3.1 INSPECTION:

Installer must examine substrate and conditions under which steel doors and frames are to be installed and must notify Contractor in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION:

A. General: Install standard sheet doors, frames, and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.

B. Placing Frames:

(1) Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames", unless otherwise indicated.

(2) Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

(3) In plaster or masonry walls constructed with antifreeze additives, protect inside (concealed) faces of door frames using fibered asphalt emulsion coating. Apply approximately 1/8" thick over shop primer and allow to thoroughly dry before handling.

(4) In masonry construction, locate 2 wall anchors per jamb at hinge and strike levels. Building-in of anchors and grouting of frames is specified in Division 4.

(5) At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.

(6) Install fire-rated frames in accordance with NFPA Std. No. 80.

(7) In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws.

C. Door Installation:

(1) Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.

(2) Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

3.3 ADJUST AND CLEAN:

A. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged areas or prime coat and apply touch-up of compatible air-drying primer.

B. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.

C. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 08210 - WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General andSuuplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent and location of each type of wood door is shown on drawings and in schedules.

B. The types of doors required include the following:

Solid core flush wood doors with veneer faces.

C. Raised panel doors are included in Division 6.

D. Shop priming of wood doors is included in this section.

E. Factory-preparation for hardware (premachining) for wood doors is included in this section.

1.3 QUALITY ASSURANCE:

A. Fire-Rated Wood Doors: Provide wood doors with fire-resistance ratings indicated or required to comply with governing regulations and which are identical in materials and type of construction to those used in assemblies which have been tested in compliance with ASTM E 152 and are labeled and listed by a testing and inspection organization acceptable to authority having jurisdiction.

B. Manufacturer: Obtain doors from a single manufacturer to ensure uniformity in quality of appearance and construction, unless otherwise indicated.

1.4 REFERENCES:

A. Comply with the applicable requirements of the following standards unless otherwise indicated:

(1) ANSI/NWMA I.S.1, "Industry Standard for Wood Flush Doors" published by National Woodwork Manufacturers Association (NWMA).

(2) AWI Quality Standard: Section 1300 of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI). Designations for grade and core construction under types of doors refer to this standard.

1.5 SUBMITTALS:

A. Product Data: Submit door manufacturer's product data specifications and installation instructions for each type of wood door.

(1) Include details of core and edge construction, trim for openings and louvers (if any) and similar components.

(2) Include certifications as may be required to show compliance with specifications.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements of factory finishing and other pertinent data.

C. Specific Product Warranty:

(1) Submit written agreement in door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show telegraphing of core construction below in face veneers, or do not conform to tolerance limitations of NWMA and AWI.

(2) The warranty shall include refinishing and reinstallation which may be required due to repair or replacement of defective doors.

(3) Warranty shall be in effect during following period of time after date of substantial completion.

Solid Core Flush Interior Doors:

Life of installation.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the "On- Site Care" recommendations of NWMA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instructions, and as otherwise indicated.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Algoma Hardwoods Inc.
Cal-Wood Door Div., Timberland Ind., Inc.
Eggers Hardwood Prodcts Corp.
Glen-Mar Door Mfg. Co.
Weyerhauser Company.

2.2 MATERIALS AND COMPONENTS:

A. General: Provide wood doors complying with applicable requirements of referenced standards for kinds and types of doors indicated and as specified.

B. Face Panels: Manufacturer's standard 2- or 3-ply face panels, unless otherwise specified.

C. Exposed Surfaces: Provide kind shown or scheduled and as further specified. Provide same exposed surface material on both faces of each door, unless otherwise indicated.

2.3 GENERAL FABRICATION REQUIREMENTS:

A. Openings: Cut and trim openings through doors and panels as shown. Comply with applicable requirements of referenced standards for kind(s) of doors required.

B. Light Openings: Factory cut openings. Trim openings for non- fire rated doors with solid wood molding of profile shown.

2.4 EXTERIOR FLUSH WOOD DOORS:

Solid Core Doors for Opaque Finish:

A. Faces: Any closed-grain hardwood of mill option.

B. Grade: Custom.
C. Core Construction: PC (Particleboard core). (Type I waterproof)

2.5 INTERIOR FLUSH WOOD DOORS:
A. Solid Core Doors for Opaque Finish:

(1) Faces: Any closed-grain hardwood of mill option.

(2) Grade: custom.

(30 Core Construction: PC (Particleboard core).

B. Fire-Rated Solid Core Doors:

(1) Faces and AWI Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.

(2) Core Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.

(3) Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance over edges composed of a single layer of treated lumber. Provide wood lock blocks.

2.6 SHOP-PRIMING:

Before delivery of doors to project site, shop-prime as follows:

Paint Finish: Prime exposed portion of wood doors shown or scheduled for paint finish with one coat of wood primer specified in Division 9 "Painting" sections of these specifications.

2.7 PREPARATION FOR HARDWARE:

A. Premachine wood doors at factory.

B. Comply with tolerance requirements of AWI. Machine doors for hardware requiring cutting of doors. Comply with final hardware schedules and door frame shop drawings and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in factory.

PART 3 - EXECUTION

3.1 INSPECTION:

Installer must examine door frames and verify that frames are correct type and have been installed as required for proper hanging of corresponding doors and notify Contractor in writing of conditions detrimental to proper and timely installation of wood doors. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION:

A. Condition doors to average prevailing humidity in installation area prior to hanging.

B. Hardware: For installation see Division 8 "Builders Hardware" section of these specifications.

C. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and as shown.

D. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA NO. 80.

E. Job Fit Doors: Align doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining.

(1) Bevel non-rated doors 1/8" in 2" at lock and hinge edges.

(2) Bevel fire-rated doors 1/8" in 2" at lock edge.

F. Job Site Finished Doors: See painting sections in Division 9 of these specifications for requirements for finishing wood doors.

3.3 ADJUST AND CLEAN:

A. Operation: Rehang or replace doors which do not swing or operate freely, as directed by Architect.

B. Finished Doors: Refinish or replace doors damaged during installation, as directed by Architect.

C. Protection of Completed Work: Advise Contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of work.

END OF SECTION 08210

SECTION 08305 - ACCESS DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent, location, and size of each type of access door required is shown and scheduled on drawings.

B. Building of anchors and grouting of frames set in masonry construction is specified in Division 4.

C. Roof Hatches are specified in Division 7.

1.3 QUALITY ASSURANCE:

A. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for rating shown.

Provide UL label on each fire-rated access door.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes indicated.

C. Coordination: Furnish inserts and anchoring devices which must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices.

B. Shop Drawings: Submit shop drawings for fabrication and installation of customized access doors and frames, including details of each frame type, elevations and door design types, anchorage and accessory items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Available Manufacturers: Subject to compliance with requirements, manufacturers offering access doors which may be incorporated in the work include, but are not limited to, the following:

J. L. Industries
Karp Associates, Inc.
Milcor Div.; Inryco, Inc.

2.2 MATERIALS AND FABRICATION:

A. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts and ready for installation.

B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

C. Frames: Fabricate from 16 gage steel.

(1) Fabricate frame with exposed flange approximately 1" wide around perimeter of frame for units installed in the following construction:

Exposed masonry.
Exposed concrete.
Ceramic tile finish.

(2) For installation in masonry construction, furnish frames with adjustable metal masonry anchors.

(3) For drywall applications, furnish frames with drywall bead welded to perimeter of frame, so frame can be taped into drywall work.

D. Flush Panel Doors: Fabricate from not less than 14 gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.

E. For fire-rated units, provide manufacturer's standard insulated flush panel doors, with continuous piano hinge and self-closing mechanism.

F. Locking Devices: Provide one cylinder lock per access door. Furnish 2 keys per lock and key all locks alike, unless otherwise scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Comply with manufacturer's instructions for installation of access doors.

B. Coordinate installation with work of other trades.

C. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

3.2 ADJUST AND CLEAN:

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames which are warped, bowed or otherwise damaged.

END OF SECTION 08305

SECTION 08331 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of insulated overhead coiling doors is shown on drawings.

B. Provide complete operating door assemblies including door curtains, guides, counterbalance mechanisms, hardware, operators, insulation and installation accessories.

1.3 QUALITY ASSURANCE:

A. Furnish each insulated overhead coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

B. Unless otherwise acceptable to Architect, furnish overhead coiling door units by one manufacturer for entire project.

C. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of the units. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

D. See concrete and masonry sections of these specifications for installation of inserts and anchorage devices.

E. Wind Loading: Design and reinforce overhead coiling doors to withstand a 20 lb. per sq. ft. wind loading pressure unless otherwise indicated.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of overhead coiling door. Include operating instructions and maintenance information.

B. Shop Drawings: Submit shop drawings for special components and installations which are not fully dimensioned or detailed on manufacturers data sheets.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products by one of the following:

Apton Door, Div. of the Union Corp.
Atlas Door Corp.
Walter Balfour & Company, Inc.
The Cookson Company.
Cornell Iron Works Inc.
Kinnear Div., Harsco Corp.
Mahon Rolling Door Div. RCM Corp.
McKee Doo Co.
North American Door, Div. of Jim Walters.
Overhead Door Corp.
Southwestern Steel Rolling Door Co.
J. C. Wilson Corp.
Windsor Door Co., Div of Ceco Corp.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION:

A. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats designed to withstand required wind loading, of continuous length for width of door without splices. Unless otherwise indicated, provide slats of material gage recommended by door manufacturer for size and type of door required, and as follows:

(1) Steel Door Curtain Slats: Structural quality, cold-rolled galvanized steel sheets complying with ANSI/ASTM A 446, Grade A, with G90 zinc coating, complying with ASTM A 525, and phosphate treated before fabrication.

(2) Furnish manufacturer's standard "flat-face" slats for insulated doors.

B. Endlocks: Malleable iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets. Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Windlocks: Malleable iron castings secured to curtain slats with galvanized rivets. Unless otherwise recommended by door manufacturer, provide windlocks on doors exceeding 16' wide. Space windlocks approximately 24" o.c. on both edges of curtain.

D. Bottom Bar: Consisting of 2 angles, each not less than 1-1/2" x 1-1/2" x 1/8" thick, galvanized.

E. Curtain Jamb Guides: Fabricate curtain jamb guides of steel angles, or channels and angles with sufficient depth and strength to retain curtain loading. Build-up units with minimum 3/16" thick steel sections, galvanized after fabrication. Slot bolt holes for track adjustment.

Secure continuous wall angles to wall framing by 3/8" minimum bolts at not more than 30" o.c., unless closer spacing recommended by door manufacturer. Extend wall angles above door opening head to support coil brackets, unless otherwise shown. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position. Provide removable stops on guides to prevent over-travel of curtain, and continuous bar for holding windlocks, if any.

F. Vision Panels: Provide vision panels in arrangement as shown, consisting of 1/4" thick, cast thermoplastic, methyl methacrylate flat glazing sheet with smooth mirror finish. Set panels in neoprene or vinyl glazing channel, secured to curtain slats.

G. Weather Seals: Provide vinyl or neoprene weatherstripping for exterior exposed doors except where otherwise noted. At door heads, use 1/8" thick continuous sheet secured to inside of curtain coil hood. At door jambs, use 1/8" thick continuous strip secured to exterior side of jamb guide.

H. Thermal Performance: Provide insulated door with rigid or foamed-in-place polyurethane insulation between enclosing slats. Insulation shall be minimum 3/4" thick.

2.3 COUNTERBALANCING MECHANISM:

A. Counterbalance doors by means of adjustable steel helical torsion spring, mounted around a steel shaft and mounted in a spring barrel and connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and limit barrel deflection to not more than 0.03" per ft. of span under full load.

C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.

D. Fabricate torsion rod for counterbalance shaft of case-hardened steel, of required sized to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate with bell- mouth guide groove for curtain.

F. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weather seal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface- mounted hoods, and any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.

Fabricate steel hoods for doors of not less than 24 gage hot- dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 525. Phosphate treat before fabrication.

2.4 PAINTING:
Shop clean and prime ferrous metal and galvanized surfaces, exposed and unexposed, except faying and lubricated surfaces, with door manufacturer's standard rust inhibitive primer.

2.5 ELECTRIC DOOR OPERATORS:

A. General: Furnish electric door operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory-prewired motor controls, gear reduction unit, solenoid operated brake, remote control stations, control devices, conduit and wiring from controls to motor and central stations, and accessories required for proper operation.

B. Provide hand-operated disconnect or a mechanism for automatically engaging a sprocket and chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so they are accessible from floor level.Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

D. Door Operator Type: Provide wall or bracket-mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on controlbalance shaft, and a disconnect-release for manual operation. Provide motor and drive assemlby of horsepower and design as determined by door manufacturer for size of door required.

E. Electric Motors: Provide high-starting torque, reversible, constant duty, Class A insulated electric motors with overload protection, sized to move door in either direction, from any position, at not less than 2/3' nor more than 1' per second.

(1) Coordinate wiring requirements and current characteristics of motors with building electrical system.

(2) Furnish open-drip-proof type motor and controller with NEMA Type I enclosure.

F. Remote Control Station (One per door): Provide momentary-contact, 3-button control station with push button controls labeled "open", "close" and "stop".

Provide interior units, full-guarded, surface-mounted, heavy- duty, with general purpose NEMA Type 1 enclosure.

G. Radio Control: Provide a programmable system for radio activating door operator. Provide three hand-held devices labeled "open" and "close".

H. Automatic Reversing Control: Furnish each door with automatic safety switch, extending full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch before fully closing will immediately stop downward travel and reverse direction to fully opened position. Connect to control circuit through retracting safety cord and reel, or self-coiling cable.

Provide electrically actuated automatic bottom bar.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports in accordance with final shop drawings, manufacturer's instructions, and as specified herein.

B. Upon completion of installation including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist or distortion and fitting weathertight for entire perimeter.

END OF SECTION 08331

SECTION 08341 - OVERHEAD COUNTER DOOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to this section.

1.2 Description of Work:

A. Extent of overhead counter doors are indicated on drawings.

B. Provide complete operating counter door assemblies including curtains, guides, counterbalance mechanisms, hardware, operators and installation accessories, as shown on drawings and herein specified.

1.3 QUALITY ASSURANCE:

A. Provide each overhead counter door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

B. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

Apton Metal Products Co.
Atlas Door Corp.
Walter Balfour & Company, Inc.
The Cookson Company.
Cornell Iron Works, Inc.
Kinnear Div., Harsco Corp.
Mahon Rolling Door Div. RCM Corp.
Overhead Door Corp.
Southwestern Steel Rolling Door Co.
J.C. Wilson Corp.
Windsor Door Co., Div of Ceco Corp.
Jim Walter Doors, Div. of Celotex Corp.

C. Inserts and Anchorages:

(1) Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of overhead counter doors. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

(2) See concrete and masonry sections of these specifications for installation of inserts and anchorage devices.

1.4 SUBMITTALS:

A. Manufacturer's Data:

Submit manufacturer's product data, roughing-in diagrams, and instalaltion instructions for each type and size of counter door. Include operating instructions and maintenance data.

B. Shop Drawings:

Submit shop drawings for special components and installations which are not fully dimensioned or detailed on manufacturers data sheets.

PART 2 - PRODUCTS

2.1 CURTAIN:

A. Fabricate overhead counter door of interlocking slats, of continuous length for the width of the opening. Unless otherwise indicated, provide slats of the material gage recommended by the shutter manufacturer for the size and type of unit required and as follows:

B. Steel Slats: ASTM A 446, Grade A, steel sheets of physical (structural) quality with ASTM A525 designation G90 zinc coating, mill phosphatized.

C. Endlocks: Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement, of same material and finish as slats or as otherwise recommended by manufacturer.

D. Bottom Bar: Continuous angle or box shape, with replacable flexible vinyl or neoprene astragal. Bottom bar of same material and finish as curtain slats.

E. Curtain Jamb Guides: Boxed type section of same material and finish as curtain slats. Provide interlocking pile stripping on both sides of guides to prevent metal-to-metal contact.

2.2 COUNTERBALANCING MECHANISM:

A. Counterbalance doors by means of steel helical torsion spring, mounted around a steel shaft and contained in a spring barrel, connected to the curtain. Use grease-sealed ball bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance: Hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support the roll-up curtain without distortion of slats and limit barrel deflection to not more than 0.03" per ft. of span under full load.

Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance the weight of the curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to the barrel and the shaft.

Fabricate torsion rod for counterbalance shaft of case-hardened steel, sized to hold the fixed spring ends and carry the torsional load.

C. Brackets: Manufacturer's standard design, either cast iron or cold-rolled steel plate with bell-mouth guide groove for curtain.

D. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods. Provide intermediate support brackets as required to prevent sag. Fabricate hoods for steel shutters of not less than 24 gage hot-dip galvanized steel sheet with ASTM A 525, G90 zinc coating mill phosphatized.

2.3 SHUTTER OPERATION:

A. Manual Operation: Design counterbalance mechanism so that required lift or pull for counterdoor operation does not exceed 25 lbs. Adjust operating mechanism so that the curtain can be easily stopped at any point in its travel and to remain in position until movement is reactivated.

B. Provide 2 slide bolt locks on inside bottom bar, of same material and finish as curtain.

PART 3 - EXECUTION

3.1 INSPECTION:

Installer must examine the substrates and conditions under which the overhead counterdoor units are to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION:

A. Install overhead counterdoor and operating equipment complete with necessary hardware, in accordance with final shop drawings, manufacturer's instruction, and as specified herein.

B. Upon completion of installation including work by other trades, test and adjust counterdoor to operate easily, free from warp, twist or distortion.

END SECTION

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS:

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of aluminum entrances and storefronts is shown on drawings and schedules.

B. Types of aluminum entrances and storefronts required include the following:

(1) Exterior entrance doors.

(2) Vestibule doors matching entrance doors.

(3) Interior doors.

(4) Frames for exterior entrances.

(5) Frames for interior doors.

(6) Storefront type framing system.

(7) Heating element enclosures.

(8) Enclosures panels.

C. Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances and storefronts, including doors specified herein to be factory preglazed.

D. Revolving doors are specified elsewhere in Division 8.

E. Mortise lock cylinders are specified in Division-8 hardware section.

1.3 SYSTEM DESCRIPTION:

A. Thermal Movement: Fabricate exterior components from manufacturer's stock systems which have been designed to provide for expansion and contraction resulting from ambient temperature range of 120 degrees F (49 degrees C).

B. Wind Loading: Fabricate exterior components from manufacturer's stock systems which have been tested in accordance with ASTM E 330 to withstand at least the following loadings:

Uniform pressure of 25 psf inward and 25 psf outward.

C. Weather Resistance: Fabricate exterior storefront components from manufacturer's stock systems which have been tested to demonstrate permanent resistance to leakages as follows with test pressure differential of 10% of design loading (excluding operable door edges).

(1) Air infiltration: Not more than 0.06 cfm per square foot at 6.24 PSF, tested in accordance with ASTM E 283.

(2) Water infiltration: No uncontrolled water penetration at 6.24 PSF, tested in accordance with ASTM E 331.

1.4 QUALITY ASSURANCE:

A. Drawings are based on details developed by Bruce Engineering Company, Tucker, Georgia for aluminum entrance and storefront system. Another standard system of a similar and equivalent nature will be acceptable when differences do not materially detract from design concept or intended performances, as judged solely by Architect.

B. Field Measurement: Wherever possible, take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work. However, proceed with fabrication and coordinate installation tolerances as necessary when field measurements might delay work.

1.5 REFERENCES:

Standards: Comply with applicable provisions of "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA.

1.6 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, standard details, and installation recommendations for components of aluminum entrances and storefronts required for project, including data that products have been tested and comply with performance requirements.

B. Shop Drawings: Submit shop drawings for fabrication and installation of aluminum entrances and storefronts, including elevations, detail sections of typical composite members, anchorages, reinforcement, expansion provisions, and glazing.

C. Samples: Submit samples of each type and color of aluminum finish, on 12" long sections of extrusions or formed shapes and on 6" square sheets.

1.7 SPECIAL PROJECT WARRANTY:

Provide written warranty signed by Manufacturer, Installer, and Contractor, agreeing to replace aluminum entrances and storefront which fail in materials or workmanship within 3 years of acceptance. Failure of materials or workmanship includes excessive leakage or air infiltration, excessive deflections, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering, and defects in hardware, weatherstripping, and other components of the work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of:

Bruce Engineering Company

2.2 MATERIALS AND ACCESSORIES:

A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate.

B. Provide thicknesses as shown and as necessary to comply with structural loading requirements, but not less than the following:

(1) Principal Extrusions: 0.125" minimum thickness.

(2) Principal Formed Sheet Members: 0.125" minimum thickness.

(3) Extruded Glazing Stops and Trim: 0.062" minimum.

C. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components.

(1) Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.

(2) Exposed fasteners shall match finish of members and hardware being fastened.

D. Concealed Flashing: Dead-soft stainless steel, 26-gage minimum, type selected by manufacturer for compatibility.

E. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible; otherwise, nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.

F. Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.

G. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.

H. Compression Weatherstripping: Manufacturer's standard replaceable stripping of either molded neoprene gaskets complying with ASTM D 200 or molded PVC gaskets complying with ASTM D 2287.

I. Glass and Glazing Materials: Provide glass and glazing materials which comply with requirements of "Glass and Glazing" section of these specifications.

2.3 HARDWARE:

A. General: Refer to hardware section of Division 8 for requirements for hardware items.

2.4 FABRICATION:

A. General:

(1) Sizes and Profiles: Required sizes for door, frame, and heating element enclosure units, including profile requirements, are shown on drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.

Details shown are based upon standard details by manufacturer indicated. Similar details by other manufacturers listed will be acceptable, provided they comply with other requirements, including profile limitations.

(2) Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necesasry for shipment and installation.

Preglaze door and frame units to greatest extent possible, in coordination with installation and hardware requirements.

Do not drill and tap for surface-mounted hardware items until time of installation at project site.

(3) Sequence: Complete cutting, fitting, forming, drilling, and grinding of metal work prior to cleaning, finishing, surface treatment, and application of finishes. Remove arrises from cut edges and ease edges and corners to radius of approximately 1/64".

(4) Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

(5) Reinforcing: Install reinforcing as necessary for performance requirements, separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.

(6) Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

(7) Fasteners: Conceal fasteners wherever possible.

(8) Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops; at other edges, provide sweep type weatherstripping retained in adjustable strip mortised into door edge.

At interior doors and other locations without weatherstripping, provide neoprene silencers on stops to prevent metal-to-metal contact.

B. Storefront Framing System:

Inside-outside matched resilient flush-glazed system, fabricated for stick-type erection procedure with provision for glass replacement.

C. Stile-and-Rail Type Aluminum Doors:

(1) Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts, or fabricate with structurally welded joints, at manufacturer's option.

(2) Style: Except as otherwise shown or scheduled, provide doors 1-3/4" thick and of indicated style, as described in AAMA publications:

Medium stile (3 1/2" nominal width).

Bottom rail: Height as indicated.

(3) Glazing: Fabricate doors to facilitate replacment of glass or panels, without disassembly of door stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.

2.5 FINISHES:

A. After fabrication of metal work, prepare surfaces for finishing in accordance with recommendations of aluminum producer and finisher or processor.

B. Fluropolymer Coating: Pretreat aluminum surfaces as recommended by manufacturer of coating, including conversion coating. Apply 2-coat system and bake coatings at processing plant in accordance with manufacturer's instructions, to match color and specular gloss of Architect's sample, and to comply with AAMA 605.1 and following:

C. Primer: Glidden #128 "Aqualure" water base primer.

D. Dry Film Thickness: Not less than 1.2 mils, as proven by suitable tests on representative coupon samples prepared during course of application.

E. Composition: A minimum of 33% (by volume) of crystalline, high molecular weight, thermoplastic polymer of vinylidene flouride (59% fluorine by weight), together with pigments, vehicles and other compounds as recommended by coating manufacturer.

F. Color: Boston Grey, PPG #UC 50552.

G. Gloss: Medium at 60^{o}, ASTM D 523.

PART 3 - EXECUTION

3.1 INSPECTION

The window wall Fabricator must examine supporting structure and conditions under which the work is to be erected, and notify the Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected in a manner acceptable to window wall Fabricator.

3.2 INSTALLATION:

A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances, storefronts and enclosures.

B. Set units, plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

C. Drill and tap frames and doors and apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

D. Set sill members and other members in bed of compound as shown, or with joint fillers or gaskets as shown to provide weathertight construction. Comply with requirements of Division 7 for compounds, fillers, and gaskets.

E. Refer to "Glass and Glazing" section of Division 8 for installation of glass and other panels shown to be glazed into doors and framing, and not preglazed by manufacturer.

3.3 ADJUST AND CLEAN:

A. Adjust operating hardware to function properly, without binding, and to provide tight fit at contact points and weatherstripping.

B. Clean completed system, inside and out, promptly after erection and installtion of glass and sealants. Remove excess glazing and sealant compounds, dirt, and other substances from aluminum surfaces.

C. Institute protective measures and other precautions required to assure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08410

SECTION 08800 GLASS AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Definitions: "Glass" includes prime glass, processed glass, and fabricated glass products. "Glazing" includes glass installation and materials used to install glass. Types of work in this section include glass and glazing for:

(1) Window units not indicated as "preglazed."

(2) Window wall/store front construction.

(3) Entrances and other doors, not indicated as "preglazed."

(4) Interior partitions.

(5) Skylight units not indicated as "preglazed."

B. "Glass products" is hereby defined to include glazing plastics.

C. Packaged mirror units are specified as "specialties" in another section.

1.3 QUALITY ASSURANCE:

A. Prime Glass Manufacturer: One of the following for each type/color. pattern of glass:

ASG Industries, Inc.
C-E Glass Division
Ford Glass Company
Libbey-Owens-Ford Company
PPG Industries, Inc.

B. Prime Glass Standard: FS DD-G-451.

C. Heat-Treated Glass Standard: FS DD-G-1403.

D. Safety Glass Standard: ANS1 Z97.1

E. Spandrel Glass: GSA PBS-4-0885

1.4 SUBMITTALS:

Samples: 2 samples, 12" square, of each glass product, except for clear single-pane units.

1.5 JOB CONDITIONS:

Pre-Installation: Meet with Glazier and other trades affected by glass installation, prior to beginning of installation. Do not perform work under adverse weather or job conditions.Install liquid sealants when temperatures are within lower or middle third of temperature range recommended by manufacturer.

1.6 SPECIFIED PRODUCT WARRANTY:

A. Warranty on Hermetic Seals: Provide insulating glass manufacturer's written warranty, agreeing to, within specified warranty period, furnish FOB project site, replacement units for insulating glass units which have defective hermetic seals (excluding that due to glass breakage); defined to include intrusion of moisture or dirt, internal condensation at temperatures above -20 degrees F (-32 degrees C), deterioration of internal glass coatings, and other visual evidence of seal failure or performance failure; provided manufacturer's instructions for handling, installation, protection and maintenance have been adhered to during warranty period.

B. Warranty period shall be 10 years after seal date permanently imprinted on unit, but not less than 9 years after date of substantial completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS:

A. Float/Plate Glass: Type I, Quality q3, clear unless otherwise indicated.

(1) Grey: Manufacturer's standard color; 41% to 42% light transmittance and 46% solar energy transmittance for 1/4".

B. Polished Wired Glass: Type III, Kind A, Form 1, Quality q11, clear and polished both faces.

(1) Mesh: Type m1, diamond Mesh: Type m3, square.

(2) Fire Rating: Provide glass listed and labeled by UL for "fire resistance".

2.2 PROCESSED GLASS:

A. Tempered Glass: Provide prime glass of color and type indicated, which has been heat treated to strengthen glass in bending to not less than 4.5 times annealed strength. Provide tempered glass produced by manufacturer's special process which eliminates tong marks.

B. Heat-Strengthened Glass: Provide prime glass of color and type indicated, which has been heat treated to strengthen glass in bending to not less than 2.0 times annealed strength.

C. Laminated Glass: Provide two layers heat-strengthened 1/8" thick clear float glass with .060" vinyl interlayer.

2.3 FABRICATED GLASS UNITS: (1/2" air space)

A. Provide two sheets of glass as follows and 1/2" dry air or gas filled space with -20 degrees F (-29 degrees C) dew point, with Class A sealant-type edge construction to maintain a hermetic seal. Edge construction for Type 'D' shall be as indicated for Special Fabricated Glass Units.

Types refer to notation used on drawings.

(1) Type "A": Exterior lite shall be 1/4" grey tinted float glass.
Interior lite shall be 1/4" clear float glass.

(2) Type "B": Exterior lite shall be 1/4" grey tinted tempered glass.
Interior lite shall be 1/4" clear tempered glass.

(3) Type "C": Exterior lite shall be 1/4" grey heat-strengthened glass.
Interior lite shall be 1/4" clear float glass.

(4) Type "D": Exterior lite shall be 1/4" grey heat strengthened glass with reflective coating.

Acceptable:
PPG Solarban 550-14 (2) clear.
LOF Vari-Tran 3-714 Grey with silver.

Interior lite shall be heat-strengthened, laminated safety glass. Laminate 2 sheets of 1/8" thick clear float glass with a .060" thick vinyl film, by manufacturer's standard heat-plus-pressure process with dirt, air pockets, and foreign substances excluded.

Provide secondary seals, primary seals, primer, and testing as indicated below for Special Fabricated Glass Units.

(5) Type "E": Exterior lite shall be heat-strengthened, laminated safety glass. Laminate 2 sheets of 1/8" thick clear float glass with a .060 thick vinyl film, by manufacturer's standard heat-plus-pressure process with dirt, air pockets, and foreign substances excluded.

Interior lite shall be 1/4" grey heat-strengthened glass.

B. Spandrel Glass Type "F": Provide 1/4" thick prime glass of color and type indicated, which has been processed to fuse a permanent ceramic coating on one face.

2.4 GLASS FOR INTERIOR BUTT GLAZING:

Type "G": (Notation used on drawings.) Provide 3/8" thick tempered glass without tong marks at interior butt glazing.

2.5 FABRICATED GLASS UNITS: (1/4" air space)

A. Provide two sheets of glass as follows, and 1/4" dry air or gas-filled space with -20 degrees F dew point with Class A sealant-type edge construction to maintain a hermetic seal.

B. Type "H": (Notation used on drawings.) Exterior lite shall be 3/16" grey tinted float glass. Interior lite shall be 3/16" clear float glass.

2.6 SPECIAL FABRICATED GLASS UNITS: (1/2" air space)

A. Provide two sheets of glass as follows, and 1/2" dry air or gas-filled space with -20 degrees F dew point, with Class A sealant-type edge construction to maintain a hermetic seal. Use the following sealants:

(1) Secondary seals at edge: GE IGS 3204 silicone sealant or Dow Corning 999 glazing sealant.

(2) Primary seals at edge: GE 1203 or Dow-Corning 999 glazing sealant. Width and depth of sealant to be minimum 3/8" x 3/8".

(3) Primer for aluminum with flurocarbon finish: GE SC-4179 or Dow Corning 1205, applied in one thin wipe-on coat. Primer must be verified in writing by sealant manufacturer.

(4) Testing of sealants at Special Fabricated Glass Units is required. Curtainwall fabricator and glass manufacturer shall submit samples of their respective products to sealant manufacturer for testing of sealant compatibility and strength. Contractor shall schedule work to allow twenty-one calendar days for testing.

B. Types refer to notation used on drawings.

(1) Type "I": Exterior lite shall be 1/4" grey tinted heat strengthened glass.

Interior lite shall be 1/4" clear float glass.

(2) Type "J": Exterior lite shall be 1/4" spandrel glass to match PPG Spandrelite Harmony Solar Gray EG 6401.

Interior lite shall be 1/4" clear float glass.

2.7 LAMINATED GLASS:

A. Type "K": Provide laminated spandrel glass. Laminate one sheet of 1/4" thick heat-strengthened spandrel glass and one sheet of 1/4" thick clear heat-strengthened float glass with a .060" thick vinyl film, by manufacturer's standard heat-plus-pressure process with dirt, air pockets, and foreign substances excluded. spandrel glass color to match grey tinted glass. Total thickness: 9/16".

B. Type "L": Provide laminated glass consisting of 1/4" grey heat-strengthened glass, .060" thick vinyl film, and 1/4" clear heat-strengthened float glass. Total thickness: 9/16".

2.8 SPANDREL GLASS WITH INSULATION:

A. Type "M": Provide 1/4" thick spandrel glass with 3/4" thick factory applied, 6-lb. density, fiber glass insulation laminated to glass. Provide 24 gauge steel backing laminated to insulation. Total thickness: 1 1/16" (compressible to 1" at glazing rabbet).

2.9 MIRROR GLASS:

A. 1/4" Quality q2 clear float glass; full silver coating, copper coating and organic coating.

B. 1/4" Qualtiy q2 bronze tinted float glass, full silver coating, copper coating and organic coating.

2.10 GLAZING SEALANTS AND COMPOUNDS (Except for Special Fabricated Glass Units):

A. General: Provide color of exposed sealant/compound indicated or if not otherwise indicated, as selected by Architect from manufacturer's standard colors, or black if no color is so selected. Comply with manufacturer's recommendations for selection of hardness, depending upon the location of each application, conditions at time of installation, and performance requirements as indicated. Select materials, and variations or modifications, carefully for compatibility with surfaces contacted in the installation.

B. 1-Part Silicone Rubber Glazing Sealant: Elastomeric silicone sealant complying with FS TT-S-001543, Class A, non-sag. Provide acid type recommended by manufacturer where only nonporous bond surfaces are contacted; provide nonacid type recommended by manufacturer where one or more porous bond surfaces are contacted.

2.11 GLAZING GASKETS:

Extruded Neoprene Glazing Gaskets: Extruded neoprene gaskets with factory moulded corners for both interior and exterior use of the profile hardness required for watertight construction; comply with ASTM D2000 designation 2BC 415 to 3BC 620, black.

2.12 MISCELLANEOUS GLAZING MATERIALS:

A. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

B. Setting Blocks: Neoprene or EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.

C. Spacers: Neoprene or EPDM, 40-50 durometer hardness, with proven compatibility with sealants used.

D. Compressible Filler (Rod): Closed-cell or waterproof- jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5- 10 psi compression strength for 25% deflection.

PART 3 - EXECUTION

3.1 STANDARDS AND PERFORMANCE:

A. Watertight and airtight installation of each of glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and air-tight, deterioration of glazing materials and other defects in the work.

B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

C. Glazing channel dimensions as shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

D. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and with reommendations of Flat Glass Marketing Association "Glazing Manual", except where more stringent requirements are indicated.

E. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.2 PREPARATION FOR GLAZING:

A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.

B. Apply primer or sealer to joint surfaces where recommended by sealant manufacturer.

3.3 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located 1/4th of glass width from each corner. Set blocks in thin course of heel-bead compound, if any.

B. Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or preshimmed tapes are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

D. Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in channel at heel of jambs and head (do not leave voids in the sill channels), except as otherwise indicated and depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.

E. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

F. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass.Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

G. Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discolorations.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead.

3.4 CURE, PROTECTION AND CLEANING:

A. Protect exterior glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Cure sealants for high early strength and durability.

B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.

END OF SECTION 08800

SECTION 09200 - LATH AND PLASTER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Types of work includes:

A. Metal furring and lathing.

B. Portland cement plastering.

C. Cementitious coatings.

D. Fire Rated plaster.

1.3 QUALITY ASSURANCE:

A. Portland Cement Plastering Standards: ANSI A 42.2 AND A 42.3.

B. Allowable Tolerances: For flat surfaces, do not exceed 1/4" in 8'-0" for bow or warp of surface, and for plumb or level.

1.4 SUBMITTALS:

Product Data: Submit manufacturer's product specifications and installation instructions for each material, including other data as may be required to show compliance with these specifications.

Sample Panel: Provide 2' x 2' sample of cementitious coating on actual concrete column for approval by architect before proceeding with work.

1.5 PRODUCT HANDLING:

Deliver, store and protect manufactured materials to comply with referenced standards.

1.6 JOB CONDITIONS:

A. Environmental Conditions: Comply with referenced standards.

B. Protect contiguous work from soiling, spattering, moisture deterioration and other harmful effects which might result from plastering.

PART 2 - PRODUCTS

2.1 METAL SUPPORT, FURRING, LATHING AND ACCESSORY MATERIALS:

A. General:

(1) Metals and Finishes: Manufacturer's standard steel products unless indicated as zinc alloy or other metal. Where not otherwise indicated, provide manufacturer's standard galvanized finish on steel products except as follows:

(a) Exterior Components:Hot-dip galvanized finish; ASTM A 525 G90 for 18 gage and lighter formed metal products, ASTM A 123 galvanized after fabrication for 16 gage and heavier products.

(b) Exterior Exposed Plastering Accessories: Provide zinc alloy accessories for exterior work and work in "High Humidity" areas, except where fully concealed in plaster.

(3) Wire Ties: Galvanized soft steel wire, 18 gauge.

B. Ceiling Suspension/Furring Materials:

(1) Size following components to comply with referenced standards unless otherwise indicated.

Main Runners: Hot-rolled or cold-rolled steel.

Hanger Wire: ASTM A 641, Class 1 galvanized.

(2) Hanger Rods and Flats: Mild steel.

(3) Hanger Anchorage Devices: Screws, clips, bolts, cast-in-place concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3 x calculated hanger loading except size direct pull-out concrete inserts for 5 x calculated hanger loading.

(4) Channel Cross Furring: Hot-rolled or cold-rolled steel channels.

C. Metal Lathing Materials:

(1) General: Where not otherwise indicated, comply with MLSFA "Technical Bulletin 101" and ASTM C 841 for selection of metal lath for each application indicated.

Product Standards: Comply with FS QQ-L-101.

(2) Exterior Diamond Mesh Lath: 3.4 lbs. per sq. yd.

D. Metal Plastering Accessories and Reinforcement:

(1) General: Coordinate depth of accessory with thickness of and number of coats of plaster to be applied.

(2) Small-Nose Corner Beads: General purpose with expanded or perforated flanges.

(3) Square-Edged Casing Beads: Manufacturer's standard with expanded or short flange to suit application.

(4) Two-Piece Control Joints: Manufacturer's standard roll-formed pair of casing beads with modified back flanges providing positive slip joint action and dust barrier, adjustable for joint width variation of 1/8" to 5/8".

(5) Corner Reinforcement: Special stucco-type woven galvanized wire corner reinforcement strips.

(6) Line Wire: 18 gage soft annealed steel wire.

(7) Fasteners: Galvanized steel, of type and length suitable for adequate penetration of the substrate.

2.2 PORTLAND CEMENT PLASTER MATERIALS:

A. General: Provide either neat or ready-mixed (where applicable) materials, at Installer's option, complying with ANSI A42.2.

B. Base-Coat Cement: Portland cement, ASTM C 150, Type I or IA.

C. Base-Coat Lime: Special finishing hydrated lime, Type S.

D. Base-Coat Aggregate: Sand.

E. Prepared Finish-Coat: Factory-prepared finish for portland cement plaster, type recommended by the manufacturer for the color and texture indicated. Provide integral color selected by Architect from manufacturer's standard colors.

F. Texture: Sand-float finish.

2.3 CEMENTITIOUS COATING MATERIALS:

A. Cement-base, waterproof texture coating. Provide "Thoroseal Plaster Mix".

B. Textures: Smooth finish.

C. Color: Integral color selected by Architect from manufacturer's standard colors.

2.4 GYPSUM PLASTER MATERIALS

A. General: Provide either neat or ready-mixed (where applicable) materials, at installer's option, unless otherwise indicated.

B. Base Coat Plaster: Gypsum.

C. Base Coat Aggregate: Sand.

D. Where plaster is indicated as "Fire Rated Plaster", base course plaster shall be vermiculite.

E. Finish Coat Plaster: Gypsum Gauging Plasters.

F. Finishing Lime: Special finishing hydrated lime (Type 5).

G. Finish Coat Aggregate: For sand float finish, provide white silica sand passing a 30 mesh screen.

H. Finish Coat Aggregate for "Fire Rated Plaster": Finely graded vermiculite aggregate (for smooth trowel finish).

2.5 SPECIAL GYPSUM PLASTERS:

A. Use Moulding Plaster in specialized work such as cast ornamental enrichments or running cornices. Color shall be white. Comply with ASTM C28 and Federal Specification SS-P-00402B, Type V.

B. White Hydrocal Gypsum Cement shall have exceptional strength and produce fine detail in ornamental work. Use for thin sections and castings made from intricate latex molds.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Ceiling Anchorages: Coordinate work with structural ceiling work to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers.

B. Furnish concrete inserts, steel deck hanger clip and similar devices to other trades for installation well in advance of time needed for coordination with other work.

3.2 INSTALLATION OF METAL SUPPORT SYSTEMS:

A. General:

(1) Isolation: Where lathing and metal support system abuts building structure horizontally, isolate the work from structure movement sufficiently to prevent transfer of loading into the work from the building structure. Install slip or cushion type joints to absorb deflections but maintain lateral support.

Frame both sides of control and expansion joints independently, and do not bridge joints with furring and lathing or accessories.

(2) Fixture Support Framing: Install supplementary framing, blocking and bracing where work is indicated to support fixtures, equipment, services, heavy trim and similar work requiring attachment and support.

B. Ceiling Suspension Systems:

(1) Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or anchorage devices or fasteners as indicated.

(2) Space runner channels as indicated or, if not otherwise indicated, 4'-0" o.c.; and space hangers, along channels as indicated or, if not otherwise indicated, 4'-0" o.c.

(3) Level runner channels to a tolerance of 1/8" in 12'-0".

C. Steel Stud Systems:

(1) General: Install steel studs with continuous runner tracks at top and bottom of each wall/partition area, and above and below each opening more than 2'-0" in width. Anchor tracks to floor and overhead structure at each end and 24" o.c. (Max.), unless otherwise indicated.

(2) Terminate partition stud system at the ceiling line, except extend system to structure above where indicated.

(3) Space studs 16" o.c., including jack studs above and below openings, except as otherwise shown.

(4) Anchor punched steel partition studs to bottom and top runner tracks, at both flanges. Install stud shoes or clips, or weld or screw fasten to tracks.

(5) Anchor wire truss-type partition studs to runner tracks by crimping track, wire-tied stud shoes, or by using snap-in type tracks, except wire-tie end studs with stud shoes.

(6) Anchor lightgage screw-type partition studs to runner tracks by friction fit, except screw end studs to both tracks at both flanges.

(7) Install a minimum of 3 studs at partition corners and intersections, as recommended by stud manufacturer for the application indicated.

(8) Install horizontal stud system stiffeners in continuous runs as required to comply with manufacturers installation instructions and recommendations.

(9) Install additional studs at each jamb of openings more than 2'-0" wide, and secure jamb studs to frames of openings and to runner tracks above and below openings in the manner indicated (screw to frame anchors or directly to frames, or wire-tie or weld, if not otherwise indicated).

Install 2 studs at each jamb, except as otherwise shown.

Install stud system stiffeners not more than 6" above and 6" below each opening, and extend 2 regular stud spaces beyond opening both ways.

D. Metal Furring:

Space Furring members 16" o.c., except as otherwise indicated.

E. Metal Lathing:

(1) Install metal lath to comply with referenced standards unless otherwise indicated.

(2) Install self-furring diamond mesh to steel tube columns in accordance with U.L. Design No. X413.

F. Plastering Accessories:

(1) Anchor each flange of accessories 8" o.c. to plaster base.

(2) Miter or cope accessory corners, and install with tight joints accurately aligned.

(3) Set accessories plumb, level and true to line, with a tolerance of 1/8" in 10'-0".

(4) Install metal corner beads at external corners.

(5) Install casing beads at terminations of plaster work, except where plaster is indicated to pass through other work and be concealed by lapping work, and except where special screens, bases or frames act as casing beads including interior metal door frames. For exterior work, set casing beads 1/4" from abutting frames and other work (for application of sealant). Where plaster abuts concrete, set casing bead 1/4" from concrete.

(6) Install prefabricated expansion joints of 2-piece design where shown as "Expansion Joint"; 3/8" joint width for exterior.

3.5 INSTALLATION OF ORNAMENTAL PLASTERING:

Execute ornamental plaster in accordance with scale details shown on the drawings. Run cornices and mouldings full, straight and true with moulding plaster, using clean cut metal conforming to the profiles shown on the drawings. Align lines accurately with square intersections, and accurate miters at corners and angles. Prepare enriched ornamental work which cannot be run in place with White Hydrocal Gypsum cement cast in gelatine molds. Back the work solidly with jute or burlap and properly reinforce with galvanized steel. Make all joints carefully and point neatly so as to be invisible. Sandpaper rough spots and leave the entire work in proper condition, ready for decoration.

3.6 INSTALLATION OF PLASTER:

A. Mechanically mix plaster materials at the project site; do not hand mix except where small amounts are needed, using less than one bag of plaster.

B. Grout hollow metal frames, bases and similar work occurring in plastered areas, with base-coat plaster material, and prior to lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout 6" lengths at each anchorage.

C. Sequence plaster installation properly with the installation and protection of other work, so that neither will be damaged by the installation of the other.

D. Plaster flush with metal items or accessorires which act as a plaster ground, unless otherwise shown. Where plaster is not terminated at metal by casing beads, cut base-coat free from metal before plaster sets and groove finish coat at the junctures with metal.

E. Apply thicknesses and number of coats of plaster as indicated; or as required by referenced standards. Provide 3-coat plaster installation; except where portland cement skim coat is shown at columns.

F. Texture of Plaster Finishes: Except as otherwise indicated, apply finish-coat as follows:

Gypsum Plaster: Smooth dense finish.

G. Cure portland cement plaster by maintaining each coat in a moist condition for 2 days following application; keep enclosed and fog-spray (after intital set) as required to prevent dry-out.

H. Install "Fire Rated Plaster" in accordance with U.L. Design X413.

3.7 INSTALLATION OF CEMENTITIOUS COATING:

A. Follow manufacturer's instructions for mixing.

B. Apply in thicknesses sufficient to fill honeycombs and pin holes.

C. Provide smooth finish.

3.8 CUTTING AND PATCHING:

A. Cut, patch, point-up and repair plaster as necessary to accommodate other work and to restore cracks, dents and imperfections. Repair or replace work to eliminate blisters, buckles, excessive crazing and check cracking, dry-outs, efflorescence, sweat-outs and similar defects, including areas of the work which do not comply with specified tolerances, and where bond to the substrate has failed.

B. Sand smooth-troweled finishes highly to remove trowel marks and arrises.

3.9 CLEANING AND PROTECTION:

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces which are not to be plastered. Repair floors, walls and other surfaces which have been stained, marred or otherwise damamged during the plastering work. When plastering work is completed, remove unused materials, containers and equipment and clean floors of plaster debris.

B. Installer shall advise the Contractor of requirements for the protection of plaster from deterioration and damage during the remainder of the construction period.

END OF SECTION 09200

SECTION 09250 - GYPSUM DRYWALL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Types of work include:

A. Gypsum drywall including screw-type metal support system.

B. Gypsum drywall directly applied to solid (continuous) substrates.

C. Gypsum backing boards for application of other finishes.

D. Drywall finishing (joint tape-and-compound treatment).

1.3 QUALITY ASSURANCE:

A. Fire-Resistance Rating: Where gypsum drywall systems with fire resistance ratings are indicated or are required to comply with governing regulations, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL.

B. Manufacturer: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

1.4 REFERENCES:

A. Gypsum Board Standard: Comply with applicable requirements of ANSI/ASTM C 840 for application and finishing of gypsum board, unless otherwise indicated.

B. Steel Framing Standard: Comply with applicable requirements of ASTM C 754 for installation of steel framing for gypsum board.

C. Gypsum Board Terminology Standard: GA-505 by Gypsum Association.

1.5 SUBMITTALS:

Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.6 PRODUCT HANDLING:

Deliver, identify, store and protect gypspum drywall materials to comply with referenced standards.

1.7 JOB CONDITIONS:

Environmental Conditions: Comply with referenced standards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

A. Metal Support Materials:

Allied Structural Industries.
Bostwick Steel Framing Co.
Chicago Metallic Corp.
Dale Industries, Inc.
Gold Bond Building Products Div., National Gypsum Co.
Inryco Inc., Milcor Division.
Marino Industries, Inc.
United States Gypsum Co.

B. Direct Suspension Systems:

Chicago Metallic Corp.
Donn Corporation.
National Rolling Mills Co.
United States Gypsum Co.

C. Gypsum Board and Related Products:

The Celotex Corporation.
The Flintkote Company.
Georgia-Pacific Corp.
Gold Bond Building Products Div., National Gypsum Co.
United States Gypsum Co.

2.2 METAL SUPPORT MATERIALS:

A. Ceiling Support Materials and Systems:

(1) General: Size ceiling support components to comply with ASTM C 754 unless otherwise indicated.

(2) Main Runners: Steel channels with rust inhibitive paint finish, hot or cold-rolled.

(3) Hanger Wire: ASTM A 641, soft, Class 1 galvanized.

(4) Hanger Rods and Flats: Mild steel with zinc or equally rust inhibitive coating for rods and zinc or rust-inhibitive paint finish for flats.

(5) Hanger Anchorage Devices: Screws, clips, bolts, cast-in-place concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitabiltiy for use intended has been proven through standard construction practices or by certified test data. Size devices for 3x calculated load supported except size direct pull-out concrete inserts for 5x calculated loads.

(6) Furring Members: ASTM C 645; 25-gage, hat-shaped.

(7) Furring Members: ASTM C 645; 25-gage "Cee"-shaped studs.

(8) Furring Anchorages: 16-gage galvanized wire ties, manufacturer's standard wire-type clips, bolts, nails or screws as recommended by furring manufacturer and complying with C 754.

(9) Direct Suspension Systems: Manufacturer's standard zinc-coated or painted steel system of furring runners, furring tees, and accessories designed for concealed support of gypsum drywall ceilings; of proper type for use intended.

B. Wall/Partition Support Materials:

(1) Studs: ASTM C 645; 25-gage unless otherwise indicated.

Depth of Section: 3-5/8" and 6", except as otherwise indicated.

Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.

(2) Furring Members: ASTM C 645; 25-gage, hat-shaped.

(3) Z-Furring Members: Manufacturer's standard screw-type zee-shaped furring members; of not thinner than 26-gage galvanized steel, ASTM A 525, G90; of depth indicated; designed for mechanical attachment of insulation boards or blankets to monolithic concrete and masonry walls.

(4) Fasteners for Furring Members: Type and size recommended by furring manufacturer for the substrate and application indicated.

2.3 GYPSUM BOARD:

A. Gypsum Wallboard (GWB) ASTM C 36, of types, edge configuration and thickness indicated; in maximum lengths available to minimize end-to-end butt joints.

(1) Type: Regular, except where otherwise indicated.

(2) Type: Foil-backed where indicated.

(3) Type: Type X for fire-resistant rated assemblies and where indicated.

(4) Edges: Tapered.

(5) Thickness: 5/8", except where otherwise indicated.

B. Gypsum Backing Board: ASTM C 442, with square or V-groove edges; or ASTM C 36; of types and thickness indicated, in maximum lengths available to minimize end-to-end butt joints.

(1) Type: Regular, except where otherwise indicated.

(2) Type: Foil-backed where indicated.

(3) Type: Type X for fire-resistant rated asemblies and where indicated.

(4) Thickness: 5/8", except where otherwise indicated.

C. Water-Resistant Backing Board: ASTM C 630, with tapered edges and of type and thickness indicated; in maximum lengths available to minimize end-to-end butt joints.

(1) Type: Regular, except where otherwise indicated.

(2) Type: Type X for fire-resistant rated assemblies and where indicated.

(3) Thickness: 5/8", except where otherwise indicated.

D. Tile Backer Board: 1/2" thick, aggregated cement board with vinyl-coated, woven glass-fiber mesh in back and front surfaces. Edges shall be square cut.

2.4 TRIM ACCESSORIES:

A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.

B. Acceptable: US Gypsum

Dur-A Bead Corner Bead

US Gypsum No. 200 Series metal trim

2.5 JOINT TREATMENT MATERIALS:

A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.

B. Joint Tape: Perforated type.

C. Joint Compound: Ready-mixed vinyl-type for interior use.

Grade: 2 separate grades; one specifically for bedding tapes and filling depressions, and one for topping and sanding.

D. Water-Resistant Joint Compound: Special water-resistant type for treatment of joints, fastener heads and cut edges of water-resistant backing board.

Available Product: Sheetrock Brand W/R Compound; United States Gypsum Co.

2.6 MISCELLANEOUS MATERIALS:

A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

B. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.

C. Gypsum Board Screws: Comply with ASTM C 646.

D. Acoustical Sealant: Water base type, non-drying, non-bleeding, non-staining type; permanently elastic, as recommended by gypsum board manufacturers for application indicated.

E. Sound Attenuation Blankets: FS HH-1-521, Type I; semi-rigid mineral fiber blanket without membrane, Class 25 flame-spread, thicknesses as indicated.

F. Vapor Barrier: 6 mil polyethylene sheet.

PART 3 - EXECUTION

3.1 PREPARATION FOR METAL SUPPORT SYSTEMS:

A. Ceiling Anchorages: Coordinate work with structural ceiling work to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers.

B. Furnish concrete inserts, steel deck hanger clips and similar devices to other trades for installation well in advance of time needed for coordination with other work.

3.2 INSTALLATION OF METAL SUPPORT SYSTEMS:

A. Do not bridge building expansion joints (ExpJt) with support system, frame both sides of joints with furring and other support as indicated.

B. Ceiling Support Suspension Systems:

(1) Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners as indicated.

(2) Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

(3) Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

(4) Wire-tie or clip furring members to main runners and to other structural supports as indicated.

(5) Direct-hung Metal Support System: Attach perimeter wall track or angle wherever support system meets vertical surfaces. Mechanically join support members to each other and butt-cut to fit into wall track.

(6) Space furring member 16" o.c., except as otherwise indicated.

(7) Install Auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for work which cannot be adequately supported on gypsum board alone.

C. Wall/Partition Support Systems:

(1) Install supplementary framing, blocking and bracing to support fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported on gypsum board alone.

(2) Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

(3) Install runner tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.

(4) Space studs 24" o.c., except as otherwise indicated.

(5) Frame door openings with vertical studs securely attached by screws at each jamb either directly to frames or to jamb anchor clips on door frame; install runner track sections (for jack studs) at head and secure to jamb studs.

(6) Provide runner tracks of same gage as jamb studs. Space jack studs same as partition studs.

(7) Install 20-gage studs at each jamb for all doors 2'-8" wide to 4'-0" wide weighing not more than 200 lbs.; and for all doors less than 2'-8" wide weighing more than 100 lbs. but not more than 200 lbs.

(8) Install double 20-gage studs at each jamb for single doors up to 4'-0" wide weighing more than 200 lbs. but not more than 300 lbs.

(9) Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

(10) Space wall furring members 24" o.c., except as otherwise indicated.

(11) Erect thermal insulation vertically and hold in place with Z-furring members spaced 24" o.c. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails or power-drive fasteners spaced 24" o.c. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw attach short flange of furring channel to web of attached channel. Start from this furring channel with standard width insulation panel and continue in regular manner. At interior corners, space second member no more than 12" from corner and cut insulation to fit. Until gypsum board is installed hold insulation in place with 10" staples fabricated from 18-gage tie wire and inserted through slot in web of member, or by an equally acceptable method.

(12) Install supplementary framing, runners, furring, blocking and bracing at opening and terminations in the work, and at locations required to support fixtures, equipment, services, heavy trim, furnishings and similar work which casnnot be adequately supported directly on ghpsum board alone.

3.3 GENERAL GYSPUM BOARD INSTALLATION REQUIREMENTS:

A. Pre-Installation Conference: Meet at the project site with the installers of related work and review the coordination and sequencing of work to ensure that everything to be concealed by gypsum drywall has been accomplished, and that chases, access panels, openings, supplementary framing and blocking and similar provisions have been completed.

B. Install sound attenuation blankets as indicated, prior to gypsum board unless readily installed after board has been installed.

C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'-0" in alternate courses of board.

D. Install ceiling boards in the direction and manner which will minimize the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'-0".

E. Install wall/partition boards vertically to avoid end-butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.

G. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

H. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.

I. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

J. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.

K. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.

L. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" to 1/2" space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustical sealant. Do not fasten drywall directly to stud system runner tracks.

M. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board with "floating" internal corner construction, unless isolation of the intersecting boards is indicated, unless control or expansion joints are indicated, or unless fire rating is indicated.

N. Where sound-rated drywall work is indicated (STC rating), including double-layer work and work on resilient furring, seal the work at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with manufacturer's recommendations for location of beads, and close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceilings.

O. Space fasteners in gypsum boards in accordance with referenced standards and manufacaturer's recommendations, except as otherwise indicated.

3.4 METHODS OF GYPSUM DRYWALL APPLICATION:

A. Single-Layer Application: Install gypsum wallboard.

(1) On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.

(2) On partitions/walls apply gypsum board vertically (parallel), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

(3) On Z-furring members apply gypsum board vertically (parallel) with no end joints. Locate edge joints over furring members.

B. Wall Tile Base: Where drywall is base for thin-set ceramic tile and similar rigid applied wall finishes, install gypsum backing board.

At showers, tubs and similar "wet" areas, install tile backer board. Comply with manufacturer's installation instructions.

C. Acoustical Tile Base: Where drywall is base for adhesively applied applied acoustical tile, install gypsum backing board.

Provide either V-joint type backing board or tape-and-compound treatment of joints (2 coats unsanded).

D. Double-Layer Application: Install gypsum backing board for base layer and exposed gypsum board for face layer.

(1) On ceilings apply base layer prior to base layer application on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10". Apply base layers at right angles to supports unless otherwise indicated.

(2) On partitions/walls apply base layer and face layers vertically (parallel) with joints of base layer over supports and face layer joints offset at least 10" with base layer joints.

(3) On Z-furring members apply base layer vertically (parallel) and face layer either vertically (parallel) or horizontally (perpendicular) with vertical joints offset at least one furring member. Locate edge joidnts of base layer over furring members.

E. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

Fasten with screws.

F. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:

Fasten base layers with screws and face layer with adhesive and supplementary fasteners.

G. Direct-Bonding to Substrate: Where gypsum board is indicated to be directly adhered to a substrate (other than studs, joists, furring members or base layer of gypsum board), comply with gypsum board manufacturer's recommendations, and temporarily brace or fasten gypsum board until fastening adhesive has set.

3.5 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.

B. Install metal corner beads at external corners of drywall work.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim.

3.6 TRIM FOR FLUORESCENT LIGHTS:

Install "tee" spline around openings for fluorescent lights in gypsum board ceilings. "Tee" shall match exposed grid system used for acoustical tile. Support tee from structure. Provide adequate support to hold weight of light fixture.

3.7 FINISHING OF DRYWALL:

A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Prefill open joints and rounded or beveled edges, if any, using type of compound recommended by manufacturer.

(1) Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

(2) Apply joint compound in 3 coats (not including prefill of openings in base), and sand between last 2 coats and after last coat.

(3) Apply one coat joint compound over entire face of partitions which will receive semi-gloss, gloss, or deep tone paint to eliminate texture difference between sanded and unsanded GWB.

B. Water-Resistant Gypsum Board Base for Ceramic Tile: Treat joints and fasteners to comply with directions of water-resistant joint compound manufacturer.

(1) In areas to be tiled, treat fastener heads with water-resistant joint compound. Fill tapered edges in gypsum panels with water-resistant joint compound, embed joint tape firmly and wipe off excess compound; follow immediately with a second coat of water-resistant joint compound over taping coat, being careful not to crown the joint. Fold and embed tape in all interior angles to form true angle.

(2) In areas not to be tiled, treat fastener heads and embed tape as indicated above using water-resistant joint compund but finish with 2 coats of joint compound used for regular gypsum board work.

(3) Regular Gypsum Board Base for Ceramic Tile: In areas to be tiled using organic adhesive, tape joints and apply 4" wide coat of joint compound.

(4) Partial Finishing: Omit third coat (if specified) and sanding on concealed drywall work which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

(5) Refer to sections on painting, coatings and wall-coverings in Division-9 for decorative finishes to be applied to drywall work.

3.8 PROTECTION OF WORK:

Installer shall advise Contractor of required procedures for protecting gypsum drywall work from damage and deterioration during remainder of construction period.

END OF SECTION 09250

SECTION 09300 - TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Definition: Tile includes ceramic surfacing units made from clay or other ceramic materials.

B. Extent of tile work is indicated on drawings and schedules.

C. Types of tile work in this section include the following:

(1) Unglazed ceramic mosaic tile.

(2) Glazed ceramic mosaic tile.

(3) Unglazed quarry tile (non-slip).

(4) Glazed wall tile.

(5) Stone thresholds.

1.3 QUALITY ASSURANCE:

Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.

B. Samples for Verification Purposes: Submit the following:

(1) Samples for each type of tile and for each color and texture required, not less than 12" square, on plywood or hardboard backing and grouted.

(2) Full size samples for each type of trim, accessory and for each color.

(3) 6" long samples fo stone thresholds.

C. Certification: Furnish Master Grade Certificates for each shipment and type of tile, signed by manufacturer and Installer.

1.5 PRODUCT HANDLING:

Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1.6 PROJECT CONDITIONS:

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 degrees F (10 degrees C) in tiled areas during installation and for 7 days after completion, unless higher temperatures required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTAURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following manufacturers:

(1) Unglazed Ceramic Mosaic Tile:

American Olean Tile Co. Div., National Gypsum Co.

United States Ceramic Tile Co.

(2) Unglazed Quarry Tile:

American Olean Tile Co. Div., National Gypsum Co.
Summitville Tiles, Inc.
United States Ceramic Tile Co.

(3) Glazed Wall Tile:

American Olean Tile Co. Div., National Gypsum Co.
United States Ceramic Tile Co.

(4) Commercial Portland Cement Grout:

L & M Surco Mfg. Co., Inc.
The Upco Company

2.2 PRODUCTS, GENERAL:

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with installation products and materials indicated.

C. Colors, Textures and Patterns: For tile and other products requiring selection of colors, surface textures or other appearance characteristics, provide products to match characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standards. Provide tile trim and accessories which match color and finish of adjoining flat tile.

D. Mounting: Where factory-mounted tile is required provide back or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies that this type of mounting is suitable for these kinds of use and has been successfully used on other projects.

2.3 TILE PRODUCTS:

A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:

(1) Type: Porcelain.

(2) Wearing Surface: Without abrasive content except provide slip-resistant tile where indicated.

(3) Nominal Facial Dimensions: As scheduled on Drawings.

(4) Nominal Thickness: 1/4".

(5) Face: Plain with cushion edges.

B. Unglazed Quarry Tile: Provide square-edged flat tile complying with the following requirements:

(1) Wearing Surface: Slip-resistant tile with abrasive embedded in surface.

(2) Nominal Facial Dimensions: 6" x 6".

(3) Nominal Thickness: 3/4".

(4) Face: Plain.

C. Glazed Ceramic Wall Tile: Provide flat tile complying with the following requirements:

(1) Nominal Facial Dimensions: As scheduled on Drawings.

(2) Nominal Thickness: 5/16".

(3) Face: Plain with cushion edge.

D. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

(1) Size: Coordinate with sizes and coursing of adjoining flat tile, where applicable.

(2) Shapes: As follows, selected from manufacturer's standard shapes:

At unglazed ceramic mosaic tile:

Base: Cove equal to American Olean C-813 or C-833 to match floor tile with SC-813 round out corner and SB-812 or SB-816 round in corner.

External Corners: Equal to American Olean S-812 or S-832 to match floor tile.

Internal Corners: Use cove equal to American Olean at 2 x 2 tile.

At glazed ceramic wall tile:

Base: Cove equal to American Olean A-3401 or A-3401.

Caps: Equal to American Olean S-4449 or S-4449 SD-5.

E. Accessories for Glazed Wall Tile: Provide vitreous china accessories of type and size indicated and in color and finish to match adjoining glazed wall tile.

(1) One soap holder for each shower.

(2) One towel bar with plastic rod at each shower.

2.4 STONE THRESHOLDS:

A. General: Provide stone which is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and abrasion resistance for uses subject to heavy foot traffic.

Color of threshold shall match granite.

2.5 SETTING MATERIALS:

A. Portland Cement Mortar (Mortar bed for floor tile) Installation Materials: Provide materials to comply with ANSI A108.1 as required for installation method designated, unless otherwise indicated.

B. Thin-Set Portland Cement Mortar: Where thin-set portland cement mortar applications are indicated, use the following unless otherwise required. Dry-wet portland cement mortar, (Bond Coat) ANSI A118.1, factory sanded.

2.6 GROUTING MATERIALS:

Commercial Portland Cement Grout (Tile Joints): Proprietary preblended compound composed of portland cement and additives formulated for the type of tile installed.

PART 3 EXECUTION

3.1 INSPECTION:

Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

3.2 INSTALLATION, GENERAL:

A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.

C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.

F. For tile mounted in sheets make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

G. Use coves in vertical corners wherever possible.

H. Grout tile to comply with referenced installation standards, using grout materials indicated.

I. Mix and install proprietary components to comply with grout manufacturer's directions.

3.3 FLOOR INSTALLATION METHODS:

A. Ceramic Mosaic Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:

B. Portland Cement Mortar: ANSI A108.1

(1) Bond Coat: Portland cement paste on plastic bed; or thin-set portland cement on cured bed, ANSI A108.5; at Contractor's option.

(2) Concrete Subfloors, Interior: TCA F112 (bonded).

(3) Grout: Commercial portland cement.

C. Quarry Tile: Install tile to comply with requirements indicated below for setting bed method, TCA installation method related to type of subfloor construction, and grout type:

(1) Portland Cement Mortar: ANSI A108.1

(2) Bond Coat: Portland paste on plastic bed; or thin-set portland cement on cured bed, ANSI A108.5; at Contractor's option.

(3) Concrete Subfloor, Interior: TCA F112 (bonded).

(4) Grout: Commercial portland cement.

D. Stone Thresholds: Install stone thresholds at locations indicated; Set thresholds in thinset mortar.

3.4 WALL TILE INSTALLATION METHODS:

Install types of tile designated for wall application to comply with requirements indicated below for setting bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

A. Thin-Set Portland Cement Mortar: ANSI A108.5.

B. Masonry, Interior: TCA W212 (with leveling coat).

C. Metal Studs, Interior: TCA W243

D. Grout: Commercial portland cement.

3.5 CLEANING AND PROTECTION:

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.

C. Protection:

(1) When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.

(2) Prohibit foot and wheel traffic from using tiled floors for at least 7 days after grouting is completed.

(3) Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09300

SECTION 09510 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of each type of acoustical ceiling is shown and scheduled on drawings.

B. Types of acoustical ceilings specified in this section include the following:

Acoustical panel ceilings, exposed suspension.

1.3 QUALITY ASSURANCE:

A. Installer Qualifications: Firm with not less than 3 years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.

B. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.

(1) Surface Burning Characteristics: As follows, tested per ASTM E 84.

(2) Flame Spread: 25 or less

(3) Smoke Developed: 50 or less

C. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any).

1.4 SUBMITTALS:

A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.

Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performances.

B. Samples: Set of 6" x 4" square samples for each acoustical unit required, showing full range of exposed color and texture to be expected in completed work.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS:

Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING TYPES:

A. Acoustical Ceiling Type 'A':

24" x 48" x 3/4" lay-in mineral fiber ceiling panels scored to create 6" x 6" squares; white. (Equal to Armstrong "Second Look IV").

NRC Range: .50 - .60
STC Range: 35 - 39
Light Reflectance: LR-1 (over 75%).
Flame Spread: 0-25 (ASTM E-84) Class A.

B. Acoustical Ceiling Type 'B':

24" x 48" x 5/8" lay-in high density ceramic ceiling panels; white. (Equal to Armstrong "Ceramaguard").

NRC Range: .55 - .65
STC Range: 40 - 44
Light Reflectance: LR-1 (over 75%)
Flame Spread: 0 - 25 (ASTM E-84) Class A.

C. Acoustical Ceiling Type 'C':

24" x 48" x 5/8" lay-in mineral fiber ceiling panels; white. (Equal to Armstrong fissured "Minaboard").

NRC Range: .50 - .60
STC Range: 35 - 39
Light Reflectance: LR-1 (over 75%).
Flame Spread: 0 - 25 (ASTM E-84) Class A.

2.2 METAL SUSPENSION SYSTEMS, GENERAL:

A. Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard finish for type of system indicated, unless otherwise required. For exposed suspension members and accessories with painted finish, provide color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.

C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.

D. Concrete Inserts: Inserts formed from hot-dipped galvanized sheet steel and designed for attachment to concrete forms and for embedment in concrete, with holes or loops for attachment at hanger wires.

E. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.

F. Edge Moldings and Trim: Metal or extruded plastic of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

(1) For lay-in panels with reveal edge details, provide stepped edge molding which forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

(2) For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

G. Hold-Down Clips for Non-Fire-Rated Ceilings: For exterior ceilings and for interior ceilings composed at lay-in panels weighing less than 1 lbs. per sq. ft., provide hold-down clips spaced 2'-0" o.c. on all cross tees.

H. Manufacturer: Subject to compliance with requirements, provide suspension systems of one of the following:

Same as acoustical unit manufacturer
Chicago Metallic Corp.
Donn Corp.
National Rolling Mills, Inc.
Roper Eastern

2.3 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS:

A. Non-Fire-Rated Single Web Steel Suspension System:

(1) Structural Classification: Intermediate-Duty System.

(2) Finish: Painted, white.

2.4 MISCELLANEOUS MATERIALS:

A. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interor sealing of concealed construction joints.

B. Products: Subject to compliance with requirements, provide one of the following:

Tremco Acoustical Sealant; Tremco.
USG Acoustical Sealant; United States Gypsum Co.
Chem Chalk 600; Woodmont Products, Inc.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordination: Furnish layouts for inserts, clips, or other support required to be installed by other trades for support of acoustical ceilings.

Furnish concrete inserts, steel deck hangers clips and similar devices to other trades for installation well in advance of time needed for coordination of other work.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.2 INSTALLATION:

A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulatons, fire-resistance rating requirements as indicated, and industry standards applicable to work.

B. Arrange acoustical units and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans.

Install tile with pattern running in one direction.

C. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not less than 6" from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".

D. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropirate for substrate, and which will not deteriorate or fail with age or elevated temperatures.

E. Install hangers plumb and tree from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offet resulting horizonal force by bracing, countersplaying or other equally effective means.

F. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

G. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.

H. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

I. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

3.3 ADJUST AND CLEAN:

Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.4 EXTRA STOCK:

A. Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

B. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.

C. Exposed Suspension Components: Furnish quantity of each exposed component required for actual installation equal to 2.0% of amount installed.

END OF SECTION 09510

SECTION 09520 - FABRIC WRAPPED PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DESCRIPTION OF WORK:

A. Extent of fabric wrapped panels is shown on drawings and in schedules.

B. Work includes panels, fabric, padding, and hanging devices.

C. Related work includes:

(1) Architectural Woodwork, Section 06400.

(2) Painting, Section 09900.

(3) Wall coverings, Section 09950.

1.3 QUALITY ASSURANCE:

A. Field Measurements: Verify sizes of panels prior to fabrication.

B. Dye Lots: Arrange for purchase of fabric from same dye lot as any matching wallcovering. Provide fabrics for wrapped panels from single dye lots.

1.4 SUBMITTALS:

A. Shop Drawings: Submit shop drawings showing elevations, spacing, edge details, and hanging devices.

B. Samples: Submit samples of fabrics and padding.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Fabric: As shown in schedules and specified in Section 09950.

B. Panels: 1/2" thick particleboard.

C. Padding: Two layers felt backing. Color of padding shall be compatible with fabric; selected from padding manufacturer's standard colors.

D. Hanging Devices: Extruded aluminum "z" clips, manufacturer's standard finish; for concealed fastening.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Paint wall at panel joints so no bare substrate will show after panels are hung.

B. Do not proceed with installation until painting, floor covering, and ceiling work is complete in area.

3.2 FABRICATION:

A. Wrap panels with padding. Return padding minimum two inches on back side of panels and staple. Do not glue padding to panels.

B. Apply fabric over padding. Pull snug without distorting pattern or weave of fabric. Eliminate seams and wrinkles. Return fabric minimum two inches on back side of panels and staple. Do not glue fabric to padding.

C. If panels are wrapped off site, wrap finished panel with plastic and protect edges and corners from damage during shipment.

D. Match fabric panel pattern across joints.

3.3 INSTALLATION:

A. Hang panels vertical and level. Provide minimum two rows of hangers. Provide intermediate row if necessary to prevent bowing of panel.

B. Check fabric pattern match and adjust if necessary.

C. Clean fabric if necessary and vacuum any dust.

D. Protect panels from damage.

END OF SECTION 09250

SECTION 09550 - WOOD FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent of wood flooring is shown on drawings and in schedules, either by terms specified or by abbreviations.

B. Types of wood flooring required include the following:

Solid wood parquet flooring.

1.3 QUALITY ASSURANCE:

A. Installer: Specialized wood flooring firm, with not less than 3 years successful experience in installation of types specified, and acceptable to manufacturer of wood flooring.

B. General Standard: Comply with recommendations of National Oak Flooring Manufacturer's Association (NOFMA).

C. Manufacturer: Obtain flooring of each type from single manufacturer or source, to ensure match of quality, color, pattern and texture.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and instructions for each type of wood flooring. Including installation, storage, and finishing recommendations.

B. Samples: Submit sets of range samples for each type of wood flooring, including finish on 75% of each sample.

Include samples of border units where borders of different color, texture or pattern are indicated.

1.5 DELIVERY AND STORAGE:

A. Moisture Content: At time of delivery, limit average moisture content of wood flooring to 12%, with 14% max. for any piece.

B. Protect wood flooring materials from excessive moisture in shipment, storage, and handling. Deliver materials in unopened bundles and store in dry place with adequate air circulation.

1.6 JOB CONDITIONS:

Do not proceed with installation of wood flooring until spaces have been enclosed and are at approximate humidity condition planned for occupancy. Condition wood for 5 days prior to start of installation by placing in spaces to receive flooring and maintaining ambient temperature between 65 degrees F and 70 degrees F (18 degreecs C and 21 degrees C) before, during, and after installation.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Solid Wood Parquet Flooring:

(1) Species, Grade, and Cut: Provide the following wood wherever parquet flooring is indicated:

Species: Teak (Tectona Grandis).
Grade:Manufacturer's standard.
Cut: Plain sawn or mfr's standard.

(2) Units: Solid units (strips).

(3) Matching: Tongue and grove end-matched..

(4) Thickness: Nominal 3/4".

(5) Unit Sizes and Pattern: As shown on drawings.

(6) Seasoning: Manufacture parquet flooring from kiln dried lumber.

(7) Factory Assembly: Select and assemble loose pieces which make up whole pattern unit, and adhere to removable paper facing or cotton mesh backing.

B. Accessory Materials for Wood Flooring:

(1) Asphalt Saturated Felt: 15 lb. type, ASTM D 226.

(2) Adhesive/Mastic: Polyvinyl acetate or special mastic of type recommended by manufacturer of flooring, and complying with flamability and environmental control regulations.

(3) Stain: Penetrating type non-fading wood satin of color required to match Architect's sample.

(4) Wood Filler: Paste type wood filler, pigmented if necessary to match Architect's sample.

(5) Floor Sealer: "Dura Seal: #210 Neutral by Minwax Company, or equivalent sealer as recommended by flooring manufacturer.

(6) Wood Trim: Except as otherwise indicated, provide wood stripping, nosings, saddles and thresholds, as shown in or adjacent to wood flooring, of same species, grade and cut as wood flooring.

PART 3 - EXECUTION

3.1 INSPECTION:

Installer must examine substrates on which wood flooring will be installed, and conditions under which work will be performed, and must notify Contractor in writing of conditions detrimental to proper completion and maintenance of wood flooring. Do not proceed with work until unsatisfactory conditions have been corrected a manner acceptable to Installer.

3.2 PREPARATION:

A. Wherever direct application of wood flooring to concrete substrate is indicated, test for dryness before proceeding with installation. Test with 3% solution of phenolphthalein in grain alcohol. Sprinkle a few drops on concrete at several locations. If drops turn red, do not proceed.

B. Grind down high points in concrete floor. Fill any low spots with leveling compound.

3.3 INSTALLATION:

A. General: Comply with flooring manufacturer's instructions and recommendations, but not less than recommended by NOFMA in "Hardwood Flooring Installation Material" and by recommendations of APA, Inc., as applicable to type flooring required.

B. Pattern: Comply with pattern or direction of pattern for laying wood flooring as shown or, if not shown, as directed by Architect.

C. Expansion Space: Provide expansion space at walls and other obstruction and terminations of flooring, not less than 1/2" unless otherwise shown on drawings. Unless fully concealed by trim, fill expansion space with flush cork expansion strip. Nail shoe molding or other trim to baseboard, rather than to flooring.

D. Laying Solid Wood Parquet Flooring:

Set in adhesive/mastic in accordance with manufacturer's instructions and recommendations.

3.3 SANDING AND FINISHING:

A. Machine sand installed unfinished flooring to remove offsets and non-level conditions, ridges, cups, and sanding machine marks which would be visually noticeable after finishing. Use 3 grades of sandpaper, ending with 00 grade. Use disc sander or screen for final cut. Vacuum clean and immediately apply finish. Do not permit traffic on floor after sanding and until finish is completed. Cover sanded floor with building paper to provide access for application of first finish coats.

B. Apply stain if needed to match approved sample.

C. Apply wood filler by brush, followed by wiping across grain to work into pores and cracks.

D. Apply the first coat of Dura Seal Neutral with a lambswool applicator or brush. Allow to penetrate for 5 to 10 minutes. While Dura Seal is still wet, buff with #2 steel wool to remove excess and smooth the grain. Coverage approximately 500 square feet per gallon. Allow the first coat to dry approximately 8 hours and apply a second coat in the same manner as the first.

Allow the second coat to dry approximately 8 hours and buff to a satin sheen using a polishing brush or pad.

. Buff completed finish before permitting traffic. Do not wax.

3.4 PROTECTION:

Institute procedures required for protection of finished wood flooring during remainder of construction period, so that flooring and finish will be without damage or deterioration at time of acceptance.

END OF SECTION

SECTION 09650 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

Extent of resilient flooring and accessories is shown on drawings and in schedules.

1.3 QUALITY ASSURANCE

A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds. Wherever possible, provide required resilient flooring and accessories produced by a single manufacturer.

B. Fire Test Performance: Unless otherwise indicated. provide resilient flooring having the following classification or properties when tested in accordance with the standard fire tests referenced below:

(1) Flame Spread: Not more than 75 as per ASTM E 84.

(2) Smoke Developed: Not more than 450 as per ASTM E 84.

(3) Smoke Density: Not mor than 450 as per NFPA 258.

1.4 REFERENCES:

RFCI Vinyl Sheet Standard: SV-1, Resilient Floor Covering Institute recommended Specification for Resilient Floor Covering-Vinyl Plastic Sheet.

1.5 SUBMITTALS:

A. Product Data: Submit 2 copies of manufacturer's technical data and installation instructions for each type of resilient flooring and accessory.

B. Samples: Submit, for verification purposes, samples of each type, color and pattern of resilient flooring, including accessories, required, indicating full range of color and pattern variation. Provide full-size tile units, 6" x 9" samples of sheet flooring, and 2-1/2" long sections of resilient flooring accessories.

C. Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessories required.

D. Replacement Material: After completion of work, deliver to project site replacement materials from same manufactured lot as materials installed, and as follows:

(1) Tile flooring, not less than one box for each 50 boxes, or fraction thereof, for each type, size, and color installed.

(2) Sheet flooring, not less than 5 lineal yards for each type, pattern, and color installed.

1.6 JOB CONDITIONS:

A. Maintain minimum temperature of 65 degrees F (18 degrees C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55 degrees F (13 degrees C) in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

(1) Vinyl Composition Tile:

Armstrong World Industries, Inc.
GAF Corp., Floor Products Div.

(2) Vinyl Sheet without Backing:

Armstrong World Industries, Inc.
Dynamit Nobel of America.
Pinay Flooring Products, Inc.
Tarco Eastern Inc. Tarkett.

(3) Wall Base:

Afco Rubber Corp.
Amtico Flooring Div., American Biltrite, Inc.
Armstrong World Industries, Inc.
Azrock Floor Products
Flexco Div., Textile Rubber Co., Inc.
GAF Corp. Floor Products Div.
Kentile Floors, Inc.
Mercer Plstics Co., Inc.
National Floor Products Co
Vinyl Plastics Inc.

2.2 MATERIALS:

A. Colors and Patterns: As shown or scheduled, or as selected by Architect from manufacturer's standards.

B. Tile Flooring:

Vinyl Composition Tile (VCT): FS SS-T-312, Type IV, 12" x 12" unless otherwise indicated, and as follows:

(1) Composition 1 - asbestos-free.

(2) Gage: 1/8".

C. Sheet Flooring:

Vinyl Sheet Flooring without Backing: Provide vinyl sheet with pattern and color extending through full thickness, complying with FS L-F-475, Type II, except for thickness and backing requirements, and the following requirements:

(1) Thickness: 0.060" min.

(2) Width: 6'-0" minimum.

(3) Welding Thread: Vinyl thread or rod as produced by manufacturer of sheet vinyl flooring and intended for heat sealing of joints. Match field color of flooring.

D. Accessories:

(1) Wall Base: Provide base complying with FS SS-W-40; Type I rubber or as scheduled Type II vinyl, with matching end stops and preformed or molded corner units, and as follows:

Height: As indicated on drawings.

Thickness: 1/8" gage.

Style: Standard top-set cove at VCT.

Style: Straight base without cove at carpet.

Finish: Matte.

(2) Resilient Edge Strips: 1/8" thick, homogenous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from standard colors available; not less than 1" wide.

(3) Flat Stringer Vinyl: 1/8" thick by standard height as needed; length as required for each run without joints; color as scheduled on drawings.

(4) Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

(5) Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

(6) Leveling Compound: Latex type as recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 PREPARATION:

A. Broom clean or vacuum surfaces to be covered and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.

B. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.

C. Perform bond and moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and ready to receive flooring.

D. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.2 INSTALLATION:

A. General:

(1) Install flooring using method indicated in strict compliance with manufacturer's recommendations. Extend flooring into toe spaces,

plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

(3) Install flooring on covers for telephone and electrical ducts, and other such items as occur within finished floor areas. Maintin overall continuity of color and pattern with pieces of flooring installed in these covers. Tightly cement edges to perimeter of floor around covers and to covers.

(4) Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll flooring at perimeter of each covered area to assure adhesion.

B. Tile Floors:

(1) Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

(2) Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped or deformed tile are not acceptable.

(3) Lay tile with grain running in one direction.

(4) Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.

C. Sheet Flooring:

(1) Lay sheet flooring to provide as few seams as possible with economical use of materials. Match edges for color shading and pattern at seams in compliance with manufacturer's recommendations.

(2) Adhere sheet flooring to substrates using method approved by flooring manufacturer for type of sheet flooring and substrate condition indicated.

(3) Use conventional full spread adhesive method unless otherwise indicated.

(4) Use conventional perimeter bonding adhesive procedures where recommended by flooring manufacturer.

(5) Prepare seams in vinyl sheet flooring with manufacturer's special routing tool and heat weld with vinyl thread in accordance with manufacturer's instructions.

C. Accessories:

(1) Apply wall base to walls, columns, pilasters, casework and other

permanent fixtures in rooms or areas where base is required.Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

(2) On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

(3) Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring, which would otherwise be exposed.

3.3 CLEANING AND PROTECTION:

A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. Protect installed flooring with heavy Kraft paper or other covering.

B. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories.

C. Apply polish and buff, with type of polish, number of coats and buffing procedures in compliance with flooring manufacturer's instructions.

END OF SECTION

SECTION 09680 - CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. The extent of each type of carpeting (Cpt) is indicated on the drawings, and by specifications, and is defined to include carpet, cushion and accessories.

B. Each type of required carpet is specified by data sheets, included as last pages of this section. The following basic kinds of carpeting work are required:

(1) Glued-down cut pile carpet.

(2) Glued-down cut and loop carpet.

(3) Pad, carpet accessories and installation of Owner furnished rugs.

1.3 QUALITY ASSURANCE:

A. Installer: Firm with not less than 2 years of carpeting experience, similar to work of this section.

B. General Standard: "Carpet Specifier's Handbook" by The Carpet and Rug Institute; for definitions of terminology not otherwise defined herein, and for general recommendatoins and information.

C. Overrun: Where carpet is supplied from custom run at mill, produce and deliver to project at least 5% overrun on calculated yardage (carpet needed for proper installation plus waste and excess usable scraps) as follows:

Cpt - 1: 5%
Cpt - 2: 0%
Cpt - 3: 2%

1.4 SUBMITTALS:

A. Samples: Submit 18" x 27" samples of each carpet required, and 6" lengths of exposed edge stripping, and 6" squares of separate cushions.

B. Shop Drawings: Provide seaming plans for roll carpeting.

C. Product Data: In addition to complete data on each carpet and carpeting materials, provide manufacturer's certification or certified test laboratory reports for required compliances with specified tests, and provide written instructions for each type of installation required.

1.5 PRODUCT DELIVERY AND STORAGE:

Deliver carpeting materials in protective wrapping, and store inside, protected from weather, moisture and soiling.

1.6 WARRANTY:

Provide special project warranty, signed by Contractor, Installer and Manufacturer (Carpet Mill), agreeing to repair or replace defective materials and workmanship of carpeting work during 2- year warranty period following substanital completion. Attach copies of product warranties.

PART 2 - PRODUCTS

2.1 CARPET:

A. Data Sheets/Schedule: Detailed performance for each required type of carpet are specified by either carpet data sheet at end of this section or carpet schedule on drawings, to extent not specified by provisions of this section.

B. Carpet Construction: Fabricate carpet by the construction method indicated or shown on data sheets, as recognized in the carpet industry, using manufacturer's (mill's) standard process.

C. Static Resistance: Provide yarn or yarn blend as indicated in carpet construction, and include provisions to comply with static resistance ratings as indicated, either by selection of yarns known to be effective or by inclusion of small percentages of special anti-static yarn known to be effective in achieving indicated static resistance. Where rating is not otherwise indicated, provide 1.5 KV resistance for 20% R.H. at 70 degrees F (21 degrees C), AATCC 134.

2.2 CARPET CUSHIONS:

A. General: Provide manufacturer's standard carpet cushion of type, weight and thickness indicated. Refer to drawings for space-to-space variations (if any) in carpet cushion requirements. Provide cushion which passes pill test for flammability, ASTM D 2859 (DOC FF-1-70), or is rated 75 by tunnel test, ASTM E 84 (UL Test 723).

B. Rubberized Fiber/Hair Carpet Cushion: Animal hair top and jute fiber bottom with top and bottom rubber coated surfaces; treated for moth-vermine resistance; FS DDD-C-001023, Type II.

2.3 CARPET ACCESSORIES:

A. Tackless Carpet Stripping: Water-resistant plywood strips, either .38" or 9/32" thick as required to match cushion thickness, with angular pins protruding from top designed to grip and hold stretched carpet at the backing. Provide narrow stripping with 2 rows of pins where stretched width of carpet is 20' or less; wide stripping with 3 rows of pins where carpet width exceeds 20'.

B. Carpet Edge Guard, Nonmetalic: Extruded or molded vinyl or rubber carpet edge guard of size and profile indicated; colors selected by Architect from among standard colors available within the industry (any manufacturer).

C. Installation Adhesive: Water-resistant type as recommended by carpet or cushion manufacturer, and which complies with flammability requirements for installed carpet.

D. Seaming Cement: Hot-melt seaming adhesive or similar product recommended by carpet manufacturer, for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.

E. Miscellaneous Materials: As recommended by manufacturers of carpet, cushions and other carpeting products; and selected by Installer to meet project circumstance and requirements.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS:

A. Installer must examine substrates for moisture content and other conditions under which carpeting is to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting; vacuum clean immediately before installation. Check concrete surfaces to ensure no "dusting" through installed carpet; apply sealer where required to prevent dusting.

C. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.2 INSTALLATION:

A. General:

(1) Comply with manufacturer's instructions and recommendations for seam locations and direction of carpet; maintain uniformity of direction and lay of pile. At doors, center seams under doors; do not place seams in traffic direction at doorways.

(2) Extend carpet under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.

(3) Provide cut-outs where required, and bind cut edges properly where not concealed by protective edge guards or overlapping flanges.

(4) Install carpet edge guard where edge of carpet is exposed; anchor guards to substrate.

(5) Expansion Joints: Do not bridge building expansion joints with continuous carpeting, provide for movement.

B. Stretch-in-Tackless Installation: (Under rugs and where indicated on drawings.)

(1) Install tackless carpet stripping with adhesive or by nailing, or both where required for adequate strength. Locate properly for concealment of carpet edge between stripping and base of wall. Strip entire perimeter of each carpeted space, and where possible at obstructions and cutouts.

(2) Install cushion of type indicated in each space to be carpeted. Run seams at 90 degree angle with carpet seams. Place cushion with fabric-covered or smoothest face up. Apply 2" fabric-type adhesive tape on cushion seams. Cement cushion to substrate in manner recommended by manufacturer, except staple to wood substrates (if any).•

(3) In ramped floor areas, increase anchorage/bond of carpet cushion to substrate.

(4) Install carpet by trimming edges, buttering cuts with seaming cement, taping or sewing or taping-and-sewing seams to provide sufficient strength for stretching and continued stresses during life of carpet. Apply seaming cement over stitching on backing, if not covered by tape.

(5) Stretch carpet both directions, the exact amount recommended by carpet manufacturer; trim edges, secure to stripping, and conceal behind edge of stripping. Use power stretchers where sufficient space is available to operate stretchers properly.

C. Glue-Down Installation:

(1) Fit sections of carpet into each space prior to application of adhesive. Trim edges and butter cuts with seaming cement.

(2) Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt carpet edges tightly together to form seams without gaps. Roll lightly to eliminate air pockets and ensure uniform bond. Remove adhesive promptly from face of carpet.

D. Miscellaneous Installations:

Stairway Carpeting: Install by secure method, recognized to be durable and safe for traffic. Conceal edges and avoid making seams in areas of high wear. Match adjoining carpet installation in every way possible.

3.3 CLEANING AND PROTECTION:

A. Remove debris, sorting pieces to be saved from scraps to be disposed of.

B. Vacuum carpet using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed.

C. Advise Contractor of protection methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

D. Maintenance Materials: Deliver a specified overrun (if any) and usable scraps of carpet to Owner's designated storage space, properly packaged (paper wrapped) and identified. Usable scraps are defined to include roll ends of less than 9'-0" length, and pieces of more than 3 sq. ft. area and more than 8" wide. Dispose of smaller pieces as "construction waste".

E. Restretching: Return to installation after approximately 6 months of occupancy and use; restretch carpet in each space, repair faults in seaming, trim and adjust carpeting at edges.

3.4 CARPET DATA SHEETS

CARPET DATA SHEET - CPT-1

Carpet Designation: Type CPT-1 (as shown or scheduled).

Pile Fiber: 100% staple nylon; Antron XL

Carpet Construction: Tufted

Style: Cut and Level Loop

Gage: 1/8"

Stitches: 12 per inch

Thickness, Pile Height: .250

Pile Face Weight: 50 oz. per sq. yd.

Color/Texture/Pattern: Custom Color to match Architect's sample.

Dye Method: Yard Dyed - Stock or Skein (Space Dye not Available).

Flammability: Comply with code; (ASTM E 84); Steiner Tunnel Test - Class B

Primary Backing: Polypropylene

Back Coating: 26 oz. per yd. Latex or mfrs. equivalent.

Secondary Backing: 5.50 jute with 8-lb. bond strength (FS DDD-D-0095).

Tuft Bind: 8 lbs. (ASTM D 1335).

Overrun: 5% required, for delivery to Owner.

Installation: For glue-down and stretch-in tackless.

Complying Examples: Patcraft
Harbinger
Lees

CARPET DATA SHEET - CPT-2

Carpet Designation: Type CPT-2 (as shown or scheduled).

Pile Fiber: 100% staple nylon; Antron XL

Carpet Construction: Tufted

Style: Cut pile

Gage: 1/8"

Stitches: 12 per inch

Thickness, Pile Height: .250

Pile Face Weight: 50 oz. per sq. yd.

Color/Texture/Pattern: Custom Color to match Architect's sample.

Dye Method: Yard Dyed - Stock or Skein (Space Dye not Available).

Flammability: Comply with code; (ASTM E 84); Steiner Tunnel Test - Class B

Primary Backing: Polypropylene

Back Coating: 26 oz. per yd. Latex or mfrs. equivalent.

Secondary Backing: 5.50 jute with 8-lb. bond strength (FS DDD-D-0095).

Tuft Bind: 8 lbs. (ASTM D 1335).

Overrun: 5% required, for delivery to Owner.

Installation: For glue-down and stretch-in tackless.

Complying Examples: Patcraft
Harbinger

CARPET DATA SHEET - CPT-3

Carpet Designation: Type CPT-3 (as shown or scheduled).

Pile Fiber: 100% staple nylon; ANSO IV"HP" heat set nylon with permanent static control.

Carpet Construction: Tufted

Style: Cut

Ply: 2

Gage: 1/10"

Stitches per Inch: 6 inches/72

Thickness, Pile Height: 7/16

Pile Face Weight: 54 oz. per sq. yd.

Color/Texture/Pattern: Custom Color to match Architect's sample.

Dye Method: Yard Dyed - Stock or Skein (Space Dye not Available).

Flammability: Comply with code; (ASTM E 84); Steiner Tunnel Test - Class B

Primary Backing: Polybac/AS

Back Coating: 26 oz. per yd. Latex or mfrs. equivalent.

Secondary Backing: 5.50 jute with 8-lb. bond strength (FS DDD-D-0095).

Tuft Bind: 8 lbs. (ASTM D 1335).

Overrun: 5% required, for delivery to Owner.

Installation: For glue-down and/or tackless stretch-in.

Acceptable Manufacturers: Patcraft
Harbinger
Lees
Bigelow

END OF SECTION 09680

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent of painting work is shown on drawings and schedules, and as herein specified.

B. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.

Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

C. The work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated. Pipe and ductwork occurring in mechanical rooms will not require painting.

D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

E. Paint exposed surfaces whether or not colors are designated in "schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas. If color or finish is not designated, Architect will select these from standard colors available for materials systems specified.

F. Following categories of work are not included as part of field-applied finish work, or are included in other sections of these specifications.

G. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and shop-fabricated components such as architectural woodwork, wood casework, and shop-fabricated components such as factory-built mechanical and electrical equipment or accessories.

H. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, elevator entrance frames, doors and equipment.

I. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.

J. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

K. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.

Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples: Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

1. On 12" x 12" hardboard, provide two samples of each color and material, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.

2. On actual wood surfaces, provide two 4" x 8" samples of natural and stained wood finish. Label and identify each as to location and application.

3. On concrete masonry, provide two 4" square samples of masonry for each type of finish and color, defining filler, prime, and finish coat.

4. On actual wall surfaces and other exterior and interior building components, duplicate painted finishes of prepared samples. On at least 100 sq. ft. of surface as directed, provide full-coat finish samples until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.

1.4 DELIVERY AND STORAGE:

Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

Name or title of material.
Fed. Spec. number, if applicable.
Manufacturer's stock number and date of manufacturer.
Manufacturer's name.
Contents by volume, for major pigment and vehicle constituents.
Thinning instructions.
Application instructions.
Color name and number.

1.5 JOB CONDITIONS:

A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50° F (10°C) and 90°F (32°C), unless otherwise permitted by paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45°F (7°C) and 95°F (35°C), unless otherwise permitted by paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when relative humidity exceed 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.

Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

1.6 APPROVED SUBCONTRACTORS:

A. Benise-Dowling and Associates.
B. Campbell Decorating Co.
C. Fasher Painting and Decorating Co.
D. Goodman Decorating Co., Inc.
E. Hartline Thomas, Inc.
F. Rosing Painting and Wall Covering Contractors.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES:

A. Paint colors, surface treatments, and finishes, are indicated in "schedules" of the contract documents.

Prior to beginning work, Architect will furnish color chips for surfaces to be painted.

Use representative colors when preparing samples for review.

Final acceptance of colors will be from samples applied on the job.

B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.2 MATERIAL QUALITY:

A. Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

C. Manufacturer's products which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.

D. Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

2.3 EXTERIOR PAINT SYSTEMS (EPS):

Provide following paint systems for various substrates, as indicated.

Concrete, Stucco, and Masonry: (Other than concrete masonry units).

A. Stained Wood:

EPS-1: 1st Coat - Cabot "Penetawood Seal".
2nd Coat - Cabot "Bleaching Oil #241" (3-4 weeks after 1st coat).
3rd Coat - Cabot "Bleaching Oil #241" (6-8 months after 2nd coat).

B. Ferrous Metal:

EPS-2: 1st Coat - Zinc-yellow iron oxide primer.
2nd Coat - Alkyd gloss enamel.
3rd Coat - Alkyd gloss enamel
First coat not required on items delivered shop primed.

C. Zinc Coated Metal:

EPS-3: 1st Coat - Zinc dust-zinc oxide primer.
2nd Coat - Semi-gloss alkyd enamel.
3rd Coat - Semi-gloss alkyd enamel.

D. Aluminum:

EPS-4: 1st Coat - Zinc chromate primer.
2nd Coat - Semi-gloss alkyd enamel.
3rd Coat - Semi-gloss alkyd enamel.

E. Steel Railings:

EPS-4: 1st Coat - Zinc dust-zinc oxide primer
2nd Coat - Acrylic - Urethane enamel.
3rd Coat - Acrylic - Urethane enamel.

2.4 INTERIOR PAINT SYSTEMS:

Provide following paint systems for various substrates, as indicated.

A. Concrete: (Other than concrete masonry units.)

IPS-1: 1st Coat - Interior latex emulsion.
2nd Coat - Interior enamel undercoat.
3rd Coat - Interior enamel, semi-gloss not less than 3.5 mils total dry film thickness.

B. Concrete Masonry Units:

IPS-2: 1st Coat - Surface filler.
2nd Coat - Enamel undercoater.
3rd Coat - Semi-gloss alkyd enamel.
Apply filler coat at a rate to ensure complete coverage with pores filled.
Not less than 3.5 mils dry film thickness, excluding first coat.

C. Gypsum Drywall Systems:

IPS-3: 1st Coat - PPG Quick Drying Emulsion Sealer
6-2 (17-10)
MWF 3-6 mils
2nd Coat - PPG Satinhide Lo-Lustre Latex Enamel 88 line
3rd Coat - PPG Satinhide Latex Enamel 88 line
Finish coats MWF 3.6 mils

D. Ferrous Metals:

IPS-4: 1st Coat - Red lead primer.
2nd Coat - Enamel undercoater.
3rd Coat - Semi-gloss enamel.
First coat not required on items that are shop primed.
Not less than 2.5 mils dry film thickness.

E. Zinc Coated Metal:

IPS-5: 1st Coat - Zinc dust-zinc oxide primer.
2nd Coat - Enamel undercoat.
3rd Coat - Semi-gloss enamel.
Not less than 2.5 mils dry film thickness.

F. Painted Woodwork and Hardboard:

IPS-6: 1st Coat - Enamel undercoat.
2nd Coat - Semi-gloss enamel.
3rd Coat - Semi-gloss enamel.

G. Concrete Floors:

IPS-7: 1st Coat - Concrete conditioner.
2nd Coat - Polyurethane coating.
3rd Coat - Polyurethane coating.

H. Wood Floors: See Wood Flooring Section.

I. Vapor Barrier on Concrete:

IPS-8: 1st Coat - Pentagon Plastics, Inc.; PP PU Primer
2nd Coat - Pentagon Plastics, Inc.; Decadex Firecheck at 11 mils wet film thickness
3rd Coat - Pentagon Plastics, Inc; Decadex Firecheck at 11 mils wet film thickness

J. Lacquer on wood:

IPS-9: Prepare substrate by washcoat, stain, filler, and sealer. Sand with 220 grit stereated paper.

1st Coat - Lacquer Topcoat
2nd Coat - Lacquer Topcoat

PART 3 - EXECUTION

3.1 INSPECTION:

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION:

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

B. Cementitious Materials: Prepare cementitious surfaces of concrete and concrete block to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.

Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

Clean concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush floor with clean water to neutralize acid, and allow to dry before painting.

C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended know sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

D. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.

E. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.

3.3 MATERIALS PREPARATION:

Mix and prepare painting materials in accordance with manufacturer's directions.

Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.4 APPLICATION:

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.

Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.

Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.

Finish exterior doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.

Sand lightly between each succeeding enamel or varnish coat.

Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.

E. Mechanical items to be painted include, but are not limited to, the following:

Piping, pipe hangers, and supports.
Heat Exchanges.
Tanks.
Ductwork, insulation.
Motor, Mechanical Equipment, and Supports.
Accessory Items.

F. Electrical items to be painted include, but are not limited to, the following:

Conduit and fittings.
Switchgear.

G. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

H. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

I. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surfaces imperfections.

J. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 CLEAN UP AND PROTECTION:

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans, and rags at end of each work day.

Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

B. Protection: Protection of work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION 09900

SECTION 09950 - WALL COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of wall coverings required is in schedules.

B. Types of wall covering required include the following:

(1) Vinyl-coated fabric wall covering (WC).

(2) Textile wall covering (WC).

1.3 QUALILTY ASSURANCE:

A. Installer: A firm specializing in wall covering work with not less than three years of experience in installing wall coverings similar to those required for this project.

B. Approved Subcontractors:

(1) Benise - Dowling and Associates
(2) Campbell Decorating Co.
(3) Fasher Painting and Decorating Co.
(4) Goodman Decorating Co., Inc.
(5) Hartline Thomas, Inc.
(6) Rosing Painting and Wall covering Contractors.

C. Fire Hazard Classification: Provide materials bearing UL label and marking, indicating fire hazard classification of wall covering, as determined by ASTM E 84.

D. Provide materials with the following fire hazard classifications:

Flame spread not more than 25.
Fuel contributed not more than 15.
Smoke developed not more than 25.

E. Test Panels:

(1) Prior to ordering any fabric wallcovering, inspect the installation and seaming test samples of all fabric wallcoverings herein specified which are on record at the architects office; and confirm the equivalent installation can be provided for the job using the materials as specified.

(2) Prior to installing any fabric wallcovering, submit for approval to the architect 18" x 18" samples of all fabric wallcovering cut and installed butt-seamed, per the specifications, on drywall panels prepared as per the job specifications.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of wall covering and installation materials.

B. Samples: Submit full width samples of each type of wall covering, illustrating range of color and pattern variation; submit sets of sample moldings.

C. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including precautions for use of cleaning materials which could damage wall covering.

D. Replacement Materials: After completion of work, deliver to project site not less than 6 linear yards of each type, color, and pattern of wall covering installed. Furnish replacement materials from same production run as materials installed.

1.5 DELIVERY AND STORAGE:

A. General: Comply with instructions and recommendations of manufacturer and as herein specified.

B. Deliver materials to project site in original packages or containers clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classification.

C. Store materials in original undamaged packages or containers. Do not store rolled goods in upright position. Maintain temperature in storage area above 40 degrees F. (4 degrees C.).

1.6 JOB CONDITIONS:

A. Maintain constant minimum temperature of 60 degrees F (16 degrees C) at areas of installation for at least 72 hours before and 48 hours after application of materials.

B. Illuminate areas of installation using building's permanent lighting system; temporary lighting alone will not be acceptable.

PART 2 - PRODUCTS

2.1 WALL COVERING (WC):

Wall Coverings are Scheduled on Drawings.

2.2 BACKING:

Provide backing where recommended by wallcovering manufacturer. Backing shall be type recommended by manufacturer and shall be compatible with substrate. Installer shall review backing recommendations and advise Architect in writing if installer does not agree with recommendations. Disagreements shall be resolved before proceeding with application of backing to wallcovering.

2.3 ACCESSORY ITEMS:

A. Adhesives: Provide manufacturer's recommended adhesive, primer, and sealer, produced expressly for use with selected wall covering on substrate as shown on drawings. Provide materials which are mildew-resistant and nonstaining to wall covering.

B. Release Coat: Oil base sealer or enamel undercoater for drywall substrates compatible with adhesive and wallcoverings.

C. Corner Guards: Provide external corner molding manufactured expressly for use with wall coverings, equal to Construction Specialties .028 accessory moulding. Color: 106 Brown.

D. Adhesive for molding: Provide contact adhesive recommended by molding manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Acclimatize wall covering materials by removing from packaging in area of installation not less than 24 hours before application.

B. Remove switchplates, wall plates, and surface-mounted fixtures in areas where wall covering is to be applied.

C. Prime and seal substrates in accordance with wall covering manufacturer's recommendations for type of substrate. Apply surface sealer to gypsum drywall which will permit subsequent removal of wall covering without damage to paper facing.

3.2 INSTALLATION:

A. Metal Moldings:

(1) Furnish metal moldings for corners where shown on drawings.

(2) Install metal moldings in longest practicable lengths, by nailing and cementing to substrates in accordance with molding manufacturer's instructions. Tightly butt end joints and miter corner joints.

B. Vinyl Wall Covering:

(1) Place wall covering panels consecutively in order cut from rolls, including filling of spaces above or below openings. Hang by reversing alternate strips except on match patterns.

(2) Apply adhesive to back of wall covering and place in accordance with manufacturer's instructions. Install seams plumb, and at least 6" away from corners. Horizontal seams are not permitted. Overlap seams and double-cut to assure tight closure. Roll, brush, or use broad knife to remove air bubbles, wrinkles, blisters, and other defects. Cut wall covering evenly to edges of outlet boxes or support.

(3) Trim selvages as required to assure color uniformity and pattern match.

(4) Remove excess adhesive along finished seams while it is still wet using warm water and clean sponge, and wipe dry.

C. Textile Wall Covering:

(1) Place wall covering panels consecutively in order from rolls, including filling of spaces above or below openings. Hang by reversing alternate strips except on match patterns.

(2) Apply adhesive to wall surface and apply wall covering in accordance with manufacturer's instructions, taking care to avoid getting adhesive on fabric face. Install seams plumb, and at least 6" from any corner. Horizontal seams are not permitted. Carefully pretrim edges, if necessary, so that butt seams will be tight. Roll or brush covering to assure bond and to remove air bubbles, blisters, wrinkles, and other defects. Cut wall covering evenly to edges of outlet boxes or support.

3.3 ADJUST AND CLEAN:

A. Replace removed plates and fixtures; verify cut edges of wall coverings are completely concealed.

B. Remove surplus materials, rubbish, and debris resulting from wall covering installation upon completion of work, and leave areas of installation in neat, clean condition.

END OF SECTION 09950

SECTION 10100 - MARKERBOARDS AND TACKBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of markerboards and tackboards is shown on drawings.

B. Types of markerboards and tackboards specified in this section include the following:

Porcelain-on-metal chalkboards.

Natural cork tackboards wrapped with wallcovering.

1.3 QUALITY ASSURANCE:

Manufacturer: Unless otherwise acceptable to Architect, furnish all markerboards and tackboards by one manufacturer for entire project.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.

B. Samples: Submit full range of color samples for each type of markerboard, tackboard, trim and accessories required.Provide 12" square samples of sheet materials and 12" lengths of trim members for color verification after selections have been made.

1.5 SPECIAL PROJECT WARRANTY:

A. Warranty on Porcelain Enamel Chalkboards: Provide written warranty, signed by manufacturer, agreeing to replace, within warranty period, porcelain enamel chalkboards which do not retain original writing and erasing qualities, defined to include surfaces which become slick and shiny, or exhibit crazing, cracking or flaking; provided manufacturer's instructions for handling, installing, protecting and maintaining chalkboards have been adhered to during the warranty period. Replacement is limited to material replacement only and does not include labor for removal and reinstallation.

B. Warranty Period: 25 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

A. Manufacturers of Porcelain-On-Metal Chalkboards:

Alliancewall Corp. - "Whyteboard".
Greensteel Inc. - "Dry Markerboard (DMB)".

B. Manufacturers of Tackboards:

Carolina Chalkboard Co.
Claridge Products and Equipment, Inc.
Greensteel Inc.
Nelson-Adams Co.

2.2 MATERIALS:

A. Colors and Textures: Provide as shown or scheduled. If not indicated on drawings, provide colors and textures as selected by Architect from manufacturer's standards.

B. Markerboards:

(1) Porcelain-On-Metal: Balanced, high-pressure laminated, 3-ply construction, with facing sheet, core, and backing; complying with the following requirements.

(2) Facing sheet: Enameling grade steel sheet coated on exposed face with 3 coats process of primer, ground coat and color cover coat and on concealed face with 2 coat process of primer and ground coat, with ground and cover coats fused to steel at firing temperatures standard and manufacturer, but not less than 1200 degrees F (649 degrees C).

(3) Facing Sheet Thickness: 28 gage.

(4) Provide manufacturer's standard special writing surface (SWS) with gloss finish intended for use with liquid chalk markers.

(5) Wearability Test Method: Comply with requirments of PEI Test CB-1 (t) established by Porcelain Enamel Institute, Inc.

(6) Core: Particleboard of thickness indicated, ANSI A208.1, Grade 1-M-1.

Thickness: 1/2".

(7) Backing Sheet: Aluminum foil, 0.015" thick.

(8) Laminating Adhesive: Manufacturer's standard moisture- resistant thermoplastic type.

C. Tackboards:

(1) Natural Cork: Single layer 1/4" thick, seamless compressed cork sheet, face sanded for natural finish, complying with MS MIL-C15116, Type II.

(2) Unless otherwise indicated, make up rigid panels by factory laminating under pressure to 1/4" thick exterior type plywood or hardboard backing. Wrap with wallcovering as shown on drawings.

D. Trim and Accessories:

(1) General: Fabricate frames and trim of not less than 0.062" thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible and keep joints to minimum. Miter corners to neat, hairline closure.

(2) Aluminum Finish: Furnish exposed aluminum trim, accessories and fasteners with:

Manufacturer's standard color anodized satin finish with hardcoat anodic coating complying with AA requirements for Class I Integral Color Coating (AA-A42). Color shall be black.

(3) Field-Applied Trim: Provide the following type:

Slip-on trim, to eliminate grounds, similar to Greensteel "Channel Trim".

(4) Markertrough: Furnish continuous aluminum chalktroughs for each markerboard, unless otherwise indicated, as follows:

Box type, with slanted front and cast aluminum end closures.

(5) Map Rail:Furnish map rail at top of each unit, unless otherwise indicated, with the following accessories for each map rail:

(6) Display rail: Continuous cork approximately 2" wide, integral with map rail.

(7) End stops: One at each end of map rails.

2.3 FABRICATION:

A. Assembly: Provide factory-assembled markerboard and tackboard units unless field-assembled units indicated.

B. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

C. Provide manufacturer's standard vertical joint system between abutting sections of markerboard.

D. Wrap tackboards with wallcovering as scheduled. Provide concealed mounting.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Deliver factory-built markerboard and tackboard units completely assembled on one piece without joints, whenever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit at factory, disassemble for delivery, and make final joints at site. Use splines at joints to maintain surface alignment.

B. Install units in locations and mounting heights as shown on drawings and in accordance with manufacturer's instructions, keeping perimeter lines straight, plumb, and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories for complete installation.

C. Coordinate job-assembled units with grounds, trim, and accessories. Join all parts with neat, precision fit.

3.2 ADJUST AND CLEAN:

A. Verify accessories required for each unit properly installed and operating units properly functioning.

B. Clean units in accordance with manufacturer's instructions, breaking in only as recommended.

3.3 SCHEDULE OF MARKERBOARDS

A-11 Conference - 60"W x 42"H
A-32 Conference - 60"W x 42"H
A-44 Seminar 'A' - 96"W x42"H
A-45 Seminar 'B' - 144"W x 42"H
F-92 Seminar - 60"W x 42"H

3.4 SCHEDULE OF TACKBOARDS

A-42 Workroom - 30"W x 36"H
A-50 Breakroom - 30"W x 36"H
B-11 Workroom - 30"W x 36"H
B-25 Workroom - 30"W x 36"H
B-27 IRC - 42"W x 36"H
B-29 Computer Room - 96"W x 42"H
B-30 Media Workroom - 42"W x 36"H

C-24 Mail Room - 36"W x 42"H
C-29 Maintenance Shop - 30"W x 36"H
C-73 Files - 30"W x 36"H
C-74 Workroom - 42"W x 36"H
C-78 Breakroom - 30"W x 36"H
C-97 Office - 42"W x 36"H

D - Kitchen - 36"W x 42"H

F-05 Security - 30"W x 36"H
F-08 Locker Room - 24"W x 24"H
F-09 Breakroom - 30"W x 36"H
F-14 Locker Room - 24"W x 24"H
F-15 Production - 30"W x 36"H
F-23 Processing/Receiving - 30"W x 36"H
F-59 Researchers - 42"W x 36"H
F-80 Duplication - 42"W x 36"H
F-87 Audio-Visual - 30"W x 36"H
F-88 Lunch Room - 30"W x 36"H

END OF SECTION 10100

SECTION 10160 - TOILET PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of toilet partitions is indicated on drawings.

B. Toilet accessories are specified elsewhere in Division 10.

1.3 QUALITY ASSURANCE:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking field measurements before fabrication might delay work.

B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

B. Samples: Submit full range of color samples for each type of unit required. Submit 6" square samples of each color and finish on same substrate to be used in work, for color verification after selections have been made.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

American Sanitary Partition Corp.
Ampco Products Inc.
Bobrick Washroom Equipment, Inc.
Flush-Metal Partition Corp.
General Partitions Mfg. Corp.
Global Steel Products Corp.
Knickerbocker Partition Corp.
Metpar Steel Products Corp.
Sanymetal Products Co.

2.2 MATERIALS:

A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

B. Plastic Laminate: NEMA Std. LD-3, minimum 0.062" thick, color and pattern as indicated or, if not indicated, as selected by Architect from manufacturer's standards.

C. Core Material for Plastic Laminate: Manufacturer's standard particleboard for plywood, in thickness to provide nominal dimension of 1" minimum for doors, panels, and screens, 1-1/4" for pilasters.

D. Stirrup Brackets: Manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated non-ferrous cast alloy ("Zamac") or anodized aluminum.

E. Hardware and Accessories: Manufacturer's standard design, heavy- duty operating hardware and accessories of chromium-plated non-ferrous cast alloy ("Zamac").

F. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.3 FABRICATION:

A. General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.

B. Door Dimensions: Unless otherwise indicated, furnish 24" wide inswinging doors for ordinary toilet stalls and 32" wide (clear opening) outswinging doors at stalls equipped for use by handicapped.

C. Plastic Laminate Partitions and Screens:

(1) General: Pressure-laminate one-piece face sheets to core material with no splices or joints, and with edges straight and sealed. Seal exposed core material at cutouts to protect against moisture.

(2) Ceiling-Hung Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit connection to structural support above finished ceiling. Furnish devices which are designed to support pilasters from structure without transmitting load to ceiling finish. Furnish 3" high stainless steel trim piece, finished to match hardware, at each pilaster.

D. Hardware:Furnish hardware for each compartment in partition system, as follows:

(1) Hinges: Cutout inset type, adjustable to hold door open at any angle up to 90 degrees. Provide gravity type, spring- action cam type, or concealed torsion rod type, to suit manufacturer's standards.

(2) Latch and Keeper: Manufacturer's standard surface-mounted latch unit, designed for easy emergency access, with combination rubber-faced door strike and keeper.

(3) Coat Hook: Manufacturer's standard unit, combination hook and rubber-tipped bumper.

(4) Door Pull: Manufacturer's standard unit.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's recommended procedures and installation sequence. Install partitions rigid, straight, plumb, and level. Provide clearances of not more than 1/2" between pilasters and panels, and not more than 1" between panels and walls. Secure panels to walls with not less than three stirrup brackets attached near top bottom of panel. Locate wall brackets so that holes for wall anchorages occur in masonry or tile joints. Secure panels to pilasters with not less than three stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.

B. Ceiling-Hung Partitions: Secure pilasters to supporting structure, and level, plumb, and tighten installation with devices furnished. Hang doors and adjust so that bottoms of doors are level with bottom of pilasters when doors are in closed position.

3.2 ADJUST AND CLEAN:

A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on inswinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors (and entrance swing doors) to return to fully closed position.

B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION

SECTION 10200 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of louvers and vents is indicated on drawings, including indications of sizes and locations.

B. Types of louvers and vents include the following:

(1) Extruded aluminum louvers

(2) Formed sheet metal louvers

(3) Extruded aluminum brick vents

C. Sealants including installation are specified in Division 7.

D. Field-applied paint is specified in Division 9.

E. Louvers in hollow metal doors and frames are specified in Division 8.

1.3 QUALITY ASSURANCE:

A. Performance Requirements: Where louvers are indicated to comply with specific performance requirements, provide units whose performance ratings have been determined in compliance with Air Movement and Control Association (AMCA) Standard 500.

B. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures, except as otherwise indicated.

C. Field Measurements: Verify size, location and placement of louver units prior to fabrication, wherever possible.

D. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications; certified test data, where applicable; and installation instructions for required products, including finishes.

B. Shop Drawings: Submit shop drawings for fabrication and erection of louver units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.

C. Samples: Submit 6" square, of each required aluminum finish. Prepare samples of metal of the same gage and alloy to be used in work. Where normal color and texture variations are to be expected, include 2 or more units in each sample showing the limits of such variations.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

The Airolite Co.
American Warming and Ventilating Co.
Construction Specialties, Inc.

2.2 MATERIALS:

A. Galvanized Sheet Steel:ASTM A 526 and A 527, with ASTM A 525, G90 zinc coating, mill phosphatized.

B. Cold-rolled Sheet Steel: ASTM A 366, Class 1, matte finish.

C. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to provide required finish.

D. Aluminum Extrusions: ASTM B 221, Alloy 6063-T52.

E. Fastenings: Use same material as items fastened, unless otherwise indicated. Fasteners for exterior applications may be hot-dip galvanized, stainless steel or aluminum. Provide types, gages and lengths to suit unit installation conditions. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

F. Anchors and Inserts: Use non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

G. Bituminous Paint: SSPC Paint 12 (cold-applied asphalt mastic)

2.3 FABRICATION, GENERAL:

A. Provide louvers and accessories of design, materials, sizes, depth, arrangement, and metal thicknesses indicated, or if not indicated, as required for optimum performance with respect to airflow; water penetration; air leakage, where applicable (for adjustable units, if any); strength; durability; uniform appearance.

B. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealants in joints between louvers and adjoining work.

C. Include supports, anchorages, and accessories required to achieve a complete assembly.

D. Provide vertical mullions of type and at spacings indicated but not further apart than recommended by manufacturer or 72" o.c., whichever is less. At horizontal joints between louver units provide horizontal mullions except where continuous vertical assemblies are indicated.

E. Provide sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

F. Join frame members to one another and to stationary louver blades by welding, except where indicated otherwise or where field bolted connections between frame members are made necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

2.4 STATIONARY EXTRUDED ALUMINUM WALL LOUVERS:

A. Acceptable: Construction Specialties Model 0292 with birdscreen.

B. Depth: 2"

C. Finish: Painted to match adjacent storefront.

2.5 STATIONARY FORMED SHEET METAL LOUVERS:

A. Acceptable: Airolite #606 with steel security bars at 8" o.c. and with birdscreen.

B. Depth: 6"

C. Free Area: 35% +

D. Finish: Painted to match adjacent metal.

2.6 LOUVER SCREENS:

A. Provide removable 1/2" square mesh birdscreens for exterior louvers.

B. Fabricate screen frames of same metal and finish as louver units to which secured, unless otherwise indicated; 0.0625" galvanized steel wire or 0.063" aluminum wire.

Provide rewireable frames consisting of formed or extruded metal with a driven spline or insert for securing screen mesh.

C. Locate screens on inside face of louvers. Secure screens to louver frames with machine screws, spaced at each corner and at 12" o.c. between.

2.7 BRICK VENTS:

Extruded Aluminum Brick Vents: Units of size and depth indicated, with louvers and frames fabricated from aluminum extrusions not less than 0.125" thick and assembled by welding; with 18 x 14 mesh, anodized aluminum wire insect screen, inside face; incorprating weep holes, continuous drip at sill, and integral water stop on inside of sill; of loadbearing design and construction.

Acceptable: Construction Specialties
Model M33Ex.

Finish: Painted to match wall.

2.8 METAL FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are assembled. Protect finishes on exposed surfaces with protective covering, prior to shipment. Remove scratches and blemishes from exposed surfaces which will be visible after completing finishing process.

Provide colors or color matches as indicated.

B. Aluminum Finishes:

(1) High-Performance Coating (Stationary Extruded Aluminum Wall Louvers): AA-C12C42R1x (cleaned with inhibitive chemicals, conversion coated with an acid-chromate-fluoride- phosphate treatment and painted with organic coating specified below). Apply where high-performance coating is indicated in strict compliance with coating and resin manufacturer's instructions using a licensed applicator.

Fluorocarbon Coating: Inhibitive thermo-cured primer, 0.2 mil minimum dry film thickness, and thermo-cured fluorocarbon coating containing "Kynar 500" resin, 1.0 mil minimum dry film thickness.

C. Ferrous Metal Finishes (Stationary Formed Sheet Metal Louvers):

(1) Preparation: Clean surfaces of dirt, grease and loose rust or mill scale, including items fabricated from galvanized steel, if any. Apply finish to surfaces of fabricated and assembled units, whether exposed or concealed when installed, after pretreating with a conversion coating suited to organic coating applied over it.

(2) Factory-Primed Finish: Where painting (Pnt) after installation is indicated (not work of this section), apply air-dried primer immediately following cleaning and pretreatment.

PART 3 - EXECUTION

3.1 PREPARATION:

Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION:

A. Locate and place louver units plumb, level and in proper alignment with adjacent work.

B. Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers, as indicated.

D. Repair finishes damaged by cutting, welding, soldering and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations, and refinish entire unit, or provide new units, at Contractor's option.

E. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry or dissimilar metals.

F. Refer to Division 7 sections for sealants in connection with installation of louvers.

END OF SECTION 10200

SECTION 10250 - PARABOLIC LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specifications sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent and location of acrylic louvers is indicated on the drawings. Lenses for light fixtures are specified elsewhere.

1.3 SUBMITTALS:

Submit 6" x 6" square samples confirming grid size and color.

PART 2 - PRODUCTS

2.1 LOUVERS:

Provide one of the following products:

A. "Para-lite 4" as manufactured by A.L.P. Lighting & Ceiling Products, Inc.; acrylic; cell size 3/4" x 3/4" x 1/2"; specular silver finish.

B. "Parasquare" as manufactured by Scientific Lighting Products, St. Louis, MO; acrylic; cell size 5/8" x 5/8" x 1/2"; specular silver finish.

2.2 ACCESSORIES:

"L" or "T" shaped trim members with finish to match louvers.

PART 3 - EXECUTION

3.1 INSTALLATION:

Install louvers level with grids and trim members aligned. Keep cross joints to a minimum. Butt cross joints.

3.2 CLEANING AND PROTECTION:

Clean exposed surfaces in accordance with manufacturer's instructions. Replace damaged units.

END OF SECTION 10250

SECTION 10270 - ACCESS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Definition: Access flooring is a complete portable assembly including a series of modular floor panels with an elevated supporting system (understructure) forming an accessible underfloor cavity to accommodate ducts, conduits, cables, piping and other services and to provide, where required, a plenum for air distribution. Refer to drawings for underfloor clearances, offsets, closures, and accessories required.

B. Computer room air conditioning units are specified in Division 15.

C. Connection to ground of access floor understructure is specified in a Division-16 section.

D. Sealer for concrete subfloor surfaces is specified in a Division-16 section.

E. Air distribution panels are specified on Drawing M-2.1.

1.3 SYSTEM PERFORMANCES:

A. Structural Performance: Provide manufacturer's standard access flooring system which, when installed, complies with the following minimum requirements for structural performance.

B. Floor Panels: Units, including those with cutouts, capable of supporting loads of type and magnitude indicated below:

(1) Concentrated loads of 1,250 lbs, applied to one square inch located anywhere on panel, with a deflection under load and a permanent set not to exceed, respectively, 0.080" and 0.010".

(2) Pedestals: Pedestal assemblies capable of withstanding the following types of loads per pedestal, without panels or other supports in place.

Bending moment of 1000 inch-pounds.

Axial load of 5,000 lbs.

(3) Grid System: Stringers capable, without panels in place, of supporting a concentrated load of 200 lbs. at center of span with a permanent set not to exceed 0.010".

(4) Ultimate Strength: Entire access floor system capable of sustaining twice the concentrated panel loading indicated.

C. Electrical Resistance of System: Provide manufacturer's standard access flooring system which, when installed, has the following electrical resistance characteristics:

(1) Static-Control Floor Covering Resistance: Not less than 500,000 ohms nor more than 20,000 megohms measured across surface of floor covering through panel to understructure by test method for conductive flooring specified in NFPA 56A.

(2) Panel to Understructure Resistance: Not more than 10 ohms.

1.4 QUALITY ASSURANCE:

A. Installer Qualifications: Firm who is approved by access flooring manufacturer and who has successfully installed access flooring systems of a scope similar to this project.

B. NFPA Standard: Provide access flooring which, when installed, complies with requirements of NFPA No. 75 for raised floors, unless otherwise indicated.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of access flooring required, include manufacturer's maintenance instructions.

B. Shop Drawings: Submit shop drawings showing complete layout of access flooring based on field-verified dimensions; include dimensional relationships to adjoining work. Include full size details, with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, understructure and other data to permit a full evaluation of entire access flooring system.

C. Samples: Submit samples of each exposed metal finish and each type and color of floor covering and accessory.

D. Certification and Test Data: Submit manufacturer's certification including supporting laboratory test data that access flooring provided complies with indicated performance requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Donn Corporation - Model 75 with top-loc rigid grid
Liskey, Inc. - Mark 30/12 panels with bolted rigid grid
Tate - CRH with bolted grid

2.2 MATERIALS AND FABRICATIONS:

A. Standard Field Panels: Modular panels which are interchangeable with other standard field panels, easily placed and removed without disturbing adjacent panels or understructure by one person using a portable lifting device, free of exposed metal edges in installed position with floor covering in place.

B. Nominal Size: 24" x 24" unless otherwise indicated.

C. Fabricate panels to size required plus or minus 0.005" with a squareness tolerance, expressed as the difference between diagonal measurements from corner to corner of plus or minus 0.015" and with a flatness tolerance of plus or minus 0-020" measured on diagonal on top of panel.

D. Formed Steel Panels: Manufacturer's standard all-steel panel construction with die-cut flat top sheet welded to die-formed and stiffened bottom sheet, fabricated entirely of non-combustible material. Protect metal surfaces against corrosion with manufacturer's standard factory-applied finish.

E. Floor Covering: Finish tops of floor panels to comply with following requirements.

Colors and Patterns: Provide floor covering materials complying with colors and patterns indicated or, if not indicated, as selected by Architect from manufacturer's standard colors and patterns.

F. Plastic Laminate: NEMA LD 3, High Wear Type, of grade indicated below; fabricated in one piece to cover each panel face within perimeter plastic edging.

(1) Grade FL 12 (0.125" thick).

(2) Plastic Edging: Manufacturer's standard plastic edge trim applied by manufacturer's standard method either mechanically or adhesively, or both, to perimeter of each panel, of size and profile to suit floor covering selected, unless otherwise indicated.

G. Pedestals: Provide manufacturer's standard pedestal assembly including base, column with provisions for height adjustment, and head (cap); made either of steel or aluminum or a combination of both.

(1) Base: Square or circular base with not less than 16 sq. in. of bearing area.

(2) Provide vibration proof mechanism for making and holding fine adjustments in height for leveling purposes over a range of not less than 2". Include means of locking leveling mechanism at a selected height, which requires deliberate action to change height setting and prevents vibratory displacement.

(3) Fabricate units of sufficient height to provide required underfloor clearance.

(4) Head: Of proper type for grid system indicated.

H. Grid Systems: Manufacturer's standard steel modular stringer system, designed and fabricated to interlock with pedestal head and to form a grid pattern with members under each edge of each floor panel and with a pedestal under each corner of each floor panel. Protect steel components against corrosion with manufacturer's standard galvanized or paint finish.

Bolted Grid: System of main and cross stringers connected to pedestals with threaded fasteners accessible from above.

2.3 ACCESSORIES:

A. Colors and Finishes: For exposed accessories available in more than one standard color or finish, provide color or finish selected by Architect from manufacturer's full range of standard colors and finishes.

B. Cutouts: Fabricate cutouts in floor panels to accommodate cable penetrations and service outlets, if any. Comply with requirements indicated for size, shape, number and location. Provide reinforcement and additional support, if needed, to make panels with cutouts comply with standard performance requirements.

(1) Fit cutouts with manufacturer's standard grommets in sizes indicated or, where size of cutouts exceed maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding having tapered top flange.

(2) Furnish removable covers for grommets.

(3) Provide foam rubber pads for sealing annular space formed in cutouts by cables and trim edge of cutout with molding having flange and ledge for capturing and supporting pads.

C. Perforated Panels: Manufacturer's standard perforated air flow panel with high pressure plastic laminate floor covering and equivalent in

strength to standard field panel. Provide percent of open area indicated, or if not indicated, as selected by Architect from manufacturer's standard offerings.

D. Dampers: Manufacturer's standard air volume control dampers with no metal parts exposed to contact on wearing surface.

E. Panel Lifting Device: Manufacturer's standard portable lifting device of type required for lifting panels with floor covering provided.

F. Resilient Base: Resilient wall base shall be furnished and installed by others to match resilient base used elsewhere in project.

G. Perimeter Support: Where indicated provide manufacturer's standard aluminum extrusion to support panel edge and form transition between access flooring and adjoining floor covering at same level as access flooring.

PART 3 - EXECUTION

3.1 PREPARATION:

Field Measurements: When possible, take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of work. Otherwise, indicate final measurements on shop drawings.

3.2 INSTALLATION:

A. Install floor system and accessories under supervision of the manufacturer's authorized representative to ensure rigid, firm installation free of vibration, rocking, rattles, squeaks, and other unacceptable performance.

B. Layout floor panel installation to keep the number of cut panels at the floor perimeter to a minimum. Scribe panel assemblies at perimeter to provide a close fit with no voids greater than 1/8" where panels abut vertical surfaces.

C. Locate each pedestal and complete any necessary subfloor preparation, and vacuum clean the subfloor of all dust, dirt and construction debris before starting installation. Set pedestals in adhesive as recommended by the floor manufacturer to provide full bearing of the pedestal base on the subfloor.

D. Secure grid members to pedestal heads in accordance with manufacturer's instructions.

E. Thoroughly vacuum clean the subfloor area as installation of floor panels proceeds. Extend cleaning under installed panels as far as possible.

F. Cutting and Trimming or other dirt-or debris-producing operations will not be permitted in the rooms where the floor is being installed.

G. Level installed access floor to within 0.10" of true level over the entire area and within 0.0625" in any 10' distance.

3.3 CLEANING, PROTECTION AND FINAL ADJUSTMENTS:

A. After completion of installation, vacuum clean the entire floor system and cover with continuous sheets of reinforced paper or plastic. Maintain and repair damages to protective covering until directed to be removed by the Architect.

B. Replace access floor panels which are chipped, broken, stained, scratched, or otherwise damaged, or do not conform to specified requirements.

3.4 EXTRA STOCK:

A. Deliver stock to maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

B. Standard Field panels and Understructure: Furnish quantity of standard field panels and the understructure components to support them equal to 10.0% of amount installed.

END OF SECTION 10270

SECTION 10350 - FLAGPOLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

Extent and location of each of flagpole is shown on drawings.

1.03 QUALITY ASSURANCE:

A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings accessories, bases and anchorage devices.

B. Design Criteria: Provide flagpoles and installations constructed to withstand a 90 mph wind velocity minimum when flying flag of appropriate size. Use heavy pipe sizes if required for flagpole type and height shown.

C. Pole Construction: Construct pole and ship to site in one piece if possible. If more than one piece is necessary, provide snug-fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight, hairline field joints.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of flagpole required.

B. Samples: Submit samples of each finished metal for flagpoles, and accessories as may be requested.

1.05 DELIVERY, STORAGE AND HANDLING:

Spiral wrap flagpoles with heavy Kraft paper or other protective wrapping and prepare for shipment in hard fiber tube or other protective container.

Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

aabec Pole Div., Morgan-Francis Co.
ACME Flagpole Div., Lingo Inc.
American Flagpole, Div. of Kearney-National
Baartol Co., Inc.
Concord Industries, Inc.
Eder Flag Manufacturing Co.
Morgan and Co.

B. Flagpole Type:

1. Aluminium Flagpoles: Fabricate aluminum flagpoles from seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 3/16" (0.1875"), tensile strength not less than 35,000 psi and a yield point of 30,000 psi. Heat-treat and age-harden flagpoles after fabrication.

a. Provide Entasis tapered aluminum flagpoles.

2.02 FLAGPOLE MOUNTING:

Provide manufacturer's standard base system for the type of flagpole installation required.

A. Foundation Tube: For ground-set flagpoles, proved 16-gage minimum galvanized corrugated steel tube, or 12-gage rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lightning ground spike, and steel centering wedges, all welded construction. Provide loose hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.

1. Provide manufacturer's standard flash collar, finished to match flagpole.

2.03 SHAFT FINISH:

A. Aluminum: Fine, directional, mechanical satin polish (NAAMM-32), finished as follows:

1. Buff and seal aluminum surfaces with clear, hardcoat wax.

2. Natural clear anodized finish complying with NAAMM-C22A41, Class I (0.7 mil).

3. Color anodized finish to match Architect's sample, complying with NAAMM-C22A42, Class I (0.7 mil).

2.04 FITTINGS:

A. Finial Ball: Manufacturer's standard flush seam ball, size as indicated or, if not indicated, to match pole butt diameter.

1. 14 ga. spun aluminum, finished to match pole shaft.

B. Internal Halyard System: Furnish poles with internal halyard system consisting of a manually-operated, geared winch with control stop device and removable handle. Provide stainless steel braided aircraft-type cable and concealed revolving truck assembly with plastic coated counter balance and sling. Provide reinforced, flush access door, secured with cylinder lock.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Concrete: Provide concrete composed of portland cement, coarse aggregate, fine aggregate and water, mixed in proportions to attain 28-day compressive strength of not less than 3000 psi.o Use not less than 5 sacks of portland cement, complying with ASTM C 150, per cubic yard of wet concrete.

Place concrete immediately after mixing. Perform chuting to avoid segregation of mix. Compact concrete in place by use of vibrators to consolidate. Moist-cure exposed concrete for not less than 7 days, or use a non-staining curing compound in freezing weather.

B. Flagpole Installation: Install flagpoles as shown and in compliance with manufacturer's instructions.

1. Provide positive lightning ground for each flagpole installation.

Paint portions of ground-set flagpole below grade with heavy coat of bituminous paint.

END OF SECTION 10350

SECTION 10500 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of metal lockers is shown on drawings.

B. Types of product in this section include the following:

(1) Single-tier lockers

(2) Double-tier lockers

1.3 QUALITY ASSURANCE:

Uniformity: Provide each type of metal locker as produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for metal locker units.

B. Samples: Submit color samples on squares of same metal to be used for fabrication of lockers.

1.4 JOB CONDITIONS:

Do not deliver metal lockers until building is enclosed and ready for locker installation. Protect from damage during delivery, handling, storage, and installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Wardrobe Lockers:

Interior Steel Equipment Co. - "Quiet"
Medart Inc. - "Quiet"
Republic Steel Corp., Industrial Products Div. - "Quiet"

2.2 MATERIALS:

A. Sheet Steel: Mild cold-rolled and leveled steel, free from buckle, scale, and surface imperfections.

B. Fasteners: Cadmium, zinc, or nickle plated steel; exposed bolt heads, slotless type; self-locking nuts or locker washers for nuts on moving parts.

C. Equipment: Hooks and hang rods of cadmium-plated steel or cast aluminum.

2.3 FABRICATION, GENERAL:

A. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make all exposed metal edges safe to touch. Weld frame members together to form rigid, one-piece structure. Weld, bolt, or rivet other joints and connections as standard with manufacturer. Grind exposed welds flush. Do not expose bolts or rivet heads on fronts of locker doors or frames.

B. Frames: Fabricate of 16 gage channels or 12 gage angles, minimum, with continuous stop/strike formed on vertical members.

C. Finishing: Chemically pretreat metal with degreasing and phosphatizing process. Apply baked-on enamel finish to all surfaces, exposed and concealed, except plates and non-ferrous metal.

Color: Provide locker units in color(s) as shown on drawings, or if not shown, as selected by Architect from manufacturer's standards. Unless otherwise indicated, concealed parts may be manufactuer's standard neutral color.

2.4 WARDROBE LOCKERS:

A. Body: Fabricate back and sides of minimum 24 gage steel, with double-flanged connections extending full height. Form top and bottom of not less than 24 gage steel, with flanged edges.

(1) Provide 24 gage steel sheet hat shelf in single-tier units.

(2) Form exposed ends of non-recessed lockers of minimum 16 gage steel.

B. Door: One piece, minimum 16 gage sheet steel, flanged at all edges, constructed to prevent springing when opening or closing. Fabricate to swing 180 degrees unless otherwise indicated.

C. Ventilation: Full perimeter ventilation or concealed ventilation.

D. Hinges: Heavy-duty, not less than 0.050" thick steel, full- loop, 5-knuckle, tight pin, 2" high. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners which are completely concealed and tamperproof when door is closed.

Provide at least 3 hinges for each door 42" high and over, at least 2 hinges for each door less than 42" high.

E. Recessed Handle and Latch: Manufacturer's standard design consisting of housing to form recess for latch lifter and locking devices; non-protruding latch lifter containing strike and eye for padlock; and automatic, prelocking, pry-resistant latch mechanism with latching action as follows:

(1) Single-tier lockers: Not less than 3-point latching.

(2) Double-tier lockers: Not less than 2-point latching.

F. Acoustical Treatment: Provide construction treatment designed to significantly reduce noise of locker operation, including protected sound-absorbing material within door, nylon or plastic coatings on operating components to prevent metal-to-metal contact, and latching mechanism designed to operate without rattling.

2.5 LOCKER ACCESSORIES:

A. Locking: Fabricate lockers to receive padlock provided by Owner.

B. Equipment: Furnish each locker with the following items, unless otherwise shown:

(1) Single-Tier Units: Hat shelf, and not less than 2 single-prong wall hooks.

(2) Double-Tier Units: Not less than 2 single-prong wall hooks.

(3) Lockers 18" Deep: Provide hang rod in lieu of ceiling hook.

C. Number Plates: Manufacturer's standard etched, embossed, or stamped, non-ferrous metal number plates with numerals not less than 3/8" high. Number lockers in sequence as directed by Architect. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

D. Continuous Metal Base: Minimum 20 gage cold-rolled steel, fabricated in lengths as long as practicable to enclose base of lockers without additional fastening devices. Flange bottoms inward 3/4" for stiffening. Factory-finish metal base to match lockers.

E. Separators: Provide horizontal dividers of not less than 16 gage sheet steel between doors of multiple-tier lockers, to ensure rigidity.

PART 3 - EXECUTION

3.1 PREPARATION:

Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication of special components, to ensure proper fitting of work.

3.2 INSTALLATION:

A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.

B. Space fastenings about 48" o.c., unless otherwise recommended by manufacturer, and apply through back-up reinforcing plates where necessary to avoid metal distortion; conceal fasteners insofar as possible.

C. Install trim, metal base, and metal filler panels where indicated, using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

3.3 ADJUST AND CLEAN:

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Touch-up marred finishes, but replace units which cannot be restored to factory-finished appearances. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10500

SECTION 10520 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Definition: "Fire extinguishers" in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems, unless otherwise indicated.

B. Type of products in this section include:

(1) Fire extinguishers.

(2) Fire extinguisher cabinets.

(3) Mounting brackets

C. Fixed fire protection systems are specified in Division-15 sections.

1.3 QUALITY ASSURANCE:

A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.4 SUBMITTALS:

Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect is required include color charts showing full range of manufacturer's standard colors and designs available.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

J.L. Industries
Larsen's Mfg. Co.

2.2 FIRE EXTINGUISHERS:

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

B. Abbreviations indicated below to identify extinguisher types relate to UL classification and rating system and not, necessarily, to type and amount of extinguishing material contained in extinguisher.

C. Multi-Purpose Dry Chemical Type: UL-rated 4-A:6-B:C, 10 lbs. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires. Acceptable Products: "Cosmic 10-E by J. L. Industries"

D. Halon Types (Halon-FE): UL-rated 10-B:C, 5 lb. nominal capacity, in enameled steel container with pressure indicating gage, for Class B and Class C fires.

2.3 MOUNTING BRACKETS:

A. Provide manufacturer's standard bracket designed to prevent accidental dislodgement of extinguisher, of proper size for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

B. Provide brackets for extinguishers not located in cabinets.

2.4 FIRE EXTINGUISHER CABINETS:

A. General: Provide fire extinguisher cabinets where indicated, or suitable size for housing fire extinguishers of types and capacities indicated.

B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:

Recessed: Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.

D. Trim Style: Fabricate trim in one piece with corners mitered, welded and ground smooth.

E. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

(1) Flat-Trim: Square edges with backbend of 1/4" to 5/16".

Depth: 1-1/4".

(2) Trim Metal: Of same metal as door.

F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

Enameled Steel: Manufacturer's standard flush, hollow steel door construction with tubular stiles and rails. Paint to match wall unless otherwise noted.

G. Door Style: Manufacturer's standard design as indicated below and on drawings.

(1) Solid Panel: Full flush opaque panel of material indicated.

(2) Provide silk screen lettering or design to read "Fire Extingusher".

H. Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch. Provide concealed or continuous type hinge permitting door to open 180 degrees.

2.5 FACTORY FINISHING OF FIRE EXTINGUISHER CABINETS:

A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations except as otherwise indicated. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.

B. Painted Finishes:

(1) Preparation: Clean surfaces of dirt, grease, and loose rust or mill scale. Apply finish to all surfaces of fabricated and assembled units, whether exposed or concealed when installed, except those surfaces specified to receive another finish.

(2) Factory-Primed Finish: Where painting after installation is indicated (not work of this section) apply manufacturer's standard primer suitable for paint coating specified in Division 9 section.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

C. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

3.2 IDENTIFICATION:

A. Identify fire extinguisher in cabinet with lettering spelling 'FIRE EXTINGUISHER' painted on door by silk-screen process. Provide lettering on door as indicated, or if not indicated, as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

B. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location as selected by Architect.

END OF SECTION

SECTION 10620 - OPERABLE PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

Extent of operable partitions is indicated on drawings.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Firm with not less than 3 years of successful experience in installation of units similar to those required for this project and which is acceptable to or licensed by manufacturer of operable partition.

B. Sound Transmission Class: Laboratory test rating of STC 48-52 shall have been gained by application of all provisions of ASTM 90-70 in a recognised acoustical laboratory in a 14' x 9' test opening. Manufacturer's warranty shall include certification that the panels supplied on this project are the same basic construction as that used to achieve the laboratory rating.

C. Flame Spread Rating: Use only facing materials which have a Flame Spread Rating of 25 or less when tested in accordance with ASTM E84.

1.4 WARRANTY

Warrant installation for two (2) years from date of substantial completion against defects in material and workmanship.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of folding door and partition.

B. Shop Drawings: Submit shop drawings for fabrication and erection, including plans, elevations, large scale details, anchorages, and accessory items. Provide location template drawings for items supported or anchored to permanent construction, if required.

C. Certifications: Submit certifications by independent testing laboratories for the following:

(1) STC Rating.

(2) Flame Spread Classification.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance with requirements, provide products of one of the following:

(1) Manufacturers of Operable Partition:
Hough Worldwide; 8651

(2) Sound Barrier:
Federal Metals Corp.; Acoustilead

(3) Overhead Support System:
B-Line Systems
Unistrut

2.2 SOUND BARRIER

Sound barrier shall be lead sheet 1/64" thick weighing 1-lb. per sq. ft. hung vertically between partition top and floor slab above to provide an air and sound tight barrier. Lap all joints 1" and seal with duct tape.

2.3 OVERHEAD SUPPORT

Overhead structural support system shall be as detailed on Drawings.

2.4 OPERABLE PARTITION

A. Operation: Partitions shall be top supported, manually operated individual panels capable of negotiating 90° turns through "X", "T", or "L" track intersections without use of switching devices. Equip basic panels with manually operated mechanical bottom pressure seal, activated from either end with built-in trip lever/lift tab operator.

B. Panel Construction shall be 3-5/8" thick, not to exceed 48 1/2" in width, consisting of particleboard laminated to appropriate structural and acoustical backing, mounted in full perimeter protective frames of steel-reinforced anodized aluminum. Dark Bronze anodized frames shall fully enclose and protect all edges of surface material. Top channel assembly shall be adequately reinforced to support panel weight. Panel faces shall be removable and replaceable on job.

C. Panel Finish shall be factory applied with fabric furnished by Owner.

D. Weight of panels shall be 5.5-8.5 lbs./sq. ft. based on panel size.

E. Sound Seals between panels shall consist of anodized aluminum astragals incorporating two resilient gaskets. Horizontal top seals shall be continuous contact type. Horizontal bottom pressure seal shall contain two resilient vinyl gaskets mounted in retractable seal carrier. Bottom seal shall provide 2-1/2" nominal operating clearance and exert downward pressure when extended.

F. Partition Closure shall be by Lever Closure Panel. Construction shall be same as basic panels and shall be equipped with gaskets for continuous perimeter seal. Panel shall consist of a basic panel with an expanding jamb member and shall be operated from either face by a removable handle. Panel shall be capable of compensating for out-of-plumb condition or minor wall irregularities and shall provide positive vertical seal between partition and building structure.

G. Suspension System shall consist of heavy extruded aluminum track connected to structural support by threaded rods. Each panel shall be supported by two carriers. Each carrier shall consist of counter-rotating, dual horizontal steel ball bearing wheels with nylon tires.

H. Plenum Closure: Factory supplied track and trim shall be designed to permit complete closure and sound insulation of the plenum without interference by the trolley assemblies.

3.1 INSPECTION:

Installer shall examine substrate and conditions under which operable partition is to be installed and shall notify Contractor in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION

A. Installation shall be made by an authorized structural support, track and panels for single source responsibility.

3.3 PROTECTION

Advise Contractor of necessary protection during remainder of construction period.

END OF SECTION 10620

SECTION 10800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of each type of toilet accessory is indicated on drawings and schedules.

B. Types of toilet accessories required include the following:

Paper towel dispensers.
Combination towel dispenser/waste receptacle units.
Sanitary napkin dispensers.
Sanitary napkin disposal units.
Toilet tissue dispensers.
Grab bars.
Soap dispensers.
Robe hooks.
Mop and broom holder.
Framed mirrors.
Paper towel holders.

C. Some types of toilet accessories are included as part of Section, "Toilet Partitions".

1.3 QUALITY ASSURANCE:

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices of other work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide toilet accessories by one of the following:

Accessory Specialties, Inc.
American Dispenser Co., Inc.
Bobrick Washroom Equip., Inc.
Bradley Corp.
The Charles Parker Co.
Watrous, Inc.

Bobrick Numbers are used in the Schedule unless otherwise noted.

2.2 MATERIALS, GENERAL:

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage minimum, unless otherwise indicated.

B. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

C. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non- metallic paint coating complying with FS DD-M-411.

D. Galvanized Steel Mounting Devices: ASTM A 386, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.3 FABRICATION:

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Where locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish two keys for each lock.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hinge doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

2.4 SCHEDULE OF TOILET ACCESSORIES:

A. Paper towel dispenser: B-262.

B. Combination towel dispenser/waste receptacle unit: B-3900.

C. Sanitary napkin dispenser: B-3502.

D. Sanitary napkin disposal unit serving two toilets: B-354.

E. Sanitary napkin disposal unit: B-3544.

F. Toilet tissue dispenser; double roll: B-2740.

G. Toilet tissue dispenser (single): B-667.

H. Grab bar: B-6206.99 x length with 256 series concealed anchor plate.

I. Grab bar: B-6293.99 with 256 series concealed anchor plate.

J. Liquid soap dispenser (lavatory mtd.): B-829.

K. Mop and broom holder: B-223.

L. Mirror: B-165 x 1624.

M. Paper towel holder: B-253.

N. Mirror w/shelf: B-166 x 1624.

O. Recessed toilet tissue dispenser (double): B-697.

P. Liquid soap dispenser (countertop): B-8295.

Q. Towel Bar: Paul Associates, #4211 Orb polished bronze, 12" length.

R. Towel Bar: Paul Associates, #4211 Orb polished bronze, 24" length.

S. Toilet paper holder: Paul Associates, #6200 plain flat border, polished bronze.

T. Electric Hand Dryer: B-2009, white, 115 volt.

U. Shower Door:
Shower Door Company; Showerglass, Earth-tone bronze anodized finish with tempered bronze glass.

PART 3 - EXECUTION

3.1 INSTALLATION:

Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations indicated.

3.2 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanism function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing protective coatings.

END OF SECTION 010800

SECTION 10850 - WASHROOM UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of each type of washroom unit is indicated on drawings and schedules.

B. Some types of toilet accessories are included as part of Section, "Toilet Accessories".

1.3 QUALITY ASSURANCE:

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Units shall be designed to be accessible to the handicapped.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data, shop drawings and installation instructions for each unit.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide unit by one of the following:

1. Ampco Products, Inc., Hialeah, Florida
2. Barrier Free Architectural Products, Inc., Houston, Texas; Series 1.
3. Bradley Corp.
4. Bobrick Washroom Equipment, Inc.

2.2 MATERIALS, GENERAL:

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage minimum, unless otherwise indicated.

B. Brass: Leaded and unleaded, flat products, FS QQ-B-613; Rods, shapes, forgings, and flat products with finished edges, FS QQ-B-626.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gage minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FS DD-M-411.

F. Galvanized Steel Mounting Devices: ASTM A 386, hot-dip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

H. Corian: Manufacturer's standard thickness; white with integral molded lavoratory.

2.3 FABRICATION:

A. General: Stamped names or labels on exposed faces of units are not permitted, except where otherwise indicated. Where locks are required, provide same keying throughout project. Furnish two keys for each lock.

B. Washroom Units shall include the following accessories:

1. Towel Dispenser (1 per 2 basins): _____.

2. Soap Dispenser (1 per basin): _____.

3. Towel Disposal (1 per 2 basins): _____.

4. Mirror: Unframed; size as shown on drawings.

C. Quantities of each accessory type for each unit shall be as shown on drawings.

D. Accessories shall be furnished by Washroom Unit manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING:

A. Adjust accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing labels and protective coatings.

END SECTION

SECTION 11131 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of projection screens is shown on drawings.

B. Types of projection screens required include:

Recessed, electrically operated, remote controlled units.

Recessed, manually operated units.

C. Wood backing and trim for recessed screen installation is included in Division 6.

D. Electrical wiring, connections, and installation of remote control switches for electrically operated projection screens are included in Division 16.

1.3 QUALITY ASSURANCE:

Provide each type of projection screen as a complete unit produced by a single manufacturer, including necessary mounting brackets, accessories, fittings and fastenings.

1.4 SUBMITTALS:

Submit copies of manufacturer's specifications and installation instructions for each type of projection screen unit.

1.5 DELIVERY, STORAGE AND HANDLING:

Do not deliver projection screens until building is enclosed and ready for screen installation. Protect screens from damage during delivery, handling, storage and installation.

PART 2 - PRODUCTS

2.1 ELECTRICALLY OPERATED, AUTOMATIC RECESS CLOSURE SCREENS:

A. Provide screen units completely housed in a metal-lined wood case, listed by UL and bearing re-examination markers of UL. Mount top of screen fabric to metal roller, with roller supported on brackets with self-aligning bearings.

B. Screen Case: Metal-lined motor compartment, with hinged or removable access panel to motor compartment, electrical outlet box and finished manufacturer's standard prime coat. Equip case with hinged bottom connected to drive mechanism for automatic opening and closing with raising and lowering of screen surface. Mount hinges to allow alignment of bottom panel to adjacent ceiling surface, as indicated.

C. Motor Unit: Size and capacity recommended by the screen manufacturer. Use instant reversing, gear drive motor with permanently lubricated ball bearings, automatic thermal overload protection, and preset limit switches to automatically stop screen in "up" and "down" position. Provide a 3-button remote control switch ("up", "down", and "stop") in a box with cover plate for flush wall-mounting at Space C-70. Provide low-voltage system for control from two points (lectern and wall) at Space C-01. Stop action to be positive to prevent coasting.

D. Screen Fabric: Manufacturer's standard, flame and mildew-resistant, glass-beaded with chemical coating.

E. Products: Subject to compliance with requirements, provide one of the following:

Ambassador; Draper Screen Co.

Executive Electrol; Da-Lite Screen Co.

2.2 MANUALLY OPERATED SCREENS:

A. Provide projection screen units for type of mounting shown, housed in baked enamel finished metal case with universal mounting brackets.

B. Screen Fabric: Manufacturer's standard, flame-and-mildew- resistant, glass beaded with chemical coating.

C. Products: Subject to compliance with requirements, provide one of the following:

Vidio "C"; Da-Lite Screen Co.

Luma 2; Draper Screen Co.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install projection screen units and accessories at locations shown in accordance with manufacturer's instructions. Install level, plumb, secure, and at proper height. Coordinate with other trades for securing projection screen units to finished surfaces. Repair or replace damaged units as directed by Architect.

B. Provide protection for installed units so that they will be in perfect operating condition, without damage at completion of project.

C. Construct pocket in ceiling for manually operated screens.

D. Schedule of Projection Screens

A-11 Conference - 8'W x 6'H Manually Operated Screen.

A-32 Conference - 8'W x 6'H Manually Operated Screen.

A-44 Seminar 'A' - 8'W x 6'H Manually Operated Screen.

A-45 Seminar 'B' - 8"W x 6'H Manually Operated Screen.

F-92 Seminar - 8'W x 6'H Manually Operated Screen.

C-01 - Multi-purpose Room - Two (2) 10'W x 8'H electrically operated screens with low-voltage control system for control from two points.

C-70 - Conference - 8'W x 6'H electrically operated screen with wall mounted control.

END OF SECTION 11131

SECTION 11160 - LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification section, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of loading dock equipment is indicated on drawings.

B. Types of loading dock equipment include the following:

(1) Molded rubber bumpers.

(2) Hydraulic Dock Levelers.

C. Concrete work for dock levelers pits is specified in Division 3.

D. Electrical wiring and connections for loading dock equipment specified in Division 16.

1.3 QUALITY ASSURANCE:

A. Dock Leveler Standard: Comply with applicable requirements of ANSI MH14.1 for construction and operation of dock levelers (fixed dockboards) except as otherwise indicated.

B. Provide dock levelers as complete units produced by a single manufacturer, including necessary accessories, fittings and anchorages.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product data and installation instructions for each type of loading dock equipment, including installation details.

B. Test Reports: Submit certified test reports showing compliance with ANSI MH14.1 requirements for determining rated capacity of magnitude indicated.

C. Shop Drawings: Submit shop drawings for fabricating and erection of dock levelers. Include plans, elevations, and large scale details. Show anchorage and accessory items. Provide location template drawings for items supported or anchored to permanent construction.

Furnish roughing-in drawings for electrical service well in advance of concrete work.

D. Maintenance Data: Submit manufacturer's maintenance and service data, including, address and telephone number of nearest authorized service representative.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

(1) Manufacturers of Bumpers:

Blue Giant Equipment Corp.
Durable Mat Company.
Equipment Co. of America.
Kelley Company, Inc.
The McGuire Co., Inc.
Pawling Rubber Corp.

(2) Manufacturers of Dock Levelers:

Blue Giant Equipment Co.
Kelley Company, Inc.
The McGuire Company, Inc.
Overhead Door Corp.
Rite-Hite Corp.

2.2 DOCK BUMPERS:

A. Molded Rubber Bumpers: Provide dock bumper units of size and configuration indicated, fabricated of heavy molded rubber compound reinforced with nylon, rayon or tyrex cord. Furnish unit not less than 3" thick, with predrilled anchor holes.

B. Anchorage Devices: Provide anchor bolts, nuts, washers bolts, sleeves, cast-in-place and other anchorage devices as required to fasten bumpers securely in place and to suit installation indicated. Furnish anchorage components which are galvanized, or cadmium plated unless otherwise indicated.

2.3 DOCK LEVELERS:

A. General: Provide manufacturer's standard dock levelers of type, function, operation, capacity, size and construction indicated, complete with controls, safety devices, and accessories, except as otherwise indicated.

B. Type:Except as otherwise indicated, provide recessed hinged lip dock levelers designed for permanent installation in concrete pits preformed in edge of loading platform, at locations indicated.

C. Function:Provide dock leveler units which compensate for differences in height between truck bed and loading platform in the following manner.

(1) Vertical Travel: Minimum working range for dock leveler ramps of 12" above and 12" below adjoining platform level, with an operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact.

(2) Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed, to compensate automatically for upward or downward movement of truck bed during unloading and loading.

(3) Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed, to compensate automatically for canted truck beds, of up to 4" over width of ramp.

(4) Lip Operation: Extension and support, automatically of hinged lip on edge of ramp of manufacturer's standard mechanisms to enable lip to rest on truck bed over working range of dock leveler yet allow lip to yield under impact of incoming truck; with subsequent, automatic retraction of lip upon truck departure.

Length of Lip Extension: Not less than 16" from edge of ramp nor less than 12" in front of dock bumpers.

(5) Automatic Ramp Return: Automatic return of ramp, unloaded, from raised or lowered positions to stored position, level with platform, upon departure of truck.

D. Operation: Provide manufacturer's standard operating system as follows:

Hydraulic System: Electric hydraulic raising and hydraulic- lowering of ramp, controlled from remotely located push-button station. Equip leveler with packaged unit including unitized, totally enclosed, nonventilated electric motor, pump, manifold, reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Include means for lowering ramp below platform level with lip retracted behind bumpers. Provide hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free-fall to not over 3".

(1) Electrical Requirement: Coordinate wiring requirements and current characteristics with building electrical system. See Division 16 sections.

(2) Remote Control Station: Single button station of constant pressure type: Holding button depressed causes ramp to raise, releasing button allows ramp to lower at controlled rate.

E. Rated Capacity: Provide dock levelers capable of supporting the following gross moving load without permanent deflection or distortion as determined by actual tests in compliance with ANSI MH14.1 requirements for rated capacity of fixed dockboards:

20,000 lbs.

F. Safety Devices: Provide manufacturer's standard and optional safety devices as follows:

(1) Toe Guards: Protect open sides of rising ramp with metal toe guards mounted flush with edges of ramp and projecting below ramp over entire upper working range.

(2) Cross Traffic Support: Prevent support of ramp at platform level in stored position with lip retracted by manufacturer's standard method as follows:

(3) Hinged support legs, which retract automatically when lip extends to permit ramp to descend below platform level, and return to support position when lip retracts.

(4) Lip engaged in saddles.

(5) Hinged support legs.

Contractor has option of selecting any method indicated above.

G. Maintenance Strut: Provide integral strut for positive support of ramp in up position during maintenance of dock leveler.

H. Construction: Provide manufacturer's standard dock leveler construction for type and capacity of units indicated, consisting of frame made of structural and formed steel shapes; and platform, including hinged lip, fabricated from non-skid steel plate. Design and fabricate assembly to withstand deformation during operating and stored phases of service for use intended. Chamfer lip edge to minimize obstructing wheels of material handling vehicles. Include 2 dock bumpers attached to frame.

I. Finish and Color: Provide manufacturer's standard baked enamel finish system over steel surfaces which have been cleaned and pretreated to obtain optimum paint bond. Paint toe guards yellow to comply with ANSI Z53.1 requirements and remainder of surfaces in manufacturer's standard color unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION:

Coordinate and furnish anchorage with templates, diagrams, and instructions for their installations, for loading dock equipment indicated to be attached to or recessed into concrete or masonry construction. Coordinate delivery of these items to project site.

3.2 INSTALLATION:

A. General: Comply with manufacturer's detailed instructions in installing loading dock equipment.

B. Dock Bumpers: Attach dock bumper to structure to comply with requirements indicated for spacing, arrangement, position relative to top of platform, and anchorage.

Bolted Attachment: Attach to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded steel plates or angles, or if none provided, attach by drilling and anchoring with expansion anchors and bolts.

C. Dock Levelers: Coordinate forming of pit to ensure that recess is adequate to accommodate leveler in proper relationship to loading platform. Attach leveler to platform construction to comply with manufacturer's directions.

3.2 ADJUST AND CLEAN:

A. Make necessary adjustments for safe, efficient operation of loading dock equipment.

B. After installation, restore marred abraded surfaces to original condition.

END OF SECTION

SECTION 11170 - WASTE HANDLING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division -1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of waste handling equipment is indicated on drawings and by provisions of this section.

B. Types of equipment required for project include the following:

Packaged waste compactor units.

Prefabricated thru-the-wall intake door.

C. Data/performance schedules at end of this section indicate specific requirements for each major unit of waste handling equipment.

1.3 QUALITY ASSURANCE:

A. Waste Compactor Standards: Comply with Federal, State and Local regulations; and comply with other standards as indicated.

(1) ANSI Z245.1, "Safety Requirements for Refuse Collection and Compaction Equipment".

(2) ANSI/NFPA 82, "Incinerators, Waste and Linen Handling Systems and Equipment".

B. Waste Bin and Hopper Standards: Comply with Federal, State and Local regulations; and comply with other standards as indicated.

ANSI Standards: Comply with the following standards as applicable to required units:

ANSI Z245.3, "Safety Requirements for the Stability of Refuse Bins".

C. UL Labels: Provide trash door/frame assemblies bearing UL "B" label for 1.5-hr. protection with 30-min. temperature rise of 250 degrees F. (139 degrees C).

D. Electrical Component Standards: Provide components complying with NFPA 70 "National Electrical Code"; and bearing UL labels where available.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications, performance data sheets, and installation instructions for each principal component of waste handling equipment, and include certified test reports on operation of units.

B. Shop Drawings: Submit plans, elevations and details for work not fully shown by published product data; include rough-in dimensions and service connection details.

C. Maintenance Manuals: Submit bound maintenance manuals. Including operating and maintenance instructions, parts listing, parts inventory listing, purchase source listing for operational/maintenance materials, emergency instructions and similar information.

PART 2 - PRODUCTS

2.1 GENERAL: Provide manufactaurer's standard packaged, pre-engineered or prefabricated units except as otherwise indicated, with selections as indicated to comply with requirements; and with components of each unit complying with manufacturer's published product literature, and as required for a complete system.

2.2 MATERIALS, GENERAL:

A. Zinc-Coated Steel Sheet: ASTM A 526 except where another type is required for forming, heat resistance or other exposures; ASTM A 525 G90 zinc coating, with chemical treatment except mill phosphatized where indicated for painting or coating.

B. Metal Coating: Manufacturer's standard baked synthetic enamel primer and finish coats, selected for resistance to damage or deterioration from exposure conditions.

C. Casters: Caster manufacturer's heavy-duty steel casters with ball-bearing swivels and phenolic resin wheels; of grade and size recommended by manufacturer for maximum possible weight supported, but not less than 6" diameter.

D. Electrical Work: Provide materials, devices and controls of type and quality recommended by NEMA for applications indicated. Refer to Division-16 sections hereof for power characteristics and service to equipment units, including disconnect switches (not work of this section).

2.3 Fabrication:

General: Fabricate metalwork with manufacturer's standard joints and seams, with exposed edges smoothed and eased. Except as otherwise indicated, fabricate bins, hoppers, chutes, compaction chambers, unit bodies and similar components of steel plate with welded joints. Reinforce with structural steel members sized and spaced to withstand impacts and pressures of normal operations, and sufficient to prevent excessive long-term development of waves or valleys. Fabricate with replaceable parts at points of normal wear.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Set each component of work securely and accurately in place; plumb, level and properly aligned with other components and other work. Anchor as required for secure operation.

B. Complete field assembly with joints as recommended by manufacturer. Grind welds smoothe and restore finish. Comply with NECA standards for electrical work.

3.2 TESTING AND INSTRUCTIONS:

Test each item of operational equipment including safety devices and fire protection equipment. Instruct Owner's operational personnel in proper use and maintenance of equipment, and demonstrate capacity ratings, safety features, cleaning procedures, and proper storage/handling of raw and processed waste materials.

END SECTION

PACKAGED WASTE COMPACTOR PERFORMANCE DATA SHEET

Unit Designation: Compactor

Location: Pavilion 'C', Compactor Room C19.

Type: Automatic, horizontal, hydraulic, hopper fed.

Maximum Height: 5'-9" to top of hopper.

Hydraulic Unit: 12.5 ton; Cylinder shall be double acting type with 4" bore, 2" rod and 30" stroke. System shall operate at a maximum of 2000 psi; reservoir capacity shall be 2.5 gals. pump shall be 5 qpm at 3450 rpm.

Power Supplied: 1 H.P. start, torque motor, 110/220V single phase; 7.2 amps (220), 14.4 amps (110V).

Capacity: Volume displacement of 27 cu. yd. per hr..

Hopper Construction: 12-gage steel sides with a 3/8" back plate to prevent damage from heavy falling refuse.

Pressure Unit Construction: Ram face shall be 3/8" steel plate and sides shall be 3/16" steel. Bottom of ram shall be 5/16" abrasion resistant steel for extra long life.

Control System: Photocell actuator with false-start protection; automatic shut-down features for jamming, access door interlock, full bin, low oil level, motor overload, and other standard safeties offered by manufacturer.

Container: 12 gauge steel reinforced bin at all stress points.

Sanitation: Equip unit with automatic insecticide and deodorizer dispenser system.

Accessories/Supplies: Provide 2-3 yd. containers. Provide one thru-the-wall intake door, 24" x 24", class B; bottom hinged as manufactured by Wilkinson Chutes.

Acceptable Mfr/Model Nos.: Jenson Champions; Centaur 250

SECTION 11415 - WALK-IN REFRIGERATED STORAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The extent of walk-in refrigerated storage is shown by the drawings and by schedules.

B. The types of equipment specified in this section include:

Walk-in refrigerated storage units.

C. Related Work:

(1) Compressor-condenser refrigeration units are specified in Division 15.

(2) Sprinkler work is specified in Division 15.

1.3 QUALITY ASSURANCE

A. UL Labels: Label electrical components of food storage and handling work to show compliance with UL standards.

B. Flamability Labels: Label insulated panels of walk-in refrigerated storage units with UL labels to show a flame spread limitation rating of 25 or less.

1.4 SUBMITTALS:

Shop Drawings: Submit shop drawings showing layout, elevations, and typical sections and details of refrigerated storage work arranged or custom fabricated specifically to fulfill the project requirements. Show plans, elevations and sections at not less than 1/4" scale; show details at not less than 1-1/2" scale. Include piping and wiring diagrams, if any, and accessories.

1.5 PRODUCT HANDLING:

A. Exposure of Insulation: Do not store exposed (uncovered) plastic insulation materials at the project site. Deliver and install only when immediate concealment by other work is scheduled. Protect at all times against ignition, and against exposure to sunlight.

B. Protect urethane insulation against exposure to high temperatures (temperatures in excess of 100 degrees F., unless manufacturer specifically designates a higher sustained working temperature) during shipping, storage, handling and installation, and regardless of whether surfaces are exposed or concealed by other materials including metal faces.

1.6 GUARANTEE:

Walk-in Refrigerated Storage Construction: Guarantee Walk-in refrigerated storage units against defective materials and workmanship, including frost damage, panel delamination, and measurable loss of heat transfer resistance, for a period of 10 years after startup of work, except to the extent it has been subject to abuse, misuse or accidental damage. Provide guarantee signed by the Contractor, Installer and Manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT:

A. General: Provide manufacturer's standard prefabricated field-assembled units of the sizes shown, to perform with the capacities and maintained temperatures indicated, complete with the refrigeration equipment, doors and accessory items indicated. Provide manufacturer's standard units as indicated by published product literature, except as otherwise indicated.

B. Wall and Ceiling Panels: Rigid cellular plastic insulation bonded between two sheet metal faces to form modular structural panels with interlocking joints and integral joint seals. Provide preformed corner panels and preformed T-panels where insulated partitions are shown. Wall panel height 8'-6".

C. Panel Thickness: 4"

D. Insulation: Rigid, closed-cell polyurethane foam; either foamed-in-place for bond, or slab stock for adhesive lamination with panel face sheets; K-value of 0.15 at 40 degrees F. mean temperature (ASTM C 177); density of not less than 1.7 lbs. per cu. ft.; heat-aged for dimensional stability.

Where foamed-in-place type is provided, use Freon 11 as expanding agent and poured-in-place type application.

E. Panel Faces: Manufacturer's standard "stucco" patterned aluminum, not less than 0.042" thick, standard bright mill finish.

F. Top Face of Ceiling Panels: At manufacturer's option, provide top face of ceiling panel to either match exposed wall/ceiling panels or to be zinc coated steel (ASTM A 525, G90) not less than 22 gage. Provide handing devices to support ceiling panels from building structure above.

G. Panel Joint Seals: Manufacturer's standard hollow or skinned-cellular gaskets of synthetic rubber, vinyl or other elastomer liquid sealant, applied after field erection of the unit of the type which is compatible with food storage and service, and selected on the basis of lowest possible vapor permeability.

H. Panel Joint Locks: Manufacturer's standard cam-action hook-plus-draw type concealed joint locking hardware, easily operated (from inside unit) with allen wrench or other common tool, for assembly and disassembly of panels at any time. Install lock components at mid-depth of insulation, isolated from panel faces either by insulation or by thermo-break plastic support system (avoid conductive bridging of insulation sandwich). Space panel joint locks at manufacturer's standard spacing, but not more than 4'-0" o.c. Form lock component so that draw of lock results in positive compression of joint gaskets or seals.

J. Floor Panels: Manufacturer's standard floor panels matching wall and ceiling panels, except with 14 gage zinc coated steel top panel face (ASTM A 525, G90). Floor panels shall be capable of supporting concrete topping plus a live load of 400 p.s.f.

K. Entrance Doors: Provide manufacturer's standard insulated refrigerated storage unit doors, of the types and sizes indicated, complete with frame, hardware and accessories. Match wall panels of unit unless otherwise indicated.

(1) Door Sizes: Nominal 34" to 36" wide x 78" high.

(2) Door Type: Swing type on cam-type gravity hinges for self-closing operation.

Provide flush type door units which are nominally flush with exterior wall surface.

(3) Kickplate: Provide stainless steel kickplates at interior and exterior of each door. Height: 36"+_.

L. Lock/Latch and Seal: Provide manufacturer's standard lock/latch system with inside latch-and-safety release to release both lock and latch. Provide positive, double-contact, gasketed seal system at jambs and head; with either automatic multiple, spring-latch closers or continuous magnetic holders. Provide double-contact, wiper-type gaskets at sill, where direct-contact units matching jambs cannot be used. Provide double continuous heating element at jambs. head and sill (one on door and one on frame) to prevent condensation, frost and freeze-up at door seals; include adjustable thermostatic control on door frame.

(1) Provide prewired door units to include inside light fixture (above door) in vapor-tight safety globe, with outside switch and pilot light.

(2) Provide sill or threshold construction of the type indicated (to accommodate the type of floor construction and finish shown).

(3) Provide flush-mounted dial-type thermometer, showing inside temperature; located at convenient reading height in either door or frame of unit.

(4) On entrance doors of unit (excluding partition doors), provide integral cylinder or disc lock of the replaceable cylinder-type, with not less than 5 pins or discs; include 3 nickel-silver keys.

(5) Use tamperproof screws for door hinges.

M. Pressure Relief Ports: Provide manufacturer's standard pressure relief port for each insulated compartment of walk-in refrigerated storage units.

N. Manufacturer: Provide walk-in refrigerated storage units manufactured by one of the following:

Bally Case & Cooler Inc.
Hobart Corp.
The C. Schmidt Co.
Vollrath Refrigeration Inc.

O. Miscellaneous Materials and Accessories:

(1) Bituminous Setting Compound: Hot-applied fluid asphalt of a type and purity recognized in the industry as suitable for use in conjunction with food service; odor free and non-contaminating after installation and cooling.

(2) Joint Sealants: Elastomeric, self-curing; odor-free and non-contaminating after application and nominal cure; light grey unless otherwise indicated equal to GE "Silicone Construction Sealant 1200".

(3) Closure Strips: Provide closure strips formed of same materials and finishes as items of equipment requiring closure; fabricated and complying with profiles shown (if any).

(4) Refrigerant Piping: Refer to Division 15 sections for refrigerant piping, except where specified to be integral with units.

(5) Water and Drainage Piping: Refer to Division 15 sections for domestic or condenser water piping (if any) to refrigeration units, and for drainage piping not specified to be integral with units.

PART 3 - EXECUTION

3.1 SUBSTRATE INSPECTION:

The Installer of walk-in refrigerated storage units must examine the surfaces of the substrate to receive the work, and the conditions under which the work is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION:

A. General: Comply with manufacturer's instructions.

B. Seal Joints and openings, including penetrations for piping, sprinkler heads, or electrical wiring, in the outside and inside faces of walk-in refrigerated storage construction.

C. Install closure panels and strips where indicated and around exterior perimeter of walls and where installed unit of work results in a residual space which is not of sufficient size to be cleaned or maintained.

D. Seal joints in panels with silicone sealant to form a vapor barrier completely surrounding cooler and freezer.

3.3 ADJUST AND CLEAN:

Adjust all working components for proper operation. Clean all surfaces.

END OF SECTION

SECTION 11450 - RESIDENTIAL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of residential equipment required is indicated on drawings and in schedules.

B. Types of residential equipment required include the following:

Under-counter refrigerator.
Full-size refrigerators.
Micro-wave ovens.
Range/oven.
Hood.
Dishwasher.
Disposal.

C. Plumbing requirements are specified in Division 15.

D. Electrical services and connections are specified in Division 16.

1.3 QUALITY ASSURANCE:

Certification Labels: Provide residential equipment which complies with standards and bears UL certification labels.

1.4 SUBMITTALS:

Product Data: Submit manufacturer's specifications and installation instructions for each type of residential equipment, including data indicating compliance with requirements. Submit operating and maintenance instructions for each item of residential equipment.

1.5 DELIVERY AND STORAGE:

Deliver products to project site in manufacturer's undamaged protective containers, after spaces to receive them have been fully enclosed.

1.6 SPECIFIED PRODUCT WARRANTIES:

Submit manufacturer's standard written warranty for each item of residential equipment.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION:

Colors: Provide manufacturer's standard colors as shown or scheduled. If no color indicated, provide white.

2.2 SCHEDULE OF EQUIPMENT:

A50 Breakroom - Provide:

Under-counter refrigerator: Subzero 249FF with icemaker; plastic laminate front panel.

B25 Workroom, B11 Work room - Provide:

Coffee Service NIC. Provide water connection.

C72 Breakroom - Provide:

Refrigerator with Icemaker: GE TBF 17DB with Icemaker, Almond.
Microwave: GE Jet 340.

C86 Kitchen - Provide:

Range/Oven: GE JSP28GD slide-in (self-cleaning) and black chrome.
Hood: GE Model JV330, 30" vented, Almond.
Dishwasher: GE Model GSD 1000T, Almond.
Refrigerator with Icemaker: GE TBF 17DB with icemaker, Almond.
Microwave: GE Jet 340.
Disposal: GE Model GFC600.

F88 Breakroom - Provide:

Microwave: GE Jet 340.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's instructions and recommendations.

B. Built-In Equipment: Securely anchor units to supporting cabinetry or countertops and concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate for proper operation of equipment.

D. Utlities: Refer to Division 15 and 16 for plumbing and electrical requirements.

3.2 ADJUST AND CLEAN:

A. Testing: Test each item or residential equipment to verify proper operation. Make necesary adjustments.

B. Accessories: Verify that accessory items required have been furnished.

C. Cleaning: Remove packing material from residential equipment items and leave units in clean condition, ready for operation.

END OF SECTION 11450

SECTION 12500 - WINDOW TREATMENT

PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

A. The Drapery Sub-Contractor shall supervise and direct this portion of the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordination of all portions of the work, as well as for all safety precautions.

B. The Drapery Sub-Contractor shall review the requirements of the building management to determine his use of building elevators, loading docks, parking, etc. and shall include any charges related thereto in the cost of the work.

1.2 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.3 DESCRIPTION OF WORK:

The extent of window treatment is indicated on drawings and in schedules. Types of window treatment work in this section include:

(1) Horizontal blinds.

(2) Drapery tracks.

(3) Draperies.

1.4 QUALITY ASSURANCE:

Provide window treatment units which are complete assemblies produced by one manufacturer for each type required, including hardware, accessory items, mounting brackets, and fastenings.

Provide materials in colors and patterns as indicated.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of window treatment unit required.Include methods of installation for each type of opening and supporting structure.

B. Shop Drawings: Submit shop drawings for special components and application conditions of window treatment units which are not fully dimensioned or detailed in manufacturer's product data. Show relationships to adjoining work.

Include typical elevation layout indicating proposed division between blind unis and meeting edges at corners. Provide sections and details at head and sill between blind units and corners.

C. Samples:

For verification purposes, Submit samples of each component, material and finish which will be exposed to view, for each type of window treatment required. Prepare samples from same materials to be used for the work.

PART 2 - PRODUCTS

2.1 HORIZONTAL BLINDS:

A. Headrail: Manufacturer's standard headrail consisting of channel-shaped section fabricated from minimum 0.025" thick sheet steel with rolled edges at top. Increase metal thickness as recommended by manufacturer for large blind units. Furnish complete with tilting mechanism, top and end braces, top cradles, cord lock, and accessory items required for type of blind and installation indicated.

B. Bottom Rail: Manufacturer's standard tubular steel bottom rail, designed to withstand twisting or sagging. Contour top surface to match slat curvature, with flat or slightly curved bottom. Close ends with manufacturer's standard metal or plastic end caps, of same color as rail. Finish rail in same color as slats, unless otherwise indicated.

C. Slats: Manufacturer's standard, spring-tempered aluminum slats, 0.010" thick, (louver blades), with rounded corners and forming burrs removed, as follows:

Slat Width: 1" narrow slats, with other components sized to suit.

D. Ladders: Manufacturer's standard ladder construction designed to support and maintain slats at proper spacing and alignment in open and closed positions, as follows:

Braided polyester cord design consisting of vertical components of not less than 0.045" nor more than 0.066" in diameter and integrally braided ladder rungs of not less than 4 threads; space ladders not further than 21" apart and 7" from ends of slats.

E. Tilting Mechanism: Manufacturer's standard assembly including low friction gear tilter, drum and cradle at each ladder, tilt rod, tape clips, and grommet guides to prevent wear on ladder and cords; designed to hold slats at any angle and prevent movement of slats due to vibration, operated as follows:

. Wand Operation: Manufacturer's standard, detachable clear plastic wand, of proper length to suit blind installation and to provide convenient operation.

F. Lifting Mechanism: Manufacturer's standard including crash-proof cord locks with cord separators and braid polyester or nylon lift cords with tassels at ends. Size cord to suit blind type. Include cord equalizers of self-aligning type designed to maintain horizontal blind position.

G. Installation Brackets: Manufacturer's standard brackets designed to facilitate removal of head channels. Provide intermediate brackets at spacing recommended by blind manufacturer.Include all hardware necessary for secure attachment of brackets to adjoining construction and to head rails. Design brackets to support safely the weight of blind assemblies plus forces applied to operate blinds.

H. Finish: Provide finishes indicated below. Finish exposed accessories and hardware to match rail color. Provide manufacturer's standard corrosion resistant finish to concealed items of hardware.

(1) Steel Components: Galvanize and either phosphate coat or prime exposed steel surfaces, followed by manufacturer's standard baked-on synthetic resin enamel finish.

(2) Aluminum Slats: Provide manufacturer's standard factory- applied finish system consisting of chemical conversion coating followed by baked-on synthetic resin enamel finish coat.

I. Acceptable Products:

(1) "Riviera" by Levelor Lorentzen, Inc.; slat color: No. 310 Sand

(2) "Bali" by Marathon Carey-McFall Co.; slat color: No. 31M Fawn

J. Location: A11 and A32 Conference Rooms, C02 Media Room.

K. Fabrication and Operation:

Prior to fabrication, verify actual opening dimensions by accurate site measurements. Adjust dimensions for proper fit at openings. Cooperate with other trades for securing tracks to substrates and other finished surfaces.

Fabricate blind units to completely fill the openings as shown, from head-to-sill and jamb-to-jamb.

For continuous window wall installation, fabricate blinds so that ends occur only over mullions or other defined vertical separation.

Space supporting ladders to comply with manufacturer's standards, unless otherwise indicated.

Space slats to provide overlap for light exclusion when in fully closed position.

Equip horizontal blind units, unless otherwise indicated for the following operation:

Full-tilting operation with slats rotating approximately 180 degrees. Place tilt operating controls on left-hand side of blind units.

Full-height raising, to manufacturer's minimum stacking dimension, with lifting cord locks for stopping blind at any point of ascending or descending travel. Place pull cord on right-hand side of blind units.

2.2 TRAVERSING DRAPERIES:

A. Items of Work:

The work in this section includes the furnishing of all lining where required, freight, labor and all material and equipment reasonably incidental and related to the fabrication, delivery and complete installation.

B. Quantity:

All yardages and/or dimensions supplied with these specifications are appreciate and are subject to the building conditions. The successful bidder shall be responsible for checking all dimensions and shall make accurate measurements before any material is ordered. He shall also be responsible for the inspection of all fabric prior to cutting and any such manufacturing defects as shall be found are be reported immediately.

C. Workmanship:

All draperies shall be of the finest accepted custom quality to withstand dry cleaning and hard usage, methods of manufacturing, cutting allowances for shrinkage (if any), finishing and pressing. All soil marks, flaws or other defects shall be eliminated, removed or repaired.

D. Hardware for Manual Traversing Draperies:

(1) Track: Furnish and install as indicated on plans Kirsch track no. 94001, extruded .050" anodized aluminum in accordance with Aluminum Association Specification No. AA-C22A21. Curve track where required.

(2) Finish: 25 white, baked enamel.

(3) Ceiling mounting brackets no. 94130.

(4) Overlap masters.

(5) End pulley set nos. 94101 and 94102, 1" dia. heavy duty ball bearing pulley sets.

(6) No. 9932 nylon cord, fiberglass center (No. 4 size) used with 1" ball bearing end pulley sets.

(7) Tension pulley to be no. 9923.

E. Fabrication:

Unless otherwise specified, fabrication is to be as follows:

(1) Fullness for Draperies: All draperies are to be at least 200% fullness. No panel shall be less than half widths. Fullness for blackout curtain to be 60%.

(2) Coverage: All draperies are to extend the full length of the tracks. Provide Buttmaster system at casements, Overlay system at blackout curtain.

(3) Edges: All drapery widths are to be joined with a French Seam or by using a Sew and Serge machine, or other approved method of joining, and all selvage edges are to be removed if necessary for fine tailoring.

(4) Hems: All draperies are to be made with side hems of one and one-half inches (1 1/2") doubled and are to be blind stitched. Bottom hems are to be five inches (5") doubled with one inch square covered weights tacked inside all corners at each seam. Open ends of hems are to be closed by hand with blind stitching.

(5) Headings: All draperies will have headings of a double fold fabric of three to four inches (3" to 4") and this will be covering a double fold of light weight permanently stiff crinoline.

(6) Pleats: All draperies are to have sewn pinched pleats tacked at two and one-half to three and one-half inches (2 1/2" to 3 1/2") from top. If necessary, a second tacking may be required at the tops of pleats for appearance retention depending on the fabric used.

(7) Cleaning Instructions and Guarantee: The supplier shall attach a label or indelible mark at the headings of each pair of draperies indicating the proper cleaning instructions and, after the installation is completed and has been accepted, the Supplier shall provide an unconditional guarantee for one year, commencing from completion date. This guarantee shall include all workmanship, repairing and/or remaking and any other defects that may be related to the materials, fabrication and/or installation.

(8) The direction of the draw for traversing draperies shall be as indicated on the drawings.

F. Casement:

Carnegie Creation Baumann Sorolo 4616, color no. 2, special 108" wide, Cordelan 50% PVA and 50% PVC, approx. 7.5 oz. per square yard inherently flame retardent, non-toxic, passes NFPA-701.

Casement fabric same for all locations.

G. Blackout Lining:

Rockland Mills, Roc-lon blackout, color: ecru, 47/48" wide, 50% cotton, 50% polyester, insulated, 100% blackout, fire retardent finish.

Blackout lining same for all locations.

H. Description:

Traversing draperies to consist of pairs as shown on finish plans of bi-parting unlined casement draperies. Drapery to be hung from tracks mounted in the ceiling which shall be positioned so that casements extend down 1/2" above finished floor in front of window wall.

I. Location:

A01, A04, A08, A09, A13, A14, A18, A19, A24, A27, A29, A30, A33, A34, A38, A39, A42, A50
B02, B05, B06, B08, B09, B12, B25, B26, B27, B28
C56, C57, C74, C76, C77, C78, C83, C98, C99, C100, C103
D02, D16, D17, D18
E01
F01

J. Description:

Traversing draperies to consist of pairs of bi-parting unlined casement draperies and pairs of overdrapery with blackout lining, as shown on finish plans. Drapery to be hung from track mounted in the ceiling which shall be positioned so that casements extend down 1/2" above finish floor in front of window wall.

Overdrapery fabric specification and location as follows:

A45 Seminar; Knoll - Jhane Barnes Nuance
K119/7 Rainbow, 54" wide, 50% cotton, 35% silk, 15% wool

B01 Conference; Kirk Brummel - La Droit Jonquil,
56" wide, 100% cotton

C01 Multipurpose; Knoll - Jhane Barnes Nuance
K119/6 Peach, 54" wide, 37% wool, 36% silk, 27% cotton

C51 President Carter; Kirk Brummel - La Droit creme fraiche, 56" wide, 100% cotton

C61 and C67 VIP; Jack Lenor Larsen - Siamese Brocade 2402/04, Pewter, 40" wide, 91% silk, 9% polyester

C84 Mrs. Carter; Randolph and Hein - Dupion Stripe, 8006 Blush, 47" wide, 100% silk

C97 Informal Conference; BG Associates - Window Pane 100/503 Isinglass peach, 48" wide, 100% silk

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install window treatment units in manner indicated to comply with manufacturer's instructions. Position units level, plumb, secure, at proper height and location relative to adjoining window units and other related work. Securely anchor units with proper clips, brackets, anchorages, suited to type of mounting indicated.

B. Provide adequate clearance between sash and blinds to permit unemcumbered operation of sash hardware.

C. Divisions between blinds are permitted only at mullions by continuous windows or openings where more than one blind for one opening occurs, unless otherwise indicated.

D. Protect installed units to ensure their being in operating condition, without damage, blemishes, or indication of use at completion of project. Repair or replace damaged units as directed by Architect.

END OF SECTION 12500

SECTION 12651 - ASH RECEPTACLES

PART 1 - GENERAL

1.1 Furnish and install ash receptacle units where shown on the drawings.

1.2 Submit manufacturer's product descriptions and installation instructions.

PART 2 - PRODUCTS

2.1 Ash receptacles shall be wall-mounted metal units with tip-action top. Finish shall be polished bronze.

Acceptable Product:

Rectangular wall receptacle, Smokador model WU-1001.

PART 3 - EXECUTION

3.1 Install units in accordance with manufacturer's printed instruction. Mount at height shown on drawings. Install unit shall be level, plumb and attached wall surface.

END OF SECTION 12651

SECTION 12670 - ENTRANCE MATS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of entrance mat work is indicated by drawings and by provisions of this section.

B. Types of work specified as work of this section include the following:

(1) Set-in frames to receive recessed mats, or flooring units.

(2) Recessed mats or flooring units.

C. Refer to Division-3 sections of these specifications for grouting, topping and finishing of related concrete; not work of this section.

1.3 QUALITY ASSURANCE:

Manufacturer: Except as otherwise indicated, provide entrance mats and accessories by a single manufacturer for entire project.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of entrance mat. Include methods of installation for each type of substrate.

B. Samples: Submit samples for each type and color of exposed entrance mat, frames and accessories required. Provide 12" square samples of mat materials and 12" lengths of frame members.

C. Shop Drawings: Submit shop drawings for entrance mats. Include full scale sections of typical installations. Show details of patterns or designs, anchors, and accessories.

Coordinate shop drawing submittal with concrete work shop drawings showing oversized recess for delayed installation of mat frames.

D. Maintenance Data: Submit manufacturer's printed instructions for cleaning, drying, maintaining and rehandling of removable entrance mat units.

1.5 SEQUENCING/SCHEDULING:

A. General: Except as otherwise indicated herein, sequencing or scheduling for performance of work of this section in relation with other work is Contractor's option.

B. Provide oversized recesses in concrete work, to receive mat frames. Delay frame installations until building enclosure is completed and related interior finish work is in progress.

C. Install mat frames integrally with principal pour of concrete floor system. Locate, align and level frame members accurately, but recess in-fill concrete by at least 1.0" for placement of concrete topping promptly after principal pour has hardened.

D. Protection: Upon completion of frame installations and concrete work; provide temporary filler of plywood or fiberboard in mat recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.

E. Delay installation of mats, foot grilles and other finish flooring units until near time of substantial completion for project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Balco, Inc.; Wichita, KS, Model FMC-R
Construction Specialties, Inc.; Muncy, PA, Model-PM375RM
Reese Enterprises, Inc.; Rosemont, MN, Model #543

2.2 MATERIALS AND FABRICATION:

A. General: Provide colors/patterns/profiles of materials, including metals and metal finishes, as indicated on drawings or by this specification or, where not indicated, as selected by Architect from manufacturer's standard colors/patterns/profiles.

B. Shop fabricate units of entrance mat work to greatest extent possible, in sizes as indicated. Where not otherwise indicated, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements, with hairline joints, or provide prefabricated corner units without joints. Where possible, verify sizes by field measurement prior to shop fabrication.

C. Entrance Mat Frames: Provide manufacturer's standard design, of size and style to mate with insert type and adjacent finish floor or wall construction, for permanent recessed installation in subfloor; complete

with corner pins or reinforcing, and installation anchorages.

(1) Provide frames of extruded 6063-T5 alloy aluminum with Duranodic medium bronze finish. Coat surface of frame which will contact cementitious material with zinc chromate paint or manufacturer's standard protective coating.

(2) Provide frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced, and with pieces spliced together by means of straight connecting pins.

D. Roll-Up Type Foot Grilles: Provide manufacturer's standard extruded aluminum hinged tread-slat mat system, with slotted hinges of either aluminum of vinyl to form 2" wide x 3/8" thick slat modules; with top-surface tread inserts of fusion-bonded carpet of 1/4" high x 28 oz. per sq. yd. level-cut DuPont "Antron III" nylon filament; with continuous vinyl cushions on bottom surface of slats, and vinyl edge accessories to accommodate frame application as indicated.

Aluminum Finish: Medium bronze anodized finish to match frame.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install recessed frames and entrance mats to comply with manufacturer's instructions, at locations indicated and with top of frames and mats in proper relationship to one another and to adjoining finished flooring. Set mat tops at proper height for most effective cleaning action; coordinate top of mat surfaces with doors that swing across mats, to provide underdoor clearance.

B. Where frame is embedded in grout, provide necessary shims, spacers and anchorages for proper location and secure attachment.

END OF SECTION

SECTION 14225 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Refer to other sections of these specifications for related work which is not work of this section, including electrical service with fused disconnect switches for elevator system, hoistway, pits, and machinery rooms with access, lighting, ventilation and services.

1.2 DESCRIPTION OF WORK:

A. Extent of hydraulic elevator work is indicated on the drawings, in schedules and by provisions of this section.

B. Definitions: Hydraulic elevator work is hereby defined to include systems in which cars are hoisted either directly or indirectly by action of a hydraulic plunger and cylinder (jack); with other components of the work including fluid storage tank, pump, piping, valves, car enclosures, hoistway entrances, control systems, signal equipment, guide rails, electrical wiring, roping, buffers, and devices for operating, dispatching, safety, security, leveling alarm, maintenance and similar required performances and capabilities.

C. Elevator schedules indicate required performances, controls, capacities, features and finishes for each elevator.

1.3 QUALITY ASSURANCE:

A. Installer Qualifications: Either the elevator manufacturer or a licensee of the manufacturer, who has not less than 5 years' successful experience with the installation of similar elevators.

B. Regulatory Requirements:

(1) Elevator Code: Except for more stringent requirements as indicated or imposed by governing regulations (which must be complied with), comply with applicable requirements of the "American Standard Safety Code for Elevators, Dumbwaiters, Excalators and Moving Walks" (ANSI A17.1) published by The American Society of Mechanical Engineers, hereinafter referred to as the "Code".

(2) NFPA Code: Comply with applicable NFPA codes, and specifically with sections relating to electrical work and elevators.

(3) Fire Resistance of Entrances: Comply with NFPA No. 80, and provide units bearing UL Labels with 30-min. temperature rise on labels.

(4) NEII Standards for Handicapped: Except as otherwise indicated, comply with NEII "Suggested Minimum Passenger Elevator Requirements for the Handicapped", including clearances, handrails, locations for signal equipment and similar provisions.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's detailed technical product data and installation instructions for each principal component or product, and include certified test reports on required testing. List and describe features of control system, performances, and operating characteristics.

B. Show Drawings: Submit plans, elevations and details of car enclosures and hoistway entrances. Prepare elevatoring diagrams to show service to each level. Show excavation requirements for jack.

C. Maintenance Manuals: Submit bound manual for each elevator, with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information.

D. Certificates and Permits: Provide Owner with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators.

1.5 INITIAL MAINTENANCE AND WARRANTY:

A. Maintenance: For a period of 3 months following date of substantial completion, provide full maintenance of elevator work on a daily-surveillance basis. Correct operational faults and restore/replace defective/deteriorated components and finishes. Lubricate operationsl units and supply expendable materials as required for proper operations and maintenance.

B. Warranty: Provide special project warranty, signed by Contractor, Installer and Manufacturer, agreeing to replace/repair/restore defective materials and workmanship of elevator work during warranty period. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal moise or vibration, and similar unusual, unexpected and unsatisfactory conditions. Warranty period shall be 12 months starting on date of substantial completion of project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Dover Corp.
Otis Elevator Co.
Westinghouse Elevator Co.

2.2 PLATFORM AND SLING:

A. Fabricate platform of formed or structural steel shapes, gusseted and rigidly welded, with a wood top floor laid over wood subfloor. Fireproof underside of platform.

B. Sling shall consist of heavy steel stiles properly affixed to a steel crosshead and bolster, with adequate bracing members, to remove all strain from car enclosure.

C. Affix steel bumper plates to bottom of bolster channels, and provide a platen plate for fastening plunger to sling.

2.3 CAR DOORS:

Provide car entrance with horizontal sliding doors. Obtain panel rigidity by suitable steel reinforcements. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track, and are guided at bottom by non-metallic shoes sliding in a smooth threshold groove.

2.4 ALARM BELL:

Connect an emergency alarm bell to a plainly marked push button in car.

2.5 GUIDES AND GUIDE SHOES:

Guides for elevator car shall be planed steel elevator guide rails, properly fastened to building structure with steel brackets. Fit car stile at top and bottom with guide shoes of self-aligning , swivel type, with metal body and removable non-metallic liners.

2.6 POWER UNIT:

A. Oil Pumping and Control Mechanism shall be compactly and neatly designed with all of the components listed below in a self-contained unit; structural steel outer base with tank supports; floating inner base for mounting motor pump assembly; overhead oil reservoir with tank cover and controller compartment with cover; metal drip pan; an oil-hydraulic pump; an electric motor; an oil control unit with the following components built into a single housing; a high pressure relief valve; a check valve; an automatic unloading up start valve; a lowering and leveling valve; and a magnetic controller.

B. Pump shall be especially designed and manufactured for oil-hydraulic elevator service. It shall be positive displacement type, inherently designed for steady discharge with minimum pulsations to give smooth and quiet operation. Output of pump shall not vary more than 10% between no load and full load on elevator car.

C. Drive shall be multiple V-belts and sheaves of number and size to insure maximum factor of safety.

D. Motor be shall especially designed for oil-hydraulic elevator service, of standard manufacture, and of duty rating to comply with herein specified speeds and loads.

E. Oil Control Unit shall consist of the following components, all built into a single housing. Welded manifolds with separate valves to accomplish each function will not be acceptable under this specification. All adjustments shall be accessible and shall be made without removing assembly from oil line:

(1) Relief valve shall be externally adjustable, and shall be capable of bypassing total oil flow without increasing back pressure more than 10% above that required to barely open valve.

(2) Up Start and Stop Valve shall be externally adjustable, and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from Jack Unit, insuring smooth up starts and up stops.

(3) Design Check Valve to close quietly without permiting perceptible reverse flow.

(4) Lowering Valve and Leveling Valve shall be externally adjustable for drop-away speed, lowering speed, leveling speed and stopping speed to insure smooth "Down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling when slowdown is initiated.

F. Electric controller shall be full magnetic type or solid state integrated circuitry. Silver to silver contacts shall be utilized on all relays and contactors. Provide thermal overload relays to protect motor mount. All component switches in a NEMA 1 enclosure.

2.7 JACK UNIT:

A. Jack unit shall be of sufficient size to lift gross load the height specified and shall be factory tested to insure adequate strength and freedom from leakage. No brittle material, such as grey cast iron, shall be used in jack construction.

B. Jack unit shall consist of the following parts: a plunger of heavy seamless steel tubing accurately turned and polished; a stop ring electrically welded to plunger to positively prevent plunger leaving cylinder; an internal guide bearing; packing or seal of suitable design

and quality; a drip ring around cylinder top; a cylinder made of steel pipe and provided with a pipe connection and air bleeder. Weld brackets to jack cylinder for supporting elevator on pit channels. Provide an auxiliary safety bulkhead in lower end of cylinder.

2.8 JACK CYLINDER PROTECTION:

Jack cylinder and underground piping shall be double wrapped with an approved coating designed to help protect it from electrolytic and chemical corrosion.

2.9 WIRING, PIPING AND OIL:

Provide all necessary wiring in hoistway in accord with National Electrical Code. Provide all necessary pipe and fittings to connect power unit to jack unit and oil of proper grade.

2.10 AUTOMATIC GUIDE RAIL LUBRICATORS:

Provide lubricators mounted on top of upper guide shoes. Wool felt wiper shall apply an even, uniform flow of oil which shall thoroughly lubricate faces of guide rail from a leakproof oil reservoir.

2.11 FAILURE PROTECTION:

Design electrical control circuit so that if a malfunction should occur, due to motor starter failure, oil becoming low in system, or car failing to reach a landing in up direction within a pre-determined time, elevator car will automatically descend to lowest terminal landing. If power operated doors are used, doors shall automatically open when car reaches that landing to allow passengers to depart. Doors shall then automatically close and all control buttons, except "door open" button in car station, shall be made inoperative.

2.12 MAINLINE STRAINER:

Install a mainline strainer of self-cleaning type, equipped with a 40 mesh element in oil line.

2.13 OIL-HYDRAULIC SILENCER:

Muffler Device shall be installed at power unit locaton. It shall contain pulsation absorbing material inserted in a blowout proof housing arranged for inspecting interor parts without removing unit from oil line. Rubber hose without blowout proof features will not be acceptable.

2.14 SOUND ISOLATING COUPLINGS

A minimum of two shall be installed in oil line in machine room between pump and jack.

2.15 VIBRATION PADS:

Shall be mounted under power unit assembly to isolate unit from building structure.

2.16 SOUND INSULATING PANELS:

Manufactured of reinforced 16 gauge steel with a 1" thick 1 1/2# core of fiberglass affixed to interior shall be mounted on all four open sides of power unit frame.

2.17 EMERGENCY TERMINAL STOPPING DEVICE:

A. Provide an emergency terminal stopping device for speeds over 100 FPM which shall operate independently of normal terminal stopping device should it fail to slow down car at terminal as intended. They shall be so designed and installed that a single short circuit caused by a combination of grounds, or by other conditions, shall not prevent their functioning.

B. Normal and emergency terminal stopping devices shall not control the same controller switches unless two or more separate and independent switches are furnished two of which shall be closed in either direction of travel to complete the circuit to control valve solenoids in down direction and to complete circuit to pump motor for up direction of travel.

2.18 AUTOMATIC TERMINAL LIMITS:

Place electric limit switches in hatchway near terminal landings and design to cut off electric current and stop car should it run beyond either terminal landing.

2.19 AUTOMATIC SELF-LEVELING:

Provide elevator with a self-leveling feature that will automatically bring car to floor landings. This self-leveling shall, within its zone, be entirely automatic and independent of operating device and shall correct for overtravel or undertravel. Car shall also be maintained approximately level with landing irrespective of load.

2.20 BUFFERS:

Provide substantial buffers in elevator pit. They shall be mounted on continuous channels fastened to elevator guide rail or securely anchored to pit floor and provide substantial extensions if required.

2.21 CAR TOP INSPECTION STATION:

A car top inspection station with an "emergency stop" switch and with constant pressure "up-down" directon buttons shall make normal operating devices inoperative and give inspector complete control of elevator.

2.22 DOOR OPERATION

Provide a direct current motor driven heavy duty operator designed to operate car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and door operating mechanism shall be arranged for manual operation in event of power failure. Provide leading edge of car door with a retractable reversal edge arrange to automatically return car and hoistway doors to open position in event doors are obstructed during closing cycle. Doors shall then resume closing cycle. Doors shall automatically open when car arrives at landing and shall automatically close after an adjustable time interval or when car is dispatched to another landing. Direct drive geared operators, A.C. controlled units with oil checks, or other deviations from the above are not acceptable.

2.23 INTERLOCKS:

Equip each hoistway entrance with an approved type interlock tested as required by Code. Design interlock to prevent operation of design to car away from landing until doors are locked in closed position as defined by Code and prevent doors from opening at any landing from corridor side unless car is at rest at that landing or is in leveling zone and stopping at that landing. Interlocks shall bear Underwriters' Laboratories "B" label of approval.

2.24 HOISTWAY DOOR UNLOCKING DEVICE:

Hoistway door unlocking devices as specified by ANSI A-17.1 Code shall be provided to permit authorized persons to gain access to hoistway when elevator car is away from landing.

2.25 DOOR HANGERS AND TRACKS:

For each hoistway sliding door. Provide sheave type two point suspension hangers and tracks complete. Sheaves shall have polyurethane tires with ball bearings properly sealed to retain grease. Provide hangers with an adjustable slide to take up-thrust of doors. Tracks shall be drawn steel shapes, smooth surface and shaped to conform to hanger sheaves.

2.26 HOISTWAY ENTRANCES:

A. Provide hoistway entrances of hollow metal, horizontal sliding type complete at each hoistway opening.

B. Entrances shall be manufacturer's standard design and shall bear Underwriters' Laboratories "B" labels. They shall consist of frames, extruded aluminum, sills, doors, hangers, hanger supports, hanger covers, fascia plates, sight guards, and all necessary hardware. Finish shall be solid color enamel as selected from elevator manufacturer's standard colors.

C. Entire front wall of hoistway shall be left open or a rough opening provided which is 12" greater in width and 6" greater in height than finished opening, until after entrances are installed. After guide rails are set and lined, entrance frames shall be installed in perfect alignment with guide rails. Finished walls will than be completed by others.

D. Interface of elevator wall with hoistway entrance assembly shall be in strict compliance with Elevator Contractor's requirements.

2.27 SELECTIVE COLLECTIVE AUTOMATIC PUSH BUTTON OPERATION:

A. Control of elevator shall be automatic in operation by means of push buttons in car numbered to correspond to floors served, for registering car stops by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings. Momentary pressing of one or more buttons shall dispatch car to designated landings in order in which landings are reached by car, irrespective of sequence in which buttons are pressed. Each landing call shall be cancelled when answered. When car is traveling in up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed; it shall not stop at floors when "down" buttons only have been pressed, unless stop for that floor has been registered by a car button, or unless down call is at highest floor for which any buttons have been pressed. Likewise, pressing of an "up" button when car is traveling in down direction shall not intercept travel unless stop for that floor has been registered by a car button, or unless up call is lowest for which any button has been pressed.

B. When car has responded to its highest or lowest stop, and stops are registered for opposite direction, its direction of travel shall reverse automatically and it shall then answer calls registered for that directon.

C. Should both up and down calls be registered at an intermediate floor, only call corresponding to direction in which car is traveling shall be cancelled upon stopping of car at landing.

D. An adjustable time delay shall be provided so that after car has stopped in response to a hall button, entering passenger may register his car button before car will reverse to answer calls in opposite direction.

2.28 OPERATING PANEL - GENERAL ALL ELEVATORS

A. Car Operating Panel:

(1) A main car operating panel in each car containing devices required for specified operation.

(2) Panel shall include illuminating pushbuttons marked to correspond to landings served, an "emergency stop" switch, a "door open" button, a key operated car light and ventilating fan switch. Floor pushbutton shall be illuminated when a call has been registered and shall remain illuminated until car reaches indicated floor. Operation of "emergency stop" switch in car shall, in addition to stopping car, cause alarm bell to ring.

B. Position Indicator: Provide an electronic car position indicator so arranged that as car travels through hoistway its position shall be indicated by illumination of numeral corresponding to landing at which car is stopped or passing.

C. Landing Buttons: Provide riser(s) of landing pushbutton stations. Each intermediate station shall consist of two illuminated pushbuttons, one for up direction and other for down direction. Each terminal station shall contain an illuminated pushbutton. Buttons shall be illuminated to indicate that a call has been registered at that floor for indicated direction.

D. Finishes: Face plates shall be #4 satin finish stainless steel.

E. Special Features: All car fixtures shall be integral with swing front return panels. Separate, applied faceplates will not be acceptable.

2.29 OPERATING PANEL FOR 2100 POUND PAVILION "B" AND 2500 POUND PAVILION "C"

A. Auxiliary Operating Panel: Provide an auxiliary operating panel in each car so that passengers may easily register their calls. This panel shall include illuminated pushbuttons for landings served, an "emergency stop" switch, "door open" button, and an alarm button. Calls registered shall be indicated by illumination of corresponding floor buttons on both operating panels.

B. Hall Lanterns:

(1) Provide a hall lantern with an audible signal at each landing entrance for each elevator. Lanterns, when illuminated, shall indicate elevator car which shall stop at landing and in which direction car is set to travel.

(2) As soon as a car has reached a predetermined distance from a floor at which it is going to stop, corresponding hall lantern shall be illuminated and signal shall sound. Hall lantern shall remain illuminated until car doors close in preparation for leaving floor.

When Hall Position Indicators are provided, lantern shall be combined in face plate of Position Indicator.

C. Finishes: Face plates shall be #4 satin finish stainless steel.

D. Special Features: All car fixtures shall be integral with swing front return panels. Separate, applied faceplates not acceptable.

2.30 OPERATING PANEL FOR 2100 POUND PAVILION C PRESIDENTIAL, 2500 POUND MUSEUM NO. 1, AND 4000 POUND MUSEUM NO. 2

A. Hall Lanterns:

(1) Provide a hall lantern with an audible signal at each landing entrance for each elevator. Lanterns, when illuminated, shall indicate elevator car which shall stop at landing and in which direction car is set to travel.

(2) As soon as a car has reached a predetermined distance from a floor at which it is going to stop, corresponding hall lantern shall be illuminated and signal shall sound. Hall lantern shall remain illuminated until car doors close in preparation for leaving floor. When Hall Position Indicators are provided, lantern shall be combined in face plate of Position Indicator.

B. Finishes: Face plates shall be #4 satin finish stainless steel.

2.31 ELECTRONIC PASSENGER SENSING DEVICE:

A. Provide a solid state electronic detector designed to operate as described below at entrance of elevator car. In addition provide an electro-mechanical reversal edge on leading edge of car door.

B. After a stop is made, doors shall remain open for an adjustable time interval. Closing may be initiated instantaneously by registration of a car call.

C. Doors shall remain open as long as electronic detector senses presence of a passenger or object in door opening. If door movement is obstructed for a predetermined time, doors shall resume normal closing operation. If electro-mechanical reversal edge contacts a person or object while closing, doors shall immediately stop and reopen. Closing shall be initiated one-half second after passenger or object has moved from opening.

2.32 ELEVATOR SPECIFICATIONS

During emergency generator power operation elevators shall be brought to designated floor and stop until regular power is resumed. Designated floor shall be same floor as designated for fire emergency (except elevator Number in C pod which shall be fully operational from emergency generator during power outage).

PART 3 - EXECUTION

3.1 INSPECTION:

Prior to commencing elevator installation, Installer shall inspect hoistways, hoistway openings, pits and machine rooms, as constructed, shall verify all critical dimensions, and examine supporting structure and all other conditions under which elevator work is to be installed. Notify Contractor in writing of dimensional descrepancies or other conditions detrimental to proper installation or performance of elevator work. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELEVATOR SYSTEM:

A. General: Comply with manufacturer's instructions and recommendations for work required during installation.

B. Excavation for Jack:

(1) Drill excavation in each elevator pit to accommodate installation of plunger-cylinder unit through whatever soil or rock condition is encountered and provide auxiliary casing if necessary. No extra will be considered for digging or drilling through rock, water, or unusual soil condition.

(2) Install plunger-cylinder units plumb and accurately centered for elevator car position and travel; anchor securely in place.

C. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

D. Coordination: Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines and levels designated by Contractor, to ensure dimensional coordination of the work.

E. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure, and thereby eliminate sources of structure-borne noise from elevator system.

F. Install piping without routing underground, where possible; where not possible, cover underground piping with permanent protective wrapping before backfilling.

G. Lubricate operating parts of systems, including ropes, if any, as recommended by manufacturers.

H. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails, for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

I. Leveling Tolerance: 1/2" up or down regardless of load and direction of travel.

J. Grout sills with non-staining, non-shrink grout. Set units accurately aligned with and slightly above finished floor at landings.

3.3 FIELD QUALITY CONTROL:

A. Acceptable Testing: Upon nominal completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by Code and by governing regulations or agencies.

B. Advise Contractor, Owner, Architect and inspection department of governing agencies, in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION:

A. At time of substantial completion of elevator work (or portion thereof), provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

B. Provide similar protective measures for elevator operation, with Owner's personnel present and just prior to date of substantial completion. Determine that control systems and operating devices are functioning properly.

C. Continuing Maintenance: Installer shall provide a continuing maintenance proposal to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date construction contract maintenance requirements are concluded. State services, obligations, conditions and terms for agreement period, and for renewal options.

PART 4 - ELEVATOR SCHEDULES

DESCRIPTION OF EQUIPMENT: PAVILION "B"

CONTROL:	Oildraulic
CAPACITY:	2100 Pounds
SPEED:	100 F.P.M.
OPERATION:	Simplex Selective Collective
CAR SIZE: PLATFORM:	6'-8" Wide X 5'-8 1/4" Deep
CLEAR INSIDE:	5'-8" Wide X 4'-3 1/2" Deep
TRAVEL:	7'-0"
POWER SUPPLY:	277/480 VAC - 3 Phase - 60 Hertz
MACHINE LOCATION:	Remote - See Drawings
STOPS:	Two (2)
OPENINGS:	Two (2), opposite
HOISTWAY DOORS: (SIZE & TYPE)	Single Slide 3'-0" x 7'-0"
DOOR OPERATION:	Power with Electronic Sensing Device
CAR ENCLOSURE:	DAP-1
SIGNALS:	Illuminating Car and Hall Buttons Position Indicator in Car Hall Lanterns at each entrance
SPECIAL FEATURES:	All features for HANDICAPPED RECOMMENDED BY ANSI A117.1 - 1980

DESCRIPTION OF EQUIPMENT:	PAVILION "C" - PRESIDENTIAL
CONTROL:	Oildraulic
CAPACITY:	2100 Pounds
SPEED:	100 F.P.M.
OPERATION:	Simplex Selective Collective
CAR SIZE: PLATFORM:	6'-0" Wide x 5'-1" Deep
CLEAR INSIDE:	5'-8" Wide x 4'-3" Deep
TRAVEL:	16'-0"
POWER SUPPLY:	277/480 VAC - 3 Phase - 60 Hertz
MACHINE LOCATION:	Remote - See Drawings
STOPS:	Two (2)
OPENINGS:	Two (2), in line
HOISTWAY DOORS: (SIZE & TYPE)	Single Slide 3'-0" x 7'-0"
DOOR OPERATION:	Power with Electronic Sensing Device
CAR ENCLOSURE:	DAP-1
SIGNALS:	Illuminating Car and Hall Buttons Position Indicator in Car Hall Lantern at each entrance
SPECIAL FEATURES:	All features for Handicapped recommended by ANSI A117-1 - 1980 Fireman's Emergency Service Phase I, Phase II, with alternate floor return.

DESCRIPTION OF EQUIPMENT:	PAVILION "C"
CONTROL:	Oildraulic
CAPACITY:	2500 Pounds
SPEED:	100 F.P.M.
OPERATION:	Simplex Selective Collective
CAR SIZE: PLATFORM: CLEAR INSIDE:	7'-0" Wide x 5'-8 1/4" Deep 6'-8" Wide x 4'-3 1/2" Deep
TRAVEL:	16'-0"
POWER SUPPLY:	277/480 VAC - 3 Phase - 60 Hertz
MACHINE LOCATION:	Remote - See Drawings
STOPS:	Three (3)
OPENINGS:	Three (3), Two Front, One Rear
HOISTWAY DOORS: (SIZE & TYPE)	Single Slide 3'-6" x 7'-0"
DOOR OPERATION:	Power with Electronic Sensing Device
CAR ENCLOSURE:	DAP-1
SIGNALS:	Illuminating Car and Hall Buttons Position Indicator in Car Hall Lanterns at each entrance
SPECIAL FEATURES:	All features for Handicapped recommended by ANSI A117-1 - 1980 Fireman's Emergency Service Phase I, Phase II, with alternate floor return.

DESCRIPTION OF EQUIPMENT:	MUSEUM NO. 1
CONTROL:	Oildraulic
CAPACITY:	2500 Pounds
SPEED:	100 F.P.M.
OPERATION:	Simplex Selective Collective
CAR SIZE: PLATFORM CLEAR INSIDE:	7'-0" Wide x 5'-1" Deep 6'-8" Wide x 4'-3" Deep
TRAVEL:	26'-6"
POWER SUPPLY:	277/480 VAC - 3 Phase - 60 Hertz
MACHINE LOCATION:	Remote - See Drawings
STOPS:	Three (3)
OPENINGS:	Three (3), in line
HOISTWAY DOORS: (SIZE & TYPE)	Single Slide 3'-6" x 7'-0"
DOOR OPERATION:	Power with Electronic Sensing Device
CAR ENCLOSURE:	DAP-1
SIGNALS:	Illuminating Car and Hall Buttons Position Indicator in Car Hall Lanterns at each entrance
SPECIAL FEATURES:	All features for Handicapped recommended by ANSI A117-1 - 1980 Fireman's Emergency Service, Phase I, Phase II, with alternate floor return.

DESCRIPTION OF EQUIPMENT:	MUSEUM NO. 2
CONTROL:	Oildraulic
CAPACITY:	4000 Pounds
SPEED:	100 F.P.M.
OPERATION:	Simplex Selective Collective
CAR SIZE: PLATFORM:	5'-8" Wide x 8'-9" Deep
CLEAR INSIDE:	5'-4" Wide x 7'-9 1/2" Deep
TRAVEL:	23'-6"
POWER SUPPLY:	277/480 VAC - 3 Phase - 60 Hertz
MACHINE LOCATION:	Remote - See Drawings
STOPS:	Four (4)
OPENINGS:	Four (4), in line
HOISTWAY DOORS: (SIZE & TYPE)	Two Speed 4'-0" x 7'-0"
DOOR OPERATION:	Power with Electronic Sensing Device
CAR ENCLOSURE:	DLP-1
SIGNALS:	Illuminating Car and Hall Buttons Position Indicator in Car Hall Lanterns at each entrance
SPECIAL FEATURES:	All features for Handicapped recommended by ANSI A117-1 - 1980 Fireman's Emergency Service Phase I, Phase II, with alternate floor return.

CAR ENCLOSURE:	DAP-1 PAVILION "B"
WALLS:	Made of best grade stretcher furniture steel with applied panels of wood core construction faced on both sides with high pressure plastic laminate.
CANOPY:	Made of Unitized steel construction; includes Emergency exit.
FRONT & TRANSOM:	Stainless Steel
DOORS:	Hollow metal horizontal sliding type with stainless steel cladding.
CEILING:	Suspended with plastic grid diffuser in baked enamel steel frame and fluorescent lights
SILL:	Extruded aluminum
HANDRAIL(S):	Continuous 2" stainless steel bar on side walls
ACCESSORIES:	Telephone Cabinet; Instrument by Others Two-Speed Fan Emergency Lighting
FINISH FLOORING:	Carpet as selected from Elevator manufacturer's Standard Selector
FINISHES:	Baked enamel custom color as selected by Architect Plastic laminate as selected from manufacturer's standard selector. Stainless steel shall be #4 Brush Finish

CAR ENCLOSURE:	DAP-1 PAVILION "C" PRESIDENTIAL
WALLS:	Made of best grade stretcher furniture steel with applied panels of wood core construction faced on both sides with high pressure plastic laminate.
CANOPY:	Made of unitized steel construction; including emergency exit.
FRONT & TRANSOM:	Stainless steel
DOORS:	Hollow metal horizontal sliding type with stainless steel cladding.
CEILING:	Suspended with plastic grid diffuser in baked enamel steel frame and fluorescent lights
SILL:	Extruded aluminum
HANDRAIL(S):	Continuous 2" stainless steel bar on rear wall
ACCESSORIES:	Telephone Cabinet; Instrument by others Two-Speed Fan Emergency Lighting
FINISH FLOORING:	Carpet as selected from elevator manufacturer's standard selector.
FINISHES:	Baked enamel custom color as selected by Architect. Plastic laminate as selected from manufacturer's standard selector. Stainless steel shall be #4 brush finish. In addition to the above, include $15,000 cab finish allowance.

CAR ENCLOSURE:	DAP-1 MUSEUM NO. 1
WALLS:	Made of best grade stretcher furniture steel with applied panels of wood core construction faced on both sides with high pressure plastic laminate.
CANOPY:	Made of unitized steel construction; includes emergency exit.
FRONT & TRANSOM:	Stainless steel
DOORS:	Hollow metal horizontal sliding type with stainless steel cladding.
CEILING:	Suspended with plastic grid diffuser in baked enamel steel frame and fluorescent lights.
SILL:	Extruded aluminum
HANDRAIL(S):	Continuous 2" Stainless steel bar on side walls.
ACCESSORIES:	Telephone Cabinet; instrument by others Two-Speed fan Emergency lighting Protection pads and hooks
FINISH FLOORING:	Carpet as selected from elevator manufacturer's standard selector.
FINISHES:	Baked enamel custom color as selected by Architect. Plastic laminate as selected from manufacturer's standard selector. Stainless steel shall be #4 brush finish.

CAR ENCLOSURE	DLP-1 MUSEUM NO. 2
WALLS	Made of durable solid wood core, covered on both sides with high pressure plastic laminate.
CANOPY:	Made of unitized steel construction; includes emergency exit.
FRONT & TRANSOM:	Stainless steel
DOORS:	Hollow metal horizontal sliding type with stainless steel cladding.
CEILING:	Suspended with plastic grid diffuser in baked enamel steel frame and fluorescent lights.
SILL:	Extruded aluminum.
HANDRAIL(S):	Continuous 2" stainless steel bar on three sides.
ACCESSORIES:	Telephone cabinet; instrument by others Two-speed fan Emergency lighting Protection pads and hooks
FINISH FLOORING:	Carpet as selected from elevator manfacturer's standard selector.
FINISHES:	Baked enamel custom color as selected by Architect. Plastic laminate as selected from manufacturer's standard selector. Stainless steel shall be #4 brush finish.

END OF SECTION 14225

SECTION 15010 - GENERAL MECHANICAL REQUIREMENTS

1.1 RELATED DOCUMENTS

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

1.2 REQUIREMENTS

Requirements specified herein are minimum. All equipment, when installed, shall perform equal to or exceed specified requirements.

1.3 APPLICABLE PUBLICATION

Where references are made in this DIVISION to A.S.T.M. Standards or Publications, the publications shall be of the dates listed below unless otherwise noted:

A-36-77	A-234-79	C-700-78
A-47-77	A-242-79	D-698-78
A-48-76	A-278-75	D-1784-78
A-53-79	A-515-79	D-1785-76
A-120-79	A-516-79	D-2000-80
A-126-73	A-536-77	D-2146-78
A-153-78	C-36-80	D-2241-80
A-167-80	C-76-79	D-2466-78
A-181-77	C-139-73	D-2661-78
A-183-68	C-262-64	D-2665-78
A-193-79	C-425-77	E-84-80
A-216-77	C-443-79	F-405-77

1.4 DEFINITIONS

A. Manufacturers Representatives: Wherever MANUFACTURERS REPRESENTATIVE is referred to in this division of these specifications, said representative shall be regularly employed by the manufacturer to perform similar activities to those called for herein, which indicates his competence in that field of work.

B. Concealed: Where the word concealed is used in this division, it shall mean items above ceilings, in chases, in tunnels, in cabinet work, and under counters or equipment so as to be not visible from an elevation of 5 feet at a horizontal distance of 10 feet.

C. Finished Spaces or Areas: Where finished spaces or areas are referred to in this division, it shall mean all spaces except concealed spaces, mechanical rooms, or boiler rooms unless otherwise noted.

D. Extended Warranties: Where extended warranties beyond contractor's one (1) year warranty are specified, the additional warranty time shall start at the end of the contractor's one (1) year warranty. See General Conditions.

E. Provide: Furnish and install.

F. Control & Interlock Wiring: All wiring, both line voltage and low voltage, other than power wiring from electrical distribution panel, through the primary control device, to the item of equipment.

G. Primary Control Device: That ONE device for any item of equipment which interrupts power flow during normal operation. Where magnetic starters are provided, they are the primary control. For items not switched by starters, the primary control device will be that ONE thermostat, time clock, manual switch, aquastat, P.E. switch, or relay performing the primary switching.

H. Code Reference: Where reference is made to a code or ASTM without a date indicated, the date shall be the latest date or edition as of the date of the opening of bids.

I. Noted, Indicated or Shown: Where the terms "Noted", "Indicated" or "Shown" are used in these specifications, the words "in the specifications or on the plans" shall be inferred.

J. Detail: Where reference is made to a Detail, the Detail shall be on the plans unless otherwise noted.

K. Specifications: Where reference is made to these specifications, it shall be inferred in this division of specifications.

L. Notification by Contractor, and Instructions to Contractor: Where reference is made in these specifications to notification by the contractor or instructions given to the contractor, it shall be inferred that the Architect shall be the instructor or shall be notified, as the case exists, unless otherwise noted.

M. Division or Section Reference: Where reference is made to another division or section within this division, refer to specifications table of contents for division, section, or page number.

1.5 CODES AND ORDINANCES

A. General: Where requirements of these specifications exceed specified codes and ordinances, conform to these specifications. Materials and equipment included in Underwriters Label Service shall bear that label. Electrical equipment shall be U.L. approved as installed.

B. Permits: Obtain all permits, paying all fees in connection therewith. At completion, have work inspected by proper authorities and furnish the Architect for the Owner an inspection certificate showing approval of installation.

C. Plumbing: Conform to the Plumbing Code of The City of Atlanta and Standard Plumbing Code, 1982 Edition.

D. All Work: Conform to State of Georgia Chapter 120-3-3 "Rules of Safety Fire Commissioner, Rules and Regulations, August 1, 1983."

E. Energy: Conform to the Georgia State Energy Code, 1981.

F. Electrical: See Division 16.

G. Mechanical: Conform to the Mechanical Code of the City of Atlanta and the Standard Mechanical Code, 1982 Edition.

1.6 SHOP DRAWINGS

A. General: Contractor shall check data to ensure compliance with specifications prior to submitting. Submittal shall be assembled in complete sets, by trade, and bound with numbered index sheets and tabs. Submittal data shall be submitted at one time unless unavailable drawings would delay job progress. Data shall include complete installation instructions, dimensional data and electrical data, BHP, motor HP, operating weights and load distribution at mounting points.

B. Identification: All submittal data shall be identified to show project name, specification section, drawing or detail number, room number, date, revision date, contractor and subcontractors name, and the model, style and size of items being submitted. Manufacturers standard drawings shall be modified by deletions or additions to show clearly only items applicable to this project.

C. Items to be Submitted:

(1) Fixtures.

(2) Cleanouts.

(3) Water Heaters.

(4) Floor Drains & Roof Drains.

(5) Valves.

(6) Thermometers & Gauges.

(7) Vacuum Breakers.

(8) Aquastats.

(9) Pumps.

(10) Electric Water Cooler(s).

(11) Centrifugal Water Chillers:
Capacity.
Evaporator and condenser GPM, pressure drop, fouling factor, and refrigerant temperatures.

(12) Cooling Towers:
Capacity.
Tower Head.

(13) Condensing Units:
Capacity.
Suction & condensing temperatures.

(14) Hot Water Boiler:
Capacity.
Unit GPM, water pressure drop, and fuel data.

(15) Oil Storage Tank.

(16) Computer A. C. Unit.

(17) Air Handling Units:
CFM, total static pressure, individual component pressure drops, BHP, RPM, and motor HP.
Coil fin spacing, rows, and entering and leaving conditions.
Submit copy of calculations.
Coil pressure drops.
Actual fan curves showing complete RPM range.
Dimensional data, hand connections.

(18) Filters.

(19) Makeup Air Unit.

(20) Coils:
Fin spacing, rows, entering and leaving conditions.
Submit copy of calculations.
Pressure drops.

(21) Cabinet Heaters.

(22) Convectors.

(23) Electric Finned Pipe Radiation. (Refer to Architectural for custom enclosures).

(24) Unit Heaters.

(25) Terminal Reheat Units.

(26) Fan Powered Induction Heat Units.

(27) Electric Heaters.

(28) Pumps:
GPM, T.D.H., BHP, efficiency and motor HP.
Size of installed impeller.
Performance curves.
Certified results of factory test of flow and shut-off head.

(29) Fans.

(30) Sound Trap.

(31) Refrigeration Equipment for 0° and 50°F rooms.

(32) Kitchen Range Hood.

(33) Grilles, Registers, Diffusers - current test factors.

(34) Ductwork Accessories.

(35) Valves and Piping Specialities.

(36) Fire Protection System.

(37) Hood Extinguishing Systems.

(38) Vibration Isolators.

(39) Instruments.

(40) Insulation.

(41) Motors.

(42) Starters and Contactors.

(43) Identification Tags and Nameplates.

(44) Refrigerant Piping Diagram approved by equipment manufacturer.

(45) Controls and control diagrams. Interlock wiring with air conditioning and heating equipment approved by equipment manufacturers.

(46) Equipment room 1/4-inch scale layout showing actual location of equipment furnished. Equipment layout shall be dimensioned showing piping, drains, ductwork, and bases. Equipment sizes on plans are composite unless otherwise noted. Equipment shall be laid out on center line of equipment shown with service clearances provided for equipment furnished.

(47) Ductwork Shop Drawings.

(48) Operating Instructions.

(49) Within 30 Days of Notice to Proceed: Power Wiring Requirements of all proposed equipment, including H.P., amps, voltage, phase and KW, tabulated on a separate sheet. A copy of the tabulation shall be transmitted to all trades affected.

(50) Letter from contractor stating that submittals have been checked for compliance with specifications.

(51) Letter from contractor stating that plans have been reviewed in accordance with Article 15800 1.2.

(52) Other Equipment Specified Herein.

1.7 SUBSTITUTIONS

All costs incurred by acceptance of substitutions shall be borne by Contractor. Should any proposed substitute equipment require services in addition to or in excess of services provided in the contract documents, these services shall be provided at no extra cost to the Owner.

1.8 GUARANTEE

A. General: See General Conditions.

B. Instructions: Instruct operating personnel designated by Owner in operation of system. Provide signed statement certifying instructions have been received. Frame sequence of operation under glass and mount on wall in mechanical room.

C. Warranties: Provide manufacturers' warranties prior to final inspection.

D. Noise and Vibration: When in operation, the system shall be free from abnormal noise and vibration.

1.9 MANUFACTURERS RECOMMENDATIONS

The assembly, erection, testing or adjusting of equipment shall be in accordance with the manufacturers published instructions shipped with the equipment.

1.10 SERVICE CONNECTIONS

A. General: Prior to excavation for or installation of any piping, determine invert at connection. Advise Architect of any discrepancies discovered.

B. Water Service, Potable and Fire Protection: Connect to service provided under Civil site design. Pay all costs.

C. Sanitary Sewer: Connect to sanitary sewer service provided under Civil site design. Pay all costs.

D. Storm Sewer: Connect to storm sewer provided under Civil site design. Pay all costs.

1.11 SITE UTILITIES

The information shown on the plans is based upon the best information available. Prior to performing any work on the site, the contractor shall contact the Utility Company(s) serving the facility and stake out

all underground services in area of excavation. Notify Architect of any discrepancies.

1.12 TEMPORARY HEAT

Ducted air handling systems shall not be placed into operation for testing or for temporary heat until all walls in areas served by the system have been prepared for painting and the building is broom clean. Unit heaters, cabinet heaters and finned radiation may be used for temporary heat during construction.

1.13 SPACE CONDITIONS

All apparatus shall fit into the available spaces in the building and must be introduced into the building so as not to cause damage to the structure. Equipment larger than access to equipment spaces shall be disassembled into sub-assemblies for installation. Where deviations from the plans are required in order to conform to the space limitations, such changes shall be made at no additional cost to the Owner, and shall be subject to approval. All equipment requiring service shall be made accessible. Coordinate piping and ductwork installation to avoid conflict with other trades. Route piping and ductwork to avoid skylights.

1.14 DRAWINGS

Plans are diagrammatic and show the location of the equipment, ducts and pipes, but are not to be scaled. All dimensions shall be verified at the building site. Shop fabrication drawings shall be prepared and submitted for approval. Prefabrication and/or installation of work from drawings shall be at Contractor's risk. See Architectural plans for exact building dimensions and details.

1.15 CUTTING AND PATCHING

Cut or core drill, where specified, openings in existing or new work for the installation of the mechanical system. Patching shall be performed by the trade whose work is cut. Contractor shall lay out and install his work ahead of the work of other trades wherever possible.

1.16 PRESSURE TESTS

A. General: Provide 48 hours notification in advance of any test. Test shall be maintained at conditions specified until approved but, in no event, for less than 8 hours minimum duration, unless otherwise noted. Hydrostatic pressure test shall maintain pressure without change,

except that due to temperature change. Complete test prior to insulating. Leaks shall be repaired, defective materials replaced, and system shall be retested. No water pressure test shall be conducted in freezing weather. Strike all joints in copper and steel piping under pressure test. Conduct tests prior to connecting to equipment or isolate equipment from system.

B. Domestic Water System: Hydrostatic test; 150 PSIG.

C. Soil, Waste and Vent System: Static test; 10 feet minimum head. Test system in its entirety or in sections. Plug all openings except highest opening above roof.

D. Storm Drain System: Static test; 10 feet minimum head. Test system in its entirety or in sections. Plug all openings except highest opening above roof.

E. Refrigerant Piping:

(1) Pressure test; 300 PSIG and 150 PSIG dry nitrogen on high and low sides respectively; 6 hours minimum duration.

(2) Vacuum test; 500 microns; 15 minutes minimum duration. Approval not required.

(3) Break vacuum with dry nitrogen and re-evacuate to 500 microns.

(4) Break vacuum with dry nitrogen and re-evacuate to 500 microns.

(5) Break vacuum with refrigerant charge.

F. Chilled and Heating Water: Hydrostatic test; 150 PSIG.

G. Chiller Auxiliary Piping: Same as source of piping.

H. Condenser Water Piping: Hydrostatic test; 100 PSIG.

I. Oil Piping:

(1) Pressure test; 150 PSIG air or inert gas; 2 hours minimum duration.

(2) Vacuum test; 20 inches of mercury; 2 hours minimum duration.

(3) Test prior to connecting to equipment.

J. Oil Tank: Pressure test; 5 PSIG air or inert gas, 2 hours minimum duration.

K. Medium Pressure Ductwork: Test in accordance with SMACNA High Pressure Duct Construction Standards, Third Edition, 1975, Chapter 10.

1.17 COMPLETION OF WORK

A. General: See General Conditions.

B. Incomplete Work: Prior to starting the inspection process at the semifinal or other inspections where work is inspected as being completed, the contractor shall give the Architect a list of work not completed, reason for incompletion, and date when said work will be completed.

C. Inspection: At final inspection the entire system shall be shown to be in specified working condition. The following shall be available during the inspection:

(1) Contractor Representative.
(2) Mechanic with hand tools.
(3) Specified test data.
(4) Certificates.
(5) Controls Manufacturer's Representative.
(6) Complete Specifications and Drawings with all addenda and revisions.
(7) Operating and Maintenance Manuals.

1.18 RECORD DRAWINGS

A. Responsibility: The contractor shall retain one set of clean blue line drawings for recording all changes or modifications regarding relocation of pipe, valves, and equipment, and actual size of installed equipment, ductwork and piping.

B. Disposition: At the completion of the installation the set of record drawings shall be provided.

1.19 OPERATING AND MAINTENANCE MANUALS

A. Three (3) bound and indexed Operating and Maintenance Manuals shall be prepared by the Contractor for all equipment and be submitted for approval prior to final inspection. Two (2) approved copies shall be delivered to operating personnel at final inspection.

B. Each Manual shall be compiled as follows:

(1) Data shall be bound in smooth surface hard back commercial quality three-ring notebooks with project identification shown on the front cover and binding back. Identification labels shall be typed and adhered with waterproof glue.

(2) Notebooks shall have 9-1/2-inch by 11-1/2-inch covers with back width to permit the covers to lie parallel or to converge, and have not less than 1-1/2-inch back width.

(3) Index divider sheets of heavy Manila paper shall be inserted between each section of the Manual with a 2-inch x 1/3-inch ready-cut shield tab attached to each sheet for identification of sections.

(4) Data sheets and diagrams shall be 8-1/2-inch x 11-inch or be mounted on 8-1/2-inch x 11-inch sheets of 16-pound paper if smaller, with reinforced 11-inch mechanically perforated edge. Drawings and diagrams larger than 8-1/2-inch by 11-inch shall be folded up from the bottom to form a height of 11-inches and folded to the left to form a width of 8-1/2-inches.

C. Index sheets shall be provided in the order listed with the following identifications typed in capital letters:

(1) AIR COOLED CONDENSING UNITS.
(2) CENTRIFUGAL CHILLERS.
(3) COOLING TOWERS.
(4) AIR DISTRIBUTION.
(5) AIR HANDLING UNITS.
(6) AIR APPARATUS FAN AND COOLING COILS.
(7) BOILER.
(8) ENVIRONMENTAL CONTROL UNITS.
(9) FANS.
(10) FILTERS.
(11) ELECTRIC HEATERS.
(12) WATER DISTRIBUTION.
(13) PUMPS.
(14) TERMINAL EQUIPMENT.
(15) FAN COIL UNITS.
(16) CABINET HEATERS.
(17) CONVECTORS.
(18) HUMIDIFIERS.
(19) CONTROLS.

(20) TEST AND BALANCE REPORTS.
(21) DRAWINGS AND DIAGRAMS.
(22) WATER HEATERS.
(23) INSULATION.
(24) ELECTRIC WATER COOLERS.
(25) CERTIFICATES.
(26) COMPUTER A.C. UNIT.
(27) MAKE-UP AIR UNIT.
(28) RANGE HOOD SYSTEM.
(29) FIRE PROTECTION EQUIPMENT.
(30) WATER TREATMENT EQUIPMENT.

D. Each Manual shall contain the following information, data and drawings:

(1) List of contents. Insert under front cover.

(2) Copy of approved submittals, equipment and materials.

(3) Manufacturer's installation, operation and maintenance instructions for each item of equipment with moving parts listed under SHOP DRAWINGS including recommended frequency of inspections and maintenance for one year's period of time.

(4) Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.

(5) Control diagrams, electrical interlock diagrams, and control valve lists.

(6) Copy of shop drawings showing layouts and construction details.

(7) Copy of Test and Balance Reports including list of instruments and description of methods employed.

1.20 PROTECTION OF MATERIALS AND EQUIPMENT

A. Maintenance of Filters: The contractor shall be responsible for maintaining all air filters until date of final inspection. No air system shall be operated at any time without air filters, and filters shall not be allowed to become overloaded with dust and dirt.

(1) Roll Filters: Provide extra spare roll for any unit containing roll with more than 10% used.

(2) Throwaway Filters: Install new set of filters prior to final inspection. Provide spare set of filters at final inspection.

(3) High Efficiency Media: Do not install until project is complete and ready for balancing.

B. During Construction: Pipe openings shall be closed with caps or plugs, floor drains excluded which shall be taped. All equipment shall be covered and protected against water, dirt and chemical or mechanical injury. All equipment and material shall be stored in accordance with manufacturer's recommendations.

C. Prior to Final Inspection: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match. All dents and sags in ductwork and equipment casings shall be straightened.

D. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match shall be painted to match factory finish.

E. Duct Cleanliness, Museum Systems: Special care shall be exercised during construction to prevent the accumulation of dust, dirt, and refuse in the supply and return ductwork serving the controlled humidity areas. Ductwork shall be vacuumed clean and all openings shall be tightly closed with 8-mil polyethylene in controlled humidity areas.

F. Potable Water System:

(1) General: Flush all debris and pipe compound from domestic water system.

(2) Disinfection: Disinfection shall be in accordance with Georgia Department of Public Health, Chapter 270-5-15, 1970.

G. Non-domestic Water Systems: Clean before being put into operation.

(1) Condenser Water System: Treatment shall be by owners chemical treatment contractor. Notify Architect when system is clean and ready for treatment.

(2) Chilled Water and Low Temperature Heating Water Systems: Treat systems with Garratt-Callahan Company Formula 12-L to a

concentration of 600-800 ppm nitrite on chilled water, 1000-1200 ppm nitrite on hot water.

1.21 CERTIFICATES

For chillers, condensing units, boiler, cooling towers, pumps, air handling units, hood extinguishing system, water heater, environmental air conditioning units, and controls, start-up, testing, and placing into operation shall be performed by the field representatives of the manufacturers, and certificates of the manufacturers shall be provided on the letterheads of the manufacturers in which the manufacturer certifies that the equipment has been installed in strict compliance with the manufacturers recommendations and is operating properly. The manufacturers shall list in the certificate the item or items furnished to the job. The contractor shall coordinate the performance of the aforesaid services and shall, in all cases where the equipment of two or more manufacturers tie in and function together, such as controls and air conditioning apparatus, require the field representative to perform simultaneously the initial start-up, the testing, and the placing of their equipment into operation. Start-up is defined as putting the equipment into action. Testing is defined as performing such testing as is stipulated in the contract documents to be performed. Placing into operation is defined as operating the equipment for a sufficient period of time for the determination to be made that it is performing properly. Notification shall be given 48 hours in advance of start-up.

1.22 MOTORS

A. General: All motors shall have all copper windings and leads. (Aluminum is not allowed). Motors for base mounted pumps and belt driven equipment shall have cast iron yoke and bearing housings. All motors shall have rated horsepower at least 10 percent above indicated brake horsepower of equipment including belt losses and inlet vane losses. Motors manufactured by U.S. (name of manufacturer) are not allowed.

B. Efficiency and Power Factor: The minimum efficiency and power factor for motors 1HP and larger shall be:

Motor HP	Minimum Efficiency	Minimum Power Factor
1 to 3	82%	85%
5 to 15	86%	87%
20 to 40	90%	88%
50 & >	92%	88%

C. Protection: All single phase motors of 1/3 H. P. and less shall have integral overload protection in accordance with Article 430-32(c) of the 1981 National Electrical Code.

D. Voltages: Refer to Electrical Drawings. All motors shall conform to the following voltages unless otherwise noted:

(1) Up to 1/2 HP - 120 volts.

(2) 1/2 HP and Over:

a. 200 volt motors on 208 volts systems.

b. 230 volt motors on 240 volts systems.

c. 460 volt motors on 480 volts systems.

1.23 STARTERS AND CONTACTORS

A. General: Provide starters for all motors furnished hereunder unless otherwise noted.

B. Enclosures: NEMA 1 indoors; NEMA 3R outdoors; unless otherwise noted.

C. Accessories: See Control Section for sequence of operation.

D. Three Phase, Single Speed Motors: Magnetic across-the-line starter with H.O.A. switch in cover. Square 'D', class 8536; Allen-Bradley Bulletin 509; Cutler-Hammer Catalog A-10. Provide auxiliary contacts.

E. Three Phase, Two Speed Motors: Two speed, two winding; Square 'D', class 8810; Allen-Bradley Bulletin 520; Cutler-Hammer Catalog A700.

F. Single Phase, Multi-Speed Motors: Manual starter; Square 'D', class 2510; Allen-Bradley Bulletin 600; Cutler-Hammer Catalog 9101.

G. Single Phase, One Speed Motors: Manual starter Square 'D', class 2510; Allen-Bradley Bulletin 600; Cutler-Hammer Catalog 9101.

H. Combination Starters with Circuit Breakers, Three Phase Single or Two Speed Motors Where Noted on Plans: Circuit breaker shall be adjustable magnetic trip type with 10,000 amp minimum symmetrical amps interrupting capacity. Breaker operating mechanism shall include control circuit interlock kit to disconnect 120V control circuit when circuit breaker is opened. Breaker operating mechanism shall be

lock-out type. Contactor shall be magnetic across-the-line type with H.O.A. switch in cover of NEMA 1 enclosure. Square D Class 8539; Cutler-Hammer Type A40 or A41, Westinghouse Type A206, Allen Bradley 513 or 522. Provide auxiliary contacts.

I. Push Button Stations: Provide push button stations in lieu of H.O.A. switches in cover of magnetic starters where noted.

J. Single Phase, One Speed Motors Operated from Wall Switch: Press switch with red lighted button and cover plate; Arrow Hart No. 2999-R; Bryant No. 4901-RLR; Hubbell No. 1297.

K. Single Phase Motors 1/2 HP and Larger or Interlock Controlled: Provide magnetic starters.

L. Overload Elements: All legs of multi-phase starters shall be protected with overload elements. Overload elements shall be sized in accordance with National Electrical Code, 1981 Edition.

M. Coils: All holding coils shall operate on 120 volts. On 208 volt starters, coil voltage shall be obtained by neutral conductors.

N. Pilot Lights: Provide a pilot light with green jewel in cover, lit when starter is closed, for all magnetic motor starters. Pilot light bulb shall be replaceable.

O. Starters Specified Under Electrical: See Electrical drawings for starters in motor control center and specified under Electrical Work.

P. Electric Heater Contactors: Provide with equipment unless otherwise noted.

Q. Chiller: Provided with equipment.

R. Air Cooled Condensing Units: Provided with equipment.

S. Computer A.C. Units: Provided with equipment.

T. Boiler: Provide with equipment.

U. 480 Volt Starters: Provide built-in control transformer on all starters unless otherwise noted.

V. Manufacturers: Square D, Allen-Bradley, Cutler-Hammer or Furnas of description and model numbers indicated.

1.24 PIPING IDENTIFICATION

A. General: Install color coding stations and direction markers after completion of painting and thermal insulation work unless otherwise noted.

B. Materials:

(1) Tape: Vinyl tape, 5 mil thickness, of colors specified: 3M 'Scotch' brand, Mystic, Permacel, Seaton.

(2) Background: Provide background colors with a band of 5-inch wide plastic tape.

(3) Stripes: 3/4-inch wide plastic tape.

C. Spacing of Stripes:

(1) One stripe - center on background band.

(2) Two stripes - install to leave 3/4-inch wide background stripe between.

(3) Three stripes - one stripe centered on background band, other stripes installed to leave 3/4-inch background stripe between.

D. Locations:

(1) Mechanical Equipment Rooms:

a. Within 18-inches of each point of entry and exit from all rooms and tunnel.

b. Within 18-inches of each valve.

c. Within 3-feet on each side of each 90-degree elbow, tee, and connection to equipment or vessel.

d. Additional stripes to provide color identification at not over 20 foot intervals, measured along centerline of pipe.

(2) Above Suspended Ceilings:

a. Within 18-inches of each valve or valve assembly.

b. At tees, identify both main and branch within 3'-0" of tee.

c. Within 3-feet of each 90-degree elbow.

(3) Piping concealed in Chases or Shafts: Identify each pipe visible throug access door or panel.

(4) Piping Exposed in Rooms Other Than Mechanical Equipment Areas:

a. Omit identification on piping 1/2-inch size and smaller exposed at connections to equipment or plumbing fixtures.

b. With the above exception, identify at not less than one point each piping run visible in each room, with identification at not over 20-foot intervals measured along centerline of pipe.

E. Color Code Schedule for Piping Identification:

Classification	Service	Base Color	Stripe
SAFE	Domestic Cold Water----------	Green	1 Black
	Domestic Hot Water----------	Green	2 Black
	Domestic Hot Water Circulating----	Green	3 Black
	Compressed Air----------	Green	1 White
	Cooling Tower Water Flow to Condenser----------	Blue	2 Green
	Cooling Tower Water Return from Condenser----------	Blue	1 Green
	Chilled Water Flow from Chiller---	Blue	1 White
	Chilled Water Return to Chiller---	Blue	2 White
FIRE	Sprinker----------	Red	1 White
	Fire Lines----------	Red	2 White
DANGEROUS	Low Temperature Hot Water Heating Flow----------	Yellow	1 Blue
	Low Temperature Hot Water Heating Return----------	Yellow	2 Blue
	Low Pressure Natural Gas(*)------	Yellow	1 Black
DRAINAGE	Sanitary Waste----------	None	None
	Equipment Drains, Water Relief Valve Discharges----------	White	1 Black
	Storm Drain (Museum Only)---------	White	1 Blue

*In addition to banding, identify pipe with name of gas contained.

F. Direction Markers:

(1) Material - Painted in gloss enamel.

(2) Color - black.

(3) Location - Arrow adjacent to each band to indicate flow away from band.

G. Framed Color Code Schedule:

(1) Provide a color code schedule with full size color code in color, framed under 1/8-inch sheet plastic.

(2) Produce background by non-fading photographic process. Fill in colors with same tape as bands and stripes 1-inch long.

(3) Install framed color code schedule at valve tag schedule location.

1.25 VALVE IDENTIFICATION

A. General: Valves so indicated on drawings shall be identified with brass tags and chart listing all valves by numbers. Each valve identification tag shall be 18 gauge polished brass, and 1-1/2-inch diameter, with service indicated by 1/4-inch stamped black-filled letters, and valve number indicated by 1/2-inch stamped black-filled letters. Tags shall be fastened to valves with meter seals with 4 ply 0.018 copper smooth wire, brass 'S' hooked, or brass jack chain to permit easy reading. Tags shall be Seton Style 250-BL with meter seals or equal.

B. Identification: Each valve tag shall have an identifying letter designating the system, and an identifying number designating the valve. Identifying letters shall be those utilized in the Legend.

C. Chart: A chart of all valves showing the valve identification number, location, purpose and/or special information shall be mounted in an aluminum frame under 1/8-inch sheet plastic and secured to a wall in the mechanical room. Valve chart wording and numbering shall be approved prior to fabricating tags.

D. Manufacturer: Tags shall be as manufactured by Seton Name Plate Corp. or equal.

1.26 DUCT ACCESS DOORS LABELING

Access doors to fire dampers and smoke dampers shall be labeled in accordance with NFPA 90A-2-1.4.2, 1981.

1.27 NAMEPLATES

A. General: Provide for all equipment, motor starters, remote push button stations, filter gauges, pump pressure gauges, panel mounted controls, and manual damper operators in mechanical rooms. Submit identification number and wording for approval.

B. Designation: The name of each piece of equipment or usage shall be etched in 1/4-inch maximum, 1/8-inch minimum height letters and mounted on or adjacent to piece of equipment.

C. Type: White core black bakelite secured with epoxy glue.

1.28 FERROUS FASTENERS

All ferrous fasteners not having a corrosion resistant plated finish and exposed to outside conditions or in mechanical rooms shall be painted to prevent rust. (See PAINTING section)

1.29 PAINTING

A. Provided under applicable provisions of PAINTING. The following shall be painted:

(1) Condenser water piping above ground.

(2) Exposed ferrous pipe, equipment and hanger supports.

(3) Concealed pipe, equipment, and hanger supports, primer only.

B. Painting shall be complete prior to installation of piping identification.

1.30 CLEARANCE ABOVE ELECTRICAL SWITCHGEAR AND ELECTRICL PANELS

Clearance above electrical switchgear and electricl panels shall be maintained by mechanical system so that no mechanical ducts, pipes, vents or equipment is routed above or across the space directly above said equipment in conformance with 1984 N.E.C.

1.31 HOLLOW SPACES USED AS DUCTS OR PLENUMS

All materials of systems installation exposed in hollow spaces used as ducts or plenums shall hae a flame spread rating of 25 or less and a smoke development rating of 50 or less.

END OF SECTION

SECTION 15100 - BASES, SUPPORTS & SLEEVES

1.1 RELATED DOCUMENTS

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

1.2 SLEEVES IN SLABS AND MASONRY WALLS

Schedule 40 black steel pipe. Sleeves shall be of size to include the insulation with maximum gap around insulation of 1/8-inch. Omit sleeves on cast iron pipe thru slabs on grade. Omit sleeves in openings core drilled in walls and floors.

1.3 SLEEVES IN FOOTINGS AND FOUNDATION WALLS

Schedule 40 black steel pipe. Water pipe, distribution piping, soil or waste pipe or building drain passing under a footing or through a foundation wall shall be installed in a pipe sleeve, two pipe sizes larger than the pipe passing through.

1.4 CAULKING OF SLEEVES AND OPENINGS IN SLABS AND MASONRY WALLS

A. Sleeves and openings in the following walls and floors are to be caulked vaportight (V.T.), watertight (W.T.), for smoke/fire protection (S/F.P.) as applicable.

(1) Exterior walls. (W.T.)
(2) Mechanical room walls. (S/F.P.)
(3) Fire rated partitions. (S/F.P.)
(4) Floors above grade. (S/F.P.)
(5) Partitions around humidity controlled spaces. (V.T.)

B. Caulk openings with foam type sealant, U.L. Classified, for fire rated penetration seals, having a flame spread rating of 20 in accordance with ASTM E-84-76a, and capable of withstanding 450°F temperatures without softening, unless otherwise noted. Dow Corning 3-6548 silicone RTV foam, Chase CTC PR-855 Firestop. Alternative utilizing thermafiber mineral fiber as detailed acceptable.

C. Caulk sleeves in exterior walls with oakum and hot pour compound to make watertight, unless otherwise noted.

1.5 BOLTS AND INSERTS

Provide inserts and bolts for supporting pipes and equipment.

1.6 PIPE SUPPORTS

A. Insulated Pipes: Hangers for horizontal chilled water, storm drain, refrigerant, and condensate drain piping, and trapeze supports shall be outside insulation, unless otherwise noted. Hangers for all other piping and riser clamps shall be inside insulation.

B. Cast Iron, PVC Pipe: Fee & Mason Fig. 239, Grinnell Fig. 260, Elcen Fig. 12, Michigan Hanger Fig. 400. Do not hang pipe in plumbing chases.

C. Copper Tubing Unless Otherwise Noted: Fee & Mason Fig. 365, Grinnell Fig. 97, Elcen Fig. 394, Michigan Hanger Fig. 101; copper plated.

D. Steel Pipe and Insulated Copper Refrigerant Pipe: Fee & Mason Fig. No. 239, Grinnell Fig. 260, Elcen Fig. 12, Michigan Hanger Fig. 400, unless otherwise noted.

E. Acid Waste Pipe: Supports are recommended by pipe manufacturer.

F. Buried Pipe: Rest body or barrel on solid earth. Provide bell holes for all hubs.

G. Vertical Pipes:

(1) Up to 3", Hanger Size: Extension split pipe clamp hanger: Fee & Mason Fig. No. 302; Grinnell Fig. No. 139; Elcen Fig. 98.

(2) Over 3": Shelf bracket formed of 2" x 2" x 1/4" angle and 'U'-bolts.

(3) Riser Clamps: Fee & Mason Fig. 241; Grinnell Fig. 261: Elcen Fig. 39; Michigan Hanger Fig. 510.

H. Horizontal & Vertical Pipes 1" and Smaller along Walls: Concealed screw hanger, galvanized finish. Fee & Mason Fig. 317.

I. Multiple Pipes: Trapeze support, consisting of steel channel suspended from structure and pipe hangers suspended from channel, where feasible.

J. Horizontal and Vertical Pipes at Walls 1 1/4-inch and Larger: Offset strap constructed of 1 1/4-inch x 1/4-inch flat steel and 'U' bolts.

K. Hanger Spacing Schedule:

(1) Cast Iron Pipe:

a. 5 ft. lengths - maximum 5 ft. on centers.
b. 10 ft. lengths - maximum 8 ft. on centers.

(2) Acid Waste PVC Pipe: Maximum 5 ft. on centers. Support at base of each stack. Conform to manufacturer's recommendations where more stringent.

(3) Copper Pipe:

a. Up to 1 1/4-inch - maximum 5 ft. on centers.
b. 1 1/2 inch to 4 inch - maximum 8 ft. on centers.

(4) Steel Pipe:

a. Up to 1 1/2-inch - maximum 7 ft. on centers.
b. 2-inch to 4-inch - maximum 10 ft. on centers.
c. 5-inch to 8-inch - maximum 16 ft. on centers.

(5) Vertical Pipe: Same as horizontal spacing. Use riser clamps at upper floor slabs to support vertical weight of pipe; a minimum of every floor for cast iron pipe. Space as noted for other piping. Support for chilled water pipe shall be inside pipe insulation. Insulate chilled water support with foamed insulation.

(6) Changes in Direction: Provide support within 2-feet of any change in direction or unconnected end.

(7) Pneumatic Control Lines, Gauge and Instrument Piping and Other 1/2-inch and Smaller Piping:

a. 3/8-inch and under - maximum 3 ft. on centers.

b. 1/2-inch - maximum 5 ft. on centers.

c. Pipe and tubing run overhead across open spaces more than maximum spacing: Support in steel channels or cable tray type support. Do NOT run along or support from heated piping or electrical conduit. Route parallel with building walls.

1.7 HANGER SUPPORTS: Round Rod to:

A. Poured in Place Concrete: F & M Fig. 186, Grinnell Fig. 285, Unistrut Fig. M-24, Michigan Hanger Fig. 355 or Elcen Fig. 66 for single hanger; F & M Fig. 9000, Elcen Fig. 1150, or Unistrut Fig. P-3200 for multiple hangers. Alternate method: Self drilling shield, power driven shots where approved by Structural Engineer.

B. Solid Masonry: Concrete expandible anchors.

C. Steel Bar Joists: 2" x 2" x 1/4" angle clip welded to top chords for single hanger; 3" x 3" x 1/4" angle welded to top chords for multiple hanger or F & M Fig. 269; Grinnell Fig. 64; or Elcen 231, 232, or 239.

D. Steel Beams: F & M Fig. 255L, Grinnell Fig. 86, Michigan Hanger Fig. 300 or Elcen Fig. 29A clamps.

E. Hollow Masonry Units: Toggle bolts.

F. Roof Deck: Do not support from metal roof deck.

G.

Hanger Rod Diameter	Pipe Size
3/8"	2" and smaller
1/2"	2 1/2" and 3"
5/8"	4" and 5"
3/4"	6"
7/8"	8", 10" and 12"

1.8 EQUIPMENT BASES

A. General: Submit dimensioned shop drawings showing points of loading, amount of load and size of equipment bases. Provide inertia bases and housekeeping bases as shown or listed below. Rough up slab under bases before pouring concrete.

B. Materials: Refer to CAST-IN-PLACE CONCRETE. Omit test cylinders for concrete poured under this section.

C. Size: Bases shall be rectangular, unless otherwise indicated, with vertical sides 4-inches from centerline of anchor bolts or 2-inches from edge of equipment supports, whichever is greater. See details.

D. Height:

(1) Apparatus Casing Floor: 4-inches.

(2) Pumps: 6-inch inertia pad; vibration isolation and housekeeping pad.

(3) built-up Apparatus Fans: Inertia base as detailed.

(4) Centrifugal Chiller: 4-inches. 8-inches under load points, 4-inches elsewhere.

(5) Boiler: 4-inches.

(6) Tanks: 6-inches.

(7) Control Air Compressors: 6-inch inertia pad; vibration isolation and housekeeping pad.

(8) Air Handling Units: 4-inches.

(9) Air Handling Units, Museum Penthouses: Inertia Bases.

(10) Water Heater: 4-inches.

(11) Housekeeping Pads and Pads for Other Equipment: 4-inches or as shown on plans.

(12) Built-up Apparatus Curbs: 4-inches high x 8-inches wide or as otherwise detailed.

E. Chamfer: 3/4-inch on edges and corners.

F. Reinforcing: 6" x 6" 10/10 WWF at mid-depth of slab.

G. Oil Storage Tank: See Detail.

H. Bases, curbs and housekeeping pads to be poured directly on floor slabs. Provide a shop drawing showing location and size to fit equipment furnished.

1.9 EQUIPMENT AND PIPE SUPPORTS

3" x 3" x 1/4" angle spanning structural members for equipment and pipe support unless otherwise shown.

1.10 PREFABRICATED ROOF CURBS AND EQUIPMENT SUPPORT RAILS

Specified under Architectural.

1.11 VIBRATION ISOLATORS

A. General: Provide vibration isolators for all equipment with motors. All isolation devices shall be selected for uniform static deflections according to distribution of weight and for the lowest disturbing frequency of the unit.

(1) Rubber-in-Shear Isolators: Isolators shall have housings for bolting to equipment with molded mound shaped element. Single and double rubber-in-shear isolators shall be designed for 1/4-inch and 1/2-inch deflection respectively under the imposed load.

(2) Spring Isolators: Isolators shall be equipped with sound deadening pads and leveling bolts. Isolators not bolted to equipment shall have non-skid rubber pads. Springs with 2-inch deflection or more shall have neoprene limit stops to prevent undue motion during start and stop, unrestrained during normal operation. Spring isolators shall be stable type unless otherwise noted.

(3) Cork/Rubber Isolator Pads: Cork insulation permanently bonded between two layers of waffle design oil resistant synthetic

rubber; 1-inch total thickness. Size for 50 lb. per sq. in. loading.

(4) Outdoor Isolators Constructions: Steel parts other than springs shall be galvanized, springs shall be cadmium plated to resist corrosion, and shall be equipped with limit stops to resist wind velocity.

B. Minimum Requirements:

(1) Minimum Equipment Isolation: Vibration isolators for equipment on grade or equipment up to 1 HP on floors other than grade shall be selected for following minimum isolation efficiencies, unless otherwise noted.

Below 450 rpm	80% efficiency.
451 to 900 rpm	85% efficiency.
901 to 1700 rpm	90% efficiency.
Above 1700 rpm	90% efficiency.

(2) Equipment Isolation above Grade and 1 HP: Vibration isolators for equipment above 1 HP other than on grade shall have the following minimum deflections or efficiencies, unless otherwise noted.

Below 450 rpm	90% efficiency.
451 to 900 rpm	2-inch deflection.
901 to 1700 rpm	1 1/2-inch deflection.
Above 1700 rpm	1-inch deflection.

(3) Piping Isolation: All horizontal pipe runs inside mechanical and boiler room within 20 feet developed length of equipment specified with isolators shall be isolated from building structure by means of hanger with vibration isolators. Vibration isolators for hangers shall be selected for one-half deflection of connecting equipment, but not more than 1 1/2-inch. Hangers shall be provided with vertical adjustment of minimum 1-inch in either direction.

C. Equipment:

(1) Centrifugal Chiller: Single neoprene backed steel plate.

(2) Base Mounted Pumps: Double neoprene backed steel plate.

(3) Air Handling Units: Spring isolators, 1-1/2-inch minimum static deflection.

(4) Refrigeration Condensing Units: Rubber-in-shear.

(5) Suspended Fans:

a. Belt Drive - spring isolators, 3/4-inch minimum static deflection.

b. Direct Drive - rubber-in-shear.

(6) Air Compressors: Double neoprene backed steel plate.

(7) Inertia Bases: As specified for equipment.

D. Manufacturers: Amber/Booth, Consolidated Kinetic, Korfund, Mason, Vibration Eliminator Co. or Vibration Mountings & Control, Inc.

1.12 COOLING TOWER BASIN

Refer to Structural.

1.13 "SEALING" OF CONCRETE BASIN

Thoroseal plaster mix.

1.14 UNDERGROUND PIPING THRUST BLOCKS

Provide blocks at all changes in direction of 2 square feet minimum thrust area. Comply with installation instructions of piping manufacturer. Concrete shall be in accordance with provisions of Cast-in-Place Concrete, except test cylinders shall be omitted.

1.15 ANCHORS

Provide anchors as required.

END OF SECTION

SECTION 15200 - INSTRUMENTS & CONTROLS

1.1 RELATED DOCUMENTS

The general provisions of the Contract, including General and Supplementry Conditions, apply to the work specified in this section.

1.2 INSTRUMENTS

A. General: Thermometers and gauges shall be installed and adjusted to be readable from floor.

B. Stem Type Pipe Thermometers: Adjustable angle type; red reading mercury tube; black scale graduations; non-ferrous metal cast with glass window; separable brass socket with lagging extension; 3/4-inch thread; 7-inch scale; 6-inch stem on 6-12 inch pipe size, range +10°F: chilled water, 0° to 100° in 1° divisions; hot water, 20° to 220° in 2° divisions; condenser water, 20° to 180°F in 1° divisions; Ashcroft 200-36E; Duro Model 7EZ3-6; Moeller 706AW; Trerice AX9; Weiss 7VS6; Weksler AA5.

C. Test Thermometers: Easy reading type; yellow back glass; 3-inch immersion; 12-inch long; 1° divisions; 20° to 230°F range; ASTM No. 9F. Provide one matched pair to operating personnel at final inspection. Trerice 5490, Weiss 9F.

D. Separable Socket Wells: Provide for all thermometers and control bulbs mounted in piping and provide wells in piping as shown. Wells shall have lagging extension and shall have screw cap where not used to mount permanent instrument or control. Where wells are installed in straight runs of pipe smaller than 2 1/2-inch, increase pipe to 2 1/2-inch for 6-inches minimum length each side. Wells shall be installed at 45° minimum above horizontal. Provide 3/4-inch FPT pipe openings. Fill bulbs with S.A.E. 10W oil.

E. Pressure Gauges: Remote surface mounting type, aluminum case, 4 1/2-inch dial, in 2 foot graduations. Provide pulsation dampener. Pipe to gauge shall be 1/4-inch copper tubing. Scale Range for pumps shall be so suction pressure is above lower 10% and discharge pressure is below upper 10% of scale. Scale range for constant pressure gauges shall be for design pressure to occur in middle 40% of scale. Duro 102; Marsh 103; Robertshaw 313; Trerice 500X; Weksler BM1. Mount on wall adjacent to pump. (See detail). Provide for all pumps except domestic hot water recirculating pump.

F. Flow Meter: All equipment shall be provided by the same manufacturer.

(1) Flow Elements: Annular primary type constructed of 316 stainless steel with accuracy of ± .55 to ± 2.3%. Sizes 1/2 thru 2 1/2-inch shall be threaded nipple section with nipple of same schedule as piping. Sizes 3-inch and larger shall be insert type for mounting through threaded steel weld coupling. Element couplings shall be flare on positive shut-off valve for quick connect to portable meter. A non-ferrous tag shall be attached to each element showing design flow rates, meter reading at design flow rate, fluid, line size and station number. Provide condensate chambers for steam elements. Ellison-Annubar, Barco-Venturi, Mid-West, Taco 'Sentinel'.

(2) Meter: Portable dial type with integral equalizing valves, pulsation dampeners and zero adjustment; quick coupling hoses, bleed valves and carrying case. Meter range shall be so that all element design flow rates will fall in the scale of 60 to 80 percent of the usable flow range. Deliver meter to Operating Personnel at final inspection. Ellison Model 77C, Barco portable master meter, Midwest Model 831, Taco '7000'.

G. Flow Indicator-Balancer:

(1) Balancer: Calibrated bronze screwed balance valve with indicating pointer and with pressure taps for connecting differential pressure meter. Pressure taps shall be equipped with caps and integral check valves. Each valve shall have preformed, removable insulation cover. B & G Circuit Setter, AAF #6000, Taco #790, Illinois #6000.

(2) Meter: Portable differential pressure gauge with flexible tubing, shut-off valves and case. Deliver gauge to Operating Personnel upon completion of testing and balancing. B & G RO-2, AAF PG-1, Taco Circuit Setter meter.

H. Filter Gauge: Magnehelic draft gauge complete with vent valves, sensing tips and aluminum tubing. Provide gauge for each filter section on air handling units. Mount gauge on unit casing at 5'-6". Provide Operating Personnel with one portable manometer, .10-0-1.0-inches with rapid shut-off tubing connectors, 9 ft. rubber tubing and steel carrying case for calibrating purposes. Gauge shall be Dwyer 2001 with 100.5 portable manometer.

I. Water Meter: Magnetic drive; bronze case; sealed register; integral strainer; accuracy of ±2% over flow range.

(1) 5/8-inch Meter: Flow range - 1 to 20 GPM.

(2) 2-inch Meter: Flow range - 8 to 160 GPM: Provide adjustable batch control momentary electrical contactor for 120 volt service.

(3) Manufacturers: Badger Model 'ER'; Hersey Model 'MHD'; 'Sealed Register'.

1.3 CONTROL SYSTEM DISCRETE COMPONENTS

A. General: All controls shall be pneumatic unless otherwise noted or unless integral with equipment specified. All thermostats, except space thermostats, shall consist of sensor and separate receiver-controller unless otherwise noted.

B. Location: Unless otherwise noted, all controls shall be located within control panels on backboard in mechanical rooms. Locate outdoor control sensors and sensing bulbs on the North side of the building in the shade. Support as recommended by manufacturer.

C. Space Thermostats:

(1) Pneumatic: Two-pipe, with pneumatic feedback, adjustable throttling range; concealed set point adjustment with range stops except in spaces C51, C61, C67, C70, C83, C84 and C97.

(2) Electric: Snap action, external set point adjustment, range stops.

(3) Mounting: 5'-6" above finish floor at locations indicated on plans. Where thermostats are shown at same location as light switches but at higher elevation, mount in vertical line; otherwise mount adjacent and at same elevation as switch.

D. Aquastats: Strap-on-Type; electric; snap-acting, selected for operating point in middle 80% of range. Barber-Colman TC291; Honeywell LA409A; White Rogers NO-11 B02-1.

E. Safety Controls:

(1) Firestat: Electric; snap action; manual reset; mount as indicated in Sequence of Operation. Set points: RA - 125°F; exhaust - 125°F; S.A. - 160°F, unless in variance with Code or 50°F above normal operating temperature.

(2) Duct Mounted Smoke Detector: Refer to Electrical Division.

(3) In-Space Smoke Detector: Refer to Electrical Division.

(4) Freezestat: Electric; snap action; manual reset; 20 foot element attached in horizontal loops to entering air face of center cooling coil; control responsive only to lowest temperature along element; mount 5'-6" above floor on air handling unit casing; set point 35°F cutout.

F. Operators: Pneumatic; rolling diaphragms, seamless bellows or flexible rubber sleeves; positive positioners for modulating dampers over 10 square feet face area and modulating valves over 2 1/2-inch. Piston area 6 square inches minimum; sized for 80% rated capacity. Damper linkages shall have two locking screws. Provide tee with needle type fitting in line adjacent to operator. Do not provide positive positioners on fan inlet vane operators.

G. Control Valves: Direct acting mixing type; 3-way with linear total flow characteristics/two way with equal percentage characteristics; stainless steel stems and renewable single seats; 2-inch and smaller, all bronze or brass screwed; 2 1/2-inch and larger, iron body flanged; pipe connections as shown on drawings. Provide plugged tee in line adjacent to operator. Heating valves shall be N.O. to coils. Valve close-off head shall be equal to or greater than total head of pump supplying system in which valve is installed.

H. Relays: Cabinet mounted, plug in type for logic functions.

I. Interval Timer: Electric; flush mounted, 1 to 12 hours with manual 'ON' position.

J. Control Dampers:

(1) Construction: Heavy duty commercial quality opposed action; reinforced galvanized steel blades, 6-inch minimum width, 8-inch maximum width; 16 gauge minimum for single thickness, 22 gauge minimum for double thickness; steel shafts with non-corrosive plating; oilite bearings; structural 12 gauge minimum galvanized steel frames with flange dimension equal to lining; corrosion resistant finish unless otherwise noted. Multiple damper assemblies shall be provided with 1-inch minimum jackshaft assembly.

(2) Gasketing: Rubber blade edge and end seals to limit leakage to 10 CFM/S.F. at 4-inch w.g. static pressure. Foam or sponge type gasketing is not acceptable. Robertshaw OB1001, Ruskin CD-50, Arrow Pin-Lock, Pacific Pneumaseal, Johnson D-1300.

(3) Design:

a. Restrictor: Provide restrictor in control line to damper operator of OSA dampers to provide adjustable slow opening damper sequence.

b. Minimum OSA: 4000 fpm face velocity rating; two-position or modulating as scheduled; N.C.

c. Maximum OSA: 4000 fpm rating; modulating; N.C.

d. Return Air: 4000 fpm rating; modulating; N.O.

e. AVD: 4000 FPM rating; two position or modulating as scheduled; N.C. or N.O. as specified.

f. Exhaust Air: 4000 fpm rating; modulating; N.C.

g. Bypass: 4000 fpm rating; modulating; N.C.

h. Face: 1000 fpm rating; modulating; N.O.

(4) Sizes: Sizes shall be as shown. Sizes for dampers mounted in concrete shall be based on field dimensions of concrete opening. Dampers and damper assembly construction shall be rated for the face velocity ratings specified.

(5) Manufacturers: Arrow "Pin-Lock"; Pacific Pneumaseal OB-1001; Johnson D-1300; Ruskin CD-50.

K. Fan Discharge Dampers: Extruded aluminum, parallel, air-foil blade without blade-edge seals. Linkage shall be concealed and out of airstream. Damper frame shall be one-piece with no mullion in airstream. Blade shafts shall be 90° to fan shaft. Ruskin CD-40; Arrow PBDAF-206.

L. Compressed Air:

(1) Compressor Unit: Air cooled, single stage, electric motor driven, dual compressors with alternator with air intake filter and silencer, compressor discharge pulsation chamber, pressure switch, forced splash feed lubrication, magnetic starter, relief valve, belt guard, ASTM 100-psig receiver tank sized for a maximum of six (6) starts per hour, pressure gauge, automatic drain trap, manual drain. Compressor shall be sized for one-third operating time. Receiver tank shall be sized for a maximum of six

compressor starts per hour. Provide air pressure failure alarm buzzer, silencer switch, and light. Compressors 5 H.P. and above shall be two-stage and mounted on separate tanks.

(2) Refrigerated Dryer: Deliver air supply at or below 4 grains/pound moisture; automatic condensate drain trap; three valve service bypass; 120 volts.

(3) Pressure Reducing Stations: Provide dual pressure reducing valves in series; control air relief valve; filter and oil separator; pressure gauges both sides of valves.

M. Air Piping:

(1) Above Lay-in Ceilings, in Troughs, Control Panels, Conduit, hollow masonry and Stud Walls: Type FR polyethylene tubing, ASTM Type 1, Grade 5, Class B, C; barbed brass fittings without clamp; nylon fittings with clamps; supported with nylon fasteners 3 feet o/c, maximum. Tubing locations shall conform to Rules of Safety Fire Commissioner Chapter 120-3-3 Rules and Regulations, August 1, 1983, Modifications to NFPA No. 70, 1981.

(2) In Masonry Walls: Type "M" soft seamless copper; no joints.

(3) All Other Piping: Type "M" hard drawn seamless copper; cast brass fittings; 50/50 solder joints; supported at 3 feet o/c, maximum.

(4) Exposed in Mechanical Room: Polyethylene tubing in galvanized E.M.T. conduit. Single terminal lines less than 18 inches in length; harddrawn copper, polyethylene tubing in galvanized coil spring wire armored sheathed, Mayon Tubing. Support conduit as specified in Electrical Division. Provide insulating throats in ends of EMT conduit and grommets or bushings in equipment walls.

(5) Underground (100 PSIG): Polyethylene tubing; nylon or brass fittings with double stainless steel clamps on each end of fitting. Minimum pressure rating, 100 PSI at 73°F. Yardley UHMW Polyethylene pipe, Super Golden Jet. Tubing shall be installed in accordance with manufacturer's recommendations.

(6) Test: 30 PSIG; maximum pressure loss of 5 psig in 24 hours. High pressure line, 80 PSIG; maximum pressure loss of 8 PSIG in 24 hours.

N. Control Cabinet:

(1) Construction: Totally enclosed; 16 gauge steel minimum, 14 gauge aluminum minimum; with locking door; two keys; baked enamel finish; canopy light.

(2) Mounting: Wall; top of cabinet maximum 6'-6" above floor; bottom of cabinet minimum 2'-6" above floor.

(3) Wiring: Color coded; both ends of conductors identified; connections and junctions at instruments and terminal strips only; conductors in wire troughs or laced with waxed cord; crimp-on terminal connectors.

(4) Tubing: Polyethylene; run parallel to cabinet sides, both ends of tubing identified, and strap in bundles.

(5) Nameplates: All devices; bakelite with white letters. See Section 15010, GENERAL MECHANICAL REQUIREMENTS.

(6) Door Mounted Devices: (See Sequence of Operation)

a. Manual Controllers.

b. Manual Switches.

c. OFF-ON Indicators.

d. AUTOMATIC-OFF-MANUAL Switch: AUTOMATIC position controls operate automatically as specified; OFF position, all controls go to normal position; MANUAL position, remove automatic refrigeration or OA damper control from sequence and allows manual ventilation control.

e. Maximum OA/RA/Relief Damper Manual Control: Manually position maximum OA/RA/Relief dampers when switch is in manual position.

(7) Pressure Gauges: Pressure calibrated for branch ports; temperature calibrated for input; 3-1/2-inch diameter when door mounted, 1-inch minimum diameter otherwise. Temperature gauges shall be of range so that design operating point occurs in middle 40% of scale. Provide for all input and branch ports. Inputs from same sensor shall be combined in one gauge.

(8) Instruments: All instruments and controls controlling equipment within the mechanical rooms shall be installed within control cabinets in the mechanical room. Controls shall not be scattered around the room on walls or equipment.

O. Wood Backboards:

(1) General: Provide wood backboards for surface mounted control panels, pump gauges, filter gauges, and filter controls.

(2) Type: 3/4-inch thick grade 1 plywood supported by 3/4" x 3/4" x 1/8" angle iron frame attached to wall with 1/4-inch toggle bolts for hollow masonry, expansion shields for solid masonry.

(3) Finish: Frame and board with two coats light gray enamel.

P. Electrical Work:

(1) Power wiring for all motors and equipment is included under the Electrical Division.

(2) All control and interlock wiring shall be provided hereunder.

(3) Control and interlock wiring not shown on the drawings shall be provided hereunder.

(4) All control and interlock wiring methods shall comply with the Electrical Division except minimum wire size shall be #16AWG copper. Low voltage wiring in mechanical rooms shall be in raceways. Concealed low voltage wiring outside of mechanical rooms shall be plenum rated cable. Route as specified for pneumatic control lines in Division 15100.

(5) Smoke Detectors: Detectors and wiring are specified in Electrical Division. Installation in ducts is specified in Mechanical Division. Signal for fan shutdown shall be obtained from fire alarm panel for control system input.

(6) Flow Switches in Sprinkler System and Micro Switches on Sprinkler System Isolation Valves: Wiring to Fire Alarm System is specified in Electrical.

Q. Submittal Data:

(1) Control Diagrams (All diagrams shall be the same size).
(2) Electrical interlock Diagrams (Approved by equipment manufacturer).
(3) Control Cabinet Diagrams with color coding and terminal legend shown.
(4) Control Valve Schedules with Valve Indexes. (Cv = 80 to 100% terminal pressure drop unless otherwise noted).

(5) Specification Sheet for each device to be supplied.
(6) Narrative Descriptions of control functions and interlocks.
(7) DDC Program description and listings.

R. Mounted Diagrams:

(1) Permanently mount a white print copy of control and interlock diagrams and narrative descriptions in frame under 1/8-inch clear plastic, top at 6'-0" maximum, in an accessible, well lighted location near control panel. Diagrams shall represent exact "as built" job conditions.

(2) Printing, typing and lines on diagrams shall be legible; half-size reproductions acceptable; original drawing printing minimum No. 3.

S. Installation: Installation of control systems shall be by licensed mechanics regularly employed in this type work under direct supervision of control manufacturer.

T. Calibration: Upon completion of installation, the contractor and a representative of the control manufacturer shall test and calibrate all controls and shall demonstrate the complete operating cycle of all equipment to the Architect's representative prior to final inspection.

U. Indicator Lights: 24 volt L.E.D., 100,000 hour lamp life, single 'Push-To-Test' button for all lights in panel.

V. Tower Basin Level Control: Displacement type, top mounting style with flanged connection; NEMA 3R enclosure; stainless steel cable; porcelain displacers; stainless steel clamps; two SPST switches. Upper switch breaks on high level; lower switch breaks on low level. Magnetrol A-153-F tandem, Robertshaw Levelac SL-400, 2" fixed differential on upper level. Enclose displacers in cast iron pipe to prevent false reading from water turbulance.

W. Mounting: All devices shall be anchored in place.

(1) Control Panels: Wood screws to wood back boards.

(2) Panel Mounted Controls: Sheet metal screws to panel backs.

(3) Masonry Wall Mounted Controls: Screws and expansion shields in solid concrete and toggle bolts in concrete blocks, unless otherwise noted.

(4) Plaster and Gypsum Board Walls: Adhesive, plastic shields, or toggle bolts.

X. Carbon Monoxide Detection/Control System:

(1) Controller:

a. Controller shall interface with sensors to switch fan relays at preset levels (field adjustable). Fan relay shall close at 70 ppm CO concentration. Fan relay shall remain closed for a minimum of 3 minutes after CO concentration has decreased to less than 70 ppm. Controller shall have a minimum of 5 input ports for sensors.

b. Manufacturers: Macurco, Inc. Model SS103.

(2) Sensors:

a. Sensors shall convert CO concentration to linear (+7%) voltage output using OP ampdriver and be designed for humid location. Provide matching cover for sensor. Power for sensor shall be derived from controller. Sensor shall mount in Type 4S electrical boxes.

b. Manufacturers: Macurco, Inc. Model SS104.

(3) Conduit and Mounting: Sensors shall be mounted in type 4S electrical boxes. Refer to paragraph 15200 1.3.P.

Y. Space Humidistats: Pneumatic, two-pipe, ambient temperature compensating type with adjustable throttling range. Concealed setpoint adjustments with range stops.

Z. SCR Controller for Underwindow Heat: Controller shall utilize zero angle firing to cycle heaters and provide infinite variations in heater output based on signal received from DDC system. Contractor shall coordinate compatibility of signals to controller and controller inputs. Controller shall control 13.2 KW maximum, 277 volt, single phase circuit. Provide decorative remote mounted enclosure. Indeeco Model H solid state power controller or approved equivalent.

1.4 DIRECT DIGITAL CONTROL SYSTEM

A. General: A distributed, direct digital, control system with standalone DDC control panels shall be located in mechanical room. Each DDC panel shall contain a microprocessor, input/output cards, power supply, 8 hour minimum battery backup, terminal strips, and two wire communications package, keypad and alphanumeric display, all in a NEMA 1 enclosure. Unit shall be arranged for plug-in replacement of failed parts. Provide means for on-site storage of DDC software and immediate on-site re-delivery of software systems for panel. Isolate all DDC electrical circuits from the buildings electrical noise and higher voltages. Pneumatic actuators shall be utilized for all DDC loop functions unless noted otherwise with branch pressure gage located in interface panel.

B. Software: The system shall contain the software required to accomplish DDC of the sequence of operation for each item marked "DDC" in the basic sequence of operation and the additional items listed in this section. Software capabilities shall also include the following sub-routines:

(1) Time of day programming.

(2) Electrical Demand Sensing thru pulse meter and Demand Limiting utilizing a sliding window for projection of demand and shedding of loads on a linear or rotating basis.

(3) Arithmetic calculations.

(4) Logic functions.

(5) P, PI, and PID control loops.

(6) Optimized start.

(7) Analog unit definition and alarm reporting.

(8) O. A. enthalpy sensing and calculation.

(9) Password protection of software.

C. Energy Management and Control: The DDC equipment supplied shall be upgradable to an energy management system by the addition of standard accessories cataloged and offered by the successful control manufacturer. Available management software options shall include the following:

(1) Trend logging.

(2) Graphics.

(3) Maintenance logging.

(4) Boiler/chiller load profiles.

D. Temperature Sensors:

(1) Fluid: Encapsulated resistance element type for mounting in separable thermowell.

(2) Duct Sensor: Averaging resistance type, five feet minimum length.

(3) Room Sensor: Resistance sensor with locking cover without setpoint.

(4) All elements shall have identical characteristics.

E. Flow Rate Transducer (FRT) Probe mounted, low mass rotating element optically coupled to a photo transistor generating a digital pulse train. Unit shall be mounted through a corporation stop permitting removal from active pipe and shall impose no more than three foot pressure drop in pipe. Unit coupled with DDC microprocessor shall provide an accuracy within ±1% of actual flow rate, regardless of span, between minimum GPM and maximum GPM when installed in line size schedule 40 pipe. Repeatability shall be 0.5% of actual flow rate.

F. Humidity Transmitters: Solid state transmitter with built-in non-organic resistance sensor for space and return air sensing, 20 - 80% RH range. O.A. sensor shall be designed for use over wide temperature range for 0% to 100% humidity range.

G. Duct Static Pressure Sensor: Direct sensing, solid state, differential pressure type with hall effect, strain gage or LVDT transducer. Utilize P.I. control loop for control of fan modulation.

H. DDC Monitor Points: In addition to the temperature, pressure, digital or flow sensor points required to implement the sequence of operation, the following points shall be provided for all units:

(1) Temperatures:

Return air.
Mixed air.
Outside air.
Supply air.
Chilled water supply and return, building.
Chiller No. 1 and No. 2 supply & return.
Domestic hot water tank.
Heating water supply and return.
Condenser supply and return (each chiller).
Domestic H.W. supply at blender.

(2) Pressures:

VAV duct static (analog).
HP control air at each compressor (digital).
Fan Status (Digital): AH-1 thru 8, S-1, S-2, E-C2.
Pump Status (Digital): PCP-1 & 2, CP-1 & 2, TP-1 & 2, HP-1 & HP-2.
Bag Filter Pressure Drop (Digital

(3) Flow: Chiller water flow transducer.

(4) Digital Inputs - Auxiliary Contacts in Starters, Etc.:

Chillers:
Cooling Towers:
Fan Status:

(5) Provide three spare input and output digital and analog points for mechanical room.

I. Alarm Reporting: As a minimum, the system shall print and display an alarm message on the central CRT display for the following conditions. The system shall activate an audible alarm tone at the central monitor, and print alarm at printer. Critical alarms shall trigger the auto-dial function to place alarm call when central monitor indicates central monitor is not manned. Alarm feature shall allow for string variable alarm description.

(1) Low control air pressure - critical.

(2) Air flow failure for VAV systems and air handling units AH-3, 5, 6, 7, 8 only. Temperature and humidity out of range. 0° and 55° cold storage rooms.

(3) Supply air temperature rise above 60°F. AH-3, 5, 6, 7, 8 only.

(4) Heating hot water drop below setpoint.

(5) Return air humidity out of range. AH-3, 5, 6, 7, 8 only.

(6) Main Mechanical Room space temperature less than 40° - critical.

(7) Chilled water rise above setpoint.

(8) Bag filter high static pressure. (AH-3, 5, 6, 7, 8 only)

(9) Fan E-C2 Off.

J. Central Monitoring Equipment: Minimum configuration shall include a desktop micro computer with high resolution monitor, 128 K minimum RAM memory, expandable to provide software features specified, detachable ASCII key board with numeric key pad, dual floppy disk drives, hard Winchester disk with controller, disk operating system, basic language compiler/interpreter, spare diskettes (10), diskette cleaner. Dot Matrix impact printer with RS232 serial or Centronics interfaces, 7 x 9 Dot Matrix, 120 CPS, 136 column, logic seek and incremental printing, friction and form feed, printer table, and form rack with one package form feed paper. Portable Dot Matrix printing terminal and key board. Auto-Dial, Auto Answer 1200 baud smart modem for use over switched phone lines. The system software provided with the central monitoring equipment shall be specifically designed for the EMS/Data acquisition tasks specified.

K. Communications: The system shall be capable of remote diagnosis over switched telephone lines. The system shall be capable of monitoring panels located in future building on the site without any modifications to the central monitoring equipment or the DDC system. This does not include the addition of plug compatible equipment that is required to allow this communication to outlying buildings.

1.5 SCOPE OF CONTROL SYSTEM

Provide a complete hybrid DDC/pneumatic system of controls for the air conditioning, heating, and ventilating systems shown designed, installed, and calibrated by Barber-Colman Atlanta, Honeywell, Inc. Atlanta, Johnson Controls Atlanta, or Powers Atlanta.

1.6 SEQUENCE OF OPERATION

A. General:

(1) All operators shall be in NORMAL position when systems are OFF.

(2) Provide firestats in suction of all exhaust fans rated 2000 CFM to 14,999 CFM, unless otherwise noted. (Refer to NFPA 90A, 1976)

(3) Provide smoke detector in supply air stream on all A.C. systems over 2000 CFM. (See NFPA 90A, 1981)

(4) Provide smoke detector in return or exhaust air stream on all air systems over 15,000 CFM. Provide system smoke isolation dampers which close when systems are off. Provide time delay on fan start to allow and verify opening of isolation dampers. (Refer to NFPA 90A, 1976)

(5) Provide time delay restrictor with bypass check on minimum and maximum outside air dampers.

(6) All temperatures are Fahrenheit.

(7) Boiler, computer A.C. units, and chiller controls shall be in accordance with manufacturers published recommendations and control diagrams shall be marked 'Approved' by the manufacturer prior to submittal.

B. Sequence:

(1) AH-1 & 2:

a. Start-Stop:

DDC time of day programming
Interval timer.

b. Safety Controls to Stop Fan:

Firestat in R.A. duct. Freezestat in air entering cooling coil.
Smoke detector in supply air duct.
N.C. fire alarm relay.
N.C. filter media run-out relay.

c. Fan Capacity Control (DDC): Variable speed drive, N.C. fan discharge or inlet damper modulates on control of static pressure sensor in S.A. duct to maintain constant duct pressure. Set .5 inches W.G. at last terminal box.

d. Minimum O.A. Dampers: N.C.; open when DDC system indicates space is occupied.

e. Maximum OA/RA/Exhaust Dampers (DDC): N.C./N.O./N.C.; modulate to maintain 55° mixed air temperature at 55° ODT; reset to 65° mixed air temperature at 30° ODT and below; adjustable range and ratio. NORMAL when minimum O.A. damper is closed.

f. Enthalpy Control (DDC): Actuates maximum OA/RA dampers to allow O.A. for cooling whenever system is on and total heat of outside air is less than enthalpy setpoint.

g. Chilled Water Coil (DDC): N.C. two-way valve, modulates to maintain 55° S.A. temperature at 55° ODT and above.

h. Low Limit Sensor, Cooling Coil Discharge (DDC): Override controls to limit cooling coil discharge temperature to 50° minimum.

i. Morning Warmup (R.A. Temperature Below 65°F): When air handling unit supply fan is running, exhaust fan interlocked with supply air fan shall remain OFF, terminal air valves remain in full open position, fan powered induction unit air valves operate normally.

(2) AH-3, 6, 8:

a. Start-Stop: DDC time of day programming

b. Safety Controls to Stop Fan:

Smoke detector in supply and return air duct.
N.C. fire alarm relay.

c. Fan Capacity Control (DDC): N.C. inlet vanes modulate on control of static pressure sensor in S.A. duct to maintain constant duct pressure. Inlet guide vanes shall be closed on fan startup. Set 0.5 inches W.G. at last terminal box. (DDC).

d. Minimum O.A. Dampers: N.C.; open when air unit S.A. fan is ON and R.A. temperature is above 65°. Close damper if mixed air temperature falls below 40°.

e. Chilled Water Coil (DDC): N.C. two-way valve, modulates to maintain specified leaving air temperature.

f. Spray Coil Pump (DDC): Humidity sensor in return air cycles pump to limit relative humidity to less than 60%.

(3) AH-4:

a. Start-Stop:

DDC time of day programming
Interval timer.
DDC zone low limit set at 65°.

b. Safety Controls to Stop Fan:

Firestat in R.A. duct.
Smoke detector in supply air duct.

c. Minimum O.A. Dampers: N.C.; open when air unit S.A. fan is ON. Close damper if mixed air temperaure falls below 40°.

d. Multi-zone Units (DDC): DDC space sensors modulate cold deck zone dampers and hot deck zone dampers in sequence to maintain setpoint temperature. N.C. two way valve on chilled water coil modulates to maintain 56° chilled water return temperature. Two-way valve, N.C. to coil, modulates to maintain 140° hot deck temperature at ODT of 20° and below, reset to 75° at 70° ODT. (DDC) Utilize space temperature sensors for nite setup/setback during unoccupied times.

(4) AH-5:

a. Start-Stop: DDC time of day programming

b. Safety Controls to Stop Fan:

Firestat in R.A. duct.
Smoke detector in supply air duct.
N.C. fire alarm relay.

c. Fan Capacity Control (DDC): N.C. inlet vanes modulate on control of static pressure sensor in S.A. duct to maintain constant duct pressure. Inlet guide vanes shall be closed on fan startup. Set 0.5 inches W.G. at last terminal box.

d. Minimum O.A. Dampers: N.C.; open when air unit S.A. fan is ON and R.A. temperature is above 65°.

e. Chilled Water Coil (DDC): N.C. two-way valve, modulates to maintain specified leaving air temperature.

f. Spray Coil Pump (DDC): Humidity sensor in return air cycles pump to limit relative humidity to 60%.

(5) AH-7:

a. Start-Stop: DDC time of day programming

b. Safety Controls to Stop Fan:

Firestat in R.A. duct.
Smoke detector in supply air duct.
N.C. fire alarm relay.

c. Minimum O.A. Dampers: N.C.; open when air unit S.A. fan is ON and R.A. temperature is above 65°.

d. Smoke Removal Sequence: Interlock AH-7 to operate with OAD and RAD closed when fan E-Fl is in operation. This sequence shall override all safeties in control circuit.

e. Chilled Water Coil (DDC): N.C. two-way valve, modulates to maintain setpoint of DDC space sensor requiring the most cooling.

f. Heat Coils: DDC space sensor modulates N.O. two-way valves on heating coils to maintain setpoint.

g. Humidity Control (DDC): Humidity sensors in space cycles pump to limit relative humidity to 60%. Room humidity sensors will lower unit S.A. dewpoint temperature if any room relative humidity rises above setpoint.

(6) Fan S-1 & S-2:

a. Start-Stop: DDC time of day programming (2 channels)

b. Safety Controls to Stop Fan:

Freezestat in air entering cooling coil.
Smoke detector in supply and return air duct.
N.C. fire alarm relay.
N.C. filter media run-out relay.
Fan shutdown switch located within fan apparatus casing adjacent to access door.

c. Fan Capacity Control (DDC): N.C. inlet vanes modulate on control of static pressure sensor in S.A. duct to maintain constant duct pressure. Inlet guide vanes shall be closed on fan startup. Set 0.5 inches W.G. at last terminal box.

d. Minimum O.A. Dampers: N.C. open when DDC system indicates space is occupied.

e. Maximum OA/RA/Exhaust Dampers (DDC): N.C./N.O./N.C.; modulate to maintain 55° mixed air temperature at 55° ODT; reset to 65° mixed air temperature at 30° ODT and below; adjustable range and ratio. NORMAL when minimum O.A. damper is closed.

f. Enthalpy Control (DDC): Actuates maximum OA/RA dampers to allow O.A. for cooling whenever system is on and total heat of outside air is less than enthalpy setpoint.

g. Chilled Water Coil (DDC): N.C. two-way valve, modulates to maintain 55° S.A. temperature at 55° ODT and above.

h. Low Limit Sensor, Cooling Coil Discharge: Override controls to limit cooling coil discharge temperature to 50° minimum.

i. Morning Warmup (R.A. Temperature Below 65°F): When air handling unit supply fan is running, exhaust fan interlocked with supply air fan shall remain OFF, terminal air valves remain in full open position, fan powered induction unit air valves operate normally.

(7) Fan E-F5 & E-F6: Operate by electric space thermostat. ON above 80°.

(8) Fan E-A1, E-B1, E-C1, E-D1, E-E1, E-F2: ON when DDC control system indicates that area is occupied.

(9) Fan E-F3 (explosion proof): Operate by push-button station in starter cover.

(10) Fan E-A2, E-A3, E-A4, E-At, E-B-2: Operate by wall switch with pilot light.

(11) Fan E-C2: ON by panelboard.

(12) Fan E-C3: Operate to low speed by interval timer. CO sensor operates to high speed when CO content rises above setpoint.

(13) Fan E-C4: Operates when CO content rises above setpoint (DDC).

(14) Fan E-E2 (Smoke Removal): Operates by pushbutton station in face of starter in space E-04. Provide warning sign as follows: "Smoke Removal from Gallery: OPEN outside entry doors for intake prior to operation".

(15) Fan E-F1 (Smoke Removal): Operate by pushbutton station in face of starter in space F104. Provide warning label as follows: "Smoke removal from 3rd and 4th level Document Storage and Audio Visual Lab: OPEN bag filter doors on unit and penthouse entry doors and block open prior to operation."

(16) Fan E-F4 (Smoke Removal): Operate by pushbutton station in face of starter in space F-23. Provide warning label as follows: "Smoke removal from Museum. OPEN filter doors on either AH-6 (Lower Level) or AH-8 (Upper Level) and respective mechanical room doors and block open prior to operation."

(17) Fan Discharge Dampers: Two position, N.C.; open when fan starts. Provide for supply fans S-, S-2 and AH-3, 5, 6, 7 and 8.

(18) Lead Pump CP: ON when lead pump PCP is on. On continuously below 35° ODT. Provide lead/lag switch in face of panel.

(19) Lag Pump CP: ON when lag pump PCP is on.

(20) Lead Pump HP: ON when either AH-3, 4, 5, 6, 7 or 8 is on.

(21) Lag Pump HP: ON when lead pump HP is on and heating GPM flow rate rises above 62 GPM, OFF at 50 GPM.

(22) Pump TP1 & 2: ON when respective pump, CP is on.

(23) Chemical Feed Pump: Water meter in the makeup water line with electric contact cycles pump thru cycling timer.

(24) Domestic H. W. Pump: Strap-on electric aquastat mounted on recirculating line cycles pump to maintain set point temperature.

(25) Pump PCP-1 & 2: Lead pump ON when any system in building is ON. Lag pump ON when system flow is 340 GPM. OFF when system flow falls to 300 GPM. Provide lead/lag switch in face of panel.

(26) Fuel Oil "FO" Pump: ON by float switch at emergency generator day tank.

(27) Centrifugal Chillers:

a. Parallel Start-Stop: Lead chiller runs when respective CP & TP are running thru DP switches sensing pressure drop thru chiller evaporator and condenser, and electrical interlock with CP & TP starters. Lag chiller runs when respective CP & TP are running.

b. Operating Controls: Built-in operating controls operate chiller in accordance with Equipment specifications.

(28) Safety Control: Safety thermostat in chiller water entering chiller shall stop respective chilled water pump at 90°F.

(29) Tower Fans: Lead tower's N.C. blocking valve is open when either TP is on. Lead fan is on, when blocking valve is open and tower bypass valve is closed. Lag towers N.C. blocking valve is open when lag chiller is on and lag fan is on when blocking valve is open and bypass valve is closed. Provide Lead/Lag Switch. Operating relay shall have adjustable differential (DDC).

(30) Tower Bypass Valve: N.O. two way, butterfly valve modulates to maintain 75° return water from tower.

(31) Tower Basin Level Control: (Provide separate control for each tower.)

a. Normal Levels: N.C. electric solenoid make-up water valve shall open at lower and close at upper levels.

b. Blowdown: A conductivity meter shall, when cooling water is flowing, hold make-up water valve open to overflow level until water conductivity is reduced to an acceptable level.

c. Emergency Level: Respective TP pump shall stop when this level is reached. A manual reset relay shall be provided in control panel to prevent automatic restarting.

(32) Electric Boiler: When either pump HP-1 or HP-2 runs and heating water flow is 120 GPM or above, boiler operates on built-in controls to maintain 115° leaving water temperature. When ODT is below 35° boiler shall be energized regardless of flow.

(33) Tower Control During Emergency Generator Operation: Generator blocking valve opens and starts TP-1. If flow is not established in 2 seconds, TP-1 shall be turned off and TP-2 shall be started. Tower associated with successful TP shall modulate tower bypass valve and tower fan in sequence to maintain 85° EWT to generator.

(34) Dual Minimum Terminal Heat Units: Refer to Equipment Specifications. Pneumatic space thermostats modulate variable volume air dampers from maximum to minimum position and one or two-stage (as specified) electric duct heaters in sequence to maintain set point temperature.

(35) Fan Powered Series Induction Boxes: Unit fans run when respective unit supply fan is ON or by nite thermostat. Provide fan start sequence so that unit fans on series fans are operating before unit supply fan starts. Pneumatic space thermostat modulates N.C. damper actuators and two stage electric duct heaters in sequence to maintain setpoint temperature.

(36) Terminal Units: Pneumatic space thermostats modulate N.O. damper actuator to maintain set point temperature.

(37) Terminal Reheat Units (Humidity Control): Pneumatic space thermostats modulate N.C. damper to maintain setpoint temperature from maximum to adjustable minimum in sequence with N.O. hot water valve. Room humidistat shall override thermostat to modulate damper open to maintain humidity setpoint while thermostat controls reheat.

(38) Electric Unit Heaters: Fan and heater operate by three stage pilot duty electric wall thermostat thru built-in limit control. OFF above 50° ODT, 50° setpoint. Allow third stage below 30° ODT only.

(39) Automatic Roll Filter: Interlock with respective system fan. Controls provided with filter.

(40) Electric Baseboard: ON when respective unit is on and ODT is below 55° or by nite thermostat. See F.P. boxes. See relay to electric panel. Cycle on built-in thermostat.

(41) Fan Coil Units: N.O. two-way heating coil valve and N.C. two-way cooling coil valve shall modulate in sequence on control of wall mounted pneumatic thermostat to maintain space temperature. Start/stop: DDC time of day programming.

(42) Motorized Intake Damper: Pneumatic operator opens shutter when fan E-F3 is ON.

(43) Smoke Control: Fan discharge and return air dampers shall be closed whenever respective supply fan is OFF, unless otherwise noted.

(44) Unit Ventilator: Normally closed, two-position chilled water valve and face and bypass dampers shall modulate to maintain space temperature when space temperature is above setpoint. On decrease in space temperature, thermostat shall modulate N.O. hot water valve (UV-1) or cycle under window heat (UV-2) to maintain space temperature.

(45) Under Window Heat (UWH-1 and 2): On when ODT is 55° or below. Modulate by SCR controllers controlled by DDC space temperature sensor located as shown. Except heaters in space B29 shall be controlled by Mercury contactors. Locate contactors in storage space entered by door 22.

(46) Fan E-E4: ON when AH-3 is ON.

(47) Fan E-E3: (Smoke removal) Operate by pushbutton station in face of starter in space E04. Provide warning sign as follows: "Smoke removal from Auditorium: OPEN outside entry doors and auditorium doors prior to operation." Interlock N.C. control damper in exhaust duct (locate as shown on drawings) to open when fan E-E3 is energized.

END OF SECTION

SECTION 15300 - AIR DISTRIBUTION SYSTEM

1.1 RELATED DOCUMENTS

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

1.2 REQUIREMENTS

Include apparatus casing; supply, return, exhaust, relief and outside air ductwork; accoustical liner; and accessories as shown, to make a complete air distribution system. References are to SMACNA Low Pressure Duct Construction Standards, Fifth Edition, 1976, unless otherwise noted. Duct shall be galvanized steel construction. All duct dimensions are net inside, unless otherwise noted.

1.3 LOW & MEDIUM PRESSURE DUCTWORK

All supply air ductwork from supply fan discharge through terminal air valves shall be medium pressure construction. All other ductwork shall be low pressure construction, 2" static pressure rating, class "B" seal in accordance with SMACNA, except as otherwise noted.

1.4 MOISTURE INTEGRITY

A. Roof: All roof fans, curbs, outside air intakes, and roof penetrations shall be watertight.

B. Walls: All wall louvers and wall penetrations shall be watertight.

1.5 DUCT FITTINGS AND ACCESSORIES

A. Duct Hangers: Figure Nos. 5-1 through 5-7. Ducts shall not be supported from metal roof deck unless otherwise noted.

B. Flexible Connections: Install in duct connections to equipment, where shown and at all equipment with motors unless otherwise noted, of fireproof material composed of watertight, impregnated 30 ounce glass fabric. Table 2-1 and Figure 3-5. Do not install on curb mounted fans. Install 1/2" wide braided copper wire grounding strap across all flexible connections on air handling units, unless otherwise noted.

C. Branch From Trunk Duct and Tap-in Connections: Figure Nos. 2-2, 2-5, 2-6, 2-10, 2-15, 2-16 and 2-17.

D. Angle Frames: 24 gauge galvanized with dapped and lapped corners. Provide where exposed ducts penetrate walls and floors except where fire dampers or grilles are installed. Secure to ducts and caulk between frame and wall.

E. Access Panels & Doors: Insulated access doors; Figure 2-14, insulated where duct is insulated or lined with only metal exposed to the airstream. Inside dimensions shall be sized to provide access to indicated damper, 12" minimum except one dimension shall be 2" smaller than duct for ducts under 14". Provide at all concealed dampers, fire dampers, electric duct heaters and where shown. Seal door duct joints airtight for indicated duct pressures in accordance with manufacturers recommendations shipped with door. Maximum leakage per door @6" of water pressure shall not exceed 2 CFM. Factory fabricated doors are acceptable; Ventlok, Airstream, D.A.D., Prefco HAD, Cesco CAD-10, National Controlled Air ADR.

F. Turning Vanes: Figure Nos. 2-3 and 2-4; single vane for 18" width and less; double vane over 18" width or height. Provide at all square elbows where noted.

G. Acoustical Turning Vanes: Factory fabricated vanes, air foil shaped, consisting of fiberglass enclosed in aluminum casing, rated for velocities up to 4000 FPM. Airsan-Acoustiturn, John Gruss Acoustic Vane, Peabody & Wind.

H. Duct Joint Tape: Tape transverse joints in all low pressure metal supply ducts. Tape shall be SMACNA approved, U.L. 181 listed and have 50 oz. per sq. in. minimum adhesion. Taped joint shall be 2-1/2" total width minimum. Omit tape on uninsulated ducts exposed in finished areas.

I. Easements: Figure 2-8.

J. Manual Splitter Dampers, Low Pressure Ducts: Figure Nos. 2-5 and 2-11 with brass pivots. Damper blades: galvanized steel, duct depth minimum gauge: up to 12", 22 gauge; 13" to 24", 20 gauge; and 25" & deeper, 18 gauge. Dampers shall be provided with locking quadrants outside insulation, or push rods where shown. Length of damper shall be minimum of 1 1/2 times width of smaller split dimension with 12" minimum length. Seal all duct openings airtight.

K. Manual Volume Dampers: Figure Nos. 2-11 and 2-12. Dampers shall be opposed blade when larger than one blade. 2" x 1/2" x 1/8" steel channel frame with blade stops top and bottom; 16 gauge steel blades with formed edge groove to have 3/8" interlock between adjacent blades, 7" maximum blade width; self-lubricating oilite bronze or nylon bearings with 1/2" diameter cadmium plated shaft extended 6" beyond frame; blade linkage; locking quadrant and rust inhibitor coating. Provide dampers in each zone duct of multi-zone systems and as shown.

L. Heating Coil Mounting: Figure No. 2-9.

M. Test Openings: Provide plugged brass 3/8" openings in ducts and apparatus casings adjacent to all temperature and pressure transmitters.

N. Paint: Inside of ducts visible thru grilles, registers and diffusers shall be painted flat black.

O. Transformations: Changes in duct sizes shall be made via transformations. Transformations shall be provided between equipment and duct where sizes are not the same. Where duct transformations occur, unless otherwise noted, the slope shall not be greater than 1" in 4", with a slope of 1" in 7" space permitting.

P. Duct Openings: Ducts shall have openings 1/2" larger maximum than the overall duct dimensions framed in place when walls are constructed, except for sidewall grilles, and 1/2" larger maximum when floors are poured. Note different requirements for fire dampers, sound isolation treatment, and special appurtenances. Space between duct and structure shall be filled with 1" thick, 3/4# density fiberglass duct insulation except in fire and mechanical room partitions and floors which shall be sealed tight with U.L. classified foam type sealant, for fire rated penetration seals, having flame spread rating of 20 in accordance with ASTM E-84-80. Alternate utilizing thermofiber mineral fiber as detailed is acceptable.

Q. Multi-Zone A.H. Unit Zone Damper Duct Connections: Zone duct sizes connecting to zone dampers shall be not less than 80% of trunk duct size shown on plans.

1.6 LOW PRESSURE METAL DUCT CONSTRUCTION

A. All low pressure duct shall be 2-inch static pressure rating, Class "B" seal, in accordance with SMACNA Standards. Best bloom galvanized steel of gauges and construction shown in the following table, unless otherwise noted. Metal stamp shall be visible after installation, showing metal gauge.

TABLE OF LOW PRESSURE DUCT CONSTRUCTION

DIMENSION IN INCHES	GAUGE	TRAVERSE JOINTS LONGER SIDES	TRAVERSE JOINTS SHORTER SIDES	ANGLE REINFORCING BETWEEN JOINTS (1)
Thru 12	26	Hemmed S Slip	Drive Slip	---
13 thru 18	24	D.O.	Drive Slip	---
19 thru 30	24	1-inch Bar Slip	Reinforced Drive Slip	1" x 1" x 1/8" @5-feet O.C.
31 - 42	22	D.O.	1-inch Bar Slip	D.O.
43 - 54	22	1 1/2-inch Bar Slip	Same as Longer Side	1 1/2" x 1 1/2" x 1/8" @5-feet O.C.
55 - 60	20	D.O.	D.O.	D.O.
61 - 84	20	1 1/2-inch Reinforced Bar Slip W/1 3/8" x 1/8" Bar	D.O.	1 1/2" x 1 1/2" x 1/8" @30-inch. O.C.
85 - 96	18	1 1/2-inch Angle Reinforced Pocket LockO.C.	D.O.	1 1/2" x 1 1/2" x 3/16" @ 30-inch.
Over 96	18	2-inch Angle reinforced pocket lock	D.O.	2" x 2" x 1/4" @ 30-inches O.C.
Thru 8 Ø	24	Lock Type Seal - Crimped and Beaded Girth		
9 - 22	22	D.O.	D.O.	
23 - 36	20	D.O.	D.O.	

(1) Ductmate reinforcing methods is an acceptable alternate.

B. Longitudinal Seams: Pittsburgh Lock for corner seams or button punch snap lock sealed with high pressure duct sealant before assembly; Acme Lock for all other seams.

C. Gauge and reinforcing is determined by dimension of longest side of duct.

D. Reinforcing at joints is same size as reinforcing between joints.

E. Fasteners for angle reinforcing and bar slips on short sides shall be 6" O.C.

F. Drive slips shall be used on short sides 18" or less and reinforcing drive slip shall be used on short sides 19 to 30", except when pocket lock is called for on long sides, use on all four sides.

G. Joints on longer sides shall be not less than 1/4" shorter than duct dimension.

H. All dimensions and sizes are inside measurements in inches unless otherwise shown.

I. Longitudinal seams using button punch snap lock shall be sealed airtight during construction using high pressure duct sealant.

J. Longitudinal Joints: Pittsburgh Lock, 19-inch and over; button punch snaplock, 0 to 18 inch maximum size.

K. All exposed duct within Document Storage areas shall be of "Streamline" construction.

1.7 MEDIUM PRESSURE DUCT

A. Rectangular Ducts: Galvanized steel - SMACNA High Pressure Duct Construction Standards, Third Edition, 1975, Chapter 4, Table 4 3. Seal and gasket all duct joints at dampers and accessories, and seal all duct penetrations airtight. Pocket lock joints are not permitted.

B. Round Ducts: Round and oval ducts and fittings shall be spiral pipe and fittings. Use couplings at connection of flexible tubing. Assembly and installation shall be in accordance with SMACNA High Pressure Duct Construction Standards, Third Edition, 1975, Chapter Nos. 2 and 3, and manufacturer's installation data shipped with material. Reinforcement of flat oval ducts shall be for 6 inches W.G.

C. Fittings: All 90° tees shall be conical; all 90° elbows shall be radius type for small sizes, 5 gore for larger sizes. All fittings shall be factory fabricated by spiral duct manufacturer.

D. Acoustically Lined Round and Oval Duct: ("K" Duct)

(1) General: Lining and accessories shall have a composite flame-spread rating of not more than 25 and a smoke developed rating of not more than 50. Liner shall be minimum 1-inch thick fiberglass, covered with a perforated metal liner throughout. For duct sizes 34-inch ID (equivalent round) and smaller, metal liner shall be joined by slip-joints for double concentric couplings, and outer casings shall have slip-fit joints. For duct sizes larger than 34-inch ID, (equivalent round) metal liner shall have separate couplings and the outer casing shall be joined by angle-ring flanged connections. Outer casing shall be constructed of galvanized steel conforming to the following:

Nominal Duct Size	#U. S. Gauge
6" and smaller	26
7" - 20"	24
21" - 34"	22
36" - 48"	20
49" and greater	16

(2) Construction: Duct 49" (equivalent round) and greater nominal size, shall be of longitudinal seam, continuous butt welded construction. Below 34" I.D. (equivalent round) metal liner shall be joined by slip joints or double, concentric couplings. Outer casings shall have slip fit joints. Above 34" I.D. metal liner shall have separate couplings, and outer casing shall be joined by angle ring flanged connections. Duct dimensions shown are dimensions of perforated liner.

E. Tests: Duct shall be pressure tested as a whole or in part prior to installation of flexible duct and connection to equipment.

F. Joints: Seal all joints with high pressure duct sealant. On exposed duct, apply sealant to female fittings; sealant shall not be visible.

G. Manufacturers: Semco, Inc., Spiramatic, U. S. Air Duct, United Sheet Metal Company, West-Spiro Co., Peabody and Wind, Monroe Metals, R.V. Money, Spiral Duct and Fittings.

1.8 DUCTWORK BELOW SLAB

A. Ducts under concrete slab shall be installed as follows and as detailed on plans:

(1) P.V.S. Duct: Round ducts shall be P.V.S., galvanized metal sheet coated with Polyvinyl Chloride, installed as follows:

a. Manufacturers Recommendations: Installation shall be in accordance with manufacturer's recommendations.

b. Trench fill to receive duct as shown in detail. Install P.V.S. duct providing minimum clearance between top of duct and finish floor level shown and provide sand bed beneath duct. Where top of duct is 4 inches or less below bottom of slab, lay vapor barrier of width to provide 18 inch lap with floor vapor barrier. Where metal coating has been damaged, thoroughly clean surface and spray damaged area with special epoxy spray.

c. Round Fittings: P.V.S. air duct fittings. P.V.S. joints shall be made with P.V.S. hardcast tape.

d. Rectangular Fittings: 20 gauge minimum welded galvanized steel. Coat with three coats of rust preventative; one coat RUST-OLEUM No. 3268 red and one coat RUST-OLEUM No. 3237 green, and one coat asphalt mastic. Encase all metal below the floor slab with 2-inches minimum thickness of concrete wrapped in vapor barrier.

e. Provide supervisor at the job site during pouring of main slab to insure against damage to ducts.

f. Extreme care shall be exercised in the positioning and installation of supply grilles installed in the slab and supplied thru duct to insure correct location, squareness, and elevation.

B. Fiberglass Duct: As an acceptable equal to PVS duct, round ducts shall be fiberglass polyester duct and fittings as manufactured by Spunstrand, Inc. or equal, installed as follows:

(1) Manufacturers Recommendations: Installation shall be in accordance with manufacturer's recommendations.

(2) Trench fill to receive duct similar to transite detail. Install fiberglass duct providing minimum clearance between top of duct and finish floor level shown and provide 4-inch pea gravel bed beneath duct. Where top of duct is 4-inches or less below bottom of slab, lay vapor barrier of width to provide 18-inch lap with floor vapor barrier.

(3) Round Fittings: Factory fabricated Spunstrand air duct fittings.

(4) Rectangular Fittings: 20 gauge minimum welded galvanized steel. Coat with three coats of rust preventative; one coat RUST-OLEUM No. 3268 red and one coat RUST-OLEUM No. 3237 green, and one coat asphalt mastic. Encase all metal below the floor slab with 2-inches minimum thickness of concrete wrapped in vapor barrier.

(5) Provide supervisor at the job site during pouring of main slab to insure against damage to ducts.

(6) Extreme care shall be exercised in the positioning and installation of supply grilles installed in the slab and supplied thru fiberglass duct to insure correct location, squareness and elevation.

1.9 FIELD FABRICATED APPARATUS CASING

A. General: SMACNA High Pressure Duct Construction Standards, Third Edition, 1975, Chapter 8. All materials shall be galvanized steel.

B. Walls & Ceilings: Figures 8-5, 8-8 and 8-10. Standing seams shall be to inside, 22" maximum spacing. Angles shall be to outside. Provide angle frame around top and sides of doors as shown for fan and duct openings, using continuous top horizontal stiffening angle for top of door frame. Where building structure forms ceiling, provide angle at top of wall panels same as at bottom. Provide removable panel where shown.

C. Doors: Figure 8-9, Section C-C, 24" x 60" unless otherwise shown. Angle frame to be clear of Zee frame to permit door operation. Provide nominal 12" square Young Regulator No. 1313, Ventlok, or Vision Lite visual access panels in top half of doors.

D. Condensate Drain Pans: No. 316 stainless steel, 16-gauge, 1" deep, with seams and joints welded with S.S. rod. Size pans to extend 12" beyond face of coil and 4" longer than overall coil length. Provide 1 1/2" type 'L' hard drawn copper drain braced at bottom with 3/4" copper strap.

1.10 PREFABRICATED APPARATUS CASING

A. General: Apparatus casing shall be prefabricated insulated casing with minimum construction requirements, SMACNA High Pressure Duct Construction Standards, Third Edition, 1975, Chapter 8.

B. Panel Construction: 20 gauge minimum galvanized steel face and 22 gauge, minimum back sheets; or .032" thick textured aluminum; perforated back liner; 16 gauge, minimum galvanized steel trim; rigid insulation of thickness to provide a thermal conductivity not greater than 0.065 BTU/HR $Ft.^2$ °F at 75°F mean temperature. Provide removable panel where shown.

C. Building Wall & Ceilings: Where concrete or masonry building walls and ceilings form a portion of apparatus casing, abut prefabricated panels to building construction and provide angle the same as at floor and ceiling. Insulate concrete and masonry building areas as specified in Section 15700 but omit insulation on prefabricated panels.

D. Doors: Figure 8-9, Section C-C, 24" x 60" unless otherwise shown. Angle frame to be clear of Zee frame to permit door operation. Provide nominal 12" square Young Regulator No. 1313, Ventlok, or Vision Lite visual access panels in top half of doors.

E. Condensate Drain Pans: No. 316 stainless steel, 16-gauge, 1" deep, with seams and joints welded with S.S. rod. Size pans to extend 12" beyond face of coil and 4" longer than overall coil length. Provide 1-1/2" type 'L' hard drawn copper drain braced at bottom with 3/4" copper strap.

F. Manufacturers: United Type HS Uni-Housing; Gale Sound Plenum II; IAC Quiet-Flow; Buensod Acousta-Panel; Korfund Noise Guard; Semco; Peabody & Wind; Rink; Acoustifoil Sound Reduction Panels; Sound Control Devices.

1.11 FLEXIBLE DUCT (HIGH & LOW PRESSURE)

A. Core: Metal Helix bonded to a flexible fabric; U.L. listed Class 1 air duct connector; compliance with NFPA 90A and 90B; pressure rated to 10" W.G. and 200°F. Helix not constructed of corrosion resistant metal shall be coated to prevent corrosion. Polyester material is not acceptable for core.

B. Insulation: All flexible duct shall be insulated unless otherwise noted. Insulation shall be 1" minimum thick, 3/4-lb. minimum density fiberglass with vapor barrier jacket. Aluminum foil jackets shall be reinforced.

C. Installation: Flexible duct shall be installed in a fully extended condition free of sags and kinks, in maximum lengths of 5 feet. (in minimum lengths to make a smooth connection.) Flexible duct shall NOT be utilized to correct for misalignment. All flexible duct connections shall be made by coating the interior of the duct to a depth of 3" with an approved high pressure duct sealer, and secured in place over sheet metal collar with 1/2" wide positive locking steel straps. Vertically suspended ducts shall be additionally secured with a minimum of three sheet metal screws on no greater than 8" centers. Horizontal support shall be provided at maximum intervals of 3 feet with 3" wide flat banded material or as recommended by manufacturer. Wire hangers shall not be used under duct.

D. Manufacturers: Clevaflex 'KQ'; Flexmaster Type 3; Genflex IHPL-1; Portoduct AK; Thermaflex II M-KC; Wiremold 57K.

1.12 DUCTWORK ACOUSTICAL LINER

A. Plate No. 48, Fig. B. Glass fiber duct liner, 3 pound density, with mat faced, coated finish. Liner shall be glued to inside of ductwork during fabrication with fire retardant adhesive, 95% maximum adhesive coverage, and further anchored with Graham Insul-pins and Insul-clips. Adhesive shall be Benjamin Foster 81-60, Insul-Coustic #225 or Certite. Liner to have flame spread factor less than 25. Line supply, return, and all outside air ducts. Provide 26 gauge shield on leading edge at fan discharge. Duct sizes shown include allowance for liner thickness unless otherwise noted, except sizes shown for lined round and flat oval duct are sizes of perforated liner. Longitudinal and traverse joints on supply ducts shall be coated with adhesive and shall be under compression when installed to prevent air leaks and duct condensation. Liner shall be 1" thick unless otherwise noted.

B. Fasteners shall start within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and shall be spaced at a maximum of 12" o.c. around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere they shall be a maximum of 18" o.c., except that they shall be placed not more than 6" from a longitudinal joint of the liner nor 12" from a corner break.

1.13 CEILING SYSTEM SUPPLY AIR BOOT

Air diffusers shall be of a linear type and shall be designed to be compatible with the 1" wide continuous tract between ceiling modules to supply air in the specified manner. Air connector shall be die drawn steel with galvanized coating with an inner lining of fiber glass insulation, 1/2" thick minimum. Each diffuser shall be furnished with a volume control damper, adjustable from below, and an inlet collar for 6" diameter flexible duct. Air pattern control blade shall provide horizontal air distribution, two way delivery. The overall height of a diffuser and connected flexible duct shall not exceed the overall height of a fluorescent module.

1.14 LIGHT TROFFER SUPPLY AIR FITTINGS

A. General: Light troffer supply air fittings shall be internally insulated with nominal 1/2" insulation and be compatible with ceiling system and regressed slot troffers provided under other sections. Each diffuser shall be equipped with built-in volume controllers and adjustable air flow pattern that can be adjusted through the air discharge slots of the combination diffuser troffer without opening the lens door of the light fixture. The supply air fitting shall snap into the light troffer on the job without the requirement of screw type fasteners.

B. Capacities:

(1) Single side, 2' x 4' regressed slot troffer 0.14 and 0.11" W.G. pressure drop maximum respectively at 80 CFM and 70 CFM.

(2) Double side saddle, 2' x 4' regressed slot troffer 0.11" and 0.09" W.G. pressure drop maximum respectively at 130 CFM and 120 CFM.

C. Manufacturers: Barber-Colman LRLS single side and LRLS two-side or approved equal by Anemostat, Carnes, Connor, Krueger, or Tuttle & Bailey.

1.15 GRILLES, REGISTERS & DIFFUSERS

Provide supply, return, relief and exhaust air grilles and registers and ceiling diffusers as shown. Model numbers are Barber-Colman. Grilles by Anemostat, Carnes, Connor, Krueger, Titus, EAP, Metalaire or Tuttle and Bailey are acceptable. See Schedule. Furnish door grille cores for

installation under another section. Interior finish of diffusers shall be painted where visible. Provide deflectrols at supply grille and diffuser collar tap-ins to trunk ducts, at runout duct tap-ins and where shown. Grilles, registers, and diffusers located in fire rated ceilings shall be of the construction listed in the ceiling system and shall be of steel attached to duct outlet with a minimum of 3 equally spaced steel sheet metal screws. Where grilles having removable cores are specified and a manufacturer is listed which does not make removable cores, auxiliary frames shall be provided. Coordinate locations of ceiling diffusers and grilles with lights and ceiling grid. Lattice core grilles for installation in Tee-bar ceiling systems are nominal size. Size to fit applicable ceiling system. Face plates of perforated ceiling diffusers shall not be less than 22 gauge (0.0299 inch) thickness.

1.16 VARIABLE VOLUME CEILING DIFFUSERS

A. General: Variable air volume diffusers shall be thermostatically operated to vary the supply air volume between the minimum and maximum flow rates within a ±2°F temperature variation. The temperature setting shall be field adjustable within a 70° to 80°F temperature range. Diffusers shall be of type and sizes as shown. A manual volume damper for balancing maximum CFM shall be provided for each diffuser take-off or drop.

B. Cooling Only (VAV-C): Diffuser shall vary air volume from maximum at call for full cooling to minimum at call for no cooling.

C. Heating/Cooling (VAV-A): Operation shall be same as cooling only unit except sequence shall automatically reverse when supply air temperature rises above 75°F.

D. Manufacturers: 'Therma-Fuser' by Acutherm; Conner NPM with wall mounted thermostat of manufacturer and type provided under CONTROLS, Dynafuser.

1.17 SCOOP OR ADJUSTABLE EXTRACTOR

Provide adjustable extractor where scoop or extractor is shown or indicated. Extractor shall be gear operated and provided with all accessories to provide adjustment with knob from outside of duct. Adjustment shall not be by fastening of operating rod or strap to duct. Center to center distance between vanes shall be spaced to provide shut-off of air when extractor is closed (approximately 1" center to center).

1.18 DEFLECTROL

Provide where specified or indicated. Deflectrols shall be 3/4" vanes in a fixed arrangement with stiffeners. Assembly shall be adjusted and installed to a 15° angle from connecting side of duct.

1.19 AUXILIARY DRAIN PAN

Provide 18 gauge welded 304 stainless steel auxiliary drain pan for penthouse air handling units where shown. Pan depth shall be 2" minimum with screwed connection for 1" auxiliary drain pipe. Connection location and pan shall be arranged to allow pan to drain condensate and not accumulate water. S.S. welding rod shall be utilized.

1.20 ACCESS DOORS IN WALLS OR CEILINGS

Provided under Architectural.

1.21 FIRE DAMPERS

A. General: Dampers shall bear a label by a recognized testing authority, U.L., F.M., or Southwest Research, and unless otherwise shown, dampers shall be as follows:

B. Retractable Blade Dampers: Designed to comply with NFPA 90A, 1981, requirements, with Code gauge sleeve and angle frame for permanent installation. Damper shall be Type 'A', same size as duct unless otherwise noted. Net damper opening of low resistance type 'B' dampers in retracted position shall not be less than 90% of cross sectional area of attached duct. Dampers installed in supply outlet collars shall not interfere with the air distribution of the outlets. Dampers in medium pressure ducts shall be Type 'C'. Dampers shall have 1 1/2-hour rating, unless otherwise noted.

C. Fire Rated Ceiling Dampers: Dampers shall conform to requirement of ceiling rating. Where approved, dampers shall be U. L. labeled.

D. Manufacturers: Advanced Air, Inc.; American Warming and Ventilating; Air Balance; Air Stream; Louvers and Dampers; Prefco; United; Ruskin; SMACNA; Pacific Air Products; Phillips; Safe-Aire; Air Control Products; Venco; National Controlled Air.

1.22 FABRIC RELIEF DAMPER (TOILET RELIEF AIR SUPPLY (RAS))

60% minimum free area, neoprene coated fabric, 16 gauge minimum galvanized or aluminum frame, expanded metal rear grille, with rust inhibitor coating. American Warming and Ventilating Series SHB-P-1217; Breidert; Cesco Model 'H'; Dowco Model SHF; Vent Products 3600; Louvers & Dampers, Inc. PRD-220; Ruskin Type NMS; Industrial Louvers BDD-900 relief damper with fabric blades.

1.23 COUNTER BALANCED RELIEF DAMPER

Linked aluminum blades, 16 gauge minimum; horizontal mounting vinyl gasketed blade edge seals and end stops; ball bearings; steel channel frame; 2500 FPM maximum rated velocity; factory set at 0.1"W.G. with field

readjustment, and flanges as required. American Warming No. 494; Ruskin No. CBD-4; Dowco No. BRL; Industrial Louvers A-BDD910.

1.24 LOUVERS

Specified under Architectural.

1.25 PENTHOUSE

Extruded aluminum, pitched roof, box corner, 45° angle stormproof blade with 1/2" mesh aluminum screen, curb cap and thermal insulation and acoustic damping panel of sizes shown. Provide factory fabricated metal curb with formed cant to match penthouse. Air Balance Model AC; American Warming & Ventilating 1447, "K" blade; Carnes P-442; Exitaire type LR; Penn "Pennhouse"; Louvers & Dampers PL-310; Dowco P-LE; Industrial Louvers LPH-482; Shipman LPH; Industrial Louvers 482; Cook "TRE".

1.26 EMERGENCY GENERATOR EXHAUST DUCT

ASTM A167, Type 304L stainless steel, 12 gauge.

1.27 EXHAUST DUCTS FROM HOODS OVER COOKING EQUIPMENT

A. 16 gauge black steel with welded joints and seams, free from interior obstructions in accordance with NFPA Pamphlet #96. Connect to hood collar.

B. When permitted by the authority having jurisdiction, ducts may terminate into the base of an up discharge exhaust fan provided the ductwork extends a minimum of 18" above the roof surface and is constructed of materials complying with the provisions of 3-2.1, and at least 40" of clearance above the roof is maintained between the exhaust discharge and the roof surface.

1.28 DISHWASHER EXHAUST DUCT

20 gauge aluminum with joints and seams sealed with waterproof mastic joint sealer. Install and slope duct so that any interior condensate will drain out grille or hood connections. Sealer shall not be visible outside duct and shall be 3M-800, Tuff Bond #29, United, Miracle D618 duct sealant.

1.29 DRYER VENT

Duct shall be high pressure spiral pipe with fabricated fittings with the interior free of sheet metal screws and obstructions. SMACNA High Velocity Duct Construction Standards, Second Edition, Figure 2-2. Vent as shown.

1.30 CARBON MONOXIDE FUME COLLECTION SYSTEM DUCT

A. Underground: Cast in place concrete. Refer to Architectural.

B. Above Ground:

(1) Round Duct: High pressure spiral pipe and fittings as manufactured by United Sheet Metal Company. Clean male end of fitting with solvent, apply sealer, assemble joint, and secure by tack welding minimum four points. Solvent and sealer shall be as recommended by duct manufacturer.

(2) Duct & Fittings:

a. Duct: 22-gauge galvanized steel minimum meeting ASTM A-39-59T requirements except 20-gauge drops to booths.

b. Fittings: 20-gauge galvanized steel minimum.

c. 90 Degree Elbow: 5 piece.

d. 45 Degree Elbow: 3 piece.

e. Tees and Laterals: Conical.

f. Reducers: Eccentric.

g. Volume Damper: Provide damper with locking quadrant at each take off.

(3) Manufacturers: Ray Industries, Pressure Air Duct, Spira-Matic, United Sheet Metal Company, or West-Spiro Co.

(4) Rectangular: 18 gauge black steel with welded joints.

1.31 DUCT LAGGING

A. General: Exterior of rectangular ductwork where noted shall be covered with two layers of gypsum wallboard.

B. Materials:

(1) Wall Board: 5/8-inch thick type X, unfinished gypsum wall board complying with requirements of ASTM C-36.

(2) Screws: Self-tapping Phillips head dry wall screws, black oxide finish, 1-inch length.

(3) Adhesive, Joint Compound and Tape Reinforcement: Standard of wallboard manufacturer for wall board-to-metal.

(4) Galvanized Wire Ties: 16 gauge steel.

C. Installation:

(1) Install base layer of wallboard around exterior of duct, imbedded in adhesive, and secure with screws a maximum of 24-inches on center. Butt traverse joints and lap joints at corners.

(2) Install screws no closer than 1-inch to end or edge of wallboard. Drive screws with power screwdriver as recommended by wall board manufacturer.

(3) Fill heads of all screws, with joint compound and seal all joints and corners with joint compound and tape reinforcement.

(4) Adhesively attach second layer of wallboard to the base layer and wire tie in place a maximum of 24-inches on center. Stagger all traverse and edge joints a minimum of 12 inches from joints in base layer. Seal all joints and corners with joint compound and tape reinforcement.

(5) Coat screw penetrations inside duct with high pressure duct sealant to seal airtight.

1.32 ROOF MOUNTED HOOD

Rectangular, low silhouette type, 18 gauge galvanized construction with prime coated paint finish bird screen, fiberglass thermal insulation and acoustic damping panel of sizes shown. Acme 'Skymaster'; Carnes 'LV'; Greenheck 'FHR'; Louvers and Dampers AGE 200; Penn 'Airette'; Shipman 'S-RV-1'; Hurricane 'EV', Cesco model 'VS'; Power Line 'RR-L'; Vent Products '6100'.

1.33 ROOF CAPS

Galvanized steel, non-back draft design. Minimum gauges: Up thru 12" neck diameter, 24; 14" - 18", 22; 20" & 24", 20; and 20" - 48", 18. Acme MVR; Breidert type "L"; Louvers & Dampers SV; Penn Omega; Triangle AFL.

END OF SECTION

SECTION 15400 - EQUIPMENT

1.1 RELATED DOCUMENTS

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

1.2 REQUIREMENTS

Requirements specified herein are minimum. All equipment, when installed, shall perform equal to or exceed specified requirements.

1.3 INSTALLATION

All equipment shall be installed in accordance with manufacturers published installation instructions shipped with the equipment. In the event there is a discrepancy between these specifications or plans and the manufacturers instructions, no work shall be performed until additional instructions are received.

1.4 CENTRIFUGAL WATER CHILLER

A. General: Hermetic water chilling package consisting of rotating compressor, motor, evaporator, condenser, lubrication system, starters, instrumentation, capacity and safety controls, steel mounting base (a maximum of four assembly mounting points), refrigerant and oil charges. Approved refrigerants are R-11, R-12 and R-22. Seller of chiller shall have factory maintained service organization and repair parts stock within the State of Georgia.

B. Motor: (See SECTION 15010.) Refrigerant cooled four (4) pole squirrel cage induction type with six (6) external leads for Star-start Delta-run operation or open motor. KW input shall not exceed nameplate rating. Starting inrush current shall not exceed one-third of nameplate locked rotor current rating.

C. Starter: NEMA I free standing enclosure with door lock, containing compressor and oil pump starters, and current transformer for compressor load limit mechanism. Compressor starter shall be Star-start Delta-run closed transition type with three-phase overload protection and time-limit acceleration. A 3 KVA, minimum, transformer shall be mounted within enclosure to provide 120 volt power for purge pump and chiller control. Power and control wiring shall be complete to terminal blocks, requiring only external field connections. A wiring diagram shall be permanently affixed to the inside of the

enclosure door. Instruments specified below and not included in the machine's control cabinet shall be flush mounted in the enclosure door. Provide built-in molded case circuit breakers, 25,000 A.I.C. symmetrical, minimum, for compressor, oil pump, and primary and secondary of transformer. Starter shall be equipped with phase failure, phase reversal, under voltage and ground-fault protection; surge capacitor and lightning arrestors. Nameplate on starter door shall indicate chiller F.L.A. An approved starter mounted on the chiller from the factory will be acceptable.

D. Compressor: Rotating compressors of the enclosed impeller centrifugal type are approved. Compressors shall have gas flow control to vary machine capacity from 100% to 10% while maintaining stable operation of the machine with cooling water supplied between 65°F and 85°F. KW input at 10% capacity shall not exceed 20% of full load rated KW.

E. Lubrication System: Hermetic forced feed type with oil sump containing low density electric heater, cooling coil, thermometer, sight glass and charging valve, filter, pressure relief valveand interconnecting tubing. Compressor and gear oil reservoirs shall have capacity to provide bearing lubrication during spin-down, with power off. A separate 120 volt circuit shall be provided for oil heater.

F. Heat Exchangers: Shell and straight tube type; steel tube sheets; copper integral finned tubes rolled into tube sheets and supports; 150 psig water side construction; diaphragm type relief valve; relief liquid level sight glass and marine water boxes on evaporator and condenser. (Refer to alternate) Evaporator and condenser flanges shall have gauge tappings.

G. Purge Unit: Provide for machines operating below atmospheric pressure. Machine mounted, automatic, intermittant operation. For water cooled units, provide water for operation of unit while machine is shut down.

H. Pumpout Unit: Provide for machines operating above atmospheric pressure; machine-mounted with auxiliary vessel; water cooled with regulating/shutoff valve; manually operated; control cabinet with starter switch and pilot light; piping connections to machine and auxiliary vessel.

I. Instruments: The following instruments shall be permanently installed in the machine control panel or starter enclosure door:

(1) Pressure: Oil, purge drum, refrigerant suction and discharge. Refrigerant gauges shall be pressure/temperature.

(2) Oil temperature.

(3) Ammeter with four-position switch.

(4) Lapsed operating time indicator.

(5) Start counter.

(6) Cycle timer with concealed or locked manual reset.

J. Auxiliary Condenser (Chiller No. 1 Only): Same as specified for heat exchanger except flanged cast iron heads. Separate condenser of nominal capacity to heat 130 GPM of building heat water from 95 to 115° LWT to provide for heating water for building. 2-pass configuration. Total chiller capacity shall be as specified. Maximum pressure drop shall be 9 feet W.G.

K. Operating Controls: (See CONTROLS)

(1) Machine:

a. On-off switch.

b. Automatic start-up from outside air thermostat and after shutdown by leaving chilled water controller.

c. Adjustable manual load limit switch, 40% to 100% of full load current.

d. Indicators to indicate safety control causing shutdown.

e. Manual reset button for critical safety controls.

f. Ramp start "soft loading".

g. Automatic capacity control from sensor in return water.

L. Safety Controls:

(1) Startup (conditions to be satisfied):

a. Chilled water flowing and cooling water pump operating.

b. Oil pump operation, oil pressure established, oil temperature at set point and capacity control vanes fully closed.

c. Vanes open slowly on startup regardless of load.

(2) Shutdown by:

a. Low oil pressure, low refrigerant and chilled water temperature, high condenser pressure, high bearing temperature, high motor temperature, low evaporator, or condenser flow.

b. Electrical overload and power failure.

(3) Vanes: Close fully on shutdown with or without power available.

(4) Re-start: Time delayed to prevent short cycling.

M. Performance:

(1) Capacity: Cool 342 GPM of water, plus auxiliary requirements, from 58° to 44°F when supplied with 600 GPM of cooling water at 85°F.

(2) Fouling Factor: Chiller and heat recovery condenser, 0.0005; main condenser, 0.001. 0.001 F.F. shall be determined by adding 2.5°F to 0.0005 condenser F.F. rating.

(3) Minimum Evaporating Temperature: 32°F at full load when delivering 42°F water.

(4) Maximum Water Pressure Drops: Evaporator - 15 ft.; Condenser - 15 ft.

(5) Maximum Tube Velocity: 10 fps.

(6) Maximum Power Input: Maximum KW including oil pump:

Chiller #1	160
Chiller #2	160

N. Installation:

(1) Installation and Operating Instructions and Wiring Diagrams: Three (3) sets shall be shipped with machine. One set shall be kept at job site in good condition and be available at all times. Each set shall include installation, operation and maintenance instructions, parts list, recommended spare parts and prices, maintenance and inspection schedules and a listing of all components including starters with identifying description and serial numbers. Each manual shall include one copy of the contractor's control and interlock diagram.

(2) Erection: Machine and auxiliary units shall be erected and leveled in conformance with manufacturer's published instructions and recommendations. Minimum clearance between bottom of insulation and top of concrete base shall be 2".

(3) Tubing and Wiring: Installed in ducts or conduit running horizontally or vertically. Vertical runs shall be bent to conform to machine surfaces. Free hanging capillaries and wires will not be accepted.

(4) Water Piping: Install as shown to permit servicing, replacement of components, and tube cleaning without dismounting piping beyond first flanged joints. Piping shall be aligned and supported to eliminate all stresses on flanges and nozzles before tightening bolts. Needle vent and plug disc globe type drain valves shall be installed in each water box.

(5) Pressure Relief: Pipe full size to outside building and turn down with 90° ell. Connect pipe to unit with 12-inch length of wire reinforced neoprene industrial hose secured to king nipples with two hose clamps at each end. Provide condensate drip at chiller and slope pipe away from relief device to avoid condensation damage onto refrigeration disc.

O. Insulation: See 15700. Factory insulated with flexible foamed plastic insulation. Insulate cooler portion of shell and all surfaces subject to condensation at relative humidities up to 90% and dry bulb temperatures ranging from 50° to 90°F. Paint exposed insulation with two (2) coats white vinyl insulation paint. Allow two (2) hours between coats. Water heads shall be field insulated.

P. Testing and Start-up. (See SECTION 15900.) A factory trained mechanic in full-time employ of the manufacturer shall inspect the completed installation including power wiring, interlock wiring, controls and piping, and supervise testing, evacuation, charging, and start-up of the machine. Provide 8 hours minimum instruction of operating personnel.

Q. Maintenance and Emergency Service: See SECTION 15100.

R. Manufacturers:

(1) Carrier: Chiller #1 19HR6550CE
Chiller #2 19DK5743CB

Trane: Chiller #1
Chiller #2 - CVHE-20G-AA-2G2553DA-11CA-7

1.5 COMPUTER AIR CONDITIONING UNIT (N.I.C.)

A. General: Computer room air conditioning system shall be a complete downflow unit and shall be completely operable with the connection of chilled water, domestic water, and power with chilled water coils, electric heating coils, humidifier interconnecting piping, and automatic temperature and humidity control panel. The cabinet shall be welded base frame with interior 1-inch, 1-1/2-pound thermal and acoustical insulation. All panels shall be hinged removable door type constructed of furniture steel with gaskets and invisible fasteners. Fans shall be forward curved centrifugal type designed for quiet operation with ball bearings driven by inherently overload protected dripproof motor through adjustable V-belt drive. Filters shall be 2-inch thick, throw-away type rated at not less than 89% NBS Cottrell test, and shall be easily removable from top of the unit. Evaporator coils shall be chilled water type of seamless copper tubes and aluminum fins, split 2/3 - 1/3 capacity. In-space unit shall have non-stratification features and arrangement to provide uniform supply air conditions off unit as applied.

B. Humidifier: Humidifier shall be evaporative type designed for trouble-free service and shall be complete with isolation valve and make-up valve and float assembly.

C. Heaters: Heaters shall be 80/20 Nickel-Chrome alloy coil with automatic cutouts in power to elements and be U.L. listed. Provide 3 steps minimum.

D. Electrical Panel: The electrical panel shall be constructed in accordance with U.L. rquirements and shall be complete with fused disconnects, high interrupting capacity fuses, contactors, and all devices for a completely automatic air conditioning system.

E. Controls: The control system shall be a completely internally mounted automatic temperature and humidity control system. An alarm circuit shall indicate system failure by means of an audible alarm and indicating light in case of:

(1) Temporary loss of power.
(2) Loss of air flow.
(3) Dirty filters.
(4) System overload.
(5) Excessive room temperature.

F. Temperature Control: Cooling occurs only when air flow is established. On a drop in return air temperature below set point, the 3-way chilled water valve (2/3 capacity coil) shall modulate to reduce water flow to chilled water coil. A further drop in temperature closes the 3-way valve to the coil and modulates reheat coil valve open as required. A rise in temperature reverses the sequence until the 3-way valve is fully open to the chilled water coil. A further increase in return air temperature will energize 2-way solenoid valve to the dehumidification section (1/3) of chilled water coil. A drop in return air temperature will cause 3-way valve to modulate water away from (2/3) cooling coil. When the 3-way valve reaches the 50% bypass position, 2-way dehumidification valve shallclose.

G. Humidity Control: Humidification or dehumidification can occur only when air flow is established. A drop in humidity will cause humidification valve to open. Upon an increase in humidity, humidification solenoid valve shall close and a further rise shall open dehumidification valve and route water to dehumidification portion of 1/3 cooling coil. Room temperature shall be maintained by main thermostat controlling the reheat coil.

H. A drop in voltage power shall disconnect the unit until manually restarted. Additional pilot lights shall indicate power on the system and system operation. The humidity and temperature controller shall sense conditions in the return air stream of the unit and shall adjust system capacity from no load to full load in infinite steps. Control tolerance in the space shall be 72°F., ±1°F., and 50% relative humidity, ±5%. The control system shall be installed and tested at the factory and shall not require any field connection.

I. Factory Test: Certified factory test data shall be furnished on the unit by the manufacturer.

J. Start-up: A representative of the manufacturer shall visit the site after units installation and certify in writing that the units have been installed in accordance with the manufacturer's recommendations, and are operating properly.

K. Capacities: Capacity of unit shall be not less than 5000 CFM @ 0.5" W.G. E.S.P., 95 MBH total, 90 MBH sensible capacity at 72°F. D.B. and 60°F W.B. entering air temperature, 44°F EWT, 12 KW reheat minimum (20 KW maximum) and heater for humidification.

L. Layout Basis: Composite.

M. Manufacturers: EdPac CDCW-12, Contempo 10 ton compact CEMC, or Liebert FD190C.

1.6 ELECTRIC HOT WATER BOILER

A. General: Boiler shall be designed for constant use, built in accordance with ASME Code, Power Boilers Section 1; stamped for 125 psig maximum working pressure, U.L. listed and labeled. Vessel shall be complete with threaded or flanged connections; drain valve; at least one hand hole; heating elements; fuses; controls; all factory assembled, wired and tested; fully insulated with 2-inch minimum thickness fiberglass; and encased in an enameled steel, 18 gauge minimum, jacket.

B. Heating Elements: Heating elements shall be seamless copper, industrial grade, immersion type. Sheath minimum thickness shall be 0.030-inch. Resistance wire shall be 80% nickel, 20% chrome. Elements shall be brazed into flanges, and flanges shall be secured with stainless steel bolts.

C. Controls: Safety and operating controls shall be complete and shall include:

(1) Sequence for minimum 10 steps of control, driven by proportioning temperature control. Set for 115°F.

(2) Manual reset high limit aquastat.

(3) Evenload sequence reverser to equalize loading of contactors and prevent uneven heating elements wear. Unit shall recycle elements in event of power failure.

(4) ON-OFF switch, and pilot lights to indicate the sequencing operation of boiler controls.

(5) Visible water level gauge.

(6) Safety relief valves at rated capacity with side outlet connection. Set 100 PSIG. Pipe to outside of building.

(7) McDonnell & Miller low water cut-off.

(8) Auxiliary low water cut-off.

(9) Spring loaded fuse clips and fuses between power bus bar and contactors.

(10) Pressure gauge mounted on brass syphon tube.

(11) Control power transformer.

(12) Power circuit capable of withstanding fault current of 100,000 symmetrical amps.

D. Capacity: Capacity of boiler shall be not less than 450 KW minimum, 480 KW maximum and 460 volts - 3 phase. Set boiler for 100 psig relief.

E. Manufacturers: Chromalox CHW-480 or Precision Xl, Indeeco 346N450.

1.7 UNDERGROUND OIL STORAGE TANK, FIBERGLASS - REINFORCED PLASTIC

A. General: U. L. listed fiberglas - reinforced plastic (FRP) underground storage tank for #2 oil with FRP manway extension; with NFP fill, vent, gauge, oil suction and return piping, and other openings as shown. FRP holddown straps shall be furnished by tank manufacturer with storage tank. Provide cylinder padlock with two keys for filler cap and sounding rod.

B. Installation: Tank hole shall be prepared, tank shall be handled, and tank shall be lowered into hole in accordance with manufacturer's recommendations (Owens/Corning Pub. No. 3-PE-6304, December 1973), conforming to NFPA 30 and 31. Hole size shall be large enough to allow 12" minimum clearance all sides with minimum depth of bury, top to grade, of 36-inches. Bed of 12 inch minimum depth pea gravel (1/8" to 3/4" diameter) and pea gravel backfill shall be provided. See Detail.

C. Capacity: 2000 gallon minimum, 6'-0" O.D. diameter maximum.

D. Test: Pressure test tank at 5 PSI with soap bubbles.

E. Manufacturer: Owen/Corning Fiberglas; Xeres Century-Cast. Buffalo steel tank with Bufhide fiberglass coating is an acceptable equivalent to fiberglass tank.

1.8 APPLIED AIR HANDLING UNITS (AH-1, 2 and 4)

A. General: Applied blow thru type multi-zone or draw thru type as scheduled unit complete with all appurtenances. Casing shall be galvanized or painted cold rolled steel, braced with the unit structural frame and additional structural members. All components shall have removable gasketed panels for access, or gasketed insulated access doors, 18" x 24" minimum size. Unit structural frame shall be designed so that the fan shaft and wheels, and coils shall remain in place when the removable panels are removed. All components except the drain pan shall be internally insulated with 1 inch thick, 3 pound density, fiberglass insulation, neoprene coated to prevent erosion,

adhered with waterproof adhesive, 100% coverage, and weld pins 24 inch minimum o.c. additionally on units 15,000 CFM and larger. Corner posts and other structural forms shall be insulated with foamed-in-place polyurethane where fiberglass does not cover. Unit arrangement shall be as shown.

B. Fan Section: Fans shall operate at stable point on curve from maximum unit CFM to minimum unit CFM as determined by variable volume air valves. Fan section shall have DWDI centrifugal type fans, forward curved, backward inclined, or air foil as scheduled. Fans shall be low or medium pressure as scheduled, statically and dynamically tested and balanced at rated speed after assembly in the factory. Fan wheel shall be secured to shaft with minimum of two set screws 90 degrees apart or with a keyway. Bearings shall have bearing support on both sides of fan wheels minimum and shall be self-aligning, grease-lubricated ball bearings with a minimum B-10 life of 50,000 hours mounted in flange block housing. Bearings housing shall be mounted on fan structural frame not on casing with extended lubrication lines to outside of fan casing. Fan motor shall be quiet operating and mounted on an adjustable base exterior of the unit casing or be provided with access door to motor and drive. Fan drive shall be variable pitch V-belt drive sized for a 1.5 service factor with design RPM at mid-point of sheave adjustment, enclosed within fan belt guard with tachometer openings. Multiple belts shall be matched sets. Provide inlet vanes or fan discharge damper (refer to Section 15200 for specification) to modulate for fan CFM.

C. Zone Damper Section (MZ Units): Factory supplied three deck zone damper section, low leakage design divided into hot, cold and neutral decks, internally insulated to prevent condensation and heat transfer between hot and cold deck. Damper blades shall be attached to 1/2 inch minimum diameter damper rods turning in oil impregnated bronze, or nylon bearings, with damper linkage bars joining adjacent zone segments. Damper blades shall be gasketed with resilient material top, bottom, and sides and provided with stops to prevent air leakage. Sections shall be sized, divided, arranged, and marked for indicated air quantities. Air quantities between any two equal segments shall not vary more than 20%. Damper rods shall be of a length to directly mount damper motor crank arms. Two deck multizone with duct mounted heating coils may be provided in lieu of three deck units.

D. Drain Pan: Condensate drain pans shall be water tight welded galvanized steel with zinc protective painted welds, pitched for flow to drain connection. Pan shall be insulated with 1/2 inch thick minimum closed cell rigid foamed insulation secured with waterproof

adhesive, foamed in place or 1-inch rigid board with two coats of Spray-Cor.

E. Chilled Water Coil: Seamless copper tubes, minimum wall thickness of 0.018 inch after expansion and .009 aluminum fins, 14 fins per inch maximum. Coil connections shall be on the same side unless otherwise noted. Face velocity shall not exceed scheduled FPM with total air through coil. Row depth shall be minimum of four (4) rows unless otherwise noted and shall provide conditions specified at EWT & LWT 1 degree higher than scheduled.

F. Filter: Automatic roll Medium efficiency type filter as specified herein. Filter to be provided to fit air handling unit.

G. Capacities: Capacities shall be not less than scheduled in on plans. Capacities shall be ARI certified.

H. Schedule:

Mark	AH-1	AH-2	AH-4
Type	Vert. D.T.	Vert. D.T.	MZ
Total CFM	14,000	12,500	5,900
Min. O.A. CFM	800	1,000	1,250
Max. O.A. CFM	14,000	12,500	1,250
E.S.P. (in)	1.2	1.2	.90
Assumed T.S.P. (in.)	2.5	2.5	2.0
Max. Mtr. H.P.	15	10	7 1/2

I. Cooling Coil

Coil CFM	14,000	12,500	6,000
EADB	79.4	79.56	
EAWB	65.7	65.60	
LADB	56.7	57.0	(1)
LAWB	56.3	56.5	
Total MBH	410	354	
Min. Face Area (S.F.)	26.3	24.1	13.8
Max. Air. P.D. (in.)	0.80	0.80	.80
Ent. Water Temp.	44	44	44
Lv. Water Temp.	56	56	56
G.P.M.	59	51	
Max. Water P.D. (ft.)	8	8	8
Max. Face Velocity	535	520	500

(1) Coil conditions pending area design.

J. Heating Coil	AH-1	AH-2	AH-4
Location	N.A.	N.A.	Hot Deck
Coil CFM			5900
EADB			52
MBH			125
Min. Face Area			7.4
Min. Rows			2
Max. Air P.D. (in.)			.5
Ent. Water Temp.			115
Lv. Water Temp			95
GPM			13
Max. Water P.D. (ft.)			8'

K. Manufacturers:

Carrier	39ED26	39ED26	(1)
Trane	#31	#25	#14

Note:

(1) A 2 deck bypass MZ system with heat coils in the discharge duct is an acceptable alternative. Contractor shall submit layout for approval.

1.9 APPLIED SPRAYED COIL AIR HANDLING UNITS (AH-3 thru 8)

A. General: Applied draw-thru type unit complete with all appurtenances. Casing shall be cold rolled steel with galvanized or painted protective finish, braced with unit structural frame and additional structural members. All components shall have removable gasketed panels for access, or gasketed insulated access doors, 18" x 24" minimum size. Unit structural frame shall be designed so that the fan shaft and wheels, and coil shall remain in place when the removable panels are removed. Panels shall be of watertight construction and shall be joined together into the tank with companion angles bolted and gasketed together for a watertight connection. All components subjected to temperatures below ambient temperature shall be insulated to prevent condensation with waterproof insulation. Tank shall be of 16 gauge minimum, waterproof construction with inlet baffles and eliminators to prevent carry-over of entrained moisture. Centrifugal recirculated water pump suction connection and bronze suction screens shall be located in the tank.

B. Spray Piping: Standard weight galvanized steel pipe with brass centrifugal type nozzles, completely factory assembled including pump, spray tree, nozzles, interconnecting piping, float valve assembly, shut-off valve and pressure gauge.

C. Painting: All surfaces of the unit shall be coated with a chlorinated rubber- bitumen paint for corrosion protection.

D. Chilled Water Coil: Seamless copper tubes, minimum wall thickness of 0.025 inch after expansion, and .009 copper fins, 10 fins per inch maximum. Coil connections shall be on the same side. Face velocity shall not exceed scheduled FPM with total air through coil. Row depth shall be minimum of four (4) rows unless otherwise noted and shall provide conditions specified at EWT & LWT 1 degree high than scheduled.

E. Filter: Horizontal air flow bag filter enclosure with media contained in rigid, gasketed frame. Filters shall be 85% efficient.

F. Capacities and Manufacturers: Unit capacities and manufacturers shall be as scheduled at end of this Section.

1.10 FANS

A. Performance Ratings: Based upon tests conducted in accordance with AMCA Standard #210, 1973.

B. Motors and Drives: Fans shall be belt drive with belt guard, unless otherwise noted, with drives selected at 1.5 x motor HP and with standard open motors mounted on sliding rails for ease of belt adjustment. Motor sheave shall be adjustable with mid-position at scheduled operating speed. Single phase motors shall be capacitor start with resilient base. After balancing, sheaves shall be in mid-80% of adjustment.

C. Tests: Wheels shall be statically balanced before assembly and the assembled fans shall be dynamically balanced at the speeds at which they are scheduled to operate.

D. Finish: All non-corrosion resistant ferrous metal fan parts shall be cleaned and painted with a heavy coat of primer finish.

E. Centrifugal Wall Fan(s) (C.W.F.):

(1) General: Wall mounted, or direct drive as noted, spun aluminum housing, ball bearing pillow blocks, gravity aluminum shutter with gasketed edges, bird screen, and built-in disconnect switch.

(2) Manufacturers: ILG CWF; Penn Wall Domex; Jenn 'CW'.

F. Centrifugal Fans (CF):

(1) Construction: Constructed and classed in accordance with AMCA 200, 1973, Standards. Fans shall be Class I for pressures through 2 1/2-inch, Class II for pressures above 2 1/2-inch, DWDI unless otherwise noted. Bearings shall be grease lubricated, self-aligning, ball bearings with a minimum B-10 life of 50,000 hours mounted in split pillow blocks.

(2) Backward Curved Blades (BC): Airfoil design with non-overloading performance characteristics.

(3) Housings: Fabricated steel of Archimedes spiral scroll design with spun inlet cones and side supporting structure. Housings for wheel diameters 36 1/2-inch and below shall be rotatable. Housings for wheel diameters larger than 36 1/2-inch shall be of horizontal split housing construction. Housing exterior shall be finished with low gloss brushing enamel and interior shall have a primer coating.

(4) Manufacturers: Alladin, American Air Filter, Barry, Buffalo-Forge, Carrier, Cook, ILG, New York Blower, Peerless, Trane, Twin City, York.

G. In-Line Centrifugal Fan (ILC):

(1) Construction: B. I. centrifugal fan with adjustable V-belt drive, companion flanges, inlet cone, flow vanes, grease lubricated bearings with external fittings, and access door. For all fans type "ILC-CO", "all parts exposed to air stream shall be cleaned, primed, and then coated with a 2 mil minimum thickness synthetic resin, rated 300°F for acid or alkaline conditions."

(2) Manufacturers: ILC-CO: Carmon, NYB, Tubular Acoustifoil.

H. Utility Fan (UF):

(1) Construction: Constructed and classed in accordance with AMCA Standards. Bearings shall be grease lubricated, self-aligning, heavy duty ball/roller bearing pillow blocks.

(2) Wheel: Wheel shall have B.I. steel blades welded between a back plate and retaining ring enclosed in a fabricated steel housing of Archimedes spiral scroll design with spun inlet cones and side supporting structure.

(3) Fan: Fan shall be belt drive with standard open motor mounted on adjustable base rails affixed to fan housing supports, with belt guard.

(4) Manufacturers: Alladin, American Air Filter, Barry, Buffalo, Carrier, ILG, New York Blower, Peerless, Powerline, Trane, York.

I. Roof Fans (RF):

(1) General: Curb mounted, adjustable V-belt or direct drive as noted, galvanized hinged housing, ball bearing pillow blocks, gravity aluminum shutter with gasketed edges, bird screen, internally insulated sound attenuating metal roof curb with built-in cant strip factory fabricated to fit fan and built-in disconnect switch.

(2) Manufacturers, Propeller Exhaust (RFPE): Motor and drive shall be in insulated enclosure separating them from airstream. Belt drives shall have 2.0 service factor and have 2 belts minimum. Penn 'AB', Aerovent; Buffalo.

(3) Manufacturers, Centrifugal Exhaust (RFCE): Carnes 'TB'; Greenheck 'LE'; Jenn 'BLC'; Penn 'LC'; Powerline 'BEL-BR'; Cook 'LCH'.

(4) Manufacturers, Direct Drive Centrifugal (RFDD): Provide speed control Penn 'XT'; Acme; Carnes; Cook; Jenn.

J. Fume Upblast Roof Fans (URF):

(1) General: Curb mounted, adjustable V-belt drive, B.I. centrifugal wheel, spun aluminum housing, ball bearing pillow blocks, ventilation of motor with clean, uncontaminated air; built-in disconnect switch; and bird screen.

(2) Manufacturers: Acme PU, Penn Fume-X, Jenn BTD, ILG 'CUB', Cook 'URB'.

K. Cabinet and Ceiling Fans (CAB):

(1) General: Direct drive centrifugal type with internal acoustical insulation in formed metal cabinet, gravity discharge shutter and disconnect. Ceiling mounted fans shall have intake grille. Duct mounted fans shall have inlet and outlet duct connections and removable panel for service. Provide multi-speed control and wall discharge cap where shown.

(2) Manufacturers: Carnes 'VCDB', Cook 'Gemini', Greenheck 'SP', ILG 'CC', Pace 'DD', Penn 'Z', Powerline 'DCF', Jenn "J".

L. Propeller Ceiling Fans: (PCF)

(1) Propeller supply type, fabricated steel blades, direct drive, with motor resilient mounted in formed steel housing, and disconnect switch. Bearings shall be for vertically mounted shaft.

(2) Manufacturers, Direct Drive: Penn 'P' or approved equivalent.

M. Capacities: Refer to schedule: Fans shall deliver indicated air quantity at system static pressure.

N. Schedule:

MARK	E-A1	E-A2	E-A3	E-A4	E-A5
Type	R.F.C.E.	R.F.C.E.	R.F.C.E.	CAB	CAB
Blades	BI	BI	BI	FC	FC
CFM	615	260	260	600	600
S.P. (inches)	3/8	1/4	3/8	1/4	1/4
Min. Dia. (inches)	24	14	14	---	---
Max. RPM	540	890	890	---	---
Max. T.S.	3500	3500	3500	---	---
Motor HP	1/3	1/4	1/4	1/10	1/10

MARK	E-B1	E-B2	E-C1	E-C2	E-C3
Type	RFCE	CAB	RFCE	ILC-CO	ILC-CO
Blades	BI	FC	BI	BI	BI
CFM	645	500	2740	1100	2200
S.P. (inches)	1/4	1/4	.375	1/4	1/2
Min. Dia. (inches)	14	8	30	15	18
Max. RPM	840	1050	420	920	950
Max. T.S.	3500	---	3600	3600	4500
Motor HP	.25	1/10	1.0	1/4	1/2
Accessories					2-speed

MARK	E-C4	S-1	S-2	E-D1	E-D2
Type	ILC-CO	CF	LF	ILC	ILC
Blades	BI	AF	AF	BI	BI
CFM	1020	20,500	15,000	1085	1800
S.P. (inches)	1/4	2.75	2.75	.25	.375
Min. Dia. (inches)	15	30	24	15	18
Max. RPM	920	---	----	810	780
Max. T.S.	3600	---	----	3500	3700
Max. O.V.	----	2130 (1)	----	----	----
Motor HP	1/4	15	20	1/8	1/3

MARK	E-E1	E-E2	E-E3	E-E4	E-F1
Type	RFDD	RFPE	RFPE	PCF	UF
Blades	BI	Prop	Prop	Prop	BI
CFM	70	40,000	9000	250	6000
S.P. (inches)	.25	.25	.375	.125	.375
Min. Dia. (inches)	8	60	36	10	22
Max. RPM	1550	500	860	1050	500
Max. T.S.	3000	----	---	---	----
Max. O.V.	2.5	----	---	---	2200
Motor HP	1/10	10(3)	1 1/2(2)	1/10	2

MARK	E-F2	E-F3	E-F4	E-F5
Type	RFCE	URF	RFPE	UF(4)
Blades	BI	BI	Prop	BI
CFM	1490	3000	40,000	6000
S.P. (inches)	.375	.375	.25	.375
Min. Dia. (inches)	30	24	60	27
Max. RPM	430	510	500	600
Max. T.S.	3500	3500	----	---
Motor HP	3/4	1/2	10	1
Accessories			Belt Drive	

Notes:

(1) System is designed at specified static and outlet velocity. Fan static shall be increased for lower outlet velocities.
(2) Direct Drive.
(3) Belt Drive.
(4) Bottom Horizontal Discharage.

1.11 AUTOMATIC ROLL FILTER

A. General: Vertical or Horizontal traveling curtain of 2-inch thick adhesive impregnated glass fiber with clean and dirty media rolls. The filter shall be rated at specified air quantity with a maximum face velocity of not over 500 fpm and a maximum initial air resistance of not over 0.20-inch W.G. Rolls shall contain at least 65 feet media. Clean media rolls having air leaving side of media exposed on the entering air side of the unit shall be enclosed with a cover designed for easy access to the entire roll width. Unit shall be complete with structural steel frame matching air unit, roll enclosure, bearing supports, media guides and tension wires.

B. Control: Media advance shall be by a single 1/6 minimum H.P., 115 volt motor-drive on one end controlled by a pressure diffential switch, Manual advance switch, runout indicator relay and runout indicator light shall be housed in NEMA 1 enclosure designed for remote mounting. Filter shall be interlocked with supply air fans. All factory wiring shall be in E.M.T. or liquid-tight flexible metal conduit in accordance with the National Electrical Code, 1981 Edition. Runout light bulb shall be replaceable.

C. Media: Media shall be tested in accordance with NBS Dust Spot Test with minimum efficiency of 85%. Media shall be continuous interlaced, bonded, fiberglass material, reinforced to prevent sagging under tension. Dirty media shall be rewound under compression. Multiple media roll units shall have rolls of equal width.

D. Manufacturers: American Air Filter 'G' or 'H', Cambridge HAR, VAR, Farr Model V7.

E. Capacity of Built-up Apparatus, S-1/S-2 System: 35,500 CFM; 12'-0" W X 8'-0" H.

1.12 WATER COILS

A. General: Fin and tube type constructed of 0.009 inch minimum aluminum fins bonded to seamless copper tubes, minimum wall thickness of 0.018 inch after expansion. Casing and tube support sheets shall be not less than 16 gauge galvanized steel, with formed end support and top and bottom channels. A sealing strip shall be provided between the casing channel, and the fin section to prevent air bypass and reduce water carryover between the fin-tube section and top and bottom casing channel. Circuiting shall be designed to provide minimum water velocity noted without turbulators and shall be for counter flow service with same end connections. Coils shall be factory tested under water at not less than 200 PSI, shall be for 200 PSI working pressure and shall conform to the provisions of ARI Standard 410. Row depth shall provide conditions specified at EWT & LWT 1 degree higher than scheduled. Fin spacing shall not exceed 14 fins per inch for cooling coils, 14 fins per inch for heating coils.

B. Capacities: See Schedule.

C. Schedule:

MARK	CC-1 and CC-2	H7-2(2)	H7-1(2)	H8-1(2)	H8-2(2)
CFM (ea)	17,750	790	5695	5180(3)	5410(3)
Size (ea)	120 X 48	18 X 16	60 X 18	40 X 24	40 X 24
Face Area (ea)	40	2.0	7.5	6.6	6.6
Min. Rows	4	1	1	1	1
E.A.D.B.	78.3	55	55	55	55
E.A.W.B.	65.7	---	---	---	---
L.A.D.B.	55.0	80.5	80	84.2	84.0
L.A.W.B.	54.8	---	---	---	---
Ent. Water	44	115	115	115	115
Lv. Water	58	95	95	95	95
GPM (ea.)	152	2.2	15.0	8.2	8.5
Max. Water P.D.(	8	5	5	5	5
Max Air P.D.	1.0	.3	.3	.3.3	
Valve Cv	200(1)	1.6	4.6	6.5	6.5
Notes	---	(3)	(3)	(3)	(3)
Runout Sizes	4"	3/4"	1 1/2"	1 1/4"	1 1/4"

MARK	H5-3	H-F17	H-F23	H7-1	H7-2
CFM (ea)	5770	5250	7800	5495	990
Size (ea)	68 X 24	48 X 24	46 X 30	60 x 18	18 x 16
Face Area (ea)	11.3	8.0	9.5	7.5	2.0
E.A.T.	55	55	55	55	55
L.A.D.B.(5)	80	75	80	73	83
Ent. Water	115	115	115	115	115
Lv. Water	95	95	95	95	95
GPM (ea.)	9.5	11.5	10.7	12.6	6.0
Max. Water P.D.(Ft.)	5	5	5	5	5
Max Air P.D.(4)	.3	.3	.3	.3	.3
Valve Cv	6.5	8.0	8.0	8.0	4.6
Notes	(2)	(2)	(2)	(2)	(2)
Runout Sizes	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1"

Notes:

(1) For combined coils.

(2) Provide flanges for duct mounting.

(3) Max. CFM. Refer to TU F3 & F9 schedule.
LADB is based on minimum CFM: H8-1 = 2590; H8-2 = 2705 CFM.

(4) Based on maximum CFM.

(5) Based on 50% of maximum CFM.

D. Manufacturers: American Air Filter, Buffalo, Carrier, Trane, Westinghouse, York.

1.13 PUMPS

A. Design: All items in fluid stream shall be submitted prior to pump submittal. Pump heads will be recalculated and adjusted to actual conditions. Pumps shall not overload at any point on curve. Impeller diameter shall not exceed 85% of casing accommodation as measured from pump cut water thru centerline of shaft.

B. Installation: Base mounted pumps shall be bolted to concrete bases, shimmed to level in both directions and grouted in place. Couplings shall be aligned. Piping shall be inspected for alignment prior to bolting to pumps according to the Standards of the Hydraulic Institute, 10th Edition, 1964.

C. Vertical Turbine Pump:

(1) General: Water lubricated close-coupled type complete with motor and pump head, discharge column assembly and pump assembly. Manufacturer shall approve basin and sump construction shop drawings. Maximum speed, 1770 RPM.

(2) Motor and Pump Head: Unit drive construction with thrust bearing to carry weight of all rotating parts plus hydraulic impeller thrust with safety factor based on average life of five year continuous operation. Motor shall be full voltage start, vertical hollow shaft, squirrel cage induction in weather protected enclosure mounted on cast iron base with flanged discharge elbow above base. Top shaft shall be two-piece with coupling above packing gland shaft seal assembly.

(3) Discharge Column Assembly: Total distance from suction bell inlet to motor base shall be as detailed with column pipe not less than 8 inches diameter. Line shaft shall be 416 SS with 303SS couplings centered in bronze guides containing water lubricated rubber bearings and located at pipe couplings.

(4) Pump Assembly: Bowls shall be close-grained cast iron with baked-on enameled lining. Impeller shaft shall be 12% minimum chrome stainless steel supported by non-ferrous water-lubricated bearings. Impeller shall be bronze, fastened to shaft with stainless steel bushings, with impeller seal ring.

D. End Suction and In-Line Pumps:

(1) General: Pumps shall be enclosed impeller, non-overloading centrifugal type with cast iron casing and bearing housing, bronze impeller, guide ring, gland and shaft sleeves; and stainless-steel shaft. Impeller shall be keyed to shaft. Pumps shall be 1750 rpm, unless otherwise noted, with dripproof motor of capacity to prevent overloading at any point on pump curve, and shall be serviced without disturbing piping connections. Pump flanges shall be provided with gauge taps.

(2) Base Mounted Pumps: Pump and motor shall be direct connected through Woods standard sure-flex flexible coupling with coupling guard and mounted on a common metal base. Cast iron bases shall have lipped edges and tapped drainage openings; steel bases for pumps handling chilled water shall be provided with a stainless steel drain pan and 1/2-inch tapped drainage opening. Casings shall have vents at high points and drain plugs at low points and mechanical shaft seal. Bearings shall be ball or roller type, sealed against entrance of dirt or water.

E. Capacities: See Schedule at end of this Section.

F. Manufacturers: See Schedule:

1.14 FUEL OIL TRANSFER PUMP (FO-1)

A. General: Positive displacement gear type, cast iron case, steel gears, bronze bearings, stainless steel shaft, Woods Sure-Flex flexible coupling, cast iron base, and mechanical seal. Capacity 30 GPH No. 2 fuel oil (50 SSU viscosity) at 50 PSIG discharge, 10 inch hg. suction lift, 1750 RPM, and 0.125 HP motor.

B. Manufacturers: Roper, Tuthill.

1.15 COOLING TOWER

A. General: The cooling tower shall be of the induced draft, vertical discharge, double-flow type with hot-dip galvanized steel casing and louvers.

B. Casing: Casing and louvers shall be hot-dip galvanized steel. Louvers shall be slip fit.

C. Concrete Basin: Tower shall fit on concrete basin as shown on Plans. Provide shop drawing of exact dimensions to fit tower furnished. Metal basin, if provided in addition to concrete basin to support tower frame, shall be of one piece welded design with not less than 1/8-inch gauge bottom and 3/16-inch sides, hot dipped galvanized steel. Baffle shall be provided at bottom of fill to avoid air bypass under tower fill. All attachments shall have corrosion resistant finish.

D. Water Distribution: The wet deck surface shall be of fireproof construction. Distribution basings shall be flanged for direct piping connections. Fill and drift eliminator material shall be noncorrosive and nonferrous. Provide devices to equalize flow. Provide distribution basin covers.

E. Fan and Drive: Fan shall be direct drive propeller type with adjustable cast aluminum blades, attached to cast aluminum or steel hub. Fan drive shall be through parallel shaft helical gear reducer, with totally enclosed motor or belt drive with multiple groove belt. External oil lines and dip stick shall be provided.

F. Accessories: Access door in side of tower; galvanized steel ladder; hand rail; and hot dipped galvanized wire grille fan guard, flow control devices.

G. Capacity (Each Tower): 600 GPM; 95 degree F water on; 85 degree F water off; 79° degree wet bulb temperature. Provide 15 HP motor.

H. Manufacturers: Marley NC-8808; Baltimore AirCoil CFT-2417.

1.16 TERMINAL UNITS ('TU' Designation)

A. Terminal Boxes: Boxes shall include the following:

(1) Constant volume controller capable of maintaining a constant volume of air within +5% as the upstream static pressure varies from minimum specified to 4.0 inches W.C., and a resetting device to reset the control point of the constant volume controller in both summer and winter control sequences from maximum to minimum cfm or full shut off as scheduled. Controller shall be direct acting. (for hot water) reverse acting. (for electric heater) All controls shall be factory mounted and piped, requiring only connections for air supply, change-over and thermostat. Control air consumption of each terminal unit shall not exceed 0.029 SCFM free air at 20 PSIG.

(2) A calibrated orifice and flow tap to measure primary air flow and a static pressure tap for measurement of static pressure at the volume controller, with a flow chart decal showing flow tap reading versus air quantity for the entire range of the unit permanently attached to the side of the unit.

(3) Galvanized steel casing, thermally and acoustically lined to prevent condensation and for sound control.

(4) Factory setting for air quantities shown on plans, with units tagged accordingly. Field readjustment of air quantity and air reduction, made from the outside of the unit.

B. Hot Water Heat Coils (on units with heat specified in MBH): Factory assembled module located downstream of the volume controller; galvanized casing; aluminum fins; 1/2" O.D., 0.16" wall thickness seamless copper tubing with supply and return connections on the same side, for 150 PSIG working pressure; with access panel to inlet side of coil. Coil section shall be field insulated. See INSULATION.

C. Electric Heat Coils: Refer to Electric Duct Heaters - Note DH-C10 is associated with TU-C10, etc.

D. Control Sequence: Air valves shall be N.O. Control sequence shall be as follows:

(1) Terminals without heat: On a decrease in space temperature (as sensed by DDC) the damper shall proportion closed from the full

cooling position until fully closed. On a rise in space temperature, sequence shall reverse.

(2) Terminals with heat:

a. A, B, C, Pavillions and Dining Area (ie Designations TU-A5, TU-D1, etc.): Terminals shall change from heating to cooling based on thermostat signal.

1) Cooling valve modulates from 0 CFM to maximum to maintain space temperature. On a fall in space sequence shall reverse.

2) Heating: If space temperature continues to fall while in cooling mode and 0 CFM limit is reached, terminal shall change to heating mode. During heating mode, terminal valve shall open to "winter minimum" specified and thermostat shall sequence heat as specified under Instruments and Controls, Section 15200.

b. Areas E and F except TUF-17 and 18 (ie Designations TU-E1, TU-F24,etc) During all seasons, units shall operate as follows: On a decrease in space temperature, the damper shall proportion toward closed until "winter minimum" specified is reached. On a further drop in temperature, as indicated by space thermostat, heat shall be sequenced as specified in Section 15200. Note space humidistat may override space thermostat to open valve. See Section 15200.

c. Terminals TUF 16 and 17: Terminals shall operate from one space thermostat to provide the following sequence: At full cooling, both valves shall deliver maximum CFM specified and heat shall be inactive. On a decrease in space temperature, TU-16 shall modulate down to 0 CFM. TU-17 shall maintain "winter CFM" specified. On a further drop in space temperature, heat for TU-17 shall be sequenced to maintain space temperature. If humidistat overrides room thermostats (See Section 15200), TU-16 shall open to satisfy humidistat.

E. Capacities: Capacities shall be as scheduled.

(1) All cfm's based on 0.55 inches upstream static and .3 inches downstream resistance.

(2) Heat coil capacities based on 115° EAT and 95° EWT, minimum winter CFM.

(3) Max. inlet velocity 1800 FPM, unless otherwise scheduled.

(4) Maximum capacity rating of unit shall be not less than 15% greater than maximum air quantity specified.

(5) Total pressure drop across terminal, with hot water heat coil, at maximum air setting shall not exceed 0.25 inch W.G.

F. Schedule: Refer to schedule.

G. Manufacturers: Barber-Colman Model as specified in schedule as an acceptable equivalent to model 'HKP', contractor may submit a shop fabricate acoustically lined box with damper, actuator and controls for pressure independence for approval. Titus Enviromaster, Metalaire, Buensod, Trane.

H. Layout Basis: Barber-Colman.

1.17 FAN POWERED INDUCTION REHEAT UNITS

A. General: Series type fan powered induction reheat unit complete with variable volume primary air valve with pneumatic operator, centrifugal blower with multi-speed PSC, direct connected motor in sound attenuator enclosure, integral protection, toggle switch mounted on enclosure, and pre-wired for approximate speed, access panel to operator and hot water reheat coil. Powered induction unit shall provide approximately constant total supply air quantity. Controls shall be of same manufacturer as those specified under CONTROLS.

B. Air Valve: Pneumatic motor operated N.C. variable volume primary air valve with external set point adjustment, capable of maintaining constant volume of primary air within ±5% as upstream pressure varies between 1.00 and 4.0 inches of water. Primary valve shall be factory set for correct maximum and minimum primary air quantities, with tubing terminated with fitting at unit enclosure. Control air consumption of air valve shall not exceed 0.029 SCFM free air at 20 PSIG.

C. Blower: Multi-speed PSC motor(s) and centrifugal FC fans connected to a common shaft and mounted in a SMACNA Standard gauge steel cabinet, thermally and acoustically lined. Dual motor units shall be wired internally for a single power connection.

D. Hot Water Reheat Coil: 1/2" copper tubes, 0.020" minimum wall thickness, aluminum fins, galvanized enclosure, 1 or 2 row to provide capacity scheduled. Coils shall be for not less than 200 PSIG working pressure.

E. Manufacturers: Barber-Colman 'HCP', Tuttle & Bailey 'Mark I', Krueger 'TIM', Buensod 'CFD', Trane.

F. Schedule:

Mark FP-	Max.Pri. Air (CFM)(6)	Total Air (CFM) (1)	Unit Size (4)	Approx. H.P.	Max. N.C. (5)
A2	1520	1600	14/14	2@1/2	39
A3	1870	1970	16/14	2@1/2	39
A6	2175	2290	16/16	2@3/4	40
A12A	705	740	10/8	1/4	32
A12B	2170	2280	16/16	2@3/4	40
A15	1710	1800	14/14	2@1/2	39
A16	N.A.(8)	400	-/5	1/4	30
B1	760	800	10/8	1/4	32
B2	1700	1785	14/14	2@1/2	39
B3	1020	1075	12/10	1/3	34
B6	950	1000	12/10	1/3	34
B7	1065	1120	12/10	1/3	34
B9	1490	1570	14/14	2@1/2	39
B12	440	460	7/6	1/4	32
B13	910	950	10/8	1/4	32
B16	1055	1110	12/10	1/3	34
B17	N.A.(8)	400	-/5	1/4	30
C1	1125	1185	12/10	1/3	34
C3	1115	1170	12/10	1/3	34
C4	1630	1710	14/14	2@1/2	39
C5	920	970	10/10	1/3	34
C6	2090	2200	16/14	2@1/2	39
C7	1520	1600	14/14	2@1/2	39
C8	1520	1600	14/14	2@1/2	39
C11	1900	2000	14/14	2@1/2	39
C13	950	1000	10/10	1/3	34
C14	4100	4300	18/16	2@3/4	40
F1	(7)	2040	14"	2@3/4	39
F2	(7)	1240	10"	1/3	34

(1) CFM based on 0.3" W.G. downstream resistance unless otherwise noted.
(2) Inlet static pressure 0.4" W.G. maximum.
(3) Coil size shall be based on 160° EWT, 65° EAT, and specified GPM.
(4) Barber-Colman model numbers valve size/box size. Valve size indicated shall be minimum.
(5) Noise criteria (NC) are discharge sound with 5 feet of 1 inch 1.5 pound density lined duct (same size as discharge) attached and are based on 10 dB deduct for room effect.
(6) Minimum primary air shall be zero CFM unless otherwise noted.
(7) Provide box only (no air valve). Connect duct into back of box where air valve is normally located.
(8) Omit air valve and field modify box for side intake with 3 KW electric heat in inlet. Provide one power connection for 277V-1Ø power.

1.18 UNIT HEATER

A. General: Propeller type, aluminum finned, 0.020-inch minimum tube wall copper hot water coil in furniture steel cabinet with baked enamel finish.

B. Horizontal Heater: Permanent split capacitor, two speed fan motor for operation on low speed, louver-fin double deflection diffuser, and maximum outlet velocity of 600 FPM.

C. Capacities: Capacities shall be not less than schedule @ 115° EWT, 20° water drop.

D.

Mark	Capacity MBH	GPM	Valve Cv
UH-F1	20	4.0	3.5
UH-F2	20	4.0	3.5

E. Manufacturers: Airtherm, American Air Filter, Modine, Herman Nelson, Trane, Beacon Morris, Standard Fin Pipe.

1.19 UNIT VENTILATORS

A. General: Horizontal - valve and damper controlled with combination chilled water coil, separate hot water coil, shut-off and balance valve, factory installed in unit.

B. Cabinet: Horizontal exposed flush mount as scheduled, 18 gauge steel minimum with baked enamel finish, as selected by Architect.

C. Fans: Maximum tip speed of 1400 FPM connected to permanent split-capacitor motor and built-in automatic reset thermal overload, and unit mounted speed/toggle disconnect switch.

D. Filters: Roll type filter consisting of a 50' roll of replaceable filter media, a filter indicator and an advance and rewind mechanism. Furnish extended crank operator for advancing and rewinding filters.

E. Controls: Cooling coil valve shall be two position, two way, N.C. Heating valve shall be modulating two way, N.O. Face damper shall be N.O. See SECTION 15C, CONTROLS.

F. Capacities:

Mark	Trane Model	CFM	GPM Cool	GPM Heat	Cooling MBH GTH	Cooling MBH Sensible	Heating MBH
UV-1	TUVA-15-H-A1 (3)	1500	4.0	0.5	29	25.5(1)	3(2)
UV-2	TUVA-20-H-A1	2000	8.0	-0-	48	38.0(5)	(4)

(1) Capacity @ 80/67°F EAT, 44°F EWT, 12°F rise.

(2) Capacity @ 60°F EAT, 115°F EWT, 20°F drop.

(3) Unit shall be surface mounted with stamped intake grille and double deflection supply grille.

(4) No heating coil.

(5) Capacity at 75°/64° EAT, 44° EWT, 12° rise.

(6) Unit shall be flush mounting with exposed bottom. Bottom shall be hinged to provide access to coils, valves, filter, etc. Outlet shall be duct collar. Intake shall be bottom mounted bar grille.

G. Manufacturers: AAF, Herman Nelson, Trane.

1.20 DRAFT BARRIER HEATER

A. General: Baseboard heater, complete with metal sheathed finned plate elements installed in enclosure; 20 gauge minimum cold rolled steel baked enamel bottom and back panel and 18 gauge minimum cover with intake and discharge grilles; mounting brackets; end caps; built in automatic reset high limit control; built-in disconnect; prewired for wall mounting. Bottom of enclosure shall be open and cover shall have front inlet grille.

B. Manufacturers: American Stabilis Series CDF.

C. Capacities:

MARK	WATTS	VOLTAGE	APPROX. LENGTH (ft.)
UWH-1	375	277-1Ø	2'-4"
UWH-2	940	277-1Ø	5'-0"

1.21 ELECTRIC UNIT HEATERS

A. Horizontal Blow Type: Metal sheathed heating elements with corrosion resistant finish; automatic reset snap action thermal protection; totally enclosed direct drive motors for continuous fan operation with built-in thermal overheat protection; propeller type fan and fan guard, adjustable double deflection louvers; wall mounting bracket and U. L. label. Built-in contactors for operation by built-in or remote thermostat shall be provided. All metal surfaces shall be finished in baked enamel.

B. Schedule:

Mark	UH-C1	UH-C2
KW	20	50
Stages	3	3
Voltage	460-3Ø	460-3Ø
Thermostat	Built-In	N.A.

1.22 ELECTRIC DUCT HEATERS

A. General: Open, 80/20 Nickel-Chrome Alloy coil, insert type, insulated terminal box with hinged cover, built-in manual resetable cutout in power to elements, automatic reset thermal cutouts in control circuit, mercury controlling contactors, magnetic backup contactors, time delay between stages, circuit fuses for heaters over 48 amps with line side of fuses wired to common terminal block, built-in disconnect, 24-volt control transformer, factory wired differential air flow switch, factory wired PE switches furnished under control section, constructed in accordance with U.L. for zero clearance to combustible surfaces and built to meet National Electrical Code when installed as shown. Built-in electrical components shall be installed in a side mounted or bottom mounted terminal box connected to the heater, temperature controller of type and stages indicated, and one source of power. Power voltage shall be 227V-1Ø for heaters up to and including 4 KW and 460V-3Ø for heaters over 4 KW.

B. Manufacturers: Chromalox; Tennessee Plastics; Raywall; Indeeco; Valley Industries.

C. Schedule:

Mark	DH-A1	DH-A2	DH-A3	DH-A4	DH-A5	DH-A6
KW	3	8	8	2	3	8
Stages	1	2	2	1	1	2
CFM	165	1600	1970	165	260	2290
Duct Size	10X10	18X14	22X14	8X12	12X10	22X16

Mark	DH-A7	DH-A8	DH-A9	DH-A10	DH-A11	DH-A12A
KW	4	2	9	9	5	4
Stages	1	1	2	2	1	1
CFM	300	165	750	750	425	740
Duct Size	12X10	12X8	16X16	16X16	16X10	14X12

Mark	DH-A12B	DH-A13	DH-A14	DH-A15	DH-A16	DH-B1
KW	8	5	10	3	3	5
Stages	2	1	2	1	1	2
CFM	2280	450	775	1800	300	800
Duct Size	26X14	14X12	22X14	16X16	12X10	14X12

Mark	DH-B2	DH-B3	DH-B5	DH-B6	DH-B7	DH-B8
KW	6	4	5	3	4	3
Stages	2	1	1	1	1	1
CFM	1785	1075	370	1000	1120	300
Duct Size	18X16	18X12	12X12	16X12	18X12	16X12

Mark	DH-B9	DH-B10	DH-B11	DH-B12	DH-B13	DH-B14
KW	6	8	Not Used	3	4	9
Stages	2	2	Not Used	1	1	2
CFM	1570	620	Not Used	460	850	750
Duct Size	18X16	16X14	Not Used	12X10	14X12	16X16

Mark	DH-B15	DH-B16	DH-C1	DH-C2	DH-C3	DH-C4
KW	9	4	10	6	8	12
Stages	2	1	2	2	2	2
CFM	750	1110	1185	450	1170	1710
Duct Size	22X12	18X12	18X12	18X10	18X12	20X14

Mark	DH-C5	DH-C6	DH-C7	DH-C8	DH-C9	DH-C10
KW	6	5	3	12	2	10
Stages	2	1	1	2	1	2
CFM	970	2200	1600	1600	190	600
Duct Size	20X10	24X14	24X12	24X12	12X10	20X12

Mark	DH-C11	DH-C12	DH-C13	DH-C14
KW	10	6	15	15
Stages	2	2	2	2
CFM	2000	500	1000	4300
Duct Size	28X12	16X12	16X12	30X22

(1) Verify duct sizes with duct shop drawings prior to releasing heaters for fabrication.

1.23 ELECTRIC HEATER CABLE

A. UL listed automatic electric heater cable with built-in thermostat, 7 watts per linear foot, 120 volts, 220° maximum sheath temperature, 5-foot minimum cold lead, stripped ends, two wire PVC covered. Install minimum watts per linear foot of pipe as listed below on make-up and condenser water pipes exposed outdoors. Chromalox TBTU, Smith Gates Corp. UALHT, Easy-Heat.

B.

Pipe Size	Watts/Ft of Pipe
1/2	7.0
3/4	7.0
1	7.0
1 1/4	7.0
1 1/2	7.0
2	7.0
2 1/2	7.0
3	7.0
4	7.0
5	8.8
6	10.0
8	12.2
10	12.2

1.24 ELECTRIC BASEBOARD HEATERS

A. Commercial type: 18 gauge steel minimum cover finished in baked enamel finish complete with heating elements, mounting brackets, end closures, splice plates, remote thermostst, autmoatic linear overheat cutout full length of heat element, junction boxes, all to be installed in

accordance with manufacturer's recommendations with U.L. label for operation as shown.

B. Manufacturers: Chromalox BB-C, American-Stabilis CDF.

C. Schedule:

Mark	BB-C1	BB-C2	BB-F1	BB-F2
Watts	2000	500	1500	1500
Volts	277	277	277	277
Thermostat	Wall	Wall	Wall	Wall
Chromalox Model	BB-C87	BB-C27	BB-C67	BB-C67

1.25 FAN COIL UNITS

A. General: Horizontal exposed unit with integral discharge and return grilles. Unit shall be complete, conforming to drawings and space requirements. Cabinet enclosure and front panel shall be 18 gauge steel minimum with panel finished in baked-on enamel finish as selected by Architect. Unit shall include centrifugal DWDI fans direst driven by three speed PSC motor with built-in overload protection, resilient mounted motor base, sleeve bearings with oil reervoirs, unit mounted 3-speed switch, aluminum finned copper tube cooling coil with manual air vents, internal insulation, insulated condensate drain pan, auxiliary drain pan, integral supply grille, two-way modulating control valve, one balance and one isolation valve on each coil. Valve piping packages shall be factory supplied for field installation with control valves furnished by control manufacturer. Thermostats shall be remote mounted, provided by control manufacturer. Units shall not exceed indicated sound power levels in octave bands 2 thru 8 measured in accordance with ARI Standard 443-66.

B. Layout Basis: Trane Model D, Size 600, A-coil.

C. Capacities: Refer to Schedule.

D. Schedule:

Mark	CFM	Cooling BTU SHC/GTH	GPM	Notes
FC-F1, F2, F3, F4	600	15/18	3	(1)

(1) Capacities are 90° DB & 74 WB EA, 45° EWT (cooling).

E. Manufacturers: American Air Filter, Carrier, International, Trane.

1.26 TERMINAL UNIT SCHEDULES

A. Terminal Units (Policy Center):

MARK (TU)	MAX. CFM	MIN. CFM	BARBER-COLMAN SIZE #
A1	360	180	7"
A4	330	165	7"
A5	520	260	8"
A7	600	300	8"
A8	600	300	8"
A9	1500	750	14"
A10	1500	750	14"
A11	845	425	10"
A13	900	450	10"
A14	1550	775	14"
A16	600	300	8"
B1A	1125	-0-	12"
B4	375	-0-	7"
B5	740	370	10"
B8	600	310	10"
B10	1245	620	12"
B14	1500	750	14"
B15	1500	750	14"
C2	895	450	10"
C9	370	190	7"
C10	1205	600	12"
C12	980	500	12"
C15	1335	-0-	12"
C16	2660	-0-	16"
C17	960	-0-	12"
C18	670	-0-	10"
C19	670	-0-	10"
C20	120	-0-	4"

B. Terminal Units (Museum Area):

MARK (TU)	MAX. CFM	MIN. CFM	BARBER-COLMAN SIZE #	COIL MBH	GPM	PIPE RUNOUT SIZE	VALVE Cv	REMARKS
E1	2150	1075	HUPW 16	30	3.0	3/4	2.1	2
E2	1950	975	HUPW 14	30	3.0	3/4	2.1	2
E3	3550	1775	HUPW 18	55	5.5	1	4.6	1,2
E4	3750	1875	HUPW 18	55	5.5	1	4.6	1,2
E5	2400	1200	HUPW 16	45	4.5	1	3.5	2
E6	695	310	HUPW 10	15	1.5	1/2	1.3	
E7	800	400	HUPW 10	10	1.0	1/2	.9	
E8	2700	1350	HUPW 18	35	3.5	3/4	2.2	1
E9	3300	1200	HUPW 18	40	4.0	1	3.5	1
E10	2700	1350	HUPW 18	35	3.5	3/4	2.2	1
E11	1725	010	HUPW 14	25	2.5	3/4	2.1	
E12	2935	1420	HUPW 18	40	4.0	1	3.5	1
E13	2100	1050	HUPW 16	30	3.0	3/4	2.1	
E14	2400	1200	HUPW 16	35	3.5	3/4	2.2	
E15	2640	1300	HUPW 18	45	4.5	1	3.5	1
E16	2400	1200	HUPW 16	35	3.5	3/4	2.2	
E17	1000	500	HUPW 12	20	2.0	3/4	1.3	
E18	600	300	HUPW 8	20	2.0	3/4	1.3	3
F1	950	475	HUPW 10	20	2.0	3/4	1.3	
F2	740	370	HUPW 10	15	1.5			
F3	5180	2590	HKPW 20X22	NA				
F4	840	420	HUPW 10	25	2.5	3/4	1.6	
F5	720	360	HUPW 10	20	2.0	3/4	1.3	
F6	1090	545	HUPW 12	30	3.0	3/4	2.1	
F7	680	340	HUPW 10	15	1.5	1/2		
F8	460	230	HUPW 8	10	1.0	1/2	.9	
F9	5410	2705	HKPW 20X22	NA				
F10	630	315	HUPW 10	18	1.8	3/4	1.3	
F11	160	80	HUPW 5	5	.5	1/2	.9	
F12	420	210	HUPW 8	8	.8	1/2	.9	
F13	960	480	HUPW 12	25	2.5	3/4	2.1	
F14	300	150	HUPW 6	8	.8	3/4	2.1	
F15	135	70	HUPW 5	5	.5	1/2	.9	
F16	5250	-0-	HKP 28X18	N.A.				
F17	5250	5250	HKP 28X18	N.A.				
F18	1950	975	HUPE 14	21	2.1	3/4	1.6	
F19	220	110	HUPE 6	10	1.0	1/2	.9	

MARK (TU)	MAX. CFM	MIN. CFM	BARBER-COLMAN SIZE #	COIL MBH	GPM	PIPE RUNOUT SIZE	VALVE Cv	REMARKS
F20	320	160	HUPE 7	10	1.0	1/2	.9	
F21	240	120	HUPE 6	6	.6	1/2	.4	
F22	1010	505	HUPE 12	20	2.0	3/4	1.6	
F23	7800	3900	HKP 40x18	N.A.				
F24	600	300	HUPE 8	15	1.5	1/2	1.3	
5-1	1700	900	HUPW 10	30	3.0	3/4	2.1	
5-2	530	300	HUPW 8	15	1.5	1/2	1.3	
5-3	5770	3000	HKPW 72x12	N.A.				

Remarks: 1. 18" valve in 20" X 20" rectangular insulated casing.

2. Controller shall be remote located at job site at location shown on drawings. Controller shall be field "relocatable"

3. Delete humidity control on this zone.

1.27 PUMP SCHEDULE

MARK	TP-1 and TP-2	CP-1 and CP-2	PCP-1 and PCP-2
Type	Vert. Turbine	E.S.	E.S.
GPM	300	345	345
Approx. Head (ft.)	35	25	65
Min. Eff.	73	68	74
Motor H.P.	10	5	10
Volts	460	460	460
Allis Chalmers	M-10 VTMC	2000-4X3X6.5	2000-4X3X9
Aurora	------	340-3X4X9B	340-3X4X9A
Peerless	10HXB	FM-830A	FM-1025A

MARK	HP-1 and HP-2
Type	E.S.
GPM	75
Approx. Head (ft.)	40
Min. Eff.	62
Motor H.P.	1-1/2
Volts	460
Allis Chalmers	2000-2.5X2X6.55
Aurora	340-1 1/2X2X7
Peerless	FM-810A

1.28 SPRAYED COIL AIR HANDLER SCHEDULE

Mark	AH-3	AH-5	AH-6	AH-7	AH-8
Total CFM	32,300	8000	20,400	6485	21,500
Min. O.A. CFM	2500	400	3000	150	---
E.S.P. (in)	1.6	1.0	1.5	1.0	1.25
Assumed T.S.P. (in.)	3.5	3.0	3.4	3.0	3.3
Max. Mtr. H.P.	40	7.5	20	7.5	25
Cooling Coil					
Type	CHW	CHW	CHW	CHW	CHW
Coil CFM	32,300	8000	20,400	6485	21,500
EADB	75.5	71.3	77.9	71.4	81.3
EAWB	64.0	59.5	65.0	59.4	65.0
LADB	57.0	52.0	56.2	51.6	55.2
LAWB	54.7	50.9	55.1	51.0	53.9
Total MBH	894	192	614	149	580
Min. Face Area (S.F.)	63.0	16.9	39.0	13.0	40.5
Min. Rows	4	4	4	4	4
Max. Air. P.D. (in.)	.90	.80	.80	.80	.80
Ent. Water Temp.	45	45	45	45	45
Lv. Water Temp.	59	59	59	59	59
Max. Water P.D. (ft.)	12	10	10	10	10
Filter Type	Bag	Bag	Bag	Bag	Bag
Manufacturers:					
Trane	63	17	41	14	41
Carrier	39ED75	39ED18	39ED39	39ED1	39ED39L

END OF SECTION

SECTION 15500 - PLUMBING FIXTURES & EQUIPMENT

1.1 RELATED DOCUMENTS

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

1.2 PLUMBING FIXTURES

A. General: All fixtures shall be Grade A. The name or trademark of the manufacturer shall be printed or pressed on all closets and lavatories, and a label which cannot be removed without destroying it, containing the manufacturer's name or trademark and the quality or class of the fixtures shall be affixed to all fixtures. All enamel to be acid resistant.

B. Installation:

(1) Grout: Space between wall and back of all wall hung lavatories, urinals and water closets shall be grouted with white tile grout. Joints shall be finished smooth and flush.

(2) Fasteners: Wall hung lavatories and urinals equipped with bolting lugs shall be secured to walls with toggle bolts thru these lugs in addition to other supporting means.

C. Fixture Schedule:

Fix.#	Fix. Item	Special	Am.-Std.	Kohler	Eljer	Crane
A	Water Closet	Elongated	2109.405	K-3500-EB	091-0605	3-144
	*Supply		Chicago 1023-MM	K-7638	---	---
	Seat		See Notes			
	*Supply shall have metal-to-metal seats and loose key stops.					
B	Water Closet	Elongated	2108.500	K-3528-EB	091-1675	3-154
	*Supply		Chicago 1023-MM	K-7638		
	Seat		See Notes			
	*Supply shall have metal-to-metal seats and loose key stops.					

Fix.#	Fix. Item	Special	Am.-Std.	Kohler	Eljer	Crane
C	Water Closet	Round	2007.012	K-3402-PB	081-1300	3-79
	*Supply		Chicago 1023-MM	K-7653		
	Seat		Bemis 100TT	K-4662	Bemis 420	Sperzel 400R
	*Supply shall have metal-to-metal seats and loose key stops.					
D.	Water Closet	Elongated	2477.016	K-4430-ET	111-1405	3-446
	Flush Valve		See Notes			
	Seat		See Notes			
	Carrier		See Carriers			
E	Water Closet	Elongated	Same as Fixture 'D' except floor-to-rim height shall be 18"			
	Flush Valve		See Notes			
	Seat		See Notes			
	Carrier		See Carriers			
F	Urinal		6560.015	K-4985-T	161-1090	7-150
	Flush Valve		See Notes			
G	Urinal		Same as Fixture 'F' except floor-to-rim height shall be 17"			
	Flush Valve		See Notes			
H	Lavatory	20" x 18"	0356.015	K-2030	051-1848	1-194-S
	Faucet		2248.698	K-7443-T	559-0710	C-1126
	Drain		---	K-7715	803-0552	C-1065
	*Supplies		Chicago 1016MM	K-7607	---	---
	Trap	1 1/4" Adj.'P'	McGuire 8872	K-9000	Dearborn 507	Frost 6403
	*Supplies shall have metal-to-metal seats and loose key stops.					
I	Lavatory		See Architectural Specifications.			
	*Faucet		See Architectural Specifications.			
	*Drain		See Architectural Specifications			
	**Supplies		Chicago 1016MM	K-7607	---	---
	Trap	1 1/4" Adj.'P'	McGuire 8872	K-9000	Dearborn 507	Frost 6403
	*Faucet shall be back-mounted gooseneck spout with aerator and 4" wrist handles to be provided with lavatory. Drain to be provided with lavatory.					
	**Supplies shall have metal-to-metal seats and loose key stops.					

Fix.#	Fix. Item	Special	Am.-Std.	Kohler	Eljer	Crane
J	Lavatory		0475.020	K-2196	051-3328	1-287-S
	*Faucet		Paul Associates #2040TA (Moderne)			
	**Drain		Chicago 226	K-7701	803-0500	C-1060
	***Supplies		Chicago 1016MM	K-7607	---	---
	Trap	1 1/4" Adj.'P'	McGuire 8872	K-9000	Dearborn 507	Frost 6403

*Faucet shall be polished bronze by Paul Associates, 155 East 55th St., New York, N.Y. 10022.
**Drain less pull-up rod. Rod included with faucet.
***Supplies shall have metal-to-metal seats and loose key stops.

K	Sink	17" x 22"	Elkay DLR-1722-10 or Just SLX-2217-A-GR			
	Faucet		2238.285	K-13341	559-1250	CH-8034
	Strainer	1 required	4331.013	K-8801	803-0580	8-5240
	*Supplies		Chicago 1016MM	K-7607	---	---
	Trap	1 1/2" Adj.'P'	McGuire 8912	K-9000	Dearborn 510	Frost 6405

*Supplies shall have metal-to-metal seats and loose key stops.

L	Sink	22" x 22"	Elkay LR-2222 or Just SL-2222-A-GR			
	Faucet		Chicago 786-E8	K-13342-F	---	---
	Strainer	1 requird	4331.013	K-8801	803-0580	8-5240
	*Supplies		Chicago 1016MM	K-7607	---	---
	Trap	1 1/2" Adj.'P'	McGuire 8912	K-9000	Dearborn 510	Frost 6405

*Supplies shall have metal-to-metal seats and loose key stops.

M	Sink	19" x 18"	Elkay LR-1918 or Just SL-17519-A-GR			
	Faucet		Chicago 50-E3	K-7894	559-2830	---
	Strainer	1 required	4331.013	K-8801	803-0580	8-5240
	*Supplies		Chicago 1016MM	K-7607	---	---
	Trap	1 1/2" Adj.'P'	McGuire 8912	K-9000	Dearborn 510	Frost 6405

*Supplies shall have metal-to-metal seats and loose key stops.

Fix.#	Fix. Item	Special	Am.-Std.	Kohler	Eljer	Crane
N	Sink	33" x 22"	Elkay STLR-3322-R or Just LTC-2233-A-GR			
	Faucet		Chicago 1200	K-7765-T	---	8-2755-A
	Strainer	1 required	4331.013	K-8801	803-0580	8-5240
	*Supplies		Chicago 1016MM	K-7607	---	---
	Trap	1 1/2" Adj.'P'	McGuire 8912	K-9000	Dearborn 510	Frost 6405
	**Disposal		Kitchenaid KWS-200, Waste King SS-800 or G. E. GFB-950			

*Supplies shall have metal-to-metal seats and loose key stops.
**Mount disposal unit in left hand side sink.

O	Service Sink	22" x 18"	7692.049	K-6716	242-0150	---
	Faucet		8341.075	K-8906	Chicago 305-VB-R-RCF	
	Trap	3"	7798.176	K-6673	804-1060	---
	Rim Guard		7745.011	K-8936	805-0180	---
P	Mop Receptor	36" x 24"	Fiat MSB-3624 or Stern-Williams MTB-2436			
	Faucet		---	K-13624	Chicago 540-LD-L8BVB-E2-2-E	
	Mop Hanger		Fiat 889-CC	---	---	---
	Hose & Hose Bracket		Fiat 832-AA	---	---	---
Q	Tub	32" x 60"	2297.026	K-519-S	012-1520	2-152X-L
			or	or	or	or
			2295.020	K-520-S	012-1525	2-152X-R
	*Tub/Shower Valve		Paul Associates #2040TS (Moderne)			
	Drain		---	K-7172-R	---	---

*Tub/shower valve shall be polished bronze by Paul Associates, 155 East 55th St., New York, N.Y. 10022.

R	Electric Water Cooler	Wall Hung	Oasis ODP7WM-P; Kelvinator KDP7WM-P; Sunroc HCWC-8E or White-Westinghouse WEWC07-OP			
	Supply		Chicago 1016MM	K-7607	---	---
	Trap	1 1/4" Adj.'P'	McGuire 8872	K-9000	Dearborn 507	Frost 6403

*Supply shall have metal-to-metal seats and loose key stops.

Fix.#	Fix. Item	Special	Am.-Std.	Kohler	Eljer	Crane
S	Electric Water Cooler	Oasis OMDFS8; Halsey Taylor 5904WCM; Kelvinator KMDFS8; Sunroc 441-RC or White-Westinghouse WEIC08				
	*Supply		Chicago 1016MM	K-7607	---	---
	Trap	1 1/4" Adj.'P'	McGuire 8872	K-9000	Dearborn 507	Frost 6403
	*Supply shall have metal-to-metal seats and loose key stops.					
T	*Electric Water Cooler	Oasis OMDFS with IWR6 chiller on shelf support 023848; Halsey Taylor 5904M with SJ-6 chiller on shelf support; Kelvinator KMDFS with IWR-6 chiller on shelf support or White-Westinghouse WEIN00 with WENC06 chiller				
	**Supply		Chicago 1016MM	K-7607	---	---
	Trap	1 1/4" Adj.'P'	McGuire 8872	K-9000	Dearborn 507	Frost 6403
	*Chiller shall be mounted above ceiling.					
	**Supply shall have metal-to-metal seats and loose key stops.					
U	Electric Water Cooler	Oasis OMDFS8, Halsey Taylor HBL-R, Kelvinator KMDFC8, Sunroc 440-441-RC or White-Westinghouse WE3C08.				
	*Supply		Chicago 1016MM	K-7607	---	---
	Trap	1 1/4" Adj.'P'	McGuire 8872	K-9000	Dearborn 507	Frost 6403
	*Supply shall have metal-to-metal seats and loose key stops.					

Fix.#	Fix. Item	Special	Am.-Std.	Kohler	Eljer	Crane
V	Photo Sink	Unit shall be formed from one sheet of metal sized 17'0" x 2'-4" with the sinks incorporated as an integral part of the unit. Sinks shall be located from left to right of unit. First sink shall be 5'-6" x 2'-0" x 4" deep. Second sink shall be 2'-0" x 2'-0" x 8" deep. Provide 6" space between first and second sink. Unit shall be entirely manufactured of 16 gauge type 316, 18-8 stainless steel with 4" back splash and end splash (both ends). Provide wood bracing to level sink. Unit shall mount on top of cabinet work.				
	Manufacturers:	Just Marquis or Elkay.				
	Thermostatic Foto Panel	Unit shall be located on wall to the left of the 5'-6" x 2'-0" x 4" deep sink. Powers 440-1000.				
	*Faucet	Chicago 936 or T & S Brass.				
	Strainer		Chicago 1016M	K-7607	---	---
	Trap	1 1/2" Adj.'P'	McGuire 8912	K-9000	Dearborn 710	Frost 5036

*Faucet to be located center of both sinks on wall.

D. Notes:

(1) Water Closet Flush Valve (Fixture 'D'): Non-hold open type; mount 24-inches above top of bowl. Provide sweat-solder adaptor kit and C.P. sleeve.

*Delany 614CVBT5J-3 with (2) T-36 wall braces.
*Sloan Royal 3010320-3 with (2) YK wall braces.

*3 gallon flush

(2) Water Closet Flush Valve (Fixture 'E'): Non-hold open type; mount 12-inches above top of bowl. Provide sweat-solder adaptor kit and C.P. sleeve.

*Delany 602-CVBT5J-3 with (1) T-36 wall brace.
*Sloan Royal 3010120-3 with (1) YK brace.

*3 gallon flush

(3) Urinal Flush Valve (Fixture 'F' & 'G'): Non-hold open type. Provide sweat-solder adaptor kit and C.P. sleeve. 3/4" top spud.

*Delany 651C-VBT5J-1 with (1) T-36 wall brace.
*Sloan Royal 3012620-1 with (1) YK brace.

*1 gallon flush

(4) Closet Seats:

Beneke 525CH.
Church 9900.
Sperzel 80-E W/CH.
Bemis 1355-C.
Olsonite #1050.
All seats to be white.

1.3 CARRIERS

A. Water Closet:

(1) Type 'A': J. R. Smith 260-DY; Josam 10724; Wade W-330-ND or Zurn ZR-1204-ND-4.

(2) Type 'B': J. R. Smith 260-Y; Josam 10704; Wade W-330-NL or Zurn ZR-1204-N-4(LHV).

B. Lavatory: J. R. Smith 700-27-M-31; Josam 17100-63-67; Wade W-520-M24-M36 or Zurn ZR-1231-79.

C. Urinals: J. R. Smith 636; Josam 17800; Wade W-400 or Zurn ZR-1221.

D. Notes:

(1) All carriers will be bolted to floor with lag screws.

(2) All carriers shall be installed in accordance with manufacturers recommendations.

(3) All lavatory and urinal supports shall have heavy duty rectangular supports. Install carrier when fixture is located on chase walls only.

1.4 CLEANOUTS

A. General: Provide cleanouts where shown on plans as follows:

Location	Finish	J. R. Smith	Josam	Wade	Zurn
Floor Slab	Nickel Bronze	4025	56000	W-6010	ZN-1405-2
Floor Slab(7)	Nickel Bronze	4105	56040	W-6010X	Z-1435-2
Walls(8)	Stainless Steel	4477	58890	W-8470R	ZN-1460-8
Outside	Cast Iron	4280	58190	W-8530-S	Z-1420-2 less top
End of Exposed Pipe	Cast Iron	4400	58500	W-8550-S	Z-1440
Side of Exposed Pipe	Cast Iron	4510	58510	W-8560-D	Z-1445

B. Notes:

(1) Provide wrench for each type cleanout.
(2) After installation of cleanouts, remove plug, grease threads and replace.
(3) Cleanouts in exterior piping shall be brought up to grade as detailed.
(4) All cleanouts shall be accessible.
(5) See Plans for sizes.
(6) Standard cleanout denoted as 3" or 4" C.O.
(7) Extra Heavy Duty Cleanout denoted as 3" or 4" XHCO.
(8) Cleanout shall be installed in sanitary T-branch, tapped.

1.5 DRAINS

A. General:

(1) Cast iron bodies with strainers of material indicated in schedule.

(2) Provide flashing clamp on drains installed in floors with waterproof membrane.

B. Schedule:

Type	Strainer Size and Finish	J. R. Smith	Josam	Wade	Zurn
A	6" x 6" Nickel Bronze	2010-B	30000-S	W-1100-G	Z-415-Y
B	11" Cast Iron	2130	32200	W-1200	Z-505
C	5" Nickel Bronze	2021-A-BFV	30650-A	W-1120-STD-31	Z-470-1-B
D	7" Nickel Bronze	3510-F10	30000-7E2	W-1100-EF	Z-4155
E	14" Nickel Bronze	1410CU	23500C-10	W-3100-D	Z-150-C-11
Roof Drain	16" Aluminum	1010CUA	21500-64	W-3500 CC-D	Z-100

C. Note: Floor drains shall be set 3/4-inch below finish floor elevation.

1.6 CIRCULATOR PUMP

All bronze, 120 volt, single phase B & G No. 1PR, Taco 113 or Thrush TCB. Control as shown.

1.7 WATER HEATERS

A. #1:

(1) 50 gallon storage, glasslined factory insulated tank with factory installed steel jacket 12 K.W.; factory installed ASME temperature and pressure relief valve, high limit cutoff, magnesium anode. Unit must meet ASHRAE 90A-1980. State Stove Mfg.; A. O. Smith; Ruud; Rheem or Jackson.

(2) See Division 16 for electrical data.

B. #2:

(1) 100 gallon storage, glasslined factory insulated tank with factory installed steel jacket 54 K.W.; factory installed ASME temperature and pressure relief valve, high limit cutoff, magnesium anode. Unit must meet ASHRAE 90A-1980. State Stove Mfg.; A. O. Smith; Ruud; Rheem or Jackson.

(2) See Division 16 for electrical data.

C. #3:

(1) 50 gallon storage, glasslined factory insulated tank with factory installed steel jacket 12 K.W.; factory installed ASME temperature and pressure relief valve, high limit cutoff, magnesium anode. Unit must meet ASHRAE 90A-1980. State Stove Mfg.; A. O. Smith; Ruud; Rheem or Jackson.

(2) See Division 16 for electrical data.

1.8 SUMP PUMP

Submersible, 50 GPM at 12 foot head, 1/2 HP, 115 volts, single phase, Zoeller Co. number 97, Swaby number SUB-6Q.

END OF SECTION

SECTION 15600 - PIPING SYSTEM

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

A. Identification: ASTM No. and Schedule shall be stamped on each length of pipe. Bundles shall have metal tag attached showing ASTM No. and Schedule.

B. Steel Pipe Nipples: All thread nipples are prohibited. Nipples 1 1/2 inch and smaller in diameter and attached to larger pipes shall be schedule 80 and shall be attached with the use of threadolets or weldolets.

C. Weld Elbows in Steel Piping: Long radius unless otherwise noted.

D. Mitered Fittings and Tapped Pipes: Mitered fittings and tapped pipes are not allowed.

E. Weldolets and Threadolets in Steel Piping: Weldolets, threadolets, or shop fabricated lateral may be used for side outlet reducing tees if more than two pipe sizes smaller than main.

F. Unions: Provide in piping to all equipment and specialities to permit removal for service.

G. Reducers: Reducers in steel piping shall be eccentric type where grading is specified. Reducers shall be used to change pipe sizes.

H. Dissimilar Metals: Dissimilar metals such as copper and steel shall not be installed to allow direct contact between the metals. Separate with sheet lead. Provide dielectric unions as specified herein.

I. Relief Valves or Devices Discharge Piping: End of pipe or fittings from relief valves or devices shall not be threaded.

1.3 PIPE & FITTINGS

A. Exceptions: Pipe, fittings and grades shall be as listed below unless otherwise noted.

B. Fixture Connections:

(1) Water: Chromium plated brass pipe, except where concealed under counter and at rear of service sink. (See DEFINITIONS for "Concealed".)

(2) Waste:

a. Exposed: Chromium plated waste and trap, except on service sink.

b. Concealed:

1) Floor Mounted Water Closet: 4 inch cast iron stub with cast iron closet floor flange and preformed wax setting ring.

2) Wall Hung Water Closet: Chair carriers as specified.

3) Floor Mounted Water Closet (Back Outlet): Wall flange and preformed setting ring.

4) Urinals: 2-inch brass pipe and brass IPS screwed fittings from fixture to stack.

5) Lavatories and Drinking Fountains: 1-1/4-inch type L copper and copper drainage fitting from fixture to stack with C-MIP adapter at stack.

6) Counter Sinks: 1-1/2-inch type L copper and copper drainage fittings from fixture to stack with C-MIP adapter at stack.

7) Acid Resistant Sink: 1-1/2-inch acid resistant drum trap and fittings from tail piece provided with fixture.

8) Service Sink: 3-inch galvanized Yoloy with galvanized cast iron drainage fittings from fixture to stack.

9) Darkroom Sink: 1 1/2 inch PVC trap and pipe to stack with adaptor at stack.

10) Mop Basin: 2-inch cast iron P trap with 2 x 1-1/2-inch caulk adapter.

11) Kitchen Sink: Type L copper and copper drainage fittings. See detail on drawings.

12) Kitchen Sink & Unit: 1-1/2-inch type L copper and copper drainage fittings from fixture to stack with C-MIP adaptor at stack.

13) Individual Shower: 3-inch cast iron P trap.

C. Soil, Waste and Vent:

(1) Pipe: Tar coated cast iron soil pipe, service weight within building and to 5-feet outside. Pipe shall be gasketed type bell and spigot pattern below slab, hubless for cast iron couplings above grade.

(2) Fittings: Same material as piping.

(3) Grades: Horizontal drainage piping of 3-inch diameter and less shall be installed with fall of not less than 1/4-inch per foot. Drainage piping larger than 3-inch diameter shall be installed with fall of not less than 1/8-inch per foot, unless otherwise noted.

D. Soil, Waste and Vent Piping for Darkroom Sinks within Building, Insulated in Return Air Plenum:

(1) Pipe: Schedule 40 Poly-vinyl Chloride (PVC), ASTM D 2665 68; solvent weld.

(2) Fittings: Same material as piping.

(3) Grades: Horizontal drainage piping of 3-inch diameter and less shall be installed with fall of not less than 1/4-inch per foot. Drainage piping larger than 3-inch diameter shall be installed with fall of not less than 1/8-inch per foot, unless otherwise noted.

(4) Protection: Before, during, and after installation, pipe and fittings shall be protected from exposure to sunlight and damage or deterioration to the material. Solvents, solvent compounds, lubricants, elastomeric gaskets, and materials used to install the pipe shall be stored in accordance with the manufacturer's printed recommendation and shall be discarded if the storage period

exceeds the recommended shelf life. Solvents in use will be discarded when the recommended pot life is exceeded.

(5) Installation: PL-DWV-4 (Nibco); P-376 (Charlotte Plastic); 1976A (R & G Sloane).

(6) Manufacturers: Nibco, Charlotte Plastic, R & G Sloane.

E. Storm Drain: Same as SOIL, WASTE & VENT

F. Domestic Hot and Cold Water:

(1) Pipe:

a. Above Ground: Hard drawn type L copper tubing.

b. Below Concrete Slab: Soft temper type L copper tubing with no joints or fittings below the floor slab.

c. Below Ground:

1) 2-1/2-inch and Smaller: Hard drawn type K copper tubing.

2) 3-inch and Larger: Ductile iron pipe, ASA 21.51, 250 p.s.i. minimum working pressure with push-on joints, ASA- A21.11; with cement lining, ASA-A21.4.

(2) Fittings:

a. Copper Tubing: Sweat type, wrought copper. Reducers shall be used to reduce pipe size.

b. Ductile Iron Pipe: Cast iron fittings, ASA-A21.10.

G. Condenser Water:

(1) Pipe:

a. Above Ground: Black carbon steel.

1) 4-inch and Smaller: ASTM A-120, schedule 40.

2) 5-inch and 6-inch: ASTM A 53, grade B, schedule 40.

3) 8-inch and Larger: ASTM A 53, grade B, minimum schedule 20.

b. Below Ground: Schedule 80 PVC, Type I, ASTM-D-1785, pressure rated pipe.

(2) Fittings:

a. Above Ground: Buttweld carbon steel. ASTM A-234. Wall thickness to be same as piping. Companion flanges shall be 150 pound carbon steel ASTM A-181, Grade I for forged steel; ASA-516-60 for cold formed.

b. Below Ground: Same material as piping, bell and socket O-ring joint. Provide flanged fitting at connections to above ground pipe.

c. Grade: Bottom of horizontal piping level.

H. Low Temperature Heating Water:

(1) Pipe: Black carbon steel.

a. 4-inch and Smaller: ASTM A-120, schedule 40.

b. 5-inch and 6-inch: ASTM A 53, grade B, schedule 40.

(2) Fittings:

a. Steel Pipe, 2-inch and Smaller: 125 pound black threaded cast iron, ASTM A 126, Class A or malleable iron. Couplings shall be wrought steel.

b. Steel Pipe, 2-1/2-inch and Larger and All Concealed, Except Above Lay-in Ceilings: Buttweld carbon steel, ASTM A-234. Wall thickness shall be same as piping. Companion flanges shall be 150 pound carbon steel ASTM A-181, Grade I for forged steel; ASA-516-60 for cold formed.

(3) Grade: Top of horizontal piping level with eccentric reducers.

I. Chilled Water:

(1) Pipe: Black carbon steel.

a. 4-inch and Smaller: ASTM A-120, schedule 40.

b. 5-inch and 6-inch: ASTM A 53, grade B, schedule 40.

c. 8-inch and Larger: ASTM A 53, grade B, minimum schedule 20.

(2) Fittings:

a. Steel Pipe, 2-1/2-inch and Smaller: 125 pound black threaded cast iron, ASTM A 126, class A. Couplings shall be wrought steel.

b. Steel Pipe, 3-inch and Larger and All Concealed Except Above Lay-in Ceilings: Buttweld carbon steel, ASTM A-234. Wall thickness shall be same as piping. Companion flanges shall be 150 pound carbon steel ASTM A-181, Grade I for forged steel; ASA-516-60 for cold formed.

(3) Grade: Top of horizontal piping level with eccentric reducers.

J. Blowdown:

(1) Pipe: Schedule 80, black steel, ASTM A53.

(2) Fittings:

a. 2-1/2-inch and Smaller: 250 pound black threaded cast iron ASTM A126, Class A.

b. 3-inch and Larger: Extra strong carbon steel, buttweld, ASTM A234. Companion flanges shall be 300 pound forged steel ASTM A181, Grade I for forged steel; ASA 516 60 for cold formed.

K. Emergency Generator Exhaust:

(1) Pipe: Black carbon steel.

a. 4-inch and Smaller: ASTM A 120, schedule 40.

b. 5-inch and 6-inch: ASTM A 53, grade B, schedule 40.

c. 8-inch and Larger: ASTM A 53, grade B, minimum schedule 20.

(2) Fittings:

a. 2-1/2-inch and Smaller: 125 pound black threaded cast iron, ASTM A 126 73, class A. Couplings shall be wrought steel.

b. 3-inch and Larger: Buttweld carbon steel, ASTM A-234. Wall thickness shall be same as piping. Companion flanges shall be 150 pound carbon steel ASTM A-181, Grade I for forged steel; ASA 516 60 for cold formed.

(3) Grade: Bottom of horizontal piping pitch toward drain at bottom of vertical riser. Install full size capped tee at rise with 1 inch drain valve.

L. Gauge Piping:

(1) Exposed: Type L hard drawn copper with sweat type wrought copper fittings.

(2) In Conduit: Type K soft copper tubing with factory applied 0.925 density virgin polyethylene jacket.

M. Refrigerant Piping:

(1) General: Refrigerant pipe sizes are for estimating purposes only. Size and install as per manufacturer's recommendations.

(2) Pipe: Hard drawn ACR copper tubing.

(3) Fittings: Brazed type, wrought copper. Ells shall be long radius.

(4) Provide clearances for double suction riser traps.

(5) Grade: Horizontal pipes in direction of flow with traps as shown and at condensing unit.

N. Condensate Drain:

(1) Pipe: Type L hard drawn copper tubing.

(2) Fittings: Sweat type, wrought copper.

(3) Grade: Horizontal pipe 1/4-inch per foot minimum down in direction of flow.

(4) Location: Provide full size drain with 3-inch minimum water seal trap from all condensate drain pans to nearest floor drain unless otherwise shown. Pipe air compressor and chilled water pump drains to floor drain. Do not trap built-up apparatus coils drains.

O. Centrifugal Auxiliary Piping: Same material as specified for water source recommended by equipment manufacturer, ie., chilled, condenser, or make-up water.

P. Air Vent and Relief Valve Discharge Piping: Same material as specified for medium being discharged unless otherwise noted.

Q. Chemical Feed Pipe: Same as HEATING WATER.

R. Pipes under Slab and Underground: Where noted, pipes under slab and underground shall be installed in Type 'A' light wall PVC conduit and fittings.

S. Oil:

(1) Pipe: Schedule 40, black steel.

a. 4-inch and Smaller: ASTM A-120.

b. 5-inch and Larger: ASTM A-53, grade B.

(2) Fittings:

a. 2-1/2-inch and Smaller: 150 pound black threaded malleable iron, ASTM-A47, grade 32510.

b. 3-inch and Larger and Underground: Standard weight carbon steel buttweld, ASTM A234.

(3) Grade: Bottom of horizontal piping level.

(4) Buried Piping: Coat with high density 'X-Tru-Coat' polyethylene with polyethylene tape coat joints.

1.4 PIPE INSTALLATION

A. General: Remove burrs and all loose material from interior of all piping prior to assembly.

B. Air Vents and Drains on Chilled and Heating Water Lines: Install air vents at all high points and where shown. Install drains at all low points and where shown.

C. Refrigerant Pipe Installation: Pipe shall be cleaned, after removing burrs, by drawing a lint-free rag through it. Dry nitrogen shall be continuously bled through system during brazing to prevent oxidation.

D. Air Filter Gauge Piping: Tubing shall be installed utilizing tube benders, and shall be installed parallel or perpendicular with the room walls, and supported on 3'0" maximum O.C. with tubing brackets.

E. Pipe Expansion: Provide expansion loops, swing joints, expansion joints, pipe guides, thrust blocks and anchors as shown on plans.

F. Coring: Core drill all openings in slabs and masonry walls where sleeves are not installed as wall is constructed, and in all exposed masonry walls except where exposure is on mechanical room side only.

G. Pipe Routing: Pipes shall be run level, plumb, and parallel with building structure unless otherwise noted.

H. Pipe Spacing: Maintain 4-inch minimum clearance between pipe and fittings after insulating, space permitting, unless otherwise noted.

I. Refrigerant Relief: Pipe to outside of building and turn down. Install loosely fitting painted "red" cork stopper in end of refrigerant pipe outside building.

1.5 PIPE JOINTS

A. General: Joints shall be as determined by the equipment, valve or fitting specified.

B. Threaded: All threads shall be American Standard pipe thread. Apply teflon thread sealing compound to male threads only. Ream cut ends and remove all burrs.

C. Solvent Welds: Carefully conform to piping manufacturers solvent weld instructions. Clean pipe and fitting before applying solvent. Materials must be maintained between 50 and 90°F during assembly.

D. Welded: Welding procedures and welders qualifications shall be in accordance with ASA B31.1 Code for Pressure Piping, dated 1983. Provide copy of certificate of qualification for all welders to be used prior to performing any welding.

(1) 1-1/2-inch and Smaller: Gas weld with oxygen and acetylene.

(2) 2-inch and Larger: Metallic arc weld.

E. Flanges: Raised-face 150 pound welding neck flanges with carbon steel bolts full size of bolt holes and hex nuts. Install flanges in horizontal lines with bolt holes straddling vertical and horizontal pipe centerlines. Install flanges in vertical lines with bolt holes straddling lines parallel to equipment centerlines and building lines. Gaskets shall be 1/16-inch gray-black ring-type, ASA B16.21-1962. Bore of flanges shall be same as pipe bore.

F. Soldered: 95/5 solder shall be used on type L and M copper unless otherwise noted. Silver solder shall be used on type ACR copper, and type L copper heating and chilled water pipes.

G. Brazed, (Silver Solder): Joints shall be with silver-bearing alloy brazing rod having a melting point in excess of 1000°F.

H. Precast Joints: Precast collars shall be formed in both the spigot and bell of the pipe in advance of use. Collar surfaces shall be conical with sides slopes of 3° with the axis of the pipe and the length shall be equal to the depth of the socket. Prior to making joint contact, surfaces shall be cleaned and coated with solvents and adhesives as recommended by instructions on container. When the spigot end is inserted in the collar, it shall bind before contacting the base of the socket. Material shall be inert and resistant to both acids and alkalies.

I. Joints between Cast Iron Pipe and Terra Cotta Pipe and Cut Lengths of Terra Cotta Piping: Hot poured joints; National Plumbing Code, 1955 Edition, Paragraph 4.2.6. Cement joints are prohibited.

J. No Hub Waste and Vent: Compression type fitting, for use with no-hub cast iron waste piping.

K. No Hub Cast Iron Pipe: On cast iron soil, waste, storm drain and vent piping, no hub pipe couplings shall be used above grade. Couplings shall have neoprene gasket and stainless steel nuts and bolts. Manufacturers: MG Coupling Co.; Clamp-All Corp.; ANACO "Husky"; Universal C.I.

1.6 EXCAVATION & BACKFILL

A. General: See SITEWORK.

B. Excavation: Trenches shall be excavated to the line and grade determined by pipes. Do not undercut trench. The bottoms of all trenches in rock or hard strata, cinders organic soils or injurious materials shall be excavated a minimum of 6 inches below the bottom of the pipeline and refilled with 6 inches or more inorganic soil, sand, or gravel, tamped in place.

C. Dewatering: Contractor shall furnish all labor, materials, and equipment to keep the work free of water either from surface sources or from underground sources or from both. The selection of the equipment and method of the removal of the water shall be the responsibility of the Contractor. The Contractor shall be and is responsible for all damage incurred in handling water conditions. The present provision supersedes and replaces all other provisions relating to the removal of water from the site.

D. Backfill: All junk metal, timbers, bricks, rocks and material not conforming to specification for FILL shall be removed from site before backfilling. After pipelines have been tested, inspected, and approved, the trenches shall be backfilled to the first twelve inches of backfill over pipe in 4 inch layers and hand tamped. The remainder of backfill may be machine tamped. Backfill shall be compacted and tested as specified in Sitework.

E. Coverage: The minimum coverage on all pipe outside building shall be 3-feet to final grade unless otherwise noted.

1.7 VALVES

A. General:

(1) Valves shall be installed in supplies to all equipment. Provide balance valves in returns from all heat transfer equipment unless otherwise indicated.

(2) Valves installed underground shall have extension to underneath bottom of valve box cover and square operating nut.

(3) Provide gear drive with handwheels on butterfly valves 8-inch and larger.

(4) All domestic water valves with hose end connections shall be provided with vacuum breaker.

(5) All manually operated valves in chiller/boiler mechanical room 5" and larger located 7-feet above the floor shall be installed with

their spindles horizontal and shall be fitted with chain wheels. Chains shall loop to within four (4) feet of the floor, and holding clips to secure the chains when not in use shall be provided.

B. Types:

(1) Type A - Gate Valves:

a. 2-inch and Smaller: Bronze body, solid wedge disc, non-rising stem, 125 pound SWP, 200 pound WOG, solder ends. Nibco Scott S 113, Hammond IB 647, 613, Crane 438, Milwaukee 115, Jenkins 1240, Stockham B 104.

b. 2-1/2-inch and Larger: Iron body, bronze solid wedge disc, bronze seat, non-rising stem, flanged ends, 125 pound SWP, 200 pound WOG. Nibco Scott F 619, Hammond IR 1138, Crane 461, Milwaukee 2882, Jenkins 326, Stockham G 612.

(2) Type B - Globe Valves:

a. 2-inch and Smaller: Bronze body, renewable teflon disc, rising stem, 125 pound SWP, 200 pound WOG, solder ends. Nibco Scott S 211Y, Hammond IB 423, Crane 1310, Milwaukee 502, Jenkins 1200, Stockham B 14 T.

b. 2-1/2-inch and Larger: Iron body, bronze trim, bolted bonnet, renewable seat and disc, composition disc, rising stem, 125 pound SWP, 200 pound WOG, flanged ends. Nibco Scott F 718W, Hammond IR126 (2 1/2" and larger), Crane 359, Milwaukee 2981, Jenkins 142, Stockham G 514 T.

(3) Type C - Check Valves:

a. 3-inch and Smaller: Bronze body, horizontal swing, regrinding type, Y-pattern, bronze seat, renewable teflon disc, solder ends, 125 pound SWP, 200 pound WOG. Nibco Scott S 413Y, Hammond IB 943, Milwaukee 1509, Stockham B 306 B.

b. 2-1/2-inch and Larger: Iron body, swing type, bronze trimmed, bronze seat and disc, 125 pound SWP, 200 pound WOG, flanged ends. Nibco Scott F 918W, Hammond IR 1124, Crane 373, Milwaukee 2974, Jenkins 295, Stockham G 931.

(4) Type D - Ball Valves:

a. 2-1/2-inch and Smaller: Bronze body, bronze ball, full port, teflon seats, solder ends 150 pound SWP, 400 pound WOG. Nibco Scott S 595Y, Crane 2330TF, Rockwood 302, Hammond BV812 T.

(5) Type E - Sillcocks:

a. Bronze body, angle pattern, lock-shield, hose connection, bronze seat, Buna N disc. Nibco Scott 763 or Woodford 24P. Install 16 to 20 inches above grade unless otherwise noted.

(6) Type F - Globe Valves:

a. 2-inch and Smaller: Bronze body, solid wedge disc, non-rising stem, 125 pound SWP, 200 pound WOG threaded ends. Nibco Scott T 113, Hammond IB 609, Crane 438, Milwaukee 105, Jenkins 370, Stockham B 103.

b. 2-1/2-inch and Larger: Iron body, bronze solid wedge disc, bronze seat, non-rising stem, flanged ends, 125 pound SWP, 200 pound WOG. Nibco Scott F 619, Hammond IR 1138, Crane 461, Milwaukee 2882, Jenkins 326, Stockham G 612.

(7) Type G - Globe Valves:

a. 1-1/2-inch and Smaller: Bronze body, renewable teflon disc, rising stem, 125 pound SWP, 200 pound WOG, threaded ends. Nibco Scott T 211Y, Hammond IB 413T, Crane No. 1, Milwaukee 502, Jenkins 106A 2, Stockham B 13 T.

b. 2-inch and Larger: Iron body, bronze trim, bolted bonnet, renewable seat and disc, composition disc, rising stem, 125 pound SWP, 200 pound, WOG, flanged ends. Nibco Scott F 718W, Hammond IR 126 (2 1/2" & larger), Crane 359, Milwaukee 2981, Jenkins 142, Stockham G 514 T.

(8) Type H - Check Valves:

a. 2-inch and Smaller: Bronze body swing check, regrinding type, Y pattern, bronze seat, renewable teflon disc, threaded ends, 125 pound SWP, 200 pound WOG. Nibco Scott T 413Y, Hammond IB 942, Crane 34, Milwaukee 509, Stockham B 305 B.

b. 2-1/2-inch and Larger: Iron body, wafer type, bronze seat and disc, stainless steel spring, 125 pound class rating. Nibco Scott W910B, Hammond CPV10B, K & F K F wafer check,

Centerline CLC, Mission 12HMF, Muessco #91AP/92AP, Metraflex #700. Flanged type shall be used when connecting to flanges other than steel.

(9) Type I - Ball Valves:

a. 2-inch and Smaller: Bronze body, bronze ball, full port, teflon seats, threaded ends, 150 pound SWP, 400 pound WOG. Nibco Scott T 595Y, Rockwood 302, Crane 2330, Hammond BV811T.

b. 2-1/2-inch and Larger: Carbon steel body, stainless steel ball and trim, full flow, teflon seats, flanged ends, 275 pound WOG. Rockwood 1154T; Clayton Mark & Co., Petro 770 Series; and Pacific Valve Co. Fig. #225 & Flanged 400.

(10) Type J - Butterfly Valves:

a. 2-inch and Larger: Iron body, wafer type, extended neck, synthetic resilient seat liner, stainless steel shaft, lever operator and adjustable pre-set stop, 150 pound, 250°F maximum operating temperature. Nibco Scott WL 082, Keystone 100, Crane FRZ, Pratt Spacemate, Hammond 3537, Centerline Series 'A', Mission 3010AM1, Stockham LG551 DS3 B, Mueller #51 series, Metraflex BW-3/4, Mueller 51/52. Lug type valves shall be used when connecting to flanges other than steel. Provide lever operator and adjustable preset stop on valves 4-inch and smaller; manual screw operator on valves 6-inch and larger.

(11) Type K - Gauge Cocks:

a. Bronze body, bronze seat and stem, wheel handle. 200 pound SWP, 400 pound WOG, threaded ends. Hammond IB 415, Crane 88, Milwaukee 600, Jenkins 743 G, Stockham B 64, Nibco T 254.

(12) Type L - Plug Cocks:

a. 1/2 and 3/4-inch: Brass T-handle; Glauber K 428, Crane 1220.

b. 1 to 2 1/2-inch: Lubricated tapered plug type, bolted gland, 175 pound WOG, threaded ends. Rockwell 142, Powell 2200, Crane 320.

c. 3-inch and Larger: Lubricated tapered plug type, bolted gland, 175 pound WOG, flanged ends. Rockwell 143, Powell 2201, Crane 325.

d. Provide lever operator and adjustable pre-set stop.

(13) Type N - Ball Valves:

a. 2-inch and Smaller: Bronze body, bronze ball, full port, teflon seats, threaded ends, 400 pound WOG. Nibco Scott T-595Y, Rockwood 802, Crane 2330, Hammond BV811T.

b. 3-inch and Larger: Stainless steel with TFE trim, 300 pound flange. Rockwood 1034, Crane 953-TF.

(14) Type O - Interior Hose Bibbs:

a. Polished chrome Woodford model 24P lockshield loose key. Chicago 293, Nibco 763VB LS. Install 18 inches above floor unless otherwise noted.

(15) Type Q - AWWA Gate Valves:

2-inch and larger, Iron body, non-rising stem, AWWA C-500 class C, 175 lb. WWP, bronze mounted, double disc, mechanical joints ends accessories, 2-in. square operating nut, O ring dirt and pressure seals. Kennedy Fig. 571X, M & H Fig. 67M, Stockham Fig. G 743 O.

(16) Type V - Wall Hydrants, Unless Otherwise Noted:

a. Fully recessed Chrome, 3/4" hose connection with vacuum breaker. Woodford B 65; J. R. Smith 5609 VB; Josam 71050; Wade W8625 VB.

(17) Type W - Underground Stop & Waste Valves:

a. 1 1/2-inch and Smaller: Bronze body, plug-cock, removable lever handle, 125 pound WOG. 1 inch and smaller, solder ends; 1 1/4 inch and larger, threaded. Glauber K 710/K 701, Peter Healey #150/100.

(18 Type X - Eccentric Plug Valves:

a. 2-1/2-inch and Smaller: Semi-steel body, EPT coated plug, full port, square head operating nut, 175 pound WOG, threaded ends. Homestead 1512, DeZurick 118S, ACF EC.

b. 3-inch and Larger: Semi-steel body, EPT coated plug, square head operating nut, 175 pound WOG, flanged ends. Homestead 1522, DeZurick 118F, ACF EC.

(19) Type Z - U. L. Gate Valve:

a. 2-inch and Smaller: Bronze body, U.L. listed - FM approved, OS&Y, solid wedge, 175 pound W.O.G., threaded ends. Nibco-Scott T 104 O; Crane 459; Jenkins 275U; Hammond 1B681, Stockham B 133.

b. 2 1/2-inch and Larger: Iron body, bronze trim, U.L. listed - FM approved, OS&Y, solid wedge, 175 pound W.O.G., flanged ends. Nibco-Scott F 607 O; Crane 467; Jenkins 825 A; Hammond 1R1154, Stockham G 634.

(20) Type VV - Yard Hydrant:

a. Deep recessed box for flush mounting, cast bronze, non-freeze, 3/4" hose connection, 2.6 ft. depth of bury. Woodford Y 70, J. R. Smith 5810, Josam 71600 76, Zurn Z1360 8.

C. Use:

(1) Domestic Water, Unless Otherwise Noted: Type A, B, C, D, E, K, O, V, VV.

(2) Buried Domestic Water, 2-inch and Larger: Type Q, W.

(3) Chilled Water, Low Temperature Heating Hot Water, and Condenser Water, Unless Otherwise Noted: Type F, G, H, I, J, K, L, X.

(4) Balance Valves: Domestic Water - Type D; Other - Type D & I (1-1/2-inch and smaller), Type L, X, (2-inch and larger).

(5) Oil Service: Type N.

(6) Fire Protection: Type Z.

END OF SECTION

SECTION 15690 - PIPING SPECIALTIES

1.1 RELATED DOCUMENTS

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

1.2 FLASHINGS

A. Cast Iron Vents Thru Roof Unless Otherwise Noted: 4 pound sheet lead, 18-inch square base, barrel type extending up side of vent pipe and turning down inside pipe 1-inch minimum.

B. Roof and Overflow Drains: 4 pound sheet lead, 24-inches square.

C. Workmanship: Flashing materials shall be free of holes and splits, and all joints and seams shall be sealed watertight with solder.

1.3 VALVE BOX

Two piece, cast iron, round, adjustable cast iron extension with identification of service on cover. Archway bottom of plastic. Anniston Foundry Co., U. S. Pipe Co. or Clow.

1.4 FLOOR AND CEILING PLATES

Chromium plated with concealed hinge and catch. Provide where insulated and uninsulated pipes exposed to view pass through floors, walls, ceilings and cabinets in finished areas.

1.5 RELIEF VALVES

A. ASME approved in accordance with Unfired Pressure Vessel Code, Section 8, UG-136, Safety and Relief Valves and Low Pressure Heating Boilers, Section 4, Relief Valves. Provide pressure relief valve for chilled and heating water system, and pressure/temperature relief valve on domestic water systems.

B. Relief Valve Discharge:

(1) Size: Full size of valve unless indicated larger.

(2) Low Temperature Hydronic Systems: Pipe to floor.

(3) Centrifugal Refrigerant: Pipe to outside building.

1.6 STRAINERS

A. General: Y-type, with removable screen; 2-inch and larger, flanged; 1-1/2-inch and smaller, screwed. Rating 125 PSIG except high pressure

steam shall be 250 PSIG. Provide valved blowdown. Crane; Armstrong; Sarco; Hoffman; Leslie; McAlear; Metraflex; Keckley; Muessco; Mueller.

B. Heating and Chilled Water Service: 3/64-inch diameter perforated brass screen.

C. Condenser Water Service: 1/8-inch diameter perforated brass screen.

D. Cleaning: Remove screen from strainer after 60 hours minimum operating time, clean and re-install.

1.7 WATER PRESSURE REDUCING VALVE

A. General: Bronze body, nickel alloy seat, high temperature resisting diaphragm with stainless steel perforated strainer screen and built-in bypass. Watts No. 223SB, Cash-Acme Type E-93, Mason Neilan 227 or 414, Braukmann D06FU-H. See detail on plans.

B. Schedule: Refer to plans.

1.8 FLEXIBLE CONNECTIONS

Corrugated bronze inner tubing with bronze wire braid outer shield thru 4" and corrugated S.S. inner tubing with bronze wire braid outer shield 5" and above; ASA 150 lb. forged steel flanges; 145 pound minimum working pressure at 250°F; not less than four pipe diameters in length. Keflex 'KFCB', Metraflex 'ML'; BOA B3-1; Flexonics 'BRF'.

1.9 EXPANSION TANKS

Pressurized diaphragm type expansion tank, precharged to 15 PSI unless otherwise noted, 125 PSI maximum working pressure, ASME constructed, 240°F maximum operating temperature, of sizes shown on plan. Provide fill tank specialities as shown. American Tube and Controls, Inc., General Fittings, or Flair.

1.10 MANUAL AIR VENTS

As detailed.

1.11 DIELECTRIC UNIONS

Use where ferrous and non-ferrous pipes join. Dielectric union shall be comprised of steel ground joint union and standard brass nipple.

1.12 CONDENSER WATER CHEMICAL TREATMENT

Positive displacement proportioning treatment assembly consisting of pump, flow through probe, bleed control, timer, meter with contactor assembly, solenoid bleed valve and 140 gallon (minimum) centrifugally cast, chopped-glass and resin (fiberglass) tank with smooth interior and exterior, fiberglass cover, foot valve, strainer, injection check valve and plastic tubing. See detail. Liquid Metronics, Inc. Series AO-11-81A; Uniloc 9981-11/Model 18.

1.13 BYPASS CHEMICAL FEEDER

A. Provide for cooling and heating water. Five gallon minimum capacity wall mounted tank for 125 PSI working pressure with 3 1/2-inch minimum diameter fill opening and pipe tappings. Pipe as shown in detail. Dearborn, Anderson or Mogul.

B. Approximate System Volume: Refer to drawings, Sheet M7.6.

1.14 REFRIGERANT SPECIALITIES

A. General: Refrigerant specialities data with sizes shall be submitted with refrigerant piping diagram for approval. Specialities shall be compatible with refrigerant utilized in circuit and installed in accordance with manufacturer's recommendations.

B. Thermostatic Expansion Valves: Brass body, stainless steel/monel seat, Hastelloy/stainless steel pin, stainless steel diaphragm, strainer, external equalizer, and solder/solder-flange connections. All working parts shall be accessible with replaceable thermostatic element. Valve shall be sized to fit refrigerant coil circuit load. Valves shall be Alco, Henry, or Sporlan.

C. Distributors: Distributors shall be provided with direct expansion coils.

D. Solenoid Valves: Brass/Bronze/Steel Casting body, pilot port operated, synthetic to metal main and pilot port seating, solder ends, and electric junction box. Valve shall be operable in any position and be U.L. approved. Solenoid valves shall be Alco, Henry, or Sporlan.

E. Filter Drier: Welded steel shell with removable core, copper brazed fittings, with cadmium plated mounting brackets. Core shall be capable of removing moisture, acids, and foreign matter from refrigerant circuit. A filter drier shall be installed in each refrigerant circuit in the main liquid line. Filter drier shall be Alco, Henry, or Sporlan.

F. Sight Glass: Body and fittings shall be steel, copper brazed together and then copper plated. Sight glass shall allow viewing of refrigerant liquid, have an indicator for indication of moisture in the refrigerant liquid, and have a protective cap. Sight glass shall be installed in-line up to 2 1/8 inch OD liquid, and in bypass line on larger lines. Sight glass shall be Alco, Henry, or Sporlan.

G. Charging Valves: Forged brass construction, packed type for refrigerant service, removable cap connected by brass chain with flare connection. Valve shall be Imperial, Mueller, Robinair-Madden.

H. Line Valves: Forged brass or bronze construction for refrigerant service, wing cap seal with built-in operating socket wrench in cap top, bolted bonnet, and back seating. Valves shall be Imperial, Mueller or Robinair-Madden.

1.15 AIR CHAMBERS (Single Fixtures)

Install air chambers of same material as domestic water piping, 18 inches long and one pipe size larger than supply pipe, with cap sweated on, at all plumbing fixture connections, unless otherwise noted.

1.16 AIR CHAMBERS (Multiple Fixtures)

Install air chambers of same material as domestic water piping, 24-inches long and size of largest supply pipe, with cap sweated on, at all plumbing chases.

1.17 SCREWDRIVER AIR VENTS

Provide where required to avoid air binding.

1.18 BACK FLOW PREVENTER

A. General: All domestic water connections to mechanical equipment or non-potable water useage shall be provided with a backflow preventer unless a backflow preventer is built into the equipment.

B. Double check valve pressure type for pipe size 1/2 and 3/4-inch, Braukmann BF-290. Watts No. 9D, FEBCO No. 760, Lawler RZ.

C. Reduced pressure type with strainer and isolation gate valves for pipe size 1-inch and over. Watts No. 900, FEBCO No. 825, BEECO No. 6-C, Lawler RZ, Neptune model 575, Braukmann BF-299.

D. Drain: Connect vent drain pipe to discharge opening with set screws. Pipe vent drain to floor drain.

1.19 SUCTION DIFFUSER

A. Angle type cast iron body with flanged connections for bolting to end suction pump; complete with stainless steel inlet vanes, steel cylinder strainer, 16 mesh bronze start-up fine mesh strainer, adjustable foot, gauge port and blowdown tapping. Orifice cylinder shall withstand pressure differential equal to pump shutoff head and operating pressure drop shall not exceed 1 PSI at design flow. Remove start-up fine mesh strainer after 60 hours minimum operating time.

B. Manufacturers: Bell & Gossett, Armstrong, Taco.

1.20 VACUUM BREAKERS FOR HOSE END CONNECTIONS (INTERIOR ONLY)

Chrome plated for plated devices, rough brass elsewhere. Watts 8A, Nidel 34-H, T & S B-972.

1.21 VACUUM BREAKERS FOR HOSE END CONNECTIONS (EXTERIOR ONLY)

Chrome plated for plated devices, rough brass elsewhere. Nidel 34-HD, Watts NF-8 or Conbraco 38-304VCB.

1.22 TEST PLUGS

Brass body with neoprene valve core; brass cap; 1/4-inch NPT connection. Install in 1/4-inch threadolet in locations shown. Universal Lancaster, 'Petes' Plug.

1.23 NON-FREEZE GROUND OR YARD HYDRANT

Hydrant shall be constructed of bronze with rough bronze box and bronze casing with "T" handle key. Depth of bury shall be 2'-0" minimum. No vacuum breaker will be required. J. R. Smith 5810, Zurn Z-13601, Wade W-8609, Josam 71600 or Woodford Y70.

1.24 NON-FREEZE WALL HYDRANT

Hydrant shall be constructed of bronze with rough bronze box and bronze casing with "T" handle key. Unit fits two standard modular brick courses or one course of facing tile. Unit shall come complete with vacuum breaker and have an automatic drain with or without hose connected. Hydrant shall be freezeproof and vandalproof. Woodford B-65, Josam 71500-80, Wade W-8626 or Smith 5510-VB.

END OF SECTION

SECTION 15700 - INSULATION

1.1 RELATED DOCUMENTS

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

1.2 REQUIREMENTS

Insulation thicknesses specified are minimum. Exterior of visible duct and pipe insulation shall be uniform in appearance. All insulation, adhesives, materials, jackets, and sealers shall have a flame spread of 25 or less and smoke development of 50 or less (exception allowed for foamed plastic insulation, canvas jackets, and PVC fitting covers) as tested by ASTM E-84-80. All insulation, mastics, coatings, sealants, and adhesives shall be certified by the manufacturer to be asbestos-free.

1.3 CODES

A. Duct insulation materials and adhesives shall conform to NFPA 90A, 1981.

B. Refer to Section 15010, Codes and Ordinances.

1.4 DUCT INSULATION

A. Materials:

(1) Blanket Type: Glass fiber duct insulation, 3/4-pound density with FSK facing. Adhere insulation to duct with duct insulation adhesive covering 100% of duct surface. Install mechanical fasteners not more than 18-inches on centers on bottom of ducts over 24-inches wide, seal punctures with FSK tape. Lap traverse joints 2-inches minimum and seal with lap adhesive. Seal longitudinal joint with FSK tape. Wrap insulation with 18-gauge stainless steel wire 18-inches maximum on centers. Do not pull insulation tight around ducts when wrapping. Use 24-inch minimum length 6# density board type insulation on bottom of ducts at trapeze hangers.

(2) Board Type: Glass fiber rigid duct insulation board, 6-pound density with FSK facing. Cut to fit between standing seams and stiffeners to provide 1/2-inch minimum cover, and secure to ducts with 100% coverage of duct insulation adhesive and mechanical fasteners on 12-inch centers. Butt joints. Tape all joints and

pin penetrations with 4-inch wide FSK tape after pointing up clip penetrations with insulating cement.

B. Finish for Insulation Exposed Indoors: Secure metal corner beads to all exterior edges and cover with 8 ounce canvas adhered with lagging adhesive and finished with a brush coat of lagging adhesive.

C. Location and Thickness:

(1) Supply Ducts above Ceilings: Blanket; 2-inch thick.

(2) All Other Supply Ducts Unless Otherwise Noted: Blanket; 2-inch thick.

(3) Ceiling Supply Diffusers: Insulate tops of all ceiling supply diffusers. Thickness same as applicable supply duct.

(4) Supply Ducts Exposed: Board; 2-inch thick, unless otherwise noted.

(5) Supply Ducts Acoustically Lined. Insulate externally as specified herein, unless otherwise noted.

(6) Return Ducts Exposed in Chiller/Boiler and Other Mechanical Rooms: Board; 2-inch thick.

(7) Return Ducts above Ceilings: Do not insulate.

(8) Kitchen Hood Exhaust Duct & Top of Hood: Board; 2-inch thick with white breather mastic reinforced with white glass cloth.

(9) Supply Ducts Exposed in Document Storage Rooms: Do not insulate.

1.5 PIPE INSULATION

A. General:

(1) U. L. Rating: Glass fiber pipe and fittings insulation materials, adhesive, jackets and accessories shall be Underwriters Laboratories rated to provide a U.L. rated, non-combustible pipe insulation system.

(2) Fixture Supply Piping Exposed and in Cabinets: Do not insulate unless otherwise noted.

(3) Domestic Hot & Cold Water, Chilled Water, Heating Water within 5-feet of Reheat Coils, Horizontal Storm Drain, Refrigerant Suction Piping, & Condensate Drain Piping: Insulate all fittings

including valve bonnets. Leave only valve stems, open ends of wells and gauge cocks exposed.

(4) All Other Piping: Omit insulation on unions and valves. Taper insulation ends and cover with jacket material.

(5) Insulation at Hangers: Hangers for horizontal, refrigerant suction chilled water storm drain and condensate drain piping, trapeze supports and vertical pipe supports except riser clamps shall be outside insulation with saddles as specified herein.

B. Materials:

(1) Glass Fiber: Molded, sectional 4-pound minimum density glass fiber pipe insulation with ASJ self-sealing lap jacketing. Run pipe covering over fittings in concealed areas. Insulate fittings in exposed areas with pipe insulation mitered to fit and finished smooth to thickness of adjacent insulation with insulating cement. Molded fittings shall be furnished in exposed areas. On piping other than chilled water and steam, provide fiberglass inserts with PVC fitting covers. Seal butt ends of fittings and sections on chilled water pipe with white vapor barrier coating.

(2) Silicate: Molded sectional rigid pipe insulation rated up to 1200°F, maximum conductivity of 0.55 at 500°F, 11-pound minimum density, with factory applied jacket. Material shall be asbestos-free Hydrous Calcium or expanded perlite with binder. Insulate fittings with pipe insulation mitered to fit, finished smooth to thickness of adjacent insulation with insulating cement.

(3) Foamed Glass: Molded rigid cellular glass insulation. Coat bore and ends of insulation and seal all joints with asphalt cut-back mastic. Secure insulation in place with 18-gauge stainless steel wire on 9-inch centers and cover outside of insulation with mastic. Install insulation with tightly-butted, staggered joints. Cover insulation to receive canvas jacket with ASJ paper in lieu of mastic. Coat insulation with white vapor barrier coating reinforced with glass cloth.

(4) Flexible Foamed Plastic: Closed cell 5-pound minimum density foamed plastic flexible insulation having a thermal conductivity of not more than 0.26 at 75°F. Seal joints with insulation adhesive. Install insulation under compression during pipe fabrication without splitting. Do not split insulation

longitudinally except at tees and expansion bulbs. Insulation shall have flame spread rating of 25 or less when tested in accordance with ASTM E84-80.

(5) Insulation Where Supports Are Outside Insulation: Rigid insulation.

C. Finish:

(1) Concealed: Factory applied white kraft and foil laminate, reinforced, fire retardant jacket (ASJ) with self sealing lap and butt strips. Seal longitudinal lap and traverse joints with vapor barrier adhesive and apply 3-inch wide joint sealer strips in adhesive at traverse joints. Staple laps with outward clinching staples 18-inches on centers and at each fitting, outlet or end. Seal punctures with vapor barrier adhesive.

(2) Exposed Indoors: 8-ounce canvas jacket adhered with lagging adhesive and finished with a brush coat of lagging adhesive. Omit bands.

(3) Exposed Outdoors: Apply a 16 mil embossed aluminum jacket with a 2-inch overlap at longitudinal and transverse joints, secured in place with 3/4-inch by .015-inch aluminum bands on 18-inch centers. Jacket shall be outside of jacket for "concealed" insulation. Finish with gray breather mastic and glass cloth on fittings.

(4) Foamed Plastic Indoors or Outdoors: No jacket. Paint exposed insulation with two coats white vinyl insulation paint after adhesive has dried 12 hours. Allow two hours between coats.

(5) Exposed Indoors: Finish with Ceel Tite P.V.C. enclosure, UVR as manufactured by B.F. Goodrich or approved equal with longitudinal joint concealed against wall, ceiling or structure. Installation shall be in accordance with manufacturer's recommendations.

D. Type and Thickness:

(1) Domestic Water: Glass fiber.

a. Hot Water: 3/4-inch thick, 1-inch pipe and less; 1-inch thick, 1-1/4-inch to 6-inch pipe.

b. Cold Water: Exposed, 1-inch thick; concealed, 1/2-inch thick. Do not insulate buried piping.

(2) Storm Drain Piping above Grade: Exposed; glass fiber, 1/2-inch thick. Concealed blanket type as specified under duct insulation, 1 1/2-inch thick. Bottom of roof drain same as concealed piping.

(3) Drain Piping Above Grade Handling A.C. Condensate: Glass fiber; 1/2-inch thick.

(4) Chilled Water Piping: Foamed glass where exposed, glass fiber where concealed; 1-1/2-inch thick for 8-inch and smaller pipe, 2-inch thick for 10-inch and larger pipe.

(5) Domestic Hot Water Piping and Waste Piping Under Lavatories for the Handicapped: Flexible foamed plastic, 1/2-inch thick.

(6) Heating Water Piping: Silicate where exposed, glass fiber where concealed: 1-inch thick for 2-1/2-inch and smaller pipe, 1-1/2-inch thick for 3-inch and larger pipe.

(7) Exposed Parts of Valves & Fittings at Reheat Coils: Foamed plastic insulating tape; 1/8-inch thick. Glass fiber insulation in return air plenum.

(8) Condensate Drain Piping from Coil Connection: Foamed plastic; 1/2-inch thick. Do not insulate main apparatus cooling coils drains.

(9) Insulation at Saddles and Supports: Rigid insulation of length to extend 1-inch minimum beyond each end of support or saddle. Use foamed glass or urethane insulation on chilled water or refrigerant suction and condensate drains and silicate on all other, of thickness to match adjacent insulation. Composite insulation-shield units manufactured by Pipe Shields, Inc. are acceptable as equal to insulation and saddles specified herein.

(10) Condensate Drain from Built-up Apparatus: Do not insulate.

(11) Refrigerant Suction Piping (55°F Room): Flexible foamed plastic: 3/4-inch thick.

(12) Refrigerant Suction Piping (0°F Room): Flexible foamed plastic: 1-inch thick.

(13) Refrigerant Hot Gas Piping: Flexible foamed plastic: 1/2-inch thick.

(14) All Exposed Piping at Cooling Tower: Foamed glass: 1-1/2-inch thick.

(15) Manual Air Vent Piping and Miscellaneous Piping: Insulate piping from chilled water manual air vents for five feet, and all miscellaneous piping subject to condensation with foamed plastic 1/2-inch thick.

(16) Emergency Generator Exhaust: Silicate where exposed, high temperature (1200°) mineral wool where concealed: 2-inch thick. Do not insulate flexible connection or exhaust silencer.

(17) PVC Soil, Waste, Vent Piping from Darkrooms in Return Air Plenum: Glass fiber; 1/2-inch thick.

1.6 DUCT SOUND TREATMENT

A. General: Two layers 1/2" gypsum board applied to outside of rectangular supply air duct where specified. Stagger joints; glue to duct and between layers; secure to duct with sheet metal screws set in mastic with 2" square 20 gauge washers, 18 inch minimum O.C.

B. Location: Refer to Plans.

1.7 EQUIPMENT INSULATION

A. Chiller: Factory insulated. See EQUIPMENT Specifications. Field installed insulation of water heads shall be flexible foamed plastic, cut and fitted for removal and replacement.

B. Multi-Zone Unit Zone Damper Section: Same as exposed supply duct insulation or 1/2-inch thick sheet foamed insulation.

C. Terminal Air Valves: Insulate inlet collars and all parts of housing not internally insulated; same material as specified for applicable metal supply duct.

D. Boiler: Factory insulated.

E. Chilled Water Pump: Do not insulate.

F. Chilled Water Expansion Tank: Insulate with 3/4-inch minimum thickness foamed plastic shaped to fit the surface. Finish insulation with 2 coats white vinyl insulation paint after adhesive has dried 12 hours. Allow 2 hours between coats.

G. Hot Water Heater: Factory insulated.

H. Combustible Material Adjacent to Range Hood and Exhaust Duct: Protect all combustible material within 18-inches of range exhaust hood and duct with 22-gauge sheet metal on 1-inch mineral wool batts reinforced with wire mesh in accordance with NFPA 96, 1976, Appendix B.

1.8 SADDLES

A. Provide galvanized steel saddles at each point where pipe insulation passes through a hanger or rests on a support. Saddles shall be 180° arc for horizontal piping, 360° arc for vertical piping. Length and gauge of saddle shall be as follows:

Pipe Size	Saddle Gauge	Length of Saddle Insulation Thickness of		
		1/2"	1"	1-1/2"
1" & Smaller	18	6"	6"	---
1-1/4" - 2"	18	8"	6"	6"
3"	18	12"	10"	8"
4"	16	16"	12"	12"
5"	16	18"	16"	14"
6" & Larger	16	24"	20"	16"

1.9 BUILT-UP APPARATUS CASING WALLS & CEILING

A. Location: Building walls and ceiling forming air unit casing, field fabricated metal walls and ceilings (see option in 15010 for prefabricated appratus casing.) and where indicated and underside of overhead structure in mechanical room C-11.

B. Materials: Glass fiber rigid coated duct insulation board, 2-inch thick, 6-pound minimum density, uncoated. Cut to fit between standing seams and stiffeners to provide 1/2-inch minimum cover, and secure with 100% coverage of fire-resistive duct adhesive (non-flammable, wet) and mechanical fasteners at a rate of one per 2-square feet and within

6-inches of all joints. Clip pins 1/8-inch beyond face of board. Butt joints and seal with adhesive.

C. Finish Protection Over 7 Feet Above Floor: Seal joints and edges with 6-inch minimum width white glass fabric, 10 x 20 mesh strips adhered with white breather coating. Cover entire surface with a layer of white glass fabric adhered with white breather coating lapping joints a minimum of 3-inches, and apply a finish coat of adhesive to provide a uniform white finish. Protect outside corners to 6-feet above floor with 3" x 3" x .032" aluminum angle.

D. Finish Protection Within 7 Feet of Floor: Cover insulation with inner wall of 26-gauge perforated galvanized steel. Cover edges and corners of inner wall with 3" x 3" angles and 3-inch wide strips of 22-gauge galvanized steel solid sheets. Clip pins of mechanical fasteners 1/8-inch beyond face of inner wall.

1.10 INSTALLATION

A. General: All insulation shall be installed in accordance with the insulation manufacturers instructions unless prohibited herein.

B. Performance: Work shall be performed by workers regularly employed as insulators with at least three years experience.

1.11 STAPLES, BANDS, WIRES, WIRE NETTING, CORNER BEADS, AND CORNER ANGLES

A. Staples shall be outward clinching type of type 304 or 316 stainless steel, or monel.

B. Bands shall be galvanized steel, aluminum, brass, or nickel copper alloy, of 3/4-inch nominal width. The band thickness exclusive of coating shall be not less than 0.005-inch for steel and nickel copper alloy, 0.007-inch for aluminum, and 0.01-inch for brass.

C. Wire shall be 18-gage, soft annealed galvanized steel.

D. Wire netting provided for exposed surfaces of insulation to be cement finished, shall be 22-gage, 1-inch galvanized mesh, with continuous 26-gage galvanized steel corner beads having 2-1/2-inch wings.

E. Corner angles on insulation of ducts and equipment exposed in finished spaces shall be formed of 28-gage, 1-inch by 1-inch aluminum adhered to 2-inch by 2-inch heavy kraft paper to protect external corners under field applied jackets or facings.

1.12 ADHESIVES, COATINGS, SEALING COMPOUNDS AND PROTECTIVE FINISHES

A. Lagging Adhesive and Coating for Glass Cloth Jackets and Other Facings - MIL-A-3316 B, Class 1.

B. Lap Adhesive for Vapor Barrier Jackets - MIL-A-3316 B, Class 2.

C. Bonding Adhesives - for securing insulation to metal surfaces - MIL-A-3316 B, Class 2 for temperatures up to 200F.

D. Contact Type Adhesive - For installing flexible unicellular insulation - MIL-A-24179A, Type II, Class 1.

E. Bedding Compound and Joint Sealers - MIL-B-19564A.

F. Coating Compound - Vapor Barrier Treatment - MIL-C-19565B, Type I or II.

G. Protective Finish Outside of Buildings - Coating Compound - MIL-C-19565 B, Type I.

1.13 INSULATION MANUFACTURERS

Armstrong; BFG; Certainteed; Johns Manville; Owens Corning; Pittsburg Corning; Rubatex; Knauf.

END OF SECTION

SECTION 15800 - BALANCING & OPERATIONAL TESTS

1.1 RELATED DOCUMENTS

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

1.2 REVIEW

The sub-contractor performing the services under this Section shall review the plans; and specifications and existing conditions for appurtenances and arrangement for specified balancing prior to the installation of any equipment and material. The contractor shall notify the Architect of any omissions noted within 60 days of notice to proceed.

1.3 INSTRUMENTS

Instruments used for balancing air and water systems must have been calibrated within a period of six months prior to balancing. Types and dates of calibration of all instruments shall be listed in the final air and water balance reports.

1.4 ADJUSTING MINIMUM OUTSIDE AIR QUANTITIES

A. Minimum outside air quantities shall be established, as a percentage of total supply air, from measurements of return, outside and mixed air, using a 12-inch long glass thermometer with 1/2°F divisions. Minimum outside quantity shall be made after complete adjustment of supply air quantity and with a 15°F minimum temperature differential between outside and return air temperatures.

B. The following formula shall be utilized for calculating percentage outside air:

$$\text{OSA equals } \frac{TM - Tr}{To - Tr}$$

Ts = Mixed air temperature.
Tr = Return air temperature.
To = Outside air temperature.

1.5 CONNECTING EQUIPMENT

Where two elements of a system, eg. condensing unit and coil, are connected, the testing of equipment shall be simultaneous.

1.6 BALANCING

Systems shall be initially balanced for air and water quantities shown. Final balancing shall be under seasonal operating condition by adjusting for equal temperature in all spaces. This shall be done at outside temperatures above 85°F and below 50°F for cooling and heating respectively.

1.7 AIR BALANCE PERFORMANCE REQUIREMENTS

A. Measurements: Air quantity measurements in main and branch ducts shall be made by pitot tube traverse of the entire cross sectional area of the duct. Ducts having velocities of 1000 or more feet per minute shall be measured with inclined manometers, draft gage, or magnehelic gages; ducts having velocities of less than 1000 feet per minute shall be measured with micromanometers or hook gages.

B. Duct Openings: Openings in ducts for pitot tube and thermometer insertion shall be sealed with snap-in plugs after air balance is complete.

C. Outlet and Inlet Air Quantities: Determine by direct reading velocity meters in accordance with outlet and inlet manufacturer's recommendation.

D. Adjustments: Total air quantities shall be obtained by adjustment of fan speeds. Branch duct air quantities shall be adjusted by volume or splitter dampers. Dampers shall be permanently marked after air balance is complete so that they can be restored to their correct position if disturbed at any time. Final air quantities shall be within plus or minus 5% of those called for on the drawings.

E. Return Air Light Fixtures: Verify troffer heat removal slots are open and adjust R.A. slot dampers for approximately 0.06 inch W.G. pressure drop or less with maximum air supplied to the space.

1.8 WATER BALANCE PERFORMANCE REQUIREMENTS

A. Measurements: Flow meters shall be used to balance water flow. Where the above equipment is not specified, water balance shall be obtained by pressure drop across valves with known Cv or measurement of temperature differential across the various coils or elements. Balancing by temperature differential shall be performed only after air balance previously specified is complete. Automatic control valves shall be set for full flow conditions during balance procedure.

B. Adjustments: Pump capacities shall be determined by flow meter or differential pressure measurements. Water circuits shall be adjusted by use of balancing valves. All balancing valves shall be permanently marked after balance is complete so that they may be restored to their correct position if disturbed.

1.9 CERTIFIED BALANCE REPORTS

A. Three copies of the initial balance report shall be submitted prior to contractor's request for final inspection. Report shall be entitled "Initial Balance Report". This report shall include the data listed below for each system, required and actual.

B. Air Balance Data - Air Handling Equipment:

(1) Installed Air Handling Units, Fans, & Built-up Apparatus:

Unit designation.
Size and manufacturer.
Motor H.P., volts, phase, cycles, full load amps.

(2) Test Results:

Total C.F.M.
Static pressure, total and components, i.e. coil, filter.
Motors Amps and Voltage (All Legs).
Outside Air, CFM.
Fan RPM.
Fan B.H.P.
Coil air inlet and outlet dry and wet bulb temperatures.
Return and outside air dry and wet bulb temperatures.
Coil water inlet and outlet temperatures.
Coil refrigerant suction pressure and superheat temperature.
Calculated percent leakage on each zone of multi-zone unit zone damper.

C. Air Distribution System:

(1) Individual Outlets and Inlets:

Outlet and inlet identification, location and room designation.
Design and resultant test velocities.
Design and resultant test quantities in C.F.M.
Deflector or diffusion cone settings.

D. Water Balance Data Pumps:

(1) Installed Pump Data:

Designation.
Size and manufacturer.
Type drive.
Motor H.P., volts, cycles, phase and full load amps.

(2) Test Results:

Discharge pressure, design flow and no flow.
Suction pressures, design flow and no flow.
Operating head.
Design flow amps.
No flow amps.

E. Water Chillers:

(1) Installed Chiller Data:

Unit designation.
Size and manufacturer.
Motor HP, volts, phase, cycles, full load amps.

(2) Test Results:

G.P.M., cooler and condenser.
Entering and leaving water temperatures on cooler and condenser.
Entering and leaving pressures on cooler and condenser.
Cooler and condenser refrigerant pressures.
Motor amps and voltage (All Legs).
Ambient temperature.

F. Cooling Towers:

(1) Installed Tower Data:

Unit designation.
Size and manufacturer.

(2) Test Results:

GPM.
Entering and leaving water temperatures, and ambient dry and wet bulb temperatures.
Pressure drop across tower.
Bleed water and make-up water rates.

G. Chilled Water Distribution System to Carter Institute:

(1) Test Results:

G.P.M. water from Distribution System.
Entering and leaving water temperatures.

H. Electric Water Boiler:

(1) Installed Boiler Data:

Unit designation.
Size and manufacturer.
KW, volts, phase, full load amps.

(2) Test Results:

Number stages activated.
Pressure.
Unit amps draw.
Inlet and outlet water temperatures.

I. Air Cooled Condensing Units:

(1) Installed Unit Data:

Unit designation.
Size and manufacturer.
Motor Horsepower, volts, phase, cycles, and full load amps.

(2) Test Results:

Suction and Discharge Pressures.
Motor amps and voltage (All Legs).
Ambient temperature.
Hot gas bypass condition.

J. Element Tests, All Heat Transfer Equipment:

(1) Tests Results: These readings shall be taken during initial and seasonal balance.

Unit designation.
G.P.M.
Entering and leaving water temperatures.
Entering and leaving air temperatures (DB & WB on cooling coils).
Pressure drop, water and air.
Amperage and voltage (All Legs).

K. Variable Volume Units:

(1) Tests Results: These readings shall be taken during initial and seasonal balance.

Unit designation.
GPM.
Entering and leaving water temperatures.
Entering and leaving air temperatures.
Amperage and voltage.
Maximum and minimum CFM, space and primary Summer and Winter.
Box inlet S.P. with maximum primary air into box.

L. Refrigeration Equipment:

(1) Installed Condensing Unit and Evaporator Data:

Unit designation.
Size and manufacturer.
Motor HP, volts, phase, cycles, full load amps.

(2) Test Results:

Compressor suction and discharge pressures (temperature).
Evaporator suction pressure and expansion valve superheat.
Ambient temperature.
Space temperatures.
Motor amps and voltage.

M. Humidifier: Entering and leaving air temperatures, DB and WB, and air relative humidity.

N. Computer A. C. Equipment:

(1) Installed in Space Unit Data:

Unit designation.
Size and manufacturer.
Motor HP, volts, phase, cycles, full load amps.

(2) Test Results:

CFM.
Entering and leaving chilled water temperatures.
Space temperature, DB and WB.
Plenum temperature, DB and WB.
Motor amps and voltage of equipment (All Legs).
Tabulate safety controls, verify operation, and confirm same.

O. Filters:

(1) Description of condition.
(2) Pressure drop.

P. Smoke Detectors: Verify operation and confirm test.

Q. All Safety Controls: Verify operation, tabulate list of controls with settings and confirm test.

R. All Motors:

(1) Nameplate data.
(2) Operating amps and voltage (All Legs).
(3) Heater elements rating.

S. Controllers: Tabulate settings of all controllers, individually, by location, equipment, or space.

T. Sensors: Record temperature at all sensors; equipment, space, duct, and pipe; and settings of controllers.

U. Installed Data: Where installed data is specified, complete specified data on piece of equipment shall be included in report.

V. Space Temperatures: Temperature of each conditioned space and dry bulb setting of controlling thermostat.

W. Space Humidity: Humidity of each controlled humidity space and setting of controller.

X. Deficiencies: List all deficiencies noted.

1.10 BALANCE UNDER SEASONAL OPERATING CONDITIONS

A. Test: After the initial balance has been completed the contractor shall adjust the system under seasonal operating conditions by performing operational tests under both cooling and heating conditions. These tests shall be performed only after each piece of equipment has been individually tested, and is verified to be in correct operating condition, and shall be made at times when outdoor dry bulb temperatures are above 85°F for cooling, or below 50°F for heating. When test is run during the cooling cycle all lights shall be turned on. Doors to all spaces shall be closed and all space thermostats set at 75°F.

B. Purpose: Prove correctness of installation; prove functioning of capacity and safety controls; prove calibration of operating controls; and prove stability of operation under specified loading conditions.

C. Certified Reports: Three copies of the following balance data shall be submitted within five (5) days of the job visit. Report shall be entitled "Seasonal Operating Conditions Cooling or Heating. The following information shall be included in the report:

(1) Temperature of each conditioned space and dry bulb setting of controlling thermostat.

(2) Settings of all controllers, individually, by location, equipment, or space.

(3) Temperature at all sensors in equipment, space, duct, and pipe; and settings of controllers.

(4) Date and outdoor DB and WB range at the time indoor temperatures were recorded.

(5) Adjustments performed and corrective action taken.

(6) List of deficiencies noted.

(7) Certification that the purpose of the visit has been complete.

END OF SECTION

SECTION 15900 - FIRE PROTECTION SYSTEM

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

Refer to all sections of Division 15 for applicable requirements.

1.3 BASIS OF DESIGN

A. Systems are light hazard except Document Storage which shall be ordinary hazard, group 2. Pipe sizes are hydraulically calculated based upon 65 PSI static, 35 PSI residual pressure at 900 GPM flow at building entrances. Hydraulic design shall provide minimum of .085 density over any area, including the most remote 1500 sq. ft.

B. Flow rate is based upon flow provided by City of Atlanta Water Board. Contractor shall confirm flow data to assure flow equals or exceeds specified minimum listed for calculations, prior to installing system.

1.4 REQUIREMENTS

It is not the intent of these Contract Documents to provide a complete detailed description of the apparatus, materials, and equipment making a complete installation of the fire protection system. Include all material and equipment and perform all work to install the fire protection system in accordance with specified codes and governing bodies.

1.5 CODES & PERMITS

A. General: Where requirements of these specifications exceed specified codes and ordinances, conform to these specifications.

B. Permits: Obtain all city, county, and state permits required for installation of system, paying all fees in connection therewith.

C. NFPA Codes: Materials, equipment, installation, and testing shall conform to the requirements of N.F.P.A. Code.

(1) NFPA No. 13 - 1983: Standard for the Installation of Sprinkler Systems.

(2) NFPA No. 72A - 1979: Standard for the Installation, Maintenance, and Use of Local Protective Signaling Systems.

(3) NFPA No. 101 - 1981: Code for Safety to Life from Fire in Buildings and Structures.

D. Local Codes and Ordinances: Conform to local codes and ordinances. NFPA Code, where more stringent, shall take precedence.

E. Codes: Conform to the Georgia State Building Code, 1983. NFPA Code, where more stringent, shall take precedence.

1.6 SHOP DRAWINGS

See General Conditions. Plans are diagrammatic showing the piping and location of in-space heads. Submit detailed shop drawings for the complete system showing the location of heads, piping, pipe sizes, and installation details. Submit these drawings to the Georgia State Fire Marshal and to the Architect for approval prior to the fabrication or installation of any piping.

1.7 AUTHORITIES INSPECTIONS AND TESTS

Furnish all labor, equipment and conduct all specified tests in the presence of a representative of the State Fire Marshal and Architect or his designated representative.

1.8 CERTIFICATE OF APPROVAL

On completion of installation, obtain and deliver to Architect certificates of final inspection and approval by Local Fire Marshal and State Fire Marshal.

1.9 SIGNS

Signs shall be installed in accordance with NFPA Code.

1.10 FIRE ALARM SYSTEM

Provide relays and flow switches for and electrically interconnect with the fire alarm system in conformance with NFPA Code. See F.A. panel location on plans. Provide tamper switch on main sprinkler valves and zone isolation valves for electrical supervision under Division 16, Electrical. Provide flow switch for each entrance and each zone of Documents Storage (4 zones).

1.11 PIPING SYSTEM

A. Identification: ASTM, ASA, or AWWA No. shall be stamped on each length of pipe. Bundles of steel pipe shall have metal tag attached showing ASTM No. and schedule.

B. Pipe:

(1) Above Ground: Black carbon steel pipe. Federal Specification WW-P-406D Int. Amd. 1.

a. 2-inch and Smaller: ASTM-A-135, Grade A, schedule 40.

b. 2-1/2-inch thru 6-inch: ASTM-A-135, grade A, schedule 10.

c. 8-inch and Larger: ASTM A-53-79, grade B, schedule 40.

(2) Below Ground: Ductile iron pipe, ASA-21.51, 250 PSI minimum working pressure with slip-on joints, ASA-A21.11. Fittings shall be cast iron, ASA-21.10.

C. Fittings:

(1) 2-inch and Smaller Steel Pipe: 125 lb. black threaded cast iron fittings, ASTM A-126-73 class A, Federal Specification WW-P-501E, with wrought steel couplings.

(2) 2-1/2-inch and Larger Steel Pipe Not Welded: Malleable iron grooved pipe fittings.

(3) Weld Fittings: Buttweld carbon steel, ASTM-A234-79. Wall thickness shall be same as piping.

(4) Reducing Tees: Thred-o-lets or Pipe-o-lets by Bonney Forge Division of Energy Products Group or "EZ TEE" by W. B. Industries may be used for side outlet reducing tees more than two pipe sizes smaller than main.

(5) Below Ground: 3-inch and larger, class 22, bell and spigot, slip on cast iron water main. ASA A21.6-1962, AWWA C106-62.

D. Installation:

(1) Above and Below Ground: Refer to NFPA Code. Pipes utilized as trapeze hangers are not allowed.

(2) Below Ground:

a. Anchors: Concrete thrust blocks shall be provided at all offsets and tees for water main. At end of lines plugged, tie rods and collars shall be provided.

b. Cover: 3 feet minimum.

c. Supports: All pipes shall have uniform bearing on trench bottom.

E. Joints:

(1) Threaded: All male threads shall be American Standard pipe thread. Apply a commercial grade compound to male threads only.

(2) Welded: Welding procedures and welders qualifications shall be in accordance with ASA B31.1 Code for Pressure Piping, dated 1955.

a. 1-1/2-inch and Smaller: Gas weld with oxygen and acetylene.

b. 2-inch and Larger: Metallic arc weld.

(3) Slip on Joints: Joints in ductile iron water main shall be slip on type with Bell Tite rubber gasket, except that joints at valves and fire hydrants shall be mechanical joint with rubber gasket.

(4) Grooved Pipe Couplings: ASTM A-47-77 malleable iron/ASTM A-536-77 ductile iron housings; ASTM D-2000-80 chlorinated butyl grade 'H' gasket for water services to 200°F; ASTM A183-68 heat treated carbon steel bolts and nuts. Install with uniform coat of lubricant on pipe and in housing. Victaulic Style 75 & 77; Gustin-Bacon No. 100; Barco series 100.

F. Excavation & Backfill: Refer to SECTION 15600.

G. Hangers & Supports: Refer to Fig. A-3-15.1, NFPA 13, 1983.

1.12 SPRINKLER SYSTEM ACCESSORIES, VALVES, AND HYDRANTS

A. General:

(1) Devices, hangers, valves, and accessories shall be listed in Underwriters' Standards as approved material and be in accordance with NFPA Code.

(2) All threaded connections for Fire Department use shall have threads compatible with City of Atlanta Fire Department equipment.

(3) All underground valves shall have extension to grade and 2-inch square operating nut.

(4) Provide two key operators for valves to the Owner.

(5) Provide floor and ceiling plates as specified in Section 15690.

B. Gate Valves: Refer to Section 15600.

C. Check Valve: Iron body, U.L. & F.M. approved, swing type, bronze trimmed, bronze seat and disc, flanged ends, Nibco F908, Jenkins 629, Crane 375, Stockham G-939.

D. Dry Pipe Valve: Dry pipe valve with required trim including accelerator, air maintenance device, air and water side pressure gages, drain valve, cast iron body, 175 psi W.W.P., 6 to 1 air side to water side area differential, rubber faced air plate and clapper with replaceable rubbers, U.L. listed, F.M. approved.

E. Sprinkler Heads: All heads shall be F.M. Approved, with temperature actuated link; fused at 165° except heads within 6 feet of an air conditioning supply grille or diffuser and in attics shall be fused at 212°; 1/2" orifice, 1/2" N.P.T. connection. Heads shall center in ceiling tiles on exposed grid ceiling systems.

(1) Flush Type: Completely recessed in ceiling and covered from view by an off white cover plate fitting flush with ceiling.

(2) Recessed Type: Recessed escutcheon housing pendant type head with 1-1/2-inch maximum projection below ceiling; polished chrome finish.

(3) Pendant Type: Standard pendant type for wet pipe system in polished chrome finish, with flush ceiling plate.

(4) Upright Type: Standard upright type, pipe mounted, rough brass finish.

(5) Dry Type Automatic Sprinkler: Dry type pendant or upright head as shown with extension nipple, inner tube and water tight sealing elements to hold the water of wet pipe system at point of connection of extension nipple to tee in Branch line. Extension nipple shall be 12" minimum length.

(6) Locations:

a. Below Ceilings: Chrome plated recessed or flush type as shown.

b. Mechanical Rooms and Unfinished Spaces: Upright.

c. Document Storage Areas: As shown:

F. Alarm Check Valve-Riser: Alarm check valve for vertical installation with retarding chamber as approved by F.M. and listed by U.L. Fine grain cast iron body, rubber faced bronze clapper, 175 PSI W.W.P., and water meter alarm. (See Detail).

G. Air Compressor: Provide air pressure maintenance compressor for dry pipe system.

H. Flow Switches: Paddle type with retard, N.O. contact, for connection to fire alarm panel. Provide at main system risers and four (4) document storage zones.

I. Sidewalk Siamese: Cast brass body and escutcheon, 18-inch brass tubing sleeve, two 2-1/2-inch clappers with caps and chains, 4-inch main, local Fire Department threads, lettered "AUTO SPR" on head. Finish shall be polished brass. Allenco, Potter Roemer or equal.

1.13 STOCK OF SPARE SPRINKLERS

The contractor shall provide spare sprinkler heads and special sprinkler wrench in a wall mounted cabinet in accordance with NFPA 13 1983, 3-16.7.

1.14 MAINTENANCE INFORMATION

The contractor shall provide maintenance information in accordance with NFPA 13, 1983, 1-5.2.

END OF SECTION

SECTION 16010 - GENERAL ELECTRICAL REQUIREMENTS

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. General: Provide a complete electrical system as described herein or as shown on the plans.

B. Items Included: Items under Division 16 shall include but shall not be limited to:

(1) Power and lighting distribution complete, beginning with service entrance and extending through all branch circuits.

(2) Lighting fixtures and lamps.

(3) Panels, breakers & switches.

(4) Power wiring for all electrically operated equipment.

(5) Fire alarm system.

(6) Raceway & boxes for telephones.

(7) Raceway & boxes for security system.

(8) Security systems as shown.

(9) Raceway & boxes for CCTV and CATV system.

(10) Emergency generator.

(11) Multilingual translation system.

(12) Power and raceway for exhibits.

(13) Sound reinforcement system.

(14) Dimming system.

1.3 DEFINITIONS

A. Concealed: Where the word concealed is used in this division, it shall mean items above ceilings, in attics, in crawl spaces, in chases, in tunnels, in cabinet work, and under counters or equipment so as to be not visible from an elevation of 5 feet at a horizontal distance of 10 feet.

B. Finished Spaces or Areas: Where finished spaces or areas are referred to in this division, it shall mean all spaces except concealed spaces, mechanical rooms, or boiler rooms unless otherwise noted.

C. Provide: Where the word provide is used, it shall mean to furnish and install the item(s) in accordance with plans, specifications or manufacturers' instructions.

D. Control and Interlock Wiring: All wiring, both line voltage and low voltage, other than power wiring from electrical distribution panel, through the primary control device, to an item of equipment.

E. Primary Control Device: That ONE device for any item of equipment which interrupts power flow during normal operation. Where magnetic starters are provided, they are the primary control. For items not switched by starters, the primary control device will be the ONE aquastat, P.E. switch, or relay performing the primary switching.

F. Noted, Shown, or Indicated: Where the terms "Noted", "Shown" or "Indicated" are used in these specifications, the words "in the specifications or on the plans" shall be inferred.

G. Detail: Details referenced shall pertain to plans unless otherwise noted.

H. Division or Section Reference: Where reference is made to another division or section within this division, refer to specifications table of contents for division, section, or page number.

I. See Article 100 of the 1978 Georgia State Electrical Code.

J. Code Reference: Where reference is made to material or equipment construction criteria, the 1981 National Electrical Code shall apply. Where installation techniques or sizing requirements are involved, the 1978 Georgia State Electrical Code shall apply.

1.4 CODES AND ORDINANCES

A. General: Where requirements of these specifications exceed specified codes and ordinances, conform to these specifications. Materials and equipment included in Underwriters Label Service shall bear that label. Electrical equipment shall be U.L. approved as installed.

B. Permits: Obtain all permits, paying all fees in connection therewith. At completion, have work inspected by proper authorities and furnish the Architect an inspection certificate showing approval of installation.

C. Electrical: Conform to the Electrical Code of the City of Atlanta and the 1978 Georgia State Electrical Code, NFPA, 1980 Georgia State Fire Code, and The National Electrical Safety Code.

D. All Work: 1980 National Fire Codes. Conform to 1978 N.F.C. (National Fire Codes is a compilation of NFPA Codes, Volumes 1-16.)

E. Energy: Conform to Georgia State Energy Code, 1980.

1.5 SHOP DRAWINGS

A. See General and Supplementary General Conditions of the specifications. Contractor shall check data to ensure compliance with these specifications prior to submitting. Submittal shall be assembled in complete sets and bound with numbered index sheets and tabs. Submittal data shall be submitted at one time unless unavailable drawings would delay job progress. Submittal data for fire alarm, translations system, security, and sound reinforcement systems shall include diagrams showing the system connections.

B. Identification: All submittal data shall be identified to show project name, and the model, style and size of item being submitted. The contractor shall provide a letter acknowledging receipt and review of the tabulated sheet of Power Wiring Requirements of all Mechanical Equipment specified under SHOP DRAWINGS in Section 15010 of specifications. Include a copy of the tabulated sheet of power wiring requirements with the letter. The following items shall be submitted for review:

(1) Lighting Fixtures.
(2) Panelboards, Breakers & Switches.
(3) Wiring Devices.

(4) Transformers.
(5) Fire Alarm System.
(6) CCTV/CATV System.
(7) Dimming System.
(8) Disconnect Switches.
(9) Emergency Generator.
(10) Safety Switches.
(11) Translation System.
(12) Sound Reinforcement System.
(13) Security System.

1.6 GUARANTEE

A. General: See General Conditions.

B. Instructions: Instruct operating personnel designated by Owner in operation of system. Provide signed statement certifying instructions have been received.

1.7 MANUFACTURERS RECOMMENDATIONS

The assembly, erection, testing or adjusting of equipment shall be in accordance with the manufacturers published instructions shipped with the equipment.

1.8 SPACE CONDITIONS

All apparatus shall fit into the available spaces in the building and must be introduced into the building so as not to cause damage to the structure. Equipment larger than access to equipment spaces shall be disassembled into sub-assemblies for installation. Where deviations from the plans are required in order to conform to the space limitations, such changes shall be made at no additional cost to the Owner, and shall be subject to approval. All equipment requiring service shall be made accessible.

1.9 DRAWINGS

Plans are diagrammatic and show the location of the equipment, raceway and fixtures, and are not to be scaled. All dimensions shall be verified at the building site.

1.10 CUTTING AND PATCHING

Cutting and patching in connection with the installation shall be done by the trade whose work is to be cut. Contractor shall lay out and

install his work ahead of the work of other trades wherever possible. Where penetrations are made in fire rated partitions, walls, floors or ceilings during the course of electrical installation, these penetrations shall be restored to their intended fire ratings by the use of fittings or materials as approved by Underwriter's Laboratories for this purpose.

1.11 TESTS

A. At final inspection a test shall be made and the entire system shall be shown to be in working condition. The following shall be made available to personnel conducting the test:

(1) Electrician with hand tools.
(2) Accurate Voltmeter.
(3) Clamp On Ammeter.
(4) Test Lamp.
(5) Phase Rotation Indicator.
(6) Complete Electrical Specifications and Drawings with all addenda and revisions.

B. Contractor shall demonstrate operation of manual and automatic fire alarm stations, emergency generator, sound reinforcement, and translation system.

1.12 OPERATING AND MAINTENANCE MANUALS

A. Three (3) bound and indexed Operating and Maintenance Manuals shall be prepared by the Contractor and be submitted for approval prior to delivery to operating personnel. Two (2) approved copies shall be delivered to operating personnel at final inspection.

B. Data shall be bound in smooth surface hard back commercial quality three-ring notebooks with project identification shown on the front cover and binding back. Identification labels shall be typed and adhered with waterproof glue or cement.

C. Index sheets shall be provided for each category of equipment.

D. Each Manual shall contain the following information, data and drawings:

(1) List of Contents. Insert under front cover.

(2) Copy of approved submittals, equipment and materials.

(3) Installation, operation and maintenance instructions for each item of equipment.

(4) Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.

(5) Control diagrams.

1.13 CERTIFICATES

For Fire Alarm System, Translation System, Sound Reinforcement System, and Emergency Generator System, Start-up, Testing, & Placing into Operation shall be performed by the field representatives of the manufacturers; and certificates of the manufacturers shall be provided on the letterheads of the manufacturers in which the manufacturer certifies that the equipment has been installed in strict compliance with the manufacturers recommendations and is operating properly. The manufacturers shall list in the certificate the item or items furnished to the job. The contractor shall coordinate the performance of the aforesaid services and shall, in all cases where the equipment of two or more manufacturers tie in and function together, require the field representative to perform simultaneously the initial start-up, the testing, and the placing of their equipment into operation. Start-up is defined as putting the equipment into action. Testing is defined as performing such testing as is stipulated in the contract documents to be performed. Placing into operation is defined as operating the equipment for a sufficient period of time for the determination to be made that it is performing properly. Notification shall be given 48 hours in advance of start-up.

1.14 PROTECTION OF MATERIALS AND EQUIPMENT

A. During Construction: Conduit openings shall be closed with caps or plugs. All equipment shall be covered and protected against water, dirt and chemical or mechanical injury. All equipment and material shall be stored in accordance with manufacturer's recommendations.

B. Prior to Final Inspection: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match.

C. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match shall be repainted to match factory finish.

1.15 RECORD DRAWINGS

After completion, any changes in the location of conduits, the connections of circuits, or any other changes from the contract documents shall be noted on a clean set of blue line white prints and delivered to Architect before final acceptance of work.

1.16 APPARATUS OF OTHER TRADES

A. General: No roughing shall be done until roughing drawings and exact electrical demand of equipment is obtained. Notify Architect of any discrepancies.

B. Mechanical:

(1) Review tabulated sheet of Power Wiring Requirements of all Mechanical Equipment specified under SHOP DRAWINGS in Section 15010 of Specifications. Conduit, conductor, and breaker sizes shown for mechanical equipment are based upon the best available information on the equipment specified and are for estimating purposes only. Revisions will be issued for any discrepancies disclosed by the tabulated sheet (Power Wiring Requirements of all Mechanical Equipment) verifying the exact electrical requirements of the mechanical equipment.

(2) Provide 4" thick concrete housekeeping pad beneath any free standing equipment starters. Pad shall extend 2" on all sides of equipment and shall be bevelled 1 inch on all sides.

(3) Provide conduit, wiring, boxes, adaptors for equipment terminations and disconnect switches. Provide power wiring through primary control device.

(4) Starters, push-button stations, contactors, relays, limit and safety devices, and control items are provided in DIVISION 15 except as shown in Motor Control Center. Unless otherwise noted, all starters shall be mounted between 24" and 80" above finished floor. Push-button stations shall be mounted at switch height except as noted.

C. Kitchen Equipment, Media and Refrigeration Equipment: Make electrical connections to all equipment provided under this contract from outlets shown. Obtain roughing drawings prior to installing any outlets. Notify Architect of any discrepancies between roughing drawings and contract documents.

D. Owner Furnished Equipment: Provide conduit, wiring, boxes, adaptors for equipment terminations, and disconnect switches. Make all connections required.

1.17 SITE UTILITIES

The information shown on the plans is based upon the best information available. Prior to performing any work on the site, the contractor shall contact the utility company(s) serving the facility and stake out all underground services. Notify the Architect of any discrepancies.

1.18 TRADE NAMES

When reference is made in the contract documents to trade names, brand names, or to the names of manufacturers, such references are made solely to indicate that products of that description may be furnished and are not intended to restrict competitive bidding. If it is desired to use products of trade or brand names or of manufacturers' names which are different from those mentioned in the contract documents, application for the approval of the use of such products must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. The latter provision is a restriction which applies only to the party making a submittal. Therefore, the aforesaid restriction does not inhibit the Architect from adding trade names, brand names or names of manufacturers by addendum. The burden of proving acceptability of a proposed product for use in place of a product or products designated by trade names or names, brand name or names, or by the name or names of manufacturers in the contract documents rests on the party submitting the request for approval. The written application for approval of a proposed product must be accompanied by technical data which the party requesting approval desires to submit in support of his application. The Architect will give consideration to reports from reputable independent testing laboratories verified experience records showing the reputation of the proposed product with previous users, evidence of reputation of the manufacturer for prompt delivery, evidence of reputation of the manufacturer for efficiency in servicing its products, or any other written information that is helpful in the circumstances. The application to the Architect for approval of a proposed product must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the contract documents. The degree of proof required for approval of a proposed product as acceptable for use in place of a named product or named products is that amount of proof necessary to convince a reasonable

person beyond all doubt. To be approved, a proposed product must also meet or exceed all express requirements of the contract documents. If the submittal is approved by the Architect an addendum will be issued to all prospective bidders. Issuance of an addendum is a representation to all bidders that the Architect in the exercise of his professional discretion established that the product submitted for approval is acceptable and meets or exceeds all express requirements. In the event a submittal shall have been rejected by the Architect and there shall have been a request for a conference as provided in this article pursuant to which conference the said submittal shall have been found to comply with the requirements of this article, a separate addendum covering the said submittal will be issued prior to the opening of bids. In order for the Architect to prepare an addendum intelligently, an application for approval of a product must be accompanied by a copy of the published recommendations of the manufacturer for the installation of the product together with a complete schedule of changes in the drawings and specifications, if any, which must be made in other work in order to permit the use and installation of the proposed product in accordance with the recommendations of the manufacturer of the product. Unless requests for approvals of other products have been received and approvals have been published by addendum in accordance with the above procedure, the successful bidder may furnish no products of any trade names, brand names, or manufacturers' names except those designated in the contract documents. Any party who alleges that rejection of a submittal is the result of bias, prejudice, caprice, or error on the part of the Architect may request a conference with a representative of the owner, Provided: That the request for said conference, submitted in writing, shall have reached the owner at least five days prior to the date set for the opening of bids, time being of the essence.

1.19 ABBREVIATIONS - ELECTRICAL

AIC	AVAILABLE INTERRUPTING CAPACITY
A.F.	ABOVE FINISHED FLOOR
AL	ALUMINUM
ANT	ANTENNA
AWG	AMERICAN WIRE GAUGE
B.E.	BOTTOM ELEVATION
B.G.	BELOW FINISHED GRADE
BRKR	BREAKER
C.	CONDUIT
CAT.	CATALOG
C.H.	CEILING HEIGHT
CLG	CEILING
C.O.	CONVENIENCE OUTLET

COND.	CONDUCTOR(S)
CR	CONTROL RELAY
CU	COPPER
D.	DIAMETER
EMER	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
FAP	FIRE ALARM PANEL
FUT	FUTURE
GND	GROUND
H-O-A	HAND-OFF-AUTOMATIC SWITCH
HPS	HIGH PRESSURE SODIUM
HTR	HEATER
IMC	INTERMEDIATE METALLIC CONDUIT
MB	MAIN BREAKER
MFGR	MANUFACTURER
MLO	MAIN LUGS ONLY
MTD	MOUNTED
MTG	MOUNTING
N.E.C.	NATIONAL ELECTRICAL CODE (1981)
NFDS	NON FUSED DISCONNECT SWITCH
N.I.C.	NOT IN CONTRACT
NMC	NON METALLIC CONDUIT
NO.	NUMBER
PB	PUSHBUTTON
PLCS	PLACES
PVC	POLYVINYL CHLORIDE
R.	RADIUS
R.G.S.	RIGID GALVANIZED STEEL CONDUIT
SCHED.	SCHEDULE
SEC.	SECTION
SMR	SURFACE METAL RACEWAY
SURF.	SURFACE
SYM	SYMMETRICAL
TEL.	TELEPHONE
TYP.	TYPICAL
W/	WITH
WP	WEATHERPROOF
XFMR	TRANSFORMER
20A/3P	20AMP/3POLE TYPICAL

END OF SECTION

SECTION 16100 - BASIC MATERIALS

1.1 RELATED DOCUMENTS

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

1.2 RACEWAY

A. General: Raceway shall be galvanized rigid conduit for raceway 1 1/2-inch and larger, exposed below 5'-0" in Mechanical Rooms, branch circuits to motors, conduits in ground, slab or walls on or below grade, or exposed to weather. Elsewhere concealed raceway shall be electrical metallic tubing. No EMT will be allowed in slabs or below slabs in fill.

B. Connectors and Couplings: Same materials and finish as raceway. Rigid shall be malleable iron threaded. EMT shall be malleable iron split-ring compression type or tap on type. Indenter or set screw types are not acceptable.

C. Intermediate Metallic Conduit: IMC may be substituted for rigid metallic conduit as allowed by Article 345 of Georgia State Electrical Code. All fittings shall be the same as for rigid metallic conduit.

D. Threads: Cut clean and remove rough edges. Running threads shall not be used. Apply rust inhibiting coating to all threads.

E. Pullboxes: Provide in accordance with Georgia State Electrical Code Article 370.

F. Insulating Bushings: Provide on all rigid conduit terminations.

G. Insulated Throat Connectors: Provide on all EMT connections.

H. Connections to Motors: Where conduit cannot be attached to building within 18 inches of motor, a 3/4-inch minimum size vertical conduit shall be attached to ceiling and floor and wiring pulled into and from this conduit through flexible conduit as condulets. See "Flexible Conduit".

I. Metallic Conduits in Contact with Ground: Cover with two coats of asphaltic paint. Conduit with 20 mil bonded coat of PVC is acceptable in lieu of paint.

J. Expansion Fittings: Provide at all expansion joints. Appleton Type XJ, Crouse-Hinds Type XJ or O.Z. Type AX or TX.

K. Capping: Cap conduits exposed during construction to prevent entrance of moisture or foreign matter. Use T & B, Efcor, or Blackhawk Push Pennies. Taping of conduit openings only will not be permitted.

L. Plugging: Seal all conduit runs which extend from interior to exterior of building and that enter and leave refrigerated spaces, to prevent the circulation of air. Stuff conduit ends with wicking at nearest termination inside the building or outside refrigerated spaces. Sealant for refrigerated spaces shall be white permagum.

M. Leave #16 galvanized pullwire or nylon cord in spare or empty conduits.

1.3 FLEXIBLE CONDUIT

A. General: B-X cable is prohibited. Provide separate grounding conductor inside flexible conduit. Flexible conduit shall be liquid-tight neoprene coated in damp & wet locations and for all motor connections.

B. Lay-in and Flanged Light Fixtures: Connect to junction boxes with flexible conduit not exceeding 6-feet in length.

C. Motors & Equipment Containing Motors: Isolate from conduit system and from building structure with flexible conduit not less than four diameters nor more than 24-inches in length.

D. Connectors: Zinc or cadmium plated steel. Fittings anchoring conduit by means of set screws are prohibited.

1.4 RACEWAY ROUTING

A. General: All raceway shall be concealed unless otherwise noted.

B. Clearances: Maintain 3 inches crossing hot piping and 12 inches paralleling. Except where specific routing of conduit is shown, the contractor shall route conduits clear of all heating, ventilating, and air conditioning ducts; sanitary piping; roof drains and storm water piping; sprinkler piping; water pipes (domestic cold and hot water, chilled water, steam, heating water) and plumbing vents.

C. Exposed Routings: Run parallel or at right angles to the building lines.

D. Supports: Individual runs shall be anchored in place within three feet of changes in direction and at intervals not over eight feet by means of straps or clamps specifically designed for the purpose. Wire, hanger iron and nails shall not be used. Do not strap to other piping. Multiple runs shall be supported by assemblies or trapeze type hangers to provide a rigid installation. Anchor supports by means of toggle bolts on hollow masonry units, expansion anchors on solid masonry units, machine screws on steel work and wood screws on wood members.

E. Penetration of fire rated walls, partitions, floors and ceilings: The contractor shall seal around all raceway penetrating fire rated walls, partitions, floors, and ceilings with Dow Corning silicone RTV foam or 3M fire barrier compounds.

1.5 OUTLET BOXES

A. General: Provide outlet boxes for lighting fixtures, wall switches, wall receptacles, protection equipment, and all equipment.

B. Concealed:

(1) Boxes and Covers: Not less than one-sixteenth inch thick, anchored in place and provided with approved three-eighth inch (3/8") fixture studs for fixtures. Unless otherwise specified, ceiling outlet boxes need not be provided with plaster rings and shall be two inches (2") deep or more. Junction boxes shall be provided with blank covers painted to match surroundings.

(2) Ceiling outlet boxes shall be four inch octagonal or four and eleven-sixteenths inches square as specified in Georgia State Electrical Code due to number of wires; switch and wall receptacles outlet boxes in plastered walls shall be four inch square with standard switch covers. In exposed masonry or tile walls four inch square boxes with deep plaster covers shall be used. Ceiling boxes in slabs shall be concrete type. Where slab is not to be plastered, the plaster covers shall be omitted. Larger boxes shall be used to conform to the Georgia State Electrical Code.

C. Exposed: Boxes shall be corrosion resistant cast iron.

D. Pullboxes: Shall be constructed of code gauge welded and galvanized steel. Such boxes shall be sized in accordance with Georgia State Electrical Code and shall be furnished without knockouts; holes for raceways shall be drilled on the job.

E. Special Boxes: For speakers, fire alarm horns and stations, and security equipment shall be obtained from the equipment manufacturer.

F. Outlets in Poured-in-Place Concrete: A six by six by three inch (6" x 6" x 3") deep wood box shall be placed in the form before the concrete is poured. This box shall be removed before waterproofing is applied. Install outlet and grout around box. Boxes shall be set so cover plates are flush.

G. Location:

(1) The approximate locations of outlets are shown on the plans. The exact locations shall be determined at the building. The right is reserved to change the exact location of any outlet a maximum of 10 feet before it is permanently installed without additional cost.

(2) Unless otherwise indicated wall outlet boxes shall be placed with center lines at distances above the finished floor as follows:

Convenience Outlets	18"
Switches	42"
Clocks	8'-2" or 12" below ceiling Conform to lowest mounting
Fire Alarm Stations	58"
Fire Alarm Horns	8'-2" or 12" below ceiling Conform to lowest mounting
Television Outlets	18"
Telephone Outlets	18"
Drinking Fountain Outlets	As recommended by Manufacturer (Concealed behind the unit)

(3) Where outlets of different levels are shown adjacent they shall be installed in one vertical line. Outlets shown back to back on a common wall shall be offset a minimum of 10-inches to dampen sound transmission through the wall.

(4) Where the mounting height of an outlet is not shown on the plans or specifications, the contractor shall contact the Architect for exact mounting height requirements.

(5) At locations where two or more devices are shown adjacent and at the same mounting height, they shall be installed in one outlet box and covered with one face plate.

(6) Where outlets are installed in unfinished block or tile partitions, they shall be installed at the joints in the tile to permit the face plate to cover the rough opening. The horizontal and vertical locations indicated may be altered to permit doing this. However, contractor shall check the Architectural drawings to prevent conflicts when shifting location.

1.7 FLOOR BOXES

A. General: Provide as shown, complete with service fitting or unactivated as indicated.

B. Construction: All boxes in ground floor shall be watertight with threaded hubs. Boxes on other floors shall be concrete tight. All connections shall be made to prevent entrance of moisture. Where outlets are shown adjacent, two or three-gang boxes shall be used. Provide voltage barrier between power and communication sections.

C. Installation: Boxes shall be set and readjusted to provide a smooth surface, conforming to elevation and slope of the surrounding finished floor. In carpeted areas flanged shall be installed to protect carpet edges. Provide tapped holes in all boxes as determined by conduit entering box.

D. Manufacturers: Hubbell, Steel City, Walker.

E. *Watertight Boxes: Hubbell B2436(7) (3/4" or 1"), Steel City #641, Walker 854.

F. *Concrete Tight Boxes: Hubbell B2429(7), Steel City #641, Walker 854 with steel box.

*Verify conduit hub size requirements prior to ordering boxes. Hubbell #B2436(7) boxes are not available for 1 1/4 inch conduit openings.

G. Covers: Hubbell S-2425, Steel City P-64-3/4, except as listed below, cover for Walker 854.

H. Power Service Fittings:

(1) Hubbell S-3825, Steel City P-64-DU when adjacent to telephone, Walker 803GC.

(2) Hubbell S-3825, Steel City P-64-DU with carpet flange, with duplex receptacle when not adjacent to telephone and in carpet.

(3) Hubbell S-3825, Steel City #P-64-DU with duplex receptacle elsewhere.

I. Telephone Service Fittings: Hubbell S-2425, Steel City P-64-3/4, T & B #1816, Walker 854 cover.

J. A carpet flange shall be installed in all carpeted areas. In non-carpeted areas, a beveled brass carpet flange shall be installed with the entire perimeter in contact with the floor finishing material, and caulking compound shall be provided beneath the flange to keep water from seeping under the flange.

K. Communications Service Fitting: Hubbell #S-2425, Steel City P-64-3/4, T & B #1816, Walker 854 cover.

1.8 CONDUCTORS (50 to 600 VOLTS)

A. General: Minimum size AWG No. 12 copper with minimum conductance of 98% and, unless noted otherwise, solid for No. 10 and smaller, stranded for No. 8 and larger. Install in continuous conduit system.

B. Taps and Joints: Use Hi Bakelite wire connectors, 3M Skotchloks or Ideal Wing Nut for No. 10 and smaller. Anderson Versa-Crimp, Burndy Hydent or T & B Color-Keyed on No. 8 and larger.

C. Tape: All joints shall be covered with gum tape and taped over with friction tape. Vinyl plastic tape may be used in lieu of gum and friction tape.

D. Terminal Lugs: Use for connecting conductors larger than No. 10 and for all multiple connections to terminals. Anderson Versa-Crimp, Burndy Hydent or T & B Color-Keyed.

E. Lacing: All wiring in cabinets, panels, pullboxes and junction boxes are to be laced and held with T & B "Ty-Raps", Fastway "Wire Ties", or Burndy "Uni Raps".

F. Lubricants: Electro Y-ER-EAS, Ideal Wire-Lube, or Minerallac #100.

G. Color Code: Comply with Georgia State Electrical Code 210-5 and 384-3f. Use 2 inch tape bands corresponding to color code on all wire not available with factory applied color coding. Tape bands shall be visible in all equipment enclosures, junction boxes, pull boxes, outlet boxes, condulets, splice & termination locations. Unless otherwise noted, ungrounded conductors shall be color coded as follows:

For 277/480 Volt, 3 Phase, 4 Wire System:

Phase A	Brown
Phase B	Orange
Phase C	Yellow
Neutral	Gray

For 120/208 Volt, 3 Phase, 4 Wire System:

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White

H. Substitutions for the above colors are permitted, but the color coding for each system shall be maintained throughout all feeder and branch circuits for that system and no color shall be common to two systems.

I. Multi circuit lighting and receptacle branch circuits shall be connected at panelboards so all branch circuits sharing a common neutral conductor shall be attached to different phases.

J. Wire-pulling: Do not pull wires until conduit system is complete.

K. Conductor Insulation, Unless Noted Otherwise:

(1) #8 and Smaller: Type "THHN/THWN" except in fixture raceways to be type "THHN".

(2) #6 and Larger: Type "THW" or "THHN" (90°C).

1.9 BACKBOARDS

A. General: Provide wood backboards for mounting of surface power and telephone panels, starters, relays, disconnect switches, and as shown.

B. Type: 3/4-inch thick grade 1 plywood supported by 3/4" x 3/4" x 1/8" angle iron frame attached to wall with 1/4 inch toggle bolts.

C. Finish: Frame and board with two coats light gray enamel.

D. Nameplates: Label each device as specified under "Nameplates".

1.10 FERROUS FASTENERS

All ferrous fasteners exposed to outside conditions and refrigerated spaces shall be coated with corrosion resistant plated finish to prevent rust.

1.11 NAMEPLATES

A. General: Provide for all lighting and receptacle panels, power and distribution panels, safety switches, starters, contactors, circuit breakers in Main Distribution Switchboard. Mount on exterior of door on all surface panels interior on flush panels.

B. Designation: The usage of each device or circuit shall be etched in 1/4-inch letters and mounted on device cover except flush panels shall have nameplate mounted inside panel.

C. Type: White core black bakelite adhered with epoxy glue.

1.12 MULTI-OUTLET ASSEMBLIES

A. General: Provide with convenience outlets. Where more than one circuit serves, outlets shall be wired alternately.

B. Type A: 1-9/32 by 3/4-inch with Simplex receptacles 18-inches on center.

C. Type B: 2-3/4 by 1-7/16-inch with duplex receptacles 36-inches on center.

D. Devices: All devices for Type B are to be as specified under "Wiring Devices" in Section 16300.

E. Manufacturers: Wiremold, Walker/Parkersburg.

END OF SECTION

SECTION 16200 - COMMUNICATION & PROTECTION

1.1 RELATED DOCUMENTS

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

1.2 TELEPHONE SYSTEM

A. General: Provide entrance, backboard, outlets, and raceways at locations shown on plans.

B. Entrance: Provide PVC conduits as shown on plans.

C. Backboard: See "Backboards".

D. Wall Outlets: Flush boxes with bushed telephone plates.

E. Raceway: 1-inch to telephone panel. Leave #16 galvanized pullwire or nylon cord in conduits.

1.3 FIRE ALARM SYSTEM

A. General: Furnish and install a complete non-coded, electrically supervised type fire alarm system to be wired and left in first-class operating condition. Equipment specified shall be that of Simplex Time Recorder Co., Johnson Controls, Notifier Co., Pyrotronics Co., Honeywell, Inc., Edwards Co., or Faraday, Inc. Initiation of an alarm signal in any zone shall sound alarm in all zones.

B. System Operation:

(1) Operation of any manual or automatic initiating device shall cause a general alarm to sound and the initiating zone to be indicated visually on the annunciator.

(2) All alarm initiating circuits shall be electrically supervised. An open or ground in any zone circuit or relay failure in the control panel shall cause an audible alarm to sound and the trouble lamp on the control panel to glow, designating the zone in which the trouble has developed.

(3) The system shall be connected to 277 volt A.C., and will be supplied with step down transformer for operating voltages. The voltage shall be internally transformed and rectified to approximately 24 volt D.C. or A.C.

C. Equipment:

(1) Fire Alarm Control:

a. Furnish and install a Simplex Type 2001, Faraday 7800, Notifier 4800, Pyrotronics CP 30/CP 31, Honeywell W940A, or Edwards 5700, zoned fire alarm control panel. All relays shall be pluggable and equipped with dust covers. Panel shall include relays for fan shut down as required.

b. All station circuits, audible signal circuits, signal device coils and alarm initiating devices shall be electrically supervised. Each zone circuit shall have individual trouble lamps and alarm lamps, audible trouble signal and silencing switch. Zone indication lamps shall have zone identification plate fastened underneath. Provide framed floor plan under glass with each zone delineated on the floor plan.

(2) Stations: Fire alarm stations shall be red, single contact, semi-flush or flush mounted, equipped with glass rods.

(3) Alarm Devices: Alarm horns with visual indicator shall provide flashing lighted "FIRE" indicator and horn audible annunciation of minimum 90dBA at 10 feet.

(4) Automatic Heat Detectors: Where shown on plans, provide combination rate of rise, fixed temperature heat detectors. Fixed temperature setting of 190°F.

(5) Duct Mounted Smoke Detector: Detector shall be designed for detection of combustion gases, fire and smoke in ducts in compliance with NFPA Pamphlet No. 90A and U.L. Listed. The unit shall be an ionization-type-detector, complete with sampling tubes that extend over width of the duct, power and alarm indicator lights, test and reset switches.

(6) Automatic Sprinkler System: Provide connection to main sprinkler control valve and each area control valve so each valve is on a separate zone. Upon actuation of the respective flow switch, an alarm signal shall be initiated on the fire alarm system. When a sprinkler control valve is in any position other than full open, a trouble signal shall be initiated on the respective fire alarm zone.

(7) Ceiling Mounted Smoke Detectors: Detector shall be designed for detection of combustion gases, fire and smoke. The unit shall be an ionization-type detector, with alarm indicator light.

(8) Conductors: Install #14 solid copper conductors. Increase wire size on alarm device circuits so maximum 5 percent voltage drop is not exceeded.

(9) Conduit: Use EMT or rigid conduit as shown on plans.

(10) Remote Annunciator: Annunciator panel shall be flush mounted as shown on plans and shall indicate by flashing light the zone in which an alarm was initiated. Trouble lamp, audible trouble signal, silencing switch and drill switch shall be provided. Zone indication lamps shall have zone identification plate fastened underneath. Provide framed floor plan under glass with each zone delineated on the floor plan.

(11) Standby Batteries: Provide long life lead calcium type batteries to provide 1 1/2 hours operation after loss of normal power. Also provide automatic battery charger and transfer switch for transferring from normal to battery power upon failure of normal power supply and automatically transferring to normal power when normal power is restored. Batteries shall provide power to all automatic detectors, door holders, manual stations, alarm devices, control panel, and remote annunciator.

(12) Provide connection to City of Atlanta Fire Alarm System. Make all arrangements and pay all costs. Use Gamewell pedestal with RF transmitter. Verify with City Fire Department.

1.4 TELEVISION SYSTEM

A. General: Provide conduit and outlet boxes for T.V. distribution as shown leaving #16 gauge pull wire in conduit.

B. Outlets: Flush box with bushed face plate finish.

C. Panel: 12" x 12" x 4" surface mounted box with hinged cover.

1.5 PAGING SYSTEM

A. Geneal: Provide a complete system of microphone, amplifier, speakers, baffles, grilles, telephone interface, and cable to provide the paging system functions described.

B. Operation: System shall provide paging from microphone throughout the public areas of the building through speakers as shown. An interface module shall be provided to allow the telephone intercom to access the paging to all speakers. This shall be accomplished by dialing (on the telephone) a pre-determined intercom station which will provide access to page into the sound system.

C. Amplifier: Minimum 200 watt, solid state amplifier with input sources from at least three microphones and telephone intercom interface. Signal from telephone intercom interface shall access voice paging throughout the system. The amplifier shall be capable of delivering 200 watts (RMS) audio power at less than 2% distortion over the frequency range of 50 Hz to 15 KHz. The available output shall be 70 volts balanced or single ended. Output regulation shall be within 3dB from no load to full load.

D. Telephone Intercom Interface: Provide and install an interface module for converting a telephone intercom call into an overriding page signal into the amplifier.

E. Ceiling Mounted Speaker: 8-inch diameter, 8 Ohm impedance with permanent magnet minimum 4 oz. weight of Alnico or ceramic material. The frequency response shall be minimum 50 to 12,000 Hz. Provide impedance matching transformer, baffle, enclosure and white trim ring. Speaker shall have speaker capacity of 12 watts minimum. Set transformer tap initially at 2 watts and adjust as required for uniformity and quality.

F. Microphone: Desk top model with 50 to 11,000 Hz frequence response, touch bar switch and lever locking switch. Impedance shall match impedance of amplifier.

G. Manufacturers: Rauland, Bogen, Dukane, or Executone.

H. Performance: The paging system shall be balanced to provide uniform page through the public area building from any microphone or telephone intercom.

END OF SECTION

SECTION 16300 - ELECTRICAL DISTRIBUTION SYSTEM

1.1 RELATED DOCUMENTS

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

1.2 PANELBOARDS

A. General: Provide automatic circuit breaker type panelboards, factory assembled with thermal-magnetic molded-case circuit breakers of trip ratings shown.

B. Boxes: NEMA 1, general purpose with code size side and end gutters, 4" minimum, constructed of galvanized code gauge steel, 20" width by 5 3/4" depth minimum. Boxes shall NOT be furnished with concentric knockouts pre-punched by the manufacturer.

C. Fronts: Flush or surface type as scheduled, constructed of code gauge steel, finished with rust inhibiting prime coat and manufacturer's standard light gray enamel. Trim shall be complete with adjustable trim clamps, and directory for glass or clear plastic. Directory to be typewritten. Trim on all flush mounted 20" wide panels shall have trim clamps and hinges concealed when door is closed.

D. Bus Assembly Arrangement: Distribution phase sequence type vertically numbered so that odd numbered single poles and spaces are located on the left and even numbered single poles and spaces are located on the right. No two single poles or spaces, vertically, shall be connected to the same phase. All current carrying parts shall be plated. See schedules for special arrangements.

E. Circuit Breakers: Thermal and magnetic molded case; quick-make, quick-break, ambient compensated; toggle operating; bolted bus bars, internal common trip, with all load side connections of the same breaker in the same gutter for multi-pole breakers. All breakers used at 120/208V-240V shall have interrupting capacity (UL and NEMA) of not less than 10,000 amperes symmetrical. All breakers used at 277/480V shall have interrupting capacity (UL and NEMA) of not less than 14,000 amperes.

F. Mounting: Mount panel with top of panel at 6 feet above the floor. Provide 4" high, 6" deep concrete housekeeping pad beneath each surface mounted panelboard.

G. Nameplates: Label each panelboard as specified under "Nameplates".

H. Manufacturers: Square D, General Electric, Westinghouse, Cutler-Hammer.

1.3 ENCLOSED CIRCUIT BREAKERS

A. General: Enclosed type with electrical characteristics, ratings and modifications shown. Breakers shall have: NEMA 1 general purpose enclosures indoors, NEMA 3R enclosures where exposed to weather unless otherwise noted; handles which can be padlocked in the "OFF" position and remain in positive contact with the breaker handle at all times; non-teasible, positive, quick-make, quick-break mechanisms. Circuit breakers shall be molded case and have minimum interrupting capacity (UL & NEMA) of not less than 14,000 amperes symmetrical at 120/208-240 volts.

B. Nameplates: Label each device as specified under "Nameplates".

C. Manufacturers: General Electric, Square D, Westinghouse, Cutler-Hammer.

1.4 SAFETY SWITCHES (DISCONNECT SWITCH)

A. General: Heavy duty type with electrical characteristics, ratings and modifications shown. All switches shall have: NEMA 1 general purpose enclosures indoors, NEMA 3R enclosures where exposed to weather, unless otherwise noted; handle integral with switch base, with easily recognizable position and which can be padlocked in the "OFF" position; visible blades; reinforced fuse clips; non-teasible, positive, quick-make, quick-break mechanism; and switch assembly plus operating handle as an integral part of the enclosure base. All switches shall be H.P. rated, with defeatable door interlocks preventing door from opening when the operating handle is in the "ON" position, and shall have line terminal shields.

B. Nameplates: Label each device as specified under "Nameplates".

C. Manufacturers: General Electric, Square D, Westinghouse, Cutler-Hammer.

1.5 FUSES

A. General: Provide in all fused devices. This shall include equipment of other trades. Use only fuses of voltage, amperage, and class compatible with fuse holder or disconnect.

B. Disconnect Switches: 208V system U. L. Class K-5, 250 volt rating with minimum interrupting capacity of 100,000 symmetrical amperes.

C. Disconnect Switches: 277/480V or 600V systems U. L. Class K-5, 600 volt rating with minimum interrupting capacity of 200,000 symmetrical amperes.

D. Manufacturers: Bussman, G. E., Chase-Shawmut, Economy.

1.6 REMOTE CONTROL (RC) SWITCHES

A. General: Switches shall be electrically operated, mechanically held, by use of a single operating coil. Positive locking shall be obtained without the use of hook, latches or semi-permanent magnets. Main contacts shall be double-break and protected by arcing contacts. A manual operating handle shall be provided to allow manual operation at any time. Switches shall be "UL listed" in accordance with UL 508, 10th Edition, for controlling loads as shown on the nameplate without derating. Operating coil(s) shall be rated for continuous signal.

B. Manufacturers: Asco, Square D, Allen Bradley, G.E.

1.7 WIRING DEVICES

A. General: Provide devices as specified herein or as shown on the drawings.

B. Devices: Ivory except where bronze plates are used devices shall be brown.

Switches

	Arrow-Hart	Bryant	Circle F	Hubbell
SPST	1991	4901	1221	1221
Three-Way	1993	4903	1223	1223
Four-Way	1994	4904	1224	1224
SPST-Key	1991-L	4901-L	1221-L	1221-L
SPST W/pilot	2999-R	4901-RLR	1271-RD	1297
SPDT (Momentary)	1895	4821	1221-CO	1556

	G.E.	Leviton	Slater
SPST	5951	1221	720AG
Three-Way	5953	1223	723AG
Four-Way	5954	1224	724AG
SPST-Key	5951-OL	1221-L	720AG-L
SPST W/pilot	---	---	720AG-LH
SPDT (Momentary)	5935-1	---	736

Convenience Outlets

	Arrow-Hart	Bryant	Circle F	Hubbell
Simplex (20A-120V)	5361	5361	5361	5361
Duplex (15A-120V)	5262	5262	5262	5262
Duplex (20A-120V)	5739	5362	5362	5362
Clock	5708*	2828GS*	557	5235

	G.E.	Leviton	Slater
Simplex (20A-120V)	4102	5361	5361AG
Duplex (15A-120V)	5262	5262	5262AG
Duplex (20A-120V)	4108	5362	5362AG
Clock	4224-5	658	5373-3SS

*Provide matching cap with 3-foot cord.

C. Duplex receptacles shall be installed with ground poles on the bottom. Weatherproof receptacles shall be installed to prevent a blowing rain from entering the receptacle when a plug is inserted in the receptacle.

1.8 DEVICE PLATES

A. General: Provide plate for all outlets, installed with all edges in contact with finished wall. Mount plates vertically unless otherwise noted.

B. Gangs: Where two or more devices are shown adjacent, they shall be mounted in ganged boxes and covered with one face plate.

C. Size: Plates shall be standard size.

D. Finish:

(1) Device plates on exposed boxes shall be galvanized steel.

(2) All other device plates shall be plastic ivory except the following which shall be brushed bronze.

C01 MULTI-PURPOSE ROOM
C06 LOBBY
C15 TELEPHONE
C07 VESTIBULE
C102 LOBBY
C63 RECEPTION
C70 HALL
C52 HALL
C55 HALL
C85 HALL
C97 INFORMAL CONF.
C84 MRS. CARTER'S OFFICE
C51 PRES. CARTER'S OFFICE
C71 FORMAL CONF.
D02 LOBBY
D03 VESTIBULE
E02 FOYER NO. 1
E01 BOOK/GIFT SHOP
E16 FOYER NO. 3
E03 FOYER NO. 2

1.9 GROUNDING

A. General: Provide grounding in accordance with Georgia State Electrical Code and as specified herein.

B. Items to be Grounded:

(1) Conduit and other conductor enclosure.

(2) Neutral or grounded conductor of interior wiring system.

(3) All panelboards, safety switches, non-current carrying enclosures of fixed equipment.

(4) Ground pole on all receptacles. Provide a #12 AWG green bonding jumper to ground lug in outlet box.

C. Provide a separate grounding conductor in all flexible conduit.

D. Provide a #2 bare copper wire bond across the water meter, to be attached to ground clamps on water line on each side of meter.

E. Provide a code size copper wire in Schedule 40 PVC conduit from ground bus in Main Switchboard to line side of main inside water

F. Provide "TW" copper wire to water pipe for telephone equipment ground.

G. Provide #14 "TW" copper wire in all surface metal raceway and in all multi-outlet assemblies. Attach to ground terminals of each wiring device and bond to conduit grounding system.

H. Provide ground to conduit from neutral point on dry type transformers to adjacent water piping. See detail on drawings.

1.10 DRY TYPE TRANSFORMER

A. General: Provide where shown on the plans for 120/208 volt or 120/240 volt requirements. Transformers shall be rated 480 volt delta 120/208 volt wye or 480 volt: 120/240 volt single phase with KVA ratings as indicated on plans. Scott or Tee connected transformers larger than 15 KVA and all autotransformers are not acceptable.

B. Taps: Single phase transformers through 10 KVA will not require taps, single phase transformers 15 KVA through 25 KVA and three phase transformers 6 KVA through 15 KVA shall have 2-5% full capacity taps below normal rated primary voltage, all transformers 30 KVA and larger shall have 2-2 1/2% full capacity taps above and 4-2 1/2% full capacity taps below normal rated primary voltage.

C. Insulation: Transformers with the ratings through 25 KVA shall have either class B insulation and be designed so that under full load the average conductor temperature does not exceed 80°C rise above 40°C ambient, or class H insulation and be designed so that under full load the average conductor temperature does not exceed 115°C rise above 40°C ambient. Transformers with ratings 30 KVA or larger shall be constructed with class H insulation and so designed that under full load the average conductor temperature does not exceed 150°C rise.

D. Coils:

(1) Transformer coils must be vacuum impregnated with non-hygroscopic, thermosetting varnish, and shall have a final wrap of electric insulating material designed to prevent injury to the magnet wire. Transformers having coils with magnet wire visible will not be acceptable.

(2) The core and coil shall be isolated from the enclosure by means of vibration absorbing mounts. There shall be no metal to metal contact between the core and coil and the enclosure. On units 500 KVA and smaller the vibration isolating system shall be so designed as to provide for continual securement of the core and coil unit to the enclosure. Sound isolating systems requiring the removal of all tie down facilities will not be acceptable. Sound levels should not exceed the following values: 0 to 30 KVA, 42 decibels -- 45 KVA through 150 KVA, 45 decibels -- 225 KVA and 300 KVA, 50 decibels -- 500 KVA, 55 decibels. Certified test data on individual units shall be submitted at the request of the Architect.

E. Enclosures:

(1) All ventilating openings shall be of the louvered type, expanded metal coverings will not be accepted. The base of the transformer shall be constructed of twelve gauge steel minimum, with stamped openings for ventilation.

(2) Lifting eyes or provisions should be provided on all transformer enclosures, holes in the enclosure requiring the use of spreader bars will not be acceptable. The transformer enclosure shall be degreased, cleaned and phosphatized with one coat of zinc chromate primer and one coat of baked enamel.

(3) The core and coils shall be visibly grounded to the frame of the transformer cubicle by means of a flexible grounding strap. A maximum case temperature shall not exceed 35°C rise above ambient at its warmest point.

F. Manufacturers: Acme, G. E., Hevi-Duty, Jefferson, Sorgel, Square D, or Westinghouse.

END OF SECTION

SECTION 16400 - ELECTRICAL SERVICE SYSTEM

1.1 RELATED DOCUMENTS

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

1.2 METERING AND SERVICE

A. Voltage: 277/480 volt, 3 phase, 4 wire with 120/208V, 3 phase, 4 wire Wye supplied from dry transformers.

B. Services: Secondary service raceway and conductors by contractor. Transformers, transformer pads, and primary service shall be provided by the Georgia Power Co. Contractor shall provide underground raceway and conductors to transformer as shown.

1.3 MAIN SWITCHGEAR (MUSEUM & POLICY CENTER)

A. General:

(1) The switchgear shall be rated 600 volts, for 277/480 volts, 3 phase, 4 wire, with 100 percent neutral, braced for 50,000 amperes I.C. symmetrical. It shall be indoor type NEMA 1 enclosure.

(2) Sections shall not exceed 96" high and 36" deep, and shall be die-formed from 3/32" minimum steel, finished with rust inhibiting prime coat and baked enamel in manufacturers light gray color. Overall width of the switchgear shall not exceed that shown on the plans.

(3) Wiring gutters shall be provided at top, bottom, and sides of ample size to accommodate all feeder cables.

B. Bussing:

(1) Adjoining sections of the same switchboard shall be bolted together not welded, to form the complete switchboard. The main bus bars shall be of such size, quantity and spacing so that under fully loaded conditions the temperature rise shall not exceed 50-C. above a 24-hour average ambient of 30-C. or a maximum ambient of 40-C. The bars shall be of 55% conductivity aluminum treated full length with complex tin chemicals to remove the aluminum oxide from the bars and deposit an adherent base, and then receive heavy electro-tin-plating. The complete process shall be such that the bars can be punched and formed after plating. The bars shall be connected with bolted joints, using Bellville type washers; welded bus joints are not acceptable.

(2) Silver plated copper or tin plated copper will be acceptable in lieu of tin-plated aluminum for main bus, and copper shall be used for connections to fused switches or other components where required by UL listings.

(3) Bus bar bracing shall be not less than 50,000 RMS symmetrical amperes.

(4) Ground & Neutral: Switchboard shall have a 25% ground bus full length, bolted to each frame with sectionalizing links at shipping section boundaries, and a removable link between neutral bus and ground bus, accessible from the front; also a removable link in neutral bus in the service entrance section.

(5) Bus bars shall be rated as shown throughout the switchgear.

C. Main Switches:

(1) The main switches shall be fusible, equipped with an electric trip device and ground fault protection equipment. The electric trip operator shall permit closure of the switch only after the opening mechanism has been charged, to assure that the electrical tripping means will immediately be in a condition to open the switch. The electric trip operator shall prevent recharge of the mechanism until one complete close-open operation has been executed. A visible indicator shall indicate whether the switch is open or closed. A handle on the front of the switch shall be supplied for manual "tripping" by discharging the electric trip mechanism. The electric trip solenoid shall be rated 120 volt A.C., 60 HZ and be capable of operating at 55 percent of nominal voltage rating. The switch shall be capable of interrupting 12 times its continuous rating and fulfill all requirements under UL Subject 977. The switches shall accept Class "L" current limiting fuses only.

(2) The ground fault protection system shall include current sensor(s) and appropriate relaying equipment. A test winding shall be provided to simulate the flow of ground fault current through the current sensor(s), in order to test the system including sensor pick-up, relaying equipment and electric trip mechanism of the switch.

(3) The ground fault relay shall be solid state construction and have adjustable pick-up for ground fault currents from 200 amperes to 1200 amperes. Factory setting shall be 600 amperes. Time delay provided by the ground fault relay circuitry shall be nominally .2 second.

D. Distribution Fused Switches:

(1) Fusible switches shall be quick-make, quick-break, with horsepower ratings. Fusible pullouts or door operated type switches will not be acceptable. Switch handles shall indicate "ON" and "OFF" positions and shall be able to accept three padlocks having heavy duty industrial type shackles.

(2) Switches rated 800 amperes or more shall be furnished with Class "L" fuses.

(3) Switches rated less than 800 amperes shall be furnished with current limiting Class J fuses (See "Fuses") of ampere rating shown on plans. Fuse holders shall be of such design as to reject all other class fuses. Contractor shall provide three spare fuses for each ampere rating shown on plans.

(4) Switch covers shall be interlocked with the switch handles to prevent opening in the "ON" position. A means shall be provided to allow authorized personnel to defeat the interlock for inspection purposes when the switch is "ON".

E. Metering: The Main Switch section shall contain the following devices for metering:

3 - Single pole fuse blocks with current limiting fuses.
1 - Voltmeter phase selector switch, 7 position.
1 - A.C. voltmeter, 0-250 volts.
3 - Current transformers, ratio as required.
1 - Ammeter phase selector switch, 4 position.
1 - A.C. ammeter, scale 0-3000 amperes.

All indicating meters shall be approximately 7-inch scale rectangular back connected switchboard type, having an accuracy of $\pm$ 1%, shielded, 250 scale.

F. Shop drawings shall indicate that all of the functional requirements of the specifications have been met. In addition, the UL approved RMS symmetrical interrupting capacity shall be indicated for each switch and a certification that these are UL ratings shall be attached.

G. Nameplates: Switchboard shall be furnished with a black-whiteblack laminated engraved nameplate, 1 by 3-inches mounted with screws, for each device, indicating the device rating, and purpose. Furnish main device nameplate. The switchboard shall also be furnished with a large, 3 by 6-inch job identification nameplate, of same material. Contractor shall make up and submit a nameplate engraving schedule for approval by the Architect.

H. Installation: Mount switchgear on a 4 1/2" thick concrete housekeeping pad with 1" beveled corners. Pad shall extend 2" on all sides of switchgear enclosure.

I. Manufacturers: Square D Company, General Electric, I-T-E, Federal Pacific, or Cutler-Hammer.

1.4 MOTOR CONTROL CENTER

A. General:

(1) Contractor shall furnish and install as hereinafter specified and scheduled a sectional, totally freestanding, indoor, steel enclosed, dead front, low voltage motor control center. Construction shall be NEMA Class I, Type B.

(2) Each section shall be 15" deep and 90" high ± 2-inch die formed from 3/32-inch minimum steel, finished with rust inhibiting prime coat and then factory applied enamel in manufacturers light gray color. Enclosure shall be NEMA Type 1.

(3) Adjoining sections of the same motor control center shall be bolted together to form the complete motor control center. Welded joints shall not be permitted.

(4) The motor control center shall have external 3" x 1 1/2" channel sills, left to right, at front and back, making a total height 91 1/2", ± 2-inches.

(5) Unless otherwise indicated, the motor control center shall consist of a combination circuit breaker and motor starter for each motor served, plus circuit breakers only and devices, as scheduled. Units shall be plug-in type with mechanically interlocked door with voidable feature having provision for padlocking the door closed, and provision for padlocking the circuit breaker operating handle in the open position. Each unit door shall have an externally operable "RESET" button. Each combination starter shall have circuit breaker control circuit interlock kit to break control power to starter when circuit breaker is placed in "OPEN" position.

B. Bussing:

(1) All bussing shall be 98% conductivity silver plated copper or tin plated aluminum mixed on the basis of a maximum temperature rise of 40°C. above 40°C. ambient temperature. Main bus bracing shall be 25,000 RMS symmetrical amperes. Main horizontal bus shall be

provided through all sections, with capacity as specified or indicated, but at least equal to or greater than the rating or setting of the overcurrent device protecting the motor control center, but in no case less than 400 amperes. Vertical or horizontal cabling not acceptable.

(2) The motor control center shall have a 1/4" x 2" copper ground bus, full length, bonded to each section of structure.

(3) Provision shall be made for future extensions as detailed on drawings.

C. Breakers: Unless indicated otherwise, all circuit breakers shall be molded case magnetic only type of quantity, trip size, and poles as scheduled on the plans. All breakers shall be rated 480 volts. All breakers shall be over-the-center toggle type, with the handle going to a position between "ON" and "OFF" to indicate automatic tripping. Circuit breakers shall have UL listed and labeled interrupting capacities of scheduled RMS symmetrical amperes at 480 volts (not UL listed 10,000 amperes).

D. Starters

(1) Unless indicated otherwise, all motor starters shall be magnetic, full voltage, non-reversing, single speed type, with a non-adjustable overload relay in each ungrounded conductor having unit constructed eutectic alloy type heaters sized for the full load running current of the motor actually furnished and installed.

(2) On final inspection it shall be demonstrated that the overload relays are connected into the circuit by manually tripping each overload relay individually, one pole at a time.

(3) On each starter unit door there shall be mounted and wired oil tight pilot devices as specified or as indicated on the plans, or schedule. All pilot lights shall be of the type having a miniature transformer built into the base and a 6-8 volt lamp.

(4) Each starter unit shall have an externally operable mechanical "RESET" button, the operation of which shall NOT open the control circuit and a green "RUNNING" pilot light.

(5) Other pilot devices and auxiliary contacts shall be furnished as required in approved control diagrams furnished under DIVISION 15 of these specifications.

(6) All starters, relays, pilot lights, push buttons and selector switches, shall be of the same manufacture as the motor control center.

E. Nameplates: The motor control center shall be furnished with an engraved nameplate 1" x 2" with 3/16" letters mounted with screws, for each unit. Contractor shall make up and submit a nameplate engraving schedule for approval.

F. Installation: Mount motor control center on a 4" concrete housekeeping pad. The pad shall extend 2" on all sides of the motor control center enclosure and have a 1" bevelled edge.

G. Manufacturer: Allen Bradley, Cutler-Hammer, General Electric, I.T.E., Square D or Federal Pacific.

1.5 ELECTRICAL GENERATOR SET

A. General: The installation of a standby electric power system shall include an electric generating set rated for continuous standby service at 250KW, 312.5 KVA at 0.8-PF, 277/480 volt, 3 phase, 4 wire wye, 60 Hertz minimum. The system shall be a package of new and current equipment consisting of:

(1) A diesel engine driven electric generating set to provide standby power.

(2) An engine start-stop control system mounted on the generating set.

(3) An automatic load transfer control to provide automatic starting and stopping of the engine and switching of the load.

(4) Mounted accessories as specified.

B. This system shall be built, tested and shipped by one source of supply and responsibility. The performance of this generating set shall be certified as to the set's full power rating, stability and voltage and frequency regulation.

C. This standby electric power system, furnished completely by the manufacturer, shall be warranted for a period of five years from the date of installation.

D. Engine: The engine shall be diesel-fueled, four or two cycle, water-cooled with mounted radiator, fan and water pump. It shall have 4 to 8 cylinders and operating speed of 1800-rpm. Full pressure lubrication shall be supplied by a positive displacement lube oil pump.

The engine shall have air cleaner, fuel and oil filters with replaceable elements; lube oil cooler and an engine fuel pump. Engine speed shall be governed to maintain alternator frequency within 5 percent from no-load to full-load alternator output. The engine shall have a 12 or 24-volt battery charging DC, alternator with a transistorized voltage regulator. Remote, 2-wire, starting shall be by a 12 or 24-volt electric starter.

E. Engine Instruments: The engine instrument panel shall contain an oil pressure gauge, coolant temperature gauge, and battery charge rate ammeter.

F. Engine Controls: The generating set shall contain a complete engine start-stop control which starts engine on closing contact and stops engine on opening contact. A cranking limiter shall be provided to open the starting circuit in approximately 45 to 90 seconds if the engine is not started within that time. The engine controls shall also include a 3-position selector switch with the following positions: RUN-STOP-REMOTE. High engine temperature, low oil pressure, and overspeed shutdown with signal light and alarm terminals shall also be provided. Provide engine cooling water jacket heater to provide rapid starting for ambient temperatures of 15°F.

G. Brushless Alternator: The alternator shall be a 4-pole, revolving field design with temperature compensated solid state voltage regulator and brushless rotating rectifier exciter system. No brushes shall be allowed. The stator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semiflexible driving flange to insure permanent alignment.

H. Unit Performance: Frequency regulation shall not exceed 3-hertz from no load to rated load. Voltage regulation shall be within plus or minus 2 percent of rated voltage, from no load to full rated load. The instantaneous voltage dip shall be less than 14 percent of rated voltage when full, 3-phase, load and rated power factor is applied to the alternator. Recovery to stable operation shall occur within 3 seconds. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage. A rheostat shall provide a minimum of plus or minus 5 percent voltage adjustment from rated value. Temperature rise shall be within NEMA MG1-22.40 definition. Voltage drop shall not exceed 20% upon transfer of power to the emergency generator. See Section 15200 of specifications for equipment operating sequence.

I. Alternator Instrument Panel: The alternator instrument panel shall be wired, tested and shock mounted on the generating set by the manufacturer of the alternator. It shall contain panel lighting; manual reset circuit breaker; frequency meter; running time meter;

voltage adjusting rheostat; AC voltmeter; AC ammeter dual range, indicates current each phase; meter switch, voltmeter-ammeter phase selector with OFF position.

J. Generating Set Mounting: The electric generating set shall be equipped with vibration isolators and mounted on a welded steel base which shall provide suitable mounting to any level surface.

K. Accessories: All accessories needed for the proper operation of the generating set shall be furnished. These shall include a muffler, flexible exhaust connection, starting batteries, battery cables, battery rack, and detailed operation and maintenance manuals with parts list. Provide a stainless steel heat exchanger and engine driven water pump. Engine coolant shall be Ethylene Glycol solution (minimum 50%). Cooling water source shall be 85°F.

L. Automatic Load Transfer Control: The load transfer control shall be rated for continuous duty and for all classes of load. The ampere rating of the transfer switch shall be sufficient to handle the capacity of the loads being transferred. The control components shall be compatible with the electrical requirements of the standby set and provide the following functions:

(1) Upon power line outage, automatically start the generating set and when the set comes up to speed and voltage, disconnect the load circuits from the power line and transfer them to the standby set's output.

(2) Upon power line return, transfer the load back to the line and stop the standby set.

M. Manufacturers: Onan, Caterpillar, Detroit Diesel, Cummins.

1.6 ELECTRICAL GENERATOR SET

A. General: The installation of a standby electric power system shall include an electric generating set rated for continuous standby service of 300 KW at 0.8-PF, 277/480 volt, 3 phase, 4 wire wye, 60 Hertz. The system shall be new and current equipment consisting of:

(1) A diesel engine driven electric generating set to provide standby power.

(2) An engine start-stop control system mounted on the generating set.

(3) An automatic load transfer control to provide automatic starting and stopping of the engine and switching of the load.

(4) 25 gallon day tank and fuel oil transfer switch by Simplex or Fremont.

(5) Mounted accessories as specified.

B. This system shall be built, tested and shipped by one source of supply and responsibility. The performance of this generating set shall be certified by an independent testing laboratory as to the set's full power rating, stability and voltage and frequency regulation.

C. This standby electric power system, furnished completely by the manufacturer, shall be warranted for a period of five years from the date of installation.

D. Engine: The engine shall be diesel-fueled, four or two cycle, water-cooled with mounted heat exchanger for water to water exchange. Cooling water temperature will be approximately 60°F. Maximum pressure drop accross the exchanger shall be 12 feet of water pressure. A maximum operating engine speed of 1800-rpm is required. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have air cleaner, fuel and oil filters with replaceable elements; lube oil cooler and a fuel transfer pump. Engine speed shall be governed to maintain alternator frequency within 5 percent from no-load to full-load alternator output. The engine shall have a 12 or 24 volt battery charging DC, alternator with a transistorized voltage regulator. Remote, 2-wire, starting shall be by a 12 or 24 volt electric starter.

E. Engine Instruments: The engine instrument panel shall contain an oil pressure gauge, coolant temperature gauge, and battery charge rate ammeter.

F. Engine Controls: The generating set shall contain a complete engine start-stop control which starts engine on closing contact and stops engine on opening contact. A cranking limiter shall be provided to open the starting circuit in approximately 45 to 90 seconds if the engine is not started within that time. The engine controls shall also include a 3-position selector switch with the following positions: RUN-STOP-REMOTE. High engine temperature, low oil pressure, and overspeed shutdown with signal light and alarm terminals shall also be provided.

G. Brushless Alternator: The alternator shall be a 4-pole, revolving field design with temperature compensated solid state voltage regulator

and brushless rotating rectifier exciter system. No brushes shall be allowed. The stator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semiflexible driving flange to insure permanent alignment.

H. Unit Performance: Frequency regulation shall not exceed 3-hertz from no load to rated load. Voltage regulation shall be within plus or minus 2 percent of rated voltage, from no load to full rated load. The instantaneous voltage dip shall be less than 14 percent of rated voltage when full, 3-phase, load and rated power factor is applied to the alternator. Recovery to stable operation shall occur within 3 seconds. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage. A rheostat shall provide a minimum of plus or minus 5 percent voltage adjustment from rated value. Temperature rise shall be within NEMA MG1-22.40 definition.

I. Alternator Instrument Panel: The alternator instrument panel shall be wired, tested and shock mounted on the generating set by the manufacturer of the alternator. It shall contain panel lighting; manual reset circuit breaker; frequency meter; running time meter; voltage adjusting rheostat; AC voltmeter; AC ammeter dual range, indicates current each phase; meter switch, voltmeter-ammeter phase selector with OFF position.

J. Generating Set Mounting: The electric generating set shall be equipped with vibration isolators and mounted on a welded steel base which shall provide suitable mounting to any level surface.

K. Accessories: All accessories needed for the proper operation of the generating set shall be furnished. These shall include a hospital grade muffler, flexible exhaust connection, starting batteries, battery cables, battery rack, day fuel tank, transfer pump and lines, battery charger, and detailed operation and maintenance manuals with parts list.

L. Automatic Load Transfer Control: The load transfer control shall be rated for continuous duty and for all classes of load. The ampere rating of the transfer switch shall be sufficient to handle the capacity of the loads being transferred. The control components shall be compatible with the electrical requirements of the standby set and provide the following functions:

(1) Upon power line outage, automatically start the generating set and when the set comes up to speed and voltage, disconnect the load circuits from the power line and transfer them to the standby set's output.

(2) Upon power line return, transfer the load back to the line and stop the standby set.

M. Batteries: Provide lead calcium type batteries.

N. Battery Charger: Provide solid state battery charger to provide trickle charging for the batteries at all times and a high rate charging function to fully restore the batteries starting capacity within 6 hours from a full discharge condition.

O. Fuel Oil: Contractor shall provide fuel oil for testing adjusting and balancing emergency generator. Fuel oil remaining in tank shall become property of Owner.

END OF SECTION

SECTION 16500 - LIGHTING

1.1 RELATED DOCUMENTS

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

1.2 LIGHT FIXTURES

A. General: Provide lighting fixtures of types and sizes as indicated on plans and in these specifications complete with plaster frames, supports, and mounting accessories. Fixtures shall be left clean and burning at final inspection.

(1) Surface and recessed luminaires shall be constructed of not less than 22 gauge die formed, embossed or ribbed steel with enclosed ballast and wiring compartments.

(2) Metals shall be treated to provide a permanent bonded surface resistant to corrosion. Painted surfaces shall be finished with baked enamel having a reflectance value of at least 85 percent.

(3) Fluorescent ballasts shall be thermally protected and have a CBM-ETL label. Ballasts shall have a high power factor and sound rating of "A". Each ballast shall be secured to a heat radiating surface. Ballasts shall contain no PCB's. Rapid start ballasts shall be extra low energy type. Manufacturers: Advance Mark III, Universal VLH.

(4) Fluorescent lamps shall be white rapid start with a minimum of 3200 lumen per 40 watt lamp.

(5) Each luminaire shall bear the label of the Underwriters' Laboratories.

B. All 3 and 4 lamp fluorescent lighting fixtures on a common circuit and shown with multiple switches shall have the two outside lamps switched by one switch and the remaining lamp(s) switched separately except where otherwise noted.

C. Recessed Incandescent Lumenaires: Provide thermal protection for all recessed incandescent fixtures in accordance with paragraph 410-65 of the N.E.C.

D. Suspension:

(1) Grid Troffers: Omit hangers and fasten to inverted tees with holddown clips.

(2) Surface & Recessed Incandescent: For ceiling support systems with members 2-feet on center, use fixture support brackets supplied by manufacturer. Where no bracket is supplied by manufacturer and where span exceeds 2-feet, provide two 1 5/8" x 7/8" x 12 gauge minimum channels spanning ceiling supports except as noted. Secure fixture supports to ceiling supports with 18 gauge stainless steel wire ties.

(3) Surface Fluorescent, or Recessed HlD: Support from structural system with two 1/4-inch threaded rods unless otherwise noted. Use nut and locknut to secure fixture. For fixtures not connected with flexible conduit, the contractor shall verify exact location of fixture knockouts and wireway prior to roughing outlet box.

(4) Flanged Troffers: Support from structural system with two 1/4-inch threaded rods except where the suspended ceiling system includes a suspended structural channel support system to which fixture attached channel clamps may be attached.

(5) Suspended Fluorescent: Support on 1/2 or 3/4-inch stems from structural system. Stems shall have swivel canopy and shall be proper length (not less than 8 inches).

E. Structural System Attachments:

(1) Poured-in Place Concrete or Precast Solid Masonry: Concrete expandable anchors unless otherwise noted.

(2) Steel Bar Joists or Steel Beams: 1 5/8-inch x 3/4-inch x 12 gauge channel bolted to top chords. Drill channel and secure threaded rod to channel with nut and locknut unless otherwise noted.

(3) Along Bar Joist or Steel Beam Center Line: F & M Fig. 255, Grinnell Fig. 88, or Elcen Fig. 29 beam clamps unless otherwise noted.

1.3 LAMPS

A. General: Provide for all fixtures. Fixtures shall be left clean and lamps burning at final inspection. All metal halide and mercury vapor lamps shall be equipped with self extinguishing mechanisms to extinguish the arc if the outer globe is broken.

(1) Fluorescent: White 3200 lumens, nominally 40 watts.

(2) Incandescent: 130 volt type as scheduled on plans.

(3) Tungsten Halogen: Clear 130V type as scheduled on the plans.

(4) Metal Halide: Phosphor coated lamps suitable for mounting in any position.

(5) High Pressure Sodium: Clear lamps.

B. Manufacturers: General Electric, I.T.T., Sylvania, Westinghouse.

C. Fixture Manufacturer: Manufacturers names and series are shown to indicate the general type fixture and quality. The functional and material criteria of the specifications for the fixture "types" shall take precedence and no fixture shall be provided which does not comply with the criteria. Listing of a manufacturer does NOT constitute a waiver of ANY of the functional and material criteria.

1.4 FIXTURE TYPES

A. Type 4:

(1) Type 4 fixtures shall be fluorescent bracket mounted undercounter task lighting constructed of 20 gauge cold rolled steel. Finish shall be standard hi-gloss white baked enamel. Fixture shall contain a hinged-unitized wireway to house ballast, socket, lamp & starter. Fixture shall contain a grounded convenience outlet. Diffuser shall be a wrap-around plastic. Fixture shall be suitable for individual or continuous row mounting and shall have built-in switch.

(2) Manufacturers: Alkco Little Inch Series; Markstone; Thomas; Wright Light.

B. Type 5:

(1) Type 5 shall be recessed, fluorescent troffers, suitable for individual or continuous row installation. The housing, reflector, and end plates shall be made of die formed, minimum 0.0299 (22 gauge) steel treated to prevent oxidation and finished with a high gloss white baked enamel finish. Units shall have regressed extruded aluminum doors with MINIMUM 0.125 virgin acrylic extruded lens with #12 prismatic pattern. Doors shall have positive acting latches with safety hinges which will allow hinging from either side. Doors shall be painted white to match fixture housing. There shall be no light leaks around doors. Regress slots around doors shall be flat black.

(2) Heat removal units shall be capable of removing room air through the lamp compartment. Full air units shall have heat removal

feature and shall have side slots capable of removing room air directly into plenum space above the ceiling. Side slots shall be equipped with adjustable, hinged dampers to regulate the quantity of room air returned through the side slots. Full air units shall be installed with all side slot dampers closed. Side slot dampers shall be opened by the test and balance technician while balancing the air conditioning system as required. Static units shall have no openings in the housing or around the door through which room air may pass into the ceiling plenum. Units so indicated shall be equipped with air supply boot (see Division 15000). Balancing dampers shall be provided by light fixture manufacturer.

(3) With 80% effective ceiling cavity reflectance, 70% wall reflectance, and 20% effective floor cavity reflectance, the unit shall have a minimum Coefficient of Utilization of 0.55 for a 1.0 RCR, and 0.34 for a 6.0 RCR. Maximum fixture depth shall be 5-inches.

(4) Manufacturers: Columbia 5000 series; Daybrite Designer series; Mark Mark II series; Gibson GX/FX series; Globe 6000/9000 series; Guth Picture Frame series; Benjamin Atlas series; LPI T series; Lithonia Premium series; Westinghouse AR/AF series; Lightolier PLBA series; Miller Versaline series.

C. Type 8:

(1) Type 8 shall be surface mounted fluorescent fixture, suitable for individual or continuous row installation. The housing and reflector shall be made of die formed, minimum 0.0299 (22 gauge) steel treated to prevent oxidation and finished with a high gloss white baked enamel finish. Units shall have wrap-around type MINIMUM .125 virgin acrylic extruded lens with #12 prismatic pattern.

(2) Manufacturer: Benjamin Calumet Series; Globe 3800 Series; LPI Highlander II Series; Lithonia SC Series; Miller EW Series; Metalux CC Series; Westinghouse VR Series; Williams Riviera Series; Daybrite Vigilante Series; Gibson 72 Series; Keene Dominaire Series.

D. Type 9:

(1) Type 9 fixture shall be Industrial type, open end fluorescent lighting fixture for individual or continuous mounting, with channel of die-formed steel not less than 0.032 inches thick after fabrication which houses the ballast. Channel shall be arranged for either chain, pipe, stem, or messenger cable

hangers. All metal shall be treated with a rust inhibitor after fabrication and prior to the finish coat.

(2) Wiring shall be not smaller than No. 19 AWG and shall have a minimum temperature of 90°C.

(3) Provide suitable hangers and/or mounting accessories as indicated on the contract drawings. Alignment clips shall be furnished and installed on all fixtures mounted in continuous rows.

(4) The number of fixtures required in continuous rows shall be as indicated on the contract drawings. Reflectors shall be of enamel coated steel.

(4) Manufacturers: Benjamin Lite Line Series, Lithonia Atlas Series, Metalux IC Series W/end plates, Westinghouse "H" Series, Williams Titan Series, Wright Light I6 Series, and Keene SFI Series.

E. Type 10:

(1) Type 10 fixture shall be an enclosed and gasketed, vapor tight surface mounted fluorescent fixture with non-metallic, rustproof housing. Diffuser shall be patterned acrylic.

(2) Manufacturers: Benjamin FA series; Lithonia DD series; Miller KW series; Metalux VT series.

F. Type 11:

(1) Type 11 fixture shall be a wall-mounted fluorescent lumenaire with up and down lighting component(s). Assembly shall consist of an electrical backplate sub-assembly housing with acrylic refractor and diffuser. The housing shall be brushed aluminum with virgin acrylic refractor (bottom) and diffuser (top). Housing shall attach to backplate with two spring-loaded latches. Finish: white enamel finish. Backplate shall have a baked white enamel finish of 80% minimum reflectance.

(2) Manufacturers: Lithonia WB series, Keene WA series, Alkco 9618 series.

G. Type 12:

(1) Type 12 fixture shall be fluorescent strip fixture constructed of die formed cold rolled steel channel and channel cover. Unit shall be suitable for single or continuous row installation; surface, bracket, or suspension mounting. Unit finish shall be high reflectance, baked white enamel. Each unit shall be

provided with two end plates/connector straps and lamp holders compatible with specified lamps. Fixtures to be surface mounted on low density, combustible ceilings shall be furnished with ceiling spacers. Provide asymmetric reflector for designated fixtures.

(2) Manufacturers: Benjamin, Lithonia, Metalux, Westinghouse, Williams, Wright Light, and Keene.

H. Type 14:

(1) Type 14 fixture shall be incandescent round, recessed, ellipsoidal reflector, downlight. Fixture reflector shall be clear specular aluminum. Unit shall have extruded aluminum socket enclosure for heat radiation, porcelain lamp socket, and 150° wire. Baffle shall be specular gold tinted polished aluminum. Fixtures shall be U.L. listed for damp location where indicated.

(2) Manufacturers: Capri; Gotham; Kirlin; Kurt Versen; Lightolier; Marco; Major; Omega, Perfeclite; Prescolite 1220 series; HiTek series #10.

I. Type 16:

(1) Type 16 fixture shall be enclosed and gasketed incandescent suitable for wet or dirty location. Housing shall be die cast aluminum with mounting adapters having hubs tapped 1/2". Diffuser shall be clear glass globe with thread type mounting. Provide wire guard over globe. Unit shall have high temperature, glazed porcelain medium base socket. Unit shall be wall mounted.

(2) Manufacturers: Hubbell; HiTek; Stonco.

J. Type 17:

(1) Type 17 shall be a semi-recessed, aluminum housing, wet location, incandescent fixture for use in showers. The housing & trim shall be made of 0.04-inch aluminum. Vertical slotted mounting holes in the housing will provide for adjustment of up to 2-1/2-inches. Lens shall be pressed white ceramic coated glass with gaskets providing seal between glass and face trim, and face trim and housing. Lamp socket shall be vertically mounted and rated for 100 watt A-lamp. Fixtures shall be listed for 150° building supply wire.

(2) Manufacturer: Art Metal, Perfeclite.

K. Type 18:

(1) Type 18 fixture shall be a recessed incandescent can for use with reflector type lamps as indicated on Fixture Schedule. Fixture shall have polished gold reflector.

(2) Manufacturers: Capri; HiTek series #14; Kirlin; Kurt Versen; Lightolier; Marco; Omega; Perfeclite; Prescolite 1227 series.

L. Type 35:

(1) Type 35 fixture shall be high intensity discharge, round, recessed, ellipsoidal reflector, downlight. Ballast shall be enclosed and encapsulated for quiet operation and shall be accessible from below the ceiling for repair/replacement. Fixture reflector shall be gold specular aluminum. Unit shall have extruded aluminum socket enclosure for heat radiation, porcelain lamp socket, and 150° wire. Fixtures shall be U.L. listed for damp location.

(2) Manufacturers: Capri; Gotham; Kirlin; Kurt Versen; Lightolier; Marco; Major; Omega, Perfeclite; Prescolite.

M. Type 42:

(1) Type 42 shall be both normal & self powered exit sign with stencil style face and green letters. Each unit shall contain a maintenance free, lead dioxide battery that will provide a minimum of 90 minutes continuous service in the emergency mode. Solid state switching and battery charging circuits shall be included with a test switch to simulate normal power failure located on the side of the unit. A pilot light (light emitting diode) shall indicate the charger is functioning. Unit shall include two long life, 20 watt, T6 1/2 lamps and one 6 volt emergency lamp. The 6 volt lamp shall flash on & off in the emergency mode. The unit housing shall be die cast aluminum and shall have universal mounting capabilities with snap in directional arrows to be field removed as required. In the event of any power failure when the long life lamps which operate in the normal mode cease functioning, the 6 volt emergency lamp takes over, operating off the battery.

(2) Manufacturers: Lithonia ESXG series, Devine UBXXX-SG series.

N. Type 61:

(1) Type 61 fixture shall be an H.I.D. recess mounted step light. Housing and face trim shall be cast aluminum with separate galvanized 16 ga. steel ballast compartment. Unit shall be suitable for mounting in masonry or concrete pour walls. Lens shall be cast louver.

(2) Manufacturers: Devine F6 series; Moldcast Step Light series.

1.5 DIMMING SYSTEM

A. General: The contractor shall provide a lighting control system for variable intensity operation of incandescent lighting. It shall consist of a remote dimmerboard and control station(s) as specified and shown on the plans.

B. Panel: The remote dimmerboard shall be free-standing framework enclosed with not less than #12 U.S.G. steel with baked-on enamel finish, ventilated and shall contain dimmers, contactors, transformer, relays, circuit breakers as shown on the schedule, and other devices to make a complete operating system, all factory fabricated, assembled, internally wired, and tested. Enclosure shall fit into allotted space for mounting. Hinged doors shall provide access from front of enclosure. Low voltage terminals shall be grouped and isolated from the high voltage equipment terminals.

C. Dimmers: The dimmers shall be silicon controlled rectifier, slide-in type with plug-in connections, U.L. approved, with DC control voltage, and controlled by linear wound potentiometer(s). The light output shall follow the recommended I.E.S. square law curve. Adjustments for high and low settings shall be supplied. Curve adjustments shall not be required. There shall be no phase relationship between controller, and dimmer output drop shall not exceed 5 volts at full load and full voltage. Minimum dimmer capacity shall be 12 KW for loads as shown.

D. Control Stations:

(1) The intensity of the lamp loads on the output of the dimmers, shall be selected by the potentiometer on the remote control stations. Two (2) flush, wall mounted control stations shall be provided at locations shown. Each control station shall consist of a backbox, with one (1) momentary contact On-Off/Take-Control switch with pilot light and one control potentiometer.

(2) Control wiring from dimmerboards to the control stations shall be provided and all interconnections made by the contractor.

(3) Control stations face plates shall be satin stainless steel with designations engraved in metal and filled with black enamel.

E. Wiring: Dimmerboard shall be prewired internally and ready for connection of feeders, branch and control circuits by contractor. Dimmerboard shall be wired for 3 phase, 120/208 volt, balanced operation.

F. Manufacturer: Decor, Lutron, Atmos, and Electro Controls.

END OF SECTION