



Steve Beshear
Governor

**ENVIRONMENTAL AND PUBLIC PROTECTION CABINET
DEPARTMENT OF LABOR**

J. R. Gray
Commissioner

OFFICE OF WORKPLACE STANDARDS
1047 US Hwy 127 S STE 4
Frankfort, Kentucky 40601
Phone: (502) 564-3070
www.labor.ky.gov

March 6, 2008

Brent Tippey
HDR Quest Engineers Inc.
2517 Sir Barton Way
Lexington KY 40509

Re: Northern Kentucky Water District, Ft Thomas Treatment Plant - Pretreatment Bldg
059-H-00387-08-1

Advertising Date as Shown on Notification: April 1, 2008

Dear Brent Tippey:

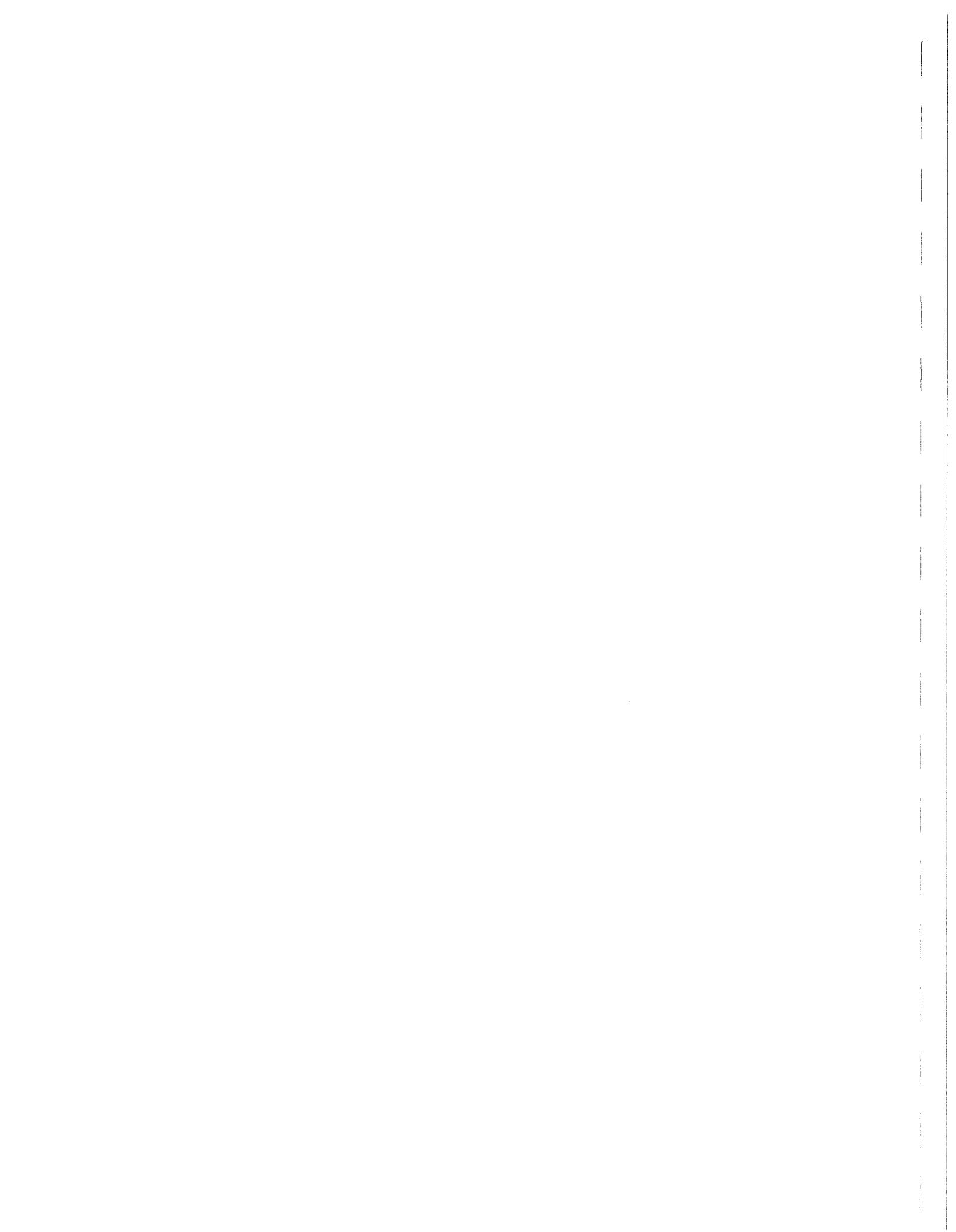
This office is in receipt of your written notification on the above project as required by KRS 337.510 (1).

I am enclosing a copy of the current prevailing wage determination number CR-1-015, dated January 28, 2008 for KENTON County. This schedule of wages shall be attached to and made a part of the specifications for the work, printed on the bidding blanks, and made a part of the contract for the construction of the public works between the public authority and the successful bidder or bidders.

The determination number assigned to this project is based upon the advertising date contained in your notification. There may be modifications to this wage determination prior to the advertising date indicated. In addition, if the contract is not awarded within 90 days of this advertising date or if the advertising date is modified, a different set of prevailing rates of wages may be applicable. It will be the responsibility of the public authority to contact this office and verify the correct schedule of the prevailing rates of wages for use on the project. Your project number is as follows: 059-H-00387-08-1, Heavy/Highway

Sincerely,

Robin M. Young
Prevailing Wage Specialist



KENTUCKY DEPARTMENT OF LABOR
PREVAILING WAGE DETERMINATION
CURRENT REVISION
LOCALITY NO. 15
KENTON COUNTY

Determination No. CR-1-015 2008

Date of Determination: January 28, 2008

Project No. 059-H-00387-08-1
Type: Heavy/Highway

This schedule of the prevailing rate of wages for Kenton County has been determined in accordance with the provisions of KRS 337.505 to 337.550. This determination shall be referred to as Prevailing Wage Determination No. CR-1-015 2008.

Apprentices shall be permitted to work as such subject to Administrative Regulations adopted by the Executive Director of Workplace Standards. Copies of these regulations will be furnished upon request to any interested person.

Overtime is to be computed at not less than one and one-half (1 1/2) times the indicated BASE RATE for all hours worked in excess of eight (8) per day, and/or in excess of forty (40) per week. However, KRS 337.540 permits an employee and employer to agree, in writing, that the employee will be compensated at a straight time base rate for hours worked in excess of eight (8) hours in any one calendar day, but not more than ten (10) hours worked in any one calendar day, if such written agreement is prior to the over eight (8) hours in a calendar day actually being worked, or where provided for in a collective bargaining agreement. The fringe benefit rate is to be paid for each hour worked at a straight time rate for all hours worked.

Fringe benefit amounts are applicable for all hours worked except when otherwise noted. Welders will receive rate for craft in which welding is incidental.

NOTE: The type of construction shall be determined by applying the following definitions:

BUILDING CONSTRUCTION

Building construction is the construction of sheltered enclosures with walk-in access for the purpose of housing persons, machinery, equipment, or supplies. It includes all construction of such structures, the installation of utilities and the installation of equipment, both above and below grade level, as well as incidental grading, utilities and paving.

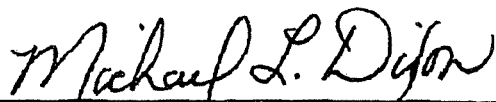
HIGHWAY CONSTRUCTION

Highway construction includes the construction, alteration or repair of roads, streets, highways, runways, taxiways, alleys, trails, paths, parking areas, and other similar projects not incidental to building or heavy construction. It includes all incidental construction in conjunction with the highway construction project.

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HEAVY CONSTRUCTION

Heavy projects are those projects that are not properly classified as either "building" or "highway". For example, dredging projects, water and sewer line projects, dams, flood control projects, sewage treatment plants and facilities, and water treatment plants and facilities are considered heavy.



Michael L. Dixon, Acting Executive Director
Office of Workplace Standards
Kentucky Department of Labor

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Determination No. CR-1-015 2008
January 28, 2008

ASBESTOS/INSULATION WORKERS:

Asbestos/Insulation Workers: (Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems):

BASE RATE \$24.63
FRINGE BENEFITS 11.29

Hazardous Material Handlers: (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems):

BASE RATE \$21.00
FRINGE BENEFITS 8.30

BOILERMAKERS:

BASE RATE \$31.29
FRINGE BENEFITS 15.47

BRICKLAYERS:

Bricklayers, Caulkers, Cleaners, Pointers & Stone Masons:

BASE RATE \$25.86
FRINGE BENEFITS 9.49

Refractory:

BUILDING

BASE RATE \$26.36
FRINGE BENEFITS 9.49

Marble Setters, Terrazzo Workers, & Tile Setters:

BUILDING

BASE RATE \$26.02
FRINGE BENEFITS 9.14

Marble, Terrazzo & Tile Finishers:

Finishers:

BUILDING

BASE RATE \$21.58
FRINGE BENEFITS 9.14

Marble Sanders, Polishers, Waxers, & Sawyers:

BUILDING

BASE RATE \$21.65
FRINGE BENEFITS 9.14

Terrazzo Base Grinders (While operating base grinding machine):

BUILDING

BASE RATE \$22.00
FRINGE BENEFITS 9.14

CARPENTERS:

Carpenters & Piledrivermen (Does not include Walls & Ceiling Work):

BUILDING BASE RATE \$20.45
FRINGE BENEFITS 8.84

HEAVY & HIGHWAY BASE RATE \$22.42
FRINGE BENEFITS 4.73

Carpenters & Lathers (Walls & Ceiling Work Only):

BUILDING BASE RATE \$20.75
FRINGE BENEFITS 8.69

Divers:

HEAVY & HIGHWAY BASE RATE \$33.63
FRINGE BENEFITS 4.73

CEMENT MASON/CONCRETE FINISHERS:

BUILDING BASE RATE \$21.65
FRINGE BENEFITS 8.50

HEAVY & HIGHWAY BASE RATE \$25.00
FRINGE BENEFITS 8.35

ELECTRICIANS:

Electricians:

BASE RATE \$24.24
FRINGE BENEFITS 9.34

LINE CONSTRUCTION:

Linemen:

BUILDING BASE RATE \$28.30
FRINGE BENEFITS 10.34

Equipment Operator:

BUILDING BASE RATE \$25.47
FRINGE BENEFITS 9.78

Groundmen:

BUILDING BASE RATE \$18.40
FRINGE BENEFITS 8.38

ELECTRICIAN SOUND COMMUNICATION:

Installer:

BASE RATE \$18.00
FRINGE BENEFITS 3.475

Cable Puller:

BASE RATE \$9.00
FRINGE BENEFITS 2.64

Electrical Sign & Luminous Building Installer:

BUILDING BASE RATE \$12.88
FRINGE BENEFITS 1.03

LABORER/BUILDING: (Continued)

Gunnite Nozzle Operator:	BUILDING	BASE RATE	\$22.95
		FRINGE BENEFITS	6.70
Brick Mason Tender:	BUILDING	BASE RATE	\$23.50
		FRINGE BENEFITS	6.70
PLASTERER TENDER:			
Mixer Pump Operator:	BUILDING	BASE RATE	\$18.45
		FRINGE BENEFITS	3.90
Tender:	BUILDING	BASE RATE	\$18.30
		FRINGE BENEFITS	3.90

LABORER/HEAVY HIGHWAY:

GROUP 1:

Asphalt Laborer, Carpenter Tender, Concrete Curing applicator, Dump Man (Batch Truck), Guardrail and Fence Installer, Joint Setter, Laborer (Construction), Landscape Laborer, Mesh Handlers & Placer, Right-of-way Laborer, Riprap Laborer & Grouter, Scaffold Erector, Seal Coating, Surface Treatment or Road Mix Laborer, Sign Installer, Slurry Seal, Utility Man, Bridge Man, Handyman, waterproofing Laborer, Flagperson, Hazardous Waste (Level D), Diver Tender, Zone Person & Traffic Control:

HEAVY & HIGHWAY	BASE RATE	\$24.12
	FRINGE BENEFITS	6.70

GROUP 2:

Skid Steer, Asphalt Raker, Concrete Puddler, Kettle Man (Pipeline), Machine Driven Tools (Gas, Electric, Air), Mason Tender, Brick Paver, Mortar Mixer, Power Buggy or Power Wheelbarrow, Sheeting & Shoring Man, Surface Grinder Man, Plastic Fusing Machine Operator, Pug Mill Operator, & Vacuum Devices (wet or dry), Rodding Machine Operator, Diver, Screwman or Paver, Screed Person, Water Blast, Hand Held Wand, Pumps 4" & Under (Gas, Air or Electric) & Hazardous Waste (Level C), Air Track and Wagon Drill, Bottom Person, Cofferdam (below 25 ft. deep), Concrete Saw Person, Cutting with Burning Torch, Form Setter, Hand Spiker (Railroad), Pipelayer, tunnel Laborer (without air) & Caisson, Underground Person (working in Sewer and Waterline, Cleaning, Repairing & Reconditioning), Sandblaster Nozzle Person, & Hazardous Waste (Level B):

HEAVY & HIGHWAY	BASE RATE	\$24.29
	FRINGE BENEFITS	6.70

GROUP 3:

Blaster, Mucker, Powder Person, Top Lander, Wrencher (Mechanical Joints & Utility Pipeline), Yarnner, Hazardous Waste (Level A), Concrete Specialist, Concrete Crew in Tunnels (With Air-pressurized - \$1.00 premium), Curb Setter & Cutter, Grade Checker, Utility Pipeline Tapper, Waterline, and Caulker:

HEAVY & HIGHWAY	BASE RATE	\$24.62
	FRINGE BENEFITS	6.70

LABORER/HEAVY & HIGHWAY: (Continued)

GROUP 4:

Miner (With Air-pressurized - \$1.00 premium), & Gunnite Nozzle Person:

HEAVY & HIGHWAY	BASE RATE	\$25.07
	FRINGE BENEFITS	6.70

Signal Person will receive the rate equal to the rate paid the laborer classification for which he or she is signaling

MILLWRIGHTS:

	BASE RATE	\$21.90
	FRINGE BENEFITS	7.92

OPERATING ENGINEERS/BUILDING:

GROUP 1

Boom & Jib 250' over:	BUILDING	BASE RATE	\$29.19
		FRINGE BENEFITS	10.06

GROUP 2

Boom & Jib Over 180' through 249:	BUILDING	BASE RATE	\$28.94
		FRINGE BENEFITS	10.06

GROUP 3

Boom & Jib 150' through 180':	BUILDING	BASE RATE	\$28.44
		FRINGE BENEFITS	10.06

GROUP 4

Master Mechanic:	BUILDING	BASE RATE	\$28.19
		FRINGE BENEFITS	10.06

GROUP 5

Barrier Moving Machine; Boiler or Compressor Mounted on Crane (Piggy-Back Operation); Boom Truck (All Types); Cableway; Cherry Picker; Combination Concrete Mixer & Tower; All Concrete Pumps with Booms; Crane (All Types); Crane-Compact, Track or Rubber Over 4,000 lbs Capacity; Crane-Self Erecting, Stationary, Track or Truck (All Configurations); Derrick (All Types); Dragline; Dredge (Dipper, Clam or Suction) 3 Man Crew; Elevating Grader or Euclid Loader; Floating Equipment; Forklift(rough terrain with winch/hoist) Gradual; Helicopter Operator & Helicopter Winch Operator (Hoisting Builders Materials); Hoe (All Types); Hoist (Two or More Drums); Horizontal Directional Drill; Hydraulic Gantry (Lift System); Laser Finishing Machine; Laser Screed and Like Equipment; Lift Slab or Panel Jack; Locomotive (All Types); Maintenance Engineer (Mechanic and/or Welder); Mixer, Paving (Multiple Drum); Mobile Concrete Pump With Boom; Panelboard (All Types on Site); Pile Driver; Power Shovel; Prentice Loader; Rail Tamper (with Automatic Lifting & Aligning device); Rotary Drill (All) used on Caisson Work for Foundations & Substructure work; Side Boom; Slip Form Paver; Straddle Carrier (Building Construction on Site); Trench Machine (Over 24" Wide); & Tug Boat:

BUILDING	BASE RATE	\$27.94
	FRINGE BENEFITS	10.06

OPERATING ENGINEERS/ BUILDING: (Continued)

GROUP 6

Asphalt Paver; Bobcat-type and/or Skid Steer Loader with Hoe Attachment Greater than 7,000 lbs.; Bulldozer; C.M.I. Type Equipment; Endloader; Hydro Milling Machine; Kolman Type Loader (Dirt Loading); Lead Greaseman; Mucking Machine; Pettibone-Rail Equipment; Power Grader; Power Scoop; Power Scraper; Push Cat; Rotomill (All), Grinders & Planers of All Types & Vermeer Type Concrete Saw:

BUILDING BASE RATE \$27.82
FRINGE BENEFITS 10.06

GROUP 7

A-Frame; Air Compressor Pressurizing Shafts or Tunnels; Asphalt Roller (All); Bobcat-type and/or Skid Steer Loader with or without Attachments; Boiler (15 lbs. pressure & over); All Concrete Pumps without Booms & with 5" System; Forklift (Except Masonry); Highway Drills-All Types (with Integral Power); Hoist (One Drum); House Elevator (except those automatic call button controlled); Man Lift; Material Hoist/Elevator; Mud Jack; Pressure Grouting; Pump (Installing or Operating Well Points or other Type of Dewatering Systems); Pump (4" and over Discharge); Railroad Tie Inserter/Remover; Rotovator (Lime soil Stabilizer); Submersible Pump (4" and over Discharge); Switch & Tie Tamper (w/o lifting & aligning device); Trench Machine (24" & under); & Utility:

BUILDING BASE RATE \$26.78
FRINGE BENEFITS 10.06

GROUP 8

Ballast Relocator; Backfiller & Tamper; Batch Plant; Bar & Joint Installing Machine; Bull Floats; Burlap & Curing Machines; Clefplanes; Compressor on Building Construction; Concrete Mixer, Capacity more than one bag; Concrete Mixer, one bag capacity (side loader); All Concrete Pumps without Booms with 4" or Smaller System; Concrete Spreading Machine; Conveyor, used for handling building materials; Crusher; Deckhand; Drum Fireman in Asphalt Plant; Farm Type Tractor, Pulling Attachments; Finishing Machines; Form Trencher; Generator; Gunite Machine; Hydro-Seeder; Pavement Breaker (Hydraulic or Cable); Post Driver; Post Hole Digger; Pressure Pump (over 1/2" discharge); Road Widening Trencher; Roller (except Asphalt); Self-propelled Power Spreader; Self-propelled Sub-Grader; Shotcrete Machine; Tire Repairman; Tractor (Pulling Sheep Foot Roller or Grader); VAC/ALL; Vibratory Compactor (with Integral Power) & Welder:

BUILDING BASE RATE \$25.60
FRINGE BENEFITS 10.06

GROUP 9

Allen Screed Paver(concrete); Boiler (Less than 15 lbs. pressure); Crane-Compact, Track or Rubber under 4,000 lbs.; Directional Drill "Locator"; Inboard & Outboard Motor Boat Launch; Light Plant; Masonry Forklift; Oiler; Power Driven Heater (Oil Fired); Power Scrubber; Power Sweeper; Pump (Under 4" discharge); & Submersible Pump (Under 4" discharge):

BUILDING BASE RATE \$20.14
FRINGE BENEFITS 10.06

OPERATING ENGINEERS/HEAVY HIGHWAY:

Master Mechanic & Boom from 150-180:

HEAVY & HIGHWAY BASE RATE \$28.19
FRINGE BENEFITS 10.06

Boom from 180 and over:

HEAVY & HIGHWAY BASE RATE 28.44
FRINGE BENEFITS 10.06

OPERATING ENGINEERS: HEAVY & HIGHWAY: (Continued)

GROUP 1

Air Compressor on Steel Erection; Barrier Moving Machine; Boiler Operator on Compressor or Generator when mounted on a Rig; Cableway; Combination Concrete Mixer & Tower; Concrete Plant (over 4 yd. Capacity); Concrete Pump; Crane (All Types, Including Boom Truck, Cherry Picker); Crane-Compact, Track or Rubber over 4,000 lbs. capacity; Cranes-Self Erecting, Stationary, Track or Truck (All Configurations); Derrick; Dragline; Dredge (Dipper, Clam or Suction); Elevating Grader or Euclid Loader; Floating Equipment (All Types); Gradual; Helicopter Crew (Operator-Hoist or Winch); Hoe (all types); Hoisting Engine on Shaft or Tunnel Work; Horizontal Directional Drill (over 500,000 ft. lbs. thrust); Hydraulic Gantry (Lifting System); Industrial-Type Tractor; Jet Engine Dryer (D8 or D9) Diesel Tractor; Locomotive (Standard Gauge); Maintenance Operator Class A; Mixer, Paving (Single or Double Drum); Mucking Machine; Multiple Scraper; Piledriving Machine (All Types); Power Shovel; Prentice Loader; Quad 9 (Double Pusher); Rail Tamper (with auto lifting & aligning device); Refrigerating Machine (Freezer Operation); Rotary Drill, on Caisson work; Rough Terrain Fork Lift with Winch/Hoist; Side-Boom; Slip-Form Paver; Tower Derrick; Tree Shredder; Trench Machine (Over 24" wide); Truck Mounted Concrete Pump; Tug Boat; Tunnel Machine and/or Mining Machine; & Wheel Excavator:

HEAVY & HIGHWAY BASE RATE \$27.94
FRINGE BENEFITS 10.06

GROUP 2

Asphalt Paver; Automatic Subgrader Machine, Self-Propelled (CMI Type); Bobcat Type and/or Skid Steer Loader with Hoe Attachment Greater than 7,000 lbs.; Boring Machine More than 48"; Bulldozer; Endloader; Hydro Milling Machine; Kolman-type Loader (production type-Dirt); Lead Greaseman; Lighting & Traffic Signal Installation Equipment (includes all groups or classifications); Material Transfer Equipment (Shuttle Buggy) Asphalt; Pettibone-Rail Equipment; Power Grader; Power Scraper; Push Cat; Rotomill (all), Grinders & Planers of All types; Trench Machine (24" wide & under); & Vermeer type Concrete Saw:

HEAVY & HIGHWAY BASE RATE \$27.82
FRINGE BENEFITS 10.06

GROUP 3

A-Frame; Air Compressor on Tunnel Work (low pressure); Asphalt Plant Engineer; Bobcat-type and/or Skid Steer Loader with or without Attachments; Highway Drills (all types); Locomotive (narrow gauge); Material Hoist/Elevator; Mixer, Concrete (more than one bag capacity); Mixer, one bag capacity (Side Loader); Power Boiler (Over 15 lbs. Pressure) Pump Operator installing & operating Well Points; Pump (4" & over discharge); Roller, Asphalt; Rotovator (lime soil stabilizer); Switch & Tie Tampers (without lifting & aligning device); Utility Operator (Small equipment); & Welding Machines:

HEAVY & HIGHWAY BASE RATE \$26.78
FRINGE BENEFITS 10.06

OPERATING ENGINEERS: HEAVY & HIGHWAY: (Continued)

GROUP 4

Backfiller; Ballast Re-locator; Bars, Joint & Mesh Installing Machine; Batch Plant; Boring Machine Operator (48" or less); Bull Floats; Burlap & Curing Machine; Concrete Plant (capacity 4 yd. & under); Concrete Saw (Multiple); Conveyor (Highway); Crusher; Deckhand; Farm-type Tractor with attachments (highway) except Masonry); Finishing Machine; Fireperson, Floating Equipment (all types); Fork Lift (highway); Form Trencher; Hydro Hammer; Hydro Seeder; Pavement Breaker; Plant Mixer; Post Driver; Post Hole Digger (Power Auger); Power Brush Burner; Power Form Handling Equipment; Road Widening Trencher; Roller (Brick, Grade & Macadam); Self-Propelled Power Spreader; Self-Propelled Power Subgrader; Steam Fireperson; Tractor (Pulling Sheepfoot, Roller or Grader); & Vibratory Compactor with Integral Power:

HEAVY & HIGHWAY BASE RATE \$25.60
FRINGE BENEFITS 10.06

GROUP 5

Compressor (Portable, Sewer, Heavy & Highway); Drum Fireperson (Asphalt); Generator; Inboard-Outboard Motor Boat Launch; Masonry Fork Lift; Oil Heater (asphalt plant); Oiler; Power Driven Heater; Power Sweeper & Scrubber; Pump (under 4" discharge); Signalperson; Tire Repairperson; & VAC/ALLS:

HEAVY & HIGHWAY BASE RATE \$20.14
FRINGE BENEFITS 10.06

PAINTERS:

Brush, Roller, Paper Hanging & Drywall Taping:

BUILDING BASE RATE \$23.00
FRINGE BENEFITS 6.30

Spray:

BUILDING BASE RATE \$23.50
FRINGE BENEFITS 6.30

Sandblasting, Waterblasting:

BUILDING BASE RATE \$23.75
FRINGE BENEFITS 6.30

Lead Abatement:

BUILDING BASE RATE \$24.00
FRINGE BENEFITS 6.30

Sign Painter & Erector:

BUILDING BASE RATE \$17.57
FRINGE BENEFITS 4.55

PAINTERS/ HEAVY & HIGHWAY

Bridge/Equipment Tender and/or Containment Builder:

HEAVY & HIGHWAY BASE RATE \$20.40
FRINGE BENEFITS 6.30

Brush & Roller:

HEAVY & HIGHWAY BASE RATE \$23.00
FRINGE BENEFITS 6.30

PAINTERS/ HEAVY & HIGHWAY: (Continued)

Spray: HEAVY & HIGHWAY BASE RATE \$23.50
FRINGE BENEFITS 6.30

Sandblasting & Water Blasting: HEAVY & HIGHWAY BASE RATE \$23.75
FRINGE BENEFITS 6.30

Elevated Tanks; Steeplejack Work; Bridge & Led Abatement: HEAVY & HIGHWAY BASE RATE \$24.00
FRINGE BENEFITS 6.30

PIPEFITTERS & PLUMBERS: BASE RATE \$27.96
FRINGE BENEFITS 13.13

PLASTERERS: BUILDING BASE RATE \$20.65
FRINGE BENEFITS 7.25

ROOFERS (excluding metal roofs):

Roofers: BASE RATE \$25.18
FRINGE BENEFITS 10.30

Pitch: BASE RATE \$26.18
FRINGE BENEFITS 10.30

SHEETMETAL WORKERS (including metal roofs): BASE RATE \$26.60
FRINGE BENEFITS 13.74

SPRINKLER FITTERS: BASE RATE \$27.05
FRINGE BENEFITS 12.90

TRUCK DRIVERS/BUILDING:

3 Tons & Under, Greaser, Tire Changer, & Mechanic Tender: BUILDING *BASE RATE \$18.77
FRINGE BENEFITS 10.13

Over 3 Tons, Semi-Trailer or Pole Trailer, Dump Tandem Axles, Farm Tractor (When used to pull building material & equipment):

BUILDING *BASE RATE \$18.88
FRINGE BENEFITS 10.13

Concrete Mixer (Hauling on jobsites), & Truck Mechanic:
BUILDING

*BASE RATE \$18.95
FRINGE BENEFITS 10.13

Euclids & Other Heavy Moving Equipment, Lowboy, Winch, A-Frame & Monorail Truck (To
transport building materials):

BUILDING

*BASE RATE \$19.05
FRINGE BENEFITS 10.13

***Work on Hazardous or Toxic Waste Site - \$4.00 Premium**

TRUCK DRIVER/HEAVY HIGHWAY:

Driver: HEAVY & HIGHWAY

BASE RATE \$15.85
FRINGE BENEFITS 4.60

Euclid Wagon, End Dump, Lowboy, Heavy Duty Equipment, Tractor-Trailer Combination, & Drag:
HEAVY & HIGHWAY

BASE RATE \$16.29
FRINGE BENEFITS 4.60

End of Document CR-1-015 2008
January 28, 2008

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END OF SECTION

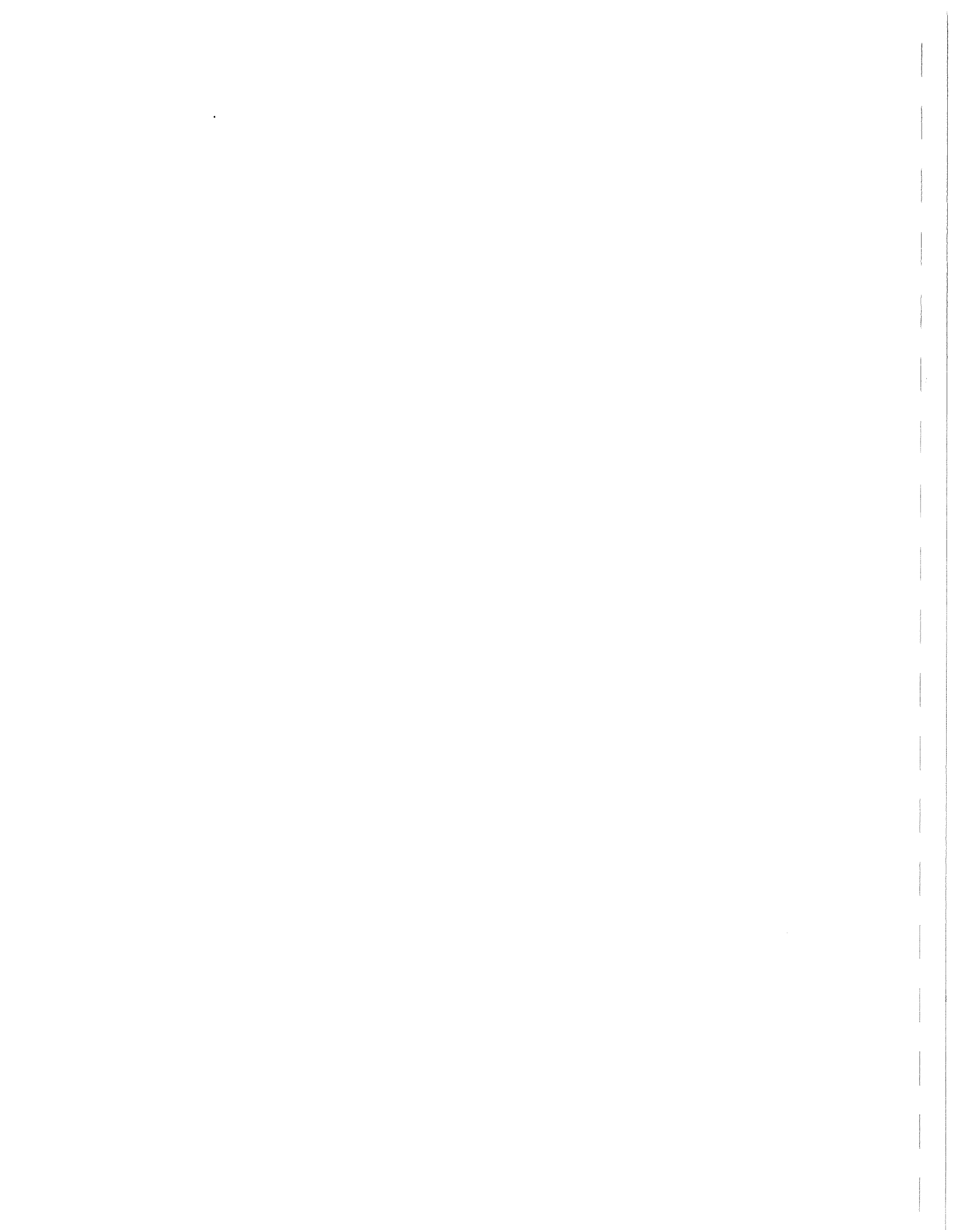
SECTION 00900 - ADDENDA

PART 1 - GENERAL

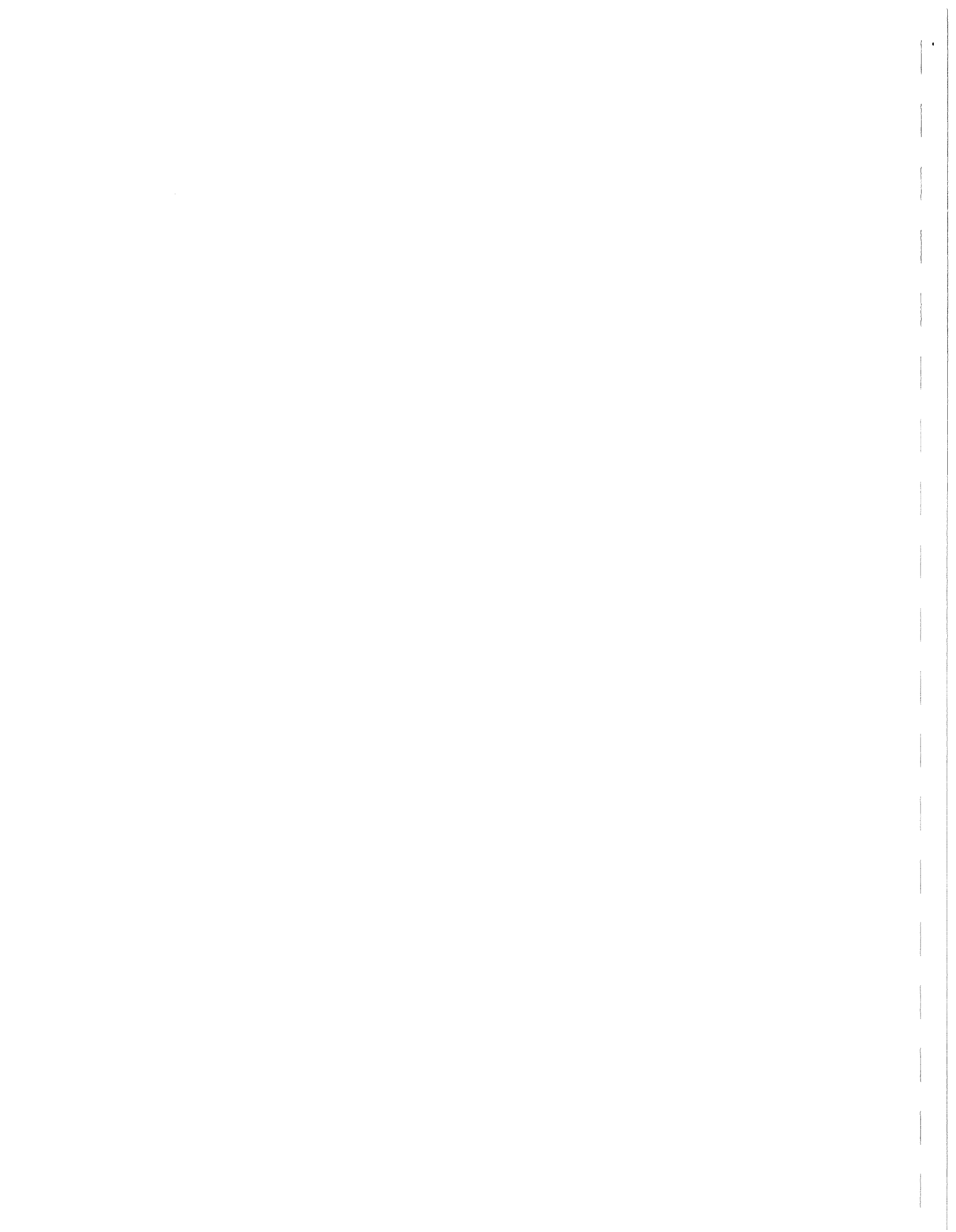
1.01 ADDENDA

All addenda issued during the bidding of the Project will be reproduced in the signed Contract Documents, on the pages following this heading sheet.

END OF SECTION



Specifications



Division 1 - General Requirements

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Instructions for Bidders, General Conditions, Supplementary Conditions, Supplemental General Conditions, Divisions 1 through 16 of the Specifications and all other Contract Documents shall apply and govern the work of all sections in this Division regardless of how the work may be apportioned to various trades or subcontractors.
- B. Work included in this section of the Specifications includes the furnishing of all labor, material, tools, and other equipment necessary to provide improvements to the chemical pretreatment facilities at the Fort Thomas Treatment Plant as shown on the Contract Drawings and as specified herein. Major components of the system upgrade include:
 - 1. Demolition and complete removal of existing carbon silo.
 - 2. Demolition of existing Copper Building.
 - 3. New dual feed carbon silo.
 - 4. New pretreatment building.
 - 5. Potassium permanganate feed system and metering pumps.
 - 6. Redundant copper sulfate feeders and metering pumps.
 - 7. Underground piping modifications.
 - 8. Site grading and drainage.
 - 9. Complete electrical and control systems.
 - 10. SCADA interface with existing plant system.

1.02 SCOPE

- A. The Contractor shall furnish and install all miscellaneous material to make all connections to all items of utilization equipment.
- B. All devices and items of equipment, including those shown on the Contract Drawings but not specifically mentioned in the Specifications or those mentioned in the Specifications but not shown on the Contract Drawings, are to be furnished under this section of the Specifications. Any such device or item of equipment, if not defined in quality, shall be equivalent to similar equipment and/or devices specified herein.
- D. Where control diagrams are not shown on the Contract Drawings, they are to be provided by the supplier of the equipment served and such diagrams shall be adhered to except as herein modified.
- F. The Contractor shall be responsible for:
 - 1. Shop drawings prior to installation.
 - 2. All equipment required.
 - 3. All wiring and ancillary equipment and appurtenances needed for proper installation and operation of equipment.
 - 4. All labor for installation and start-up of the system.
 - 5. Operations and maintenance manuals.

6. Start-up and training services.
7. Shipping, F.O.B., to the Owners destination, all items required by the contract documents.

1.03 PERMITS

Obtain any permits related or required by the Work in this Contract.

1.04 CODES

Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices, citations and similar communication to the Owner.

1.05 EXISTING CONDITIONS AND DIMENSIONS

- A. The Work in this Contract will primarily be performed in or around existing facilities which must remain functional. This Contractor must maintain the required items and/or systems functional without additional effort by Owner personnel and at no extra costs to the Owner.
- B. The Contractor is responsible for verifying all existing conditions, elevations, dimensions, etc., and providing his finished work to facilitate existing conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - INSTALLATION (NOT USED)

END OF SECTION

SECTION 01015 - PROJECT REQUIREMENTS

1. GENERAL DESCRIPTION OF WORK. The Work to be performed under these Contract Documents is generally described as follows: Furnishing all materials, equipment, supplies, labor and transportation, including fuel, power, and performing all work required in the scope of work in the Contract, in strict accordance with the specifications, schedules, and drawings, all of which are made a part hereof and including such detail drawings as may be furnished by the District from time to time during the prosecution of the work in explanation of said drawings.

2. COORDINATION. Contractor shall plan, schedule, and coordinate its operations in a manner which will facilitate the simultaneous progress of the work included under other contracts outside the scope of these Contract Documents if applicable.

3. RESPONSIBILITY FOR MATERIALS AND EQUIPMENT.

3.01. Items Furnished by Contractor. Contractor shall be fully responsible for all materials and equipment which it has furnished.

4. OFFSITE STORAGE. Offsite storage arrangement shall be approved by Owner for all materials and equipment not incorporated into the Work but included in Applications for Payment. Such offsite storage arrangement shall be presented in writing and shall afford adequate and satisfactory security and protection. Offsite storage facilities shall be accessible to Owner.

5. SUBSTITUTES AND "OR-EQUAL" ITEMS. Provisions for evaluation of substitutes and "or-equal" items of materials and equipment are covered in Paragraph 6.05 of the General Conditions. Requests for review of equivalency will not be accepted by Owner from anyone except Contractor, and such requests will not be considered until after the Contract has been awarded.

6. PREPARATION FOR SHIPMENT. All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Owner.

Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

7. SALVAGE OF MATERIALS AND EQUIPMENT. Existing materials and equipment removed, and not reused as a part of the Work, shall become Contractor's property.

Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified or indicated to be salvaged and reused or to remain the property of Owner. Contractor shall store and protect salvaged items specified or indicated to be reused in the Work.

Salvaged items not to be reused in the Work, but to remain Owner's property, shall be delivered by Contractor in good condition to Owner's storage yard.

Any items damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by Contractor in kind or with new items.

Contractor may furnish and install new items instead of those specified or indicated to be salvaged and reused, in which case such removed items will become Contractor's property.

Existing materials and equipment removed by Contractor shall not be reused in the Work except where so specified or indicated.

8. OPERATION OF EXISTING FACILITIES. The existing raw water supply system to the plant must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from Owner in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands. This may facilitate work on weekends which is considered incidental to the project.

Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

9. LINES AND GRADES. All Work shall be done to the lines, grades, and elevations indicated on the Drawings.

Basic horizontal and vertical control points will be established or designated by Owner to be used as datums for the Work. All additional survey, layout, and measurement work shall be performed by Contractor as a part of the Work.

Contractor shall provide an experienced instrument person, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement work. In addition, Contractor shall furnish, without charge, competent persons and such tools, stakes, and other materials as Owner may require in establishing or designating control points, or in checking survey, layout, and measurement work performed by Contractor.

Contractor shall keep Owner informed, a reasonable time in advance, of the times and places at which it wishes to do Work, so that horizontal and vertical control points may be established and any checking deemed necessary by Owner may be done with minimum inconvenience to Owner and minimum delay to Contractor.

Contractor shall remove and reconstruct work which is improperly located.

10. CONNECTIONS TO EXISTING FACILITIES. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In ease case, Contractor shall receive permission from Owner or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

11. UNFAVORABLE CONSTRUCTION CONDITIONS. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall confine its operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the Work in a proper and satisfactory manner.

12. CUTTING AND PATCHING. As provided in General Conditions, Contractor shall perform all cutting and patching required for the Work and as may be necessary in connection with uncovering Work for inspection or for the correction of defective Work.

Contractor shall perform all cutting and patching required for and in connection with the Work, including but not limited to the following:

- Removal of improperly timed Work.
- Removal of samples of installed materials for testing.
- Alteration of existing facilities.
- Installation of new Work in existing facilities.

Contractor shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. Contractor shall not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without Owner's concurrence.

Materials shall be cut and removed to the extent indicated on the Drawings or as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. Materials which are not salvable shall be removed from the site by Contractor.

All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to Owner, to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

13. ASBESTOS REMOVAL. If, during the progress of the Work, suspected asbestos-containing products are identified, Contractor shall stop work in the affected area and engage in asbestos removal Subcontractor to verify the materials and, if necessary, encapsulate, enclose, or remove and dispose of all asbestos in accordance with current regulations of the Environmental Protection Agency and the U.S. Department of Labor-Occupational Safety and Health Administration, the state asbestos regulating agency, and any local government agency. Payment for such work will be made by Change Order.

13.01. Subcontractor's Qualifications. The Subcontractor for asbestos removal shall be regularly engaged in this type of activity and shall be familiar with the regulations which govern this work. The Subcontractor shall demonstrate to the satisfaction of Owner that it has successfully completed at least three asbestos removal projects, that it has the necessary staff and equipment to perform the work, and that it has an approved site for disposal of the asbestos. The Subcontractor shall carry insurance as specified in the Supplementary Conditions.

13.02. Removal Methods. The asbestos removal Subcontractor shall submit a work plan of its proposed removal procedure to Owner before beginning work and shall certify that the methods are in full compliance with the governing regulations. The work plan shall cover all aspects of the removal, including health and safety of employees and building occupants, hygiene facilities, employee certification, clearance criteria, transportation and disposal, enclosure techniques, and other techniques appropriate for the proposed work.

14. CLEANING UP. Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. Contractor shall provide adequate trash receptacles about the site and shall promptly empty the containers when filled.

Construction materials, such as concrete forms and scaffolding, shall be neatly stacked by Contractor when not in use. Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.

Volatile wastes shall be properly stored in covered metal containers and removed daily.

Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and anti-pollution laws.

Adequate cleanup will be a condition for processing of progress payment applications.

15. APPLICABLE CODES. References in the Contract Documents to local codes mean the following:

- Kentucky Building Code
- Kentucky Plumbing Code
- National Electric Code
- BOCA Mechanical Code

Other standard codes which apply to the Work are designated in the Specifications.

16. PRECONSTRUCTION CONFERENCE. Prior to the commencement of Work at the site, a pre-construction conference will be held at a mutually agreed time and place. The conference shall be attended by:

- Contractor and its superintendent.
- Principal Subcontractors.
- Representatives of principal Suppliers and manufacturers as appropriate.
- Representatives of Owner.
- Government representatives as appropriate.
- Others as requested by Contractor or Owner.

Unless previously submitted to Owner, Contractor shall bring to the conference a preliminary schedule for each of the following:

- Progress.
- Procurement.
- Values for progress payment purposes.
- Shop Drawings and other submittals.

The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

- Contractor's preliminary schedules.
- Transmittal, review, and distribution of Contractor's submittals.
- Processing Applications for Payment.
- Maintaining record documents.
- Critical Work sequencing.
- Field decisions and Change Orders.
- Use of premises, office and storage areas, security, housekeeping, and Owner's needs.
- Contractor's assignments for safety and first aid.

Owner will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

17. PROGRESS MEETINGS. Contractor shall schedule and hold regular progress meetings at least monthly and at other times as requested by Owner or required by progress of the Work. Contractor, Owner, and all Subcontractors active on the site shall be represented at each meeting. Contractor may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

Contractor shall preside at the meetings. Meeting minutes will be prepared and distributed by Contractor. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

18. ALLOWANCES INCLUDED IN BID

A. Contractor shall include a \$5,000 allowance for geotechnical site visit services by the same firm which provided geotechnical investigations utilized in the structural design of the foundations for the project. Said visits shall be for the sole purpose of confirming that the conditions described in the geotechnical report are present over the foundation areas extending beyond the investigational borings. The actual costs of providing the described services is included in the bid as a "cash allowance." The Engineer or his representative may waive site visits which are intended to evaluate sub-grade conditions which, in the Engineer's opinion, are substantially identical to adjacent conditions which have been exposed and evaluated.

B. Contractor shall include a \$5,000 allowance for any fees or charges, in cash or by force account, related to the establishment of a new electrical service for the project site.

19. CONSTRUCTION LIMITATIONS/SEQUENCING. The following items must be included in the Contractor's proposed Sequence of Work.

A. Two of three raw water lines must remain in service at all times.

B. The Owner must have feed capabilities for powder activated carbon (3,500 lb/day), copper sulfate (150 lb/day) and potassium permanganate (300 lb/day) throughout the project. Leaving the existing Copper Building in service until the new chemical facilities are operational should be considered. Short term shutdowns of facilities may be considered by the Owner on

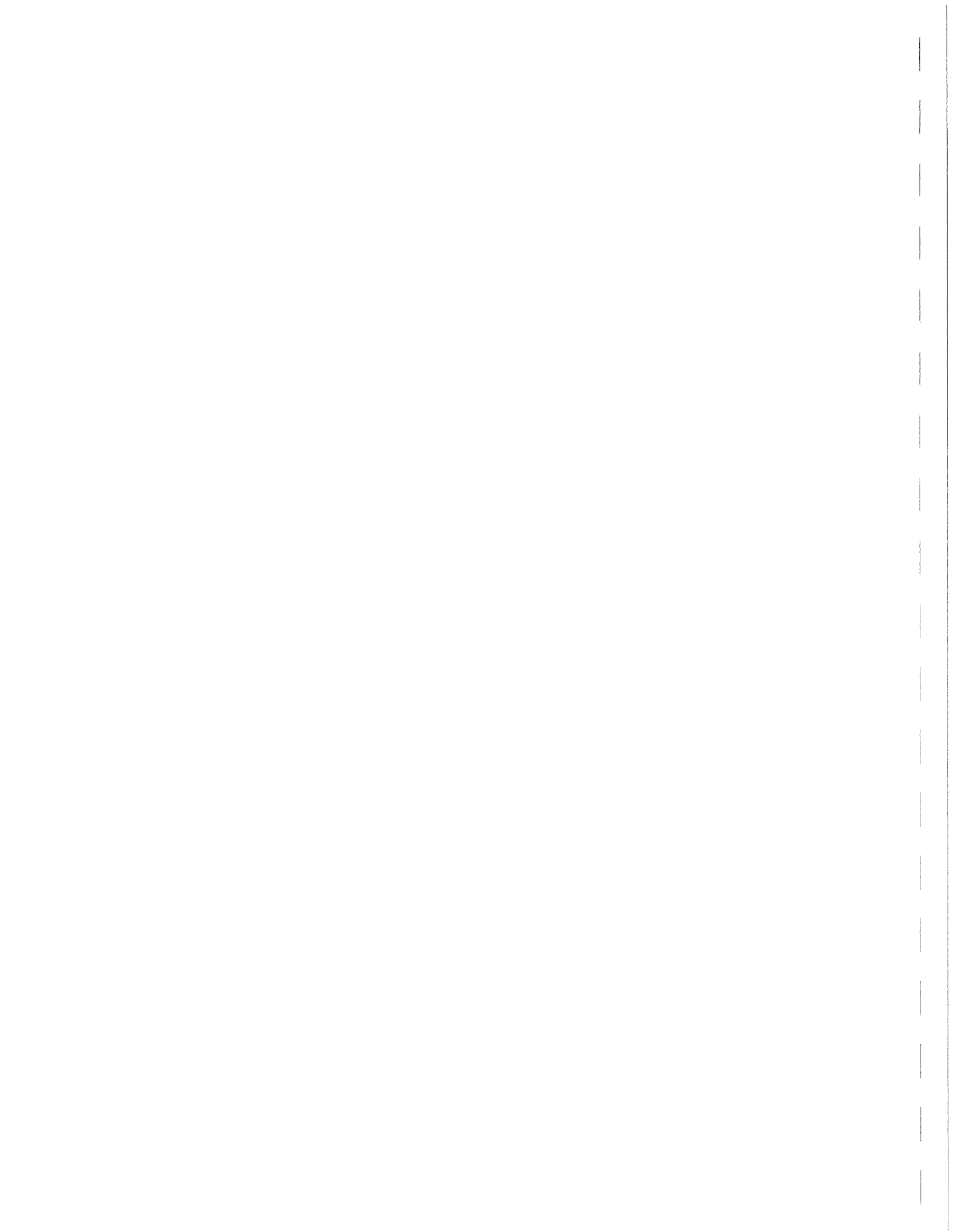
an individual basis. A denial of requested shutdown by the Owner will not be considered acceptable grounds for a Change Order. Contractor is expected to prepare a construction sequence that keeps the critical chemical feed system in operation throughout the project.

END OF SECTION

SECTION 01025 - MEASUREMENT AND PAYMENT

1. SCOPE. This section covers methods of measurement and payment for items of Work under this Contract.
2. BASE BID ITEM NO. 1. Payment for furnishing all labor, materials and equipment necessary for installation of the reinforced concrete caissons will be made at the contract unit price per vertical foot as indicated on the Bid Schedule. Payment will be made on actual installed caissons. The quantity indicated on the Bid Form is an estimation.
3. BASE BID ITEM NO. 2. The total Contract Price shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the lump sum price bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the bid.
4. BID PRICES TO INCLUDE INCIDENTAL WORK. The bid prices will cover and include the cost and expense of all contingents, accessories and incidental work and material required to complete the improvement. This includes replacement of services, pavement, fences and any other objects which are affected in the process of construction on this work. It shall also include where necessary, watchmen, flagmen, barricades, red lights, all backfill material such as gravel, flowable fill and any temporary restoration, construction joints, finishing and curing concrete, dust control, maintenance of traffic, maintenance of existing sewage flow, provision for access to property, and many other incidents which occur on a normal construction job.

END OF SECTION



SECTION 01026 – SCHEDULE OF VALUES

Part 1 - GENERAL

1.01 WORK INCLUDED

The work under this Section includes preparation and submittal of a schedule of values.

1.02 GENERAL

- A. Timing of Submittal: Submit to the Engineer, a schedule of values allocated to the various portions of the Work, within 10 days after Notice to Proceed. The first progress payment will not be made until the next pay cycle following the Engineer's approval of the Contractor's values.
- B. Supporting Data: Upon request of the Engineer, support the values with data which will substantiate their correctness.
- C. Use of Schedule: The schedule of values, unless objected to by the Engineer, shall be used only as a basis of the Contractor's Application for Payment.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Form and Identification

- 1. Type schedule on 8-1/2 x 11-inch white paper.
- 2. Contractor's standard forms and automated printout may be used.
- 3. Identify schedule with:
 - a. Title of project and location
 - b. Engineer
 - c. Name and address of Contractor
 - d. Contract designation
 - e. Date of submission

- B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. Breakdown shall be by structure, then by CSI Format, for ease of field verification of quantities completed in each structure.

C. Format

- 1. Follow the Table of Contents of the Contract Documents as the format for listing the component items.

2. Identify each item with the number and title of the respective major section of the Specifications.
- D. For each major line item list sub-values of major products or operations under the item.
- E. For the Various Portions of the Work:
1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
 2. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials, delivered and unloaded, with taxes paid.
 - b. The total installed value, including Contractor's overhead and profit, less item a. above.
- F. The sum of all values listed in the schedule shall equal the Bid Total.

END OF SECTION

SECTION 01030 - ALTERNATIVES

PART 1 - GENERAL

1.01 WORK INCLUDED

This section identifies and details work indicated on the plans or described in the specifications as an Additive or Deductive Alternative.

1.02 PERMITS AND CODE COMPLIANCE

Any permit, permit modification, code modification or submittal arising from the acceptance of any of the Alternatives will be the responsibility of the Contractor.

1.03 SUBMITTALS

The Contractor shall provide any information requested by the Owner or Engineer in a timely manner in order to determine whether an Alternative will be accepted. The submission of shop drawings and other required information shall conform with Section 01300 of these specifications.

PART 2 - SCHEDULE OF ALTERNATIVES

2.01 Alternative Bid No. 1 – Relocate Existing Carbon Silo

Delete all materials and labor associated with the work required for the new carbon silo (except for the concrete foundation). Provide all labor, materials and equipment needed to disassemble, relocate and reconstruct the existing carbon silo to the new location. Restoration shall be complete and include at a minimum the following:

- a. Sandblast and repaint all surfaces.
- b. Replacement of all equipment.
- c. Replacement of interior floor.
- d. Replacement of all piping, valves and appurtenances.
- e. Replacement of control panel and all conduit and wire.
- f. Specialized coatings below the interior floor grating.
- g. Relocate the silo from its current location to the pad adjacent to the new pretreatment building.

2.02 Alternative Bid No. 2 – Fiberoptic Line Location

Delete all materials and labor associated with the work required to install underground conduit for the 12-fiber cable from the new pretreatment building to the existing Hypo Building. Replace with overhead cable on wooden poles. Conduit/fiber to enter both buildings underground and extend to a riser pole on both ends where it will transition to overhead. Poles to be 35 feet tall and buried 5 feet in the ground and spaced no further than 200 feet apart. Cable to be suitable for outdoor use suspended on poles.

2.03

Alternative Bid No. 3 – Stone Veneer

Delete all materials, equipment and labor associated with the work required for a brick veneer exterior and replace with all labor, material and equipment needed to install a stone veneer exterior.

END OF SECTION

SECTION 01045 – CUTTING AND PATCHING

PART 1 – GENERAL

1.01 SCOPE

- A. The work under this Section includes, but is not necessarily limited to, cutting and patching work as indicated on the Drawings, herein specified and as necessary for proper and complete performance of the Work.
- B. Requirements for cutting and patching may be described in various sections of these Specifications.
- C. Execute cutting, including excavating and filling, or patching of work required to:
 - 1. Make several parts fit properly.
 - 2. Uncover work to provide for installation of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of the Contract Documents.
 - 5. Remove samples of the installed work as specified for testing.
 - 6. Install specified work in existing construction.
- D. In addition, upon written instruction of the Engineer:
 - 1. Uncover work to provide for the Engineer's observation of covered work.
 - 2. Remove samples of the installed materials for testing.
 - 3. Remove work to provide for alteration of existing work.
- E. Protection of Work
 - 1. Do not endanger any work by cutting or altering the Work or any part of it.
 - 2. Do not cut or alter the work of another contractor without written consent of the Engineer.

1.02 SUBMITTALS

- A. Prior to cutting which affects the structural safety of the Project or the work of another contractor, submit a written notice to the Engineer requesting consent to proceed with cutting. The notice shall include:
 - 1. Identification of Project
 - 2. Description of defective Work
 - 3. Necessity for cutting
 - 4. Affect on other work or on the structural integrity of the Project.
 - 5. Description of the proposed work including:
 - a. Scope of cutting and patching
 - b. Subcontractor and trades to execute work
 - c. Products proposed to be used
 - d. Extent of refinishing

6. Alternatives to cutting and patching.
 7. Designation of party responsible for the cost of cutting and patching.
- B. Cost Estimate: Prior to cutting and patching performed on instruction of the Engineer, submit a cost estimate.
- C. Should conditions of the Work or the schedule necessitate alternative materials or methods, submit a written recommendation to the Engineer that includes:
1. Compelling conditions for alternative materials or methods
 2. Recommended alternative materials or methods
 3. Submittals as required for substitutions
- D. Uncovered Work: Submit written notice to the Engineer designating the time the work will be uncovered for the Engineer's observation.

1.03 PAYMENT FOR COST

- A. Contractor's Costs: Costs caused by ill-timed or defective work or work not conforming to the Contract Documents, including costs for additional services of the Engineer, shall be paid by the Contractor.
- B. Owner's Costs: Cost of work done as the result of the Engineer's/Owner's instructions, which is not shown on the Drawings or specified, other than defective or non-conforming work, will be paid for by the Owner.

PART 2 – PRODUCTS

2.01 MATERIALS

All products and materials shall conform to the requirements of the Specifications for the type of work being performed, except where no products are specified in these Specifications for the item being replaced; then the products and materials shall be of an equivalent type, quality, thickness and width of the item removed.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of the Work including elements subject to movement or damage during cutting and patching, or excavating and backfilling.
- B. After uncovering work, inspect conditions affecting the installation of new products.

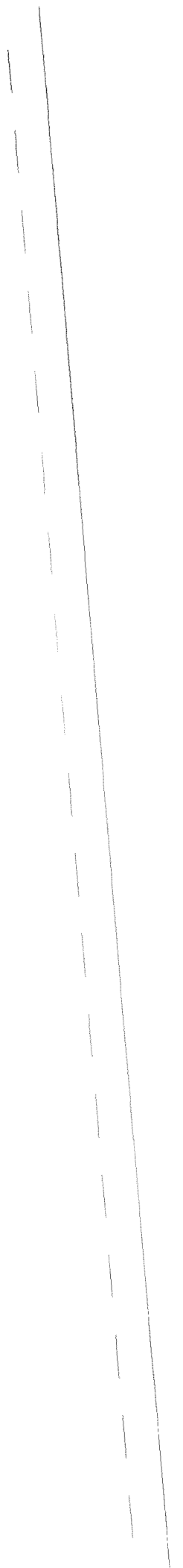
3.02 PREPARTION

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

3.03 PERFORMANCE

- A. Execute fitting and adjustments of products to provide finished installation that complies with specified tolerances and finishes.
- B. Execute cutting and demolition by means that will prevent damage to other work and will provide proper surfaces to receive installation of repairs and new work.
- C. Execute excavating and backfilling as specified in Section 02222 or Section 02225 of these Specifications.
- D. Restore work which has been cut or removed and install new products to provide completed work in accordance with the requirements of the Contract Documents.
- E. Refinish entire surfaces as necessary to provide an even finish. Continuous surfaces shall be refinished to the nearest intersection and assemblies shall be entirely refinished.

END OF SECTION



SECTION 01055 – CONSTRUCTION STAKING

PART 1 – GENERAL

1.01 SCOPE

- A. Construction staking shall include all of the surveying work required to layout the Work and control the location of the finished Project. The Contractor shall have the full responsibility for constructing the Project to the correct horizontal and vertical alignment, as shown on the Drawings, as specified, or as ordered by the Engineer. The Contractor shall assume all costs associated with rectifying work constructed in the wrong location.
- B. From the information shown on the Drawings and the information to be provided as indicated under Project Conditions below, the Contractor shall:
 - 1. Be responsible for setting reference points and/or offsets, establishment of baselines, and all other layout, staking, and all other surveying required for the construction of the Project.
 - 2. Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and shall bear the cost of re-establishing same if disturbed.
 - 3. Stake out the permanent and temporary easements or the limits of construction to ensure that the Work is not deviating from the indicated limits.
 - 4. Be responsible for all damage done to reference points, baselines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, baselines, center lines and temporary bench marks as a result of the operations.
- C. Baselines shall be defined as the line to which the location of the Work is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line.
- D. Record Drawing surveys shall be performed in accordance with Section 01720 of these Specifications.

1.02 PROJECT CONDITIONS

- A. The Drawings provide the location and/or coordinates of principal components of the Project. The alignment of some components of the Project may be indicated in the Specifications. The Engineer may order changes to the location of some of the components of the Project or provide clarification to questions regarding the correct alignment.
- B. The survey points, control points, and baseline to be provided to the Contractor shall be limited to only that information which can be found on the Project site by the Contractor.

1.03 QUALITY ASSURANCE

- A. The Contractor shall furnish documentation, prepared by a surveyor currently registered in the State in which the Project is located, confirming that staking is being done to the horizontal and vertical alignment shown in the Contract Documents. This

requires that the Contractor hire, at the Contractor's own expense, a currently registered surveyor, acceptable to the Owner, to provide ongoing construction staking or confirmation of such.

- B. Any deviations from the Drawings shall be confirmed by the Engineer prior to construction of that portion of the Project.
- C. Quantities for payments measured under this Contract shall be certified by the registered surveyor.

1.04 SITE WORK

- A. Staking Precision: The precision of construction staking shall match the precision of a component's location indicated on the Drawings. Staking of utilities shall be done in accordance with generally accepted practice for the type of utility.
- B. Written certification, by a licensed surveyor, that structure base grade and structure corner locations match the locations shown on the Drawings is required prior to beginning construction of the structure.
- C. Paved Surfaces: The Contractor shall establish a reference point for establishing and verifying the paving subgrade and finished grade elevations. Any variance with plan grades shall be identified by the Contractor and confirmed by the Engineer prior to constructing the base.

END OF SECTION

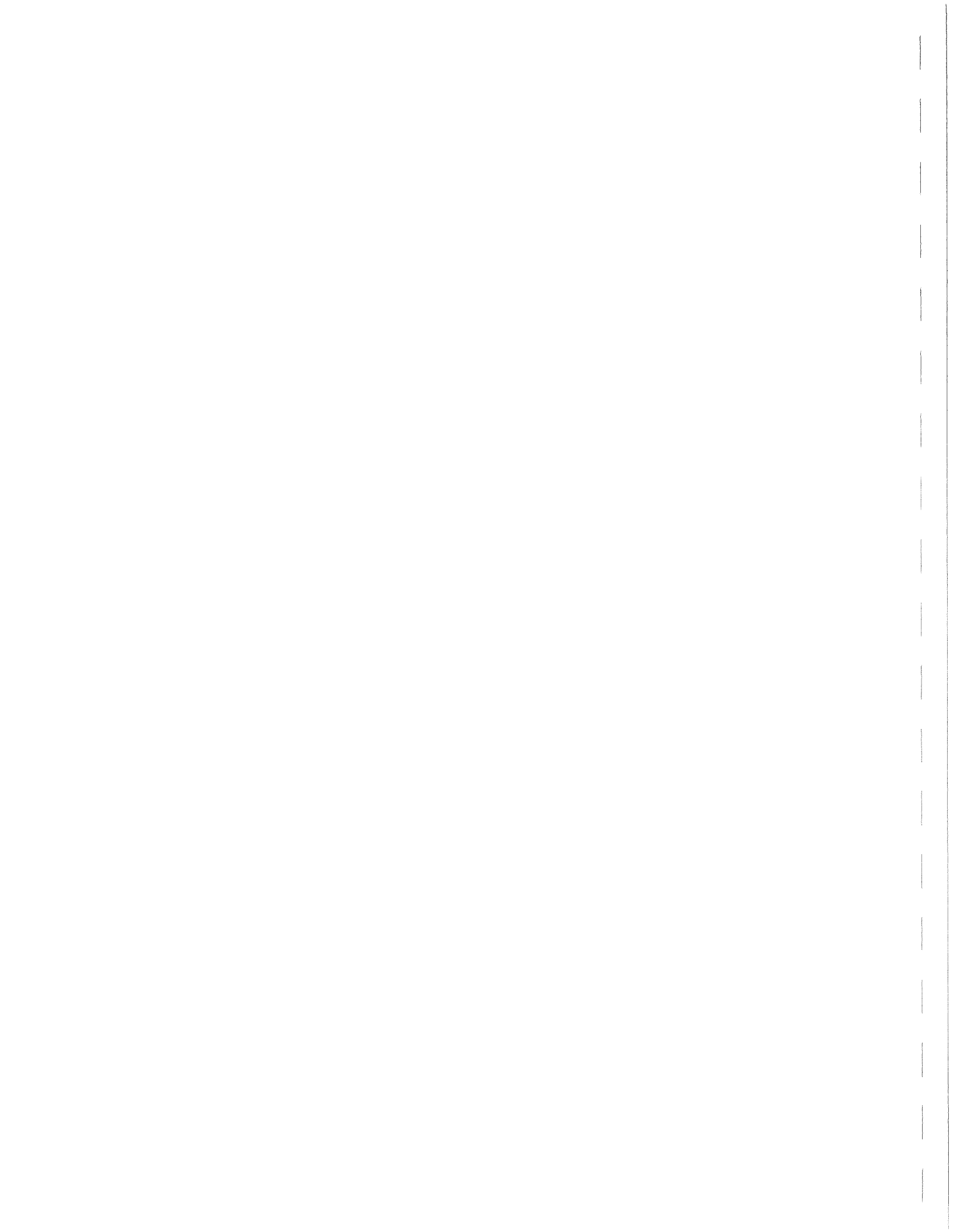
SECTION 01060 – REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.01 SCOPE

- A. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, be responsible for obtaining all necessary licenses and permits, including building permits and erosion and sedimentation control permits, and for complying with any applicable federal, state, county and municipal laws, codes and regulations, in connection with the prosecution of the Work.
- B. The Contractor shall take proper safety and health precautions to protect the Work, the workers, the public and the property of others.
- C. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the Work, except for any completed unit of construction thereof which may heretofore have been accepted.

END OF SECTION



SECTION 01070 - ABBREVIATIONS OF TERMS AND ORGANIZATIONS

1.01 LIST OF ABBREVIATIONS

Reference to standards and organizations in the Specifications shall be by the following abbreviated letter designations:

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AFBMA	Antifriction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APA	American Plywood Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood-Preservers' Association
AWPB	American Wood Preservers Bureau
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard (U.S. Department of Commerce)
DIPRA	Ductile Iron Pipe Research Association
EEl	Edison Electric Institute
EJCDC	Engineers' Joint Contract Documents Committee
EPA	Environmental Protection Agency
Fed Spec	Federal Specification
FHWA	Federal Highway Administration
FIA	Factory Insurance Association
FM	Factory Mutual
IEEE	Institute of Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute

IRI	Industrial Risk Insurers
MIL	Military Specification
MSS	Manufacturers Standardization Society of Valve and Fitting Industry
NBS	National Bureau of Standards
NCSPA	National Corrugated Steel Pipe Association
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NPC	National Plumbing Code
NPT	National Pipe Thread
NRMCA	National Ready Mixed Concrete Association
NSC	National Safety Council
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	Product Standard
SAE	Society of Automotive Engineers
SI	Système International des Unités (International System of Units)
SPFA	Steel Plate Fabricators Association
SSI	Scaffolding and Shoring Institute
SSPC	Steel Structures Painting Council
UL	Underwriters' Laboratories

End of Section

SECTION 01300 - SUBMITTALS

1. PROGRESS SCHEDULE. After the preconstruction conference and before Work is started, Contractor shall submit to Owner for review a schedule of the proposed construction operations. Owner shall cooperate with Contractor in arrangements for continuity of service and operation of valves and other control facilities. The progress schedule shall indicate the sequence of the Work, the time of starting and completion of each part, and the time for making connections to existing piping, structures, or facilities.

2. PROGRESS REPORTS. A progress report shall be furnished to Owner with each Application for Payment. If the Work falls behind schedule, Contractor shall submit additional progress reports at such intervals as Owner may request.

Each progress report shall include sufficient narrative to describe current and anticipated delaying factors, their effect on the progress schedule, and proposed corrective actions. Any Work reported complete, but which is not readily apparent to Owner, must be substantiated with satisfactory evidence.

3. SURVEY DATA. All field books, notes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to Owner for examination throughout the construction period. All such data shall be submitted to Owner with the other documentation required for final acceptance of the Work.

4. SHOP DRAWINGS AND ENGINEERING DATA.

4.01. General. Shop Drawings and engineering data (submittals) covering all equipment and fabricated and building materials which will become a permanent part of the Work under this Contract shall be submitted to Owner for review, at the Owner's address given in the Agreement. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment. When an item consists of components from several sources, Contractor shall submit a complete initial submittal including all components.

All submittals, regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of this Contract, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

Contractor shall be solely responsible for the completeness of each submission. Contractor's stamp of approval is a representation to Owner that Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that Contractor has reviewed and coordinated each submittal with the requirements of the Work and the Contract Documents.

All deviations from the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

Five copies (or one reproducible copy) of each drawing and necessary data shall be submitted to Owner. Owner will return two marked copies (or one marked reproducible copy) to Contractor. Facsimile (fax) copies will not be acceptable. Owner will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

4.02. Engineer's Review of Submittals. Engineer's review of submittals will cover only general conformity to the Drawings and Specifications, external connections, and dimensions which affect the layout. Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device, or item shown. Engineer's review shall not relieve Contractor of Contractor's sole responsibility for errors, omissions, or deviations in the drawings and data, nor of Contractor's sole responsibility for compliance with the Contract Documents.

Engineer's submittal review period shall be 21 consecutive calendar days in length and shall commence on the first calendar day immediately following the date of arrival of the submittal or resubmittal in Engineer's office. The time required to mail the submittal or resubmittal back to Contractor shall not be considered a part of the submittal review period.

When the drawings and data are returned marked "NOT ACCEPTABLE" or "RETURNED FOR CORRECTION", the corrections shall be made as noted thereon and as instructed by Engineer and five corrected copies (or one corrected reproducible copy) resubmitted. Facsimile (fax) copies will not be acceptable.

When the drawings and data are returned marked "EXCEPTIONS NOTED", "NO EXCEPTIONS NOTED", or "RECORD COPY", no additional copies need be furnished unless requested by Engineer at time of review.

4.03. Resubmittal of Drawings and Data. Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Engineer are provided on the resubmittal.

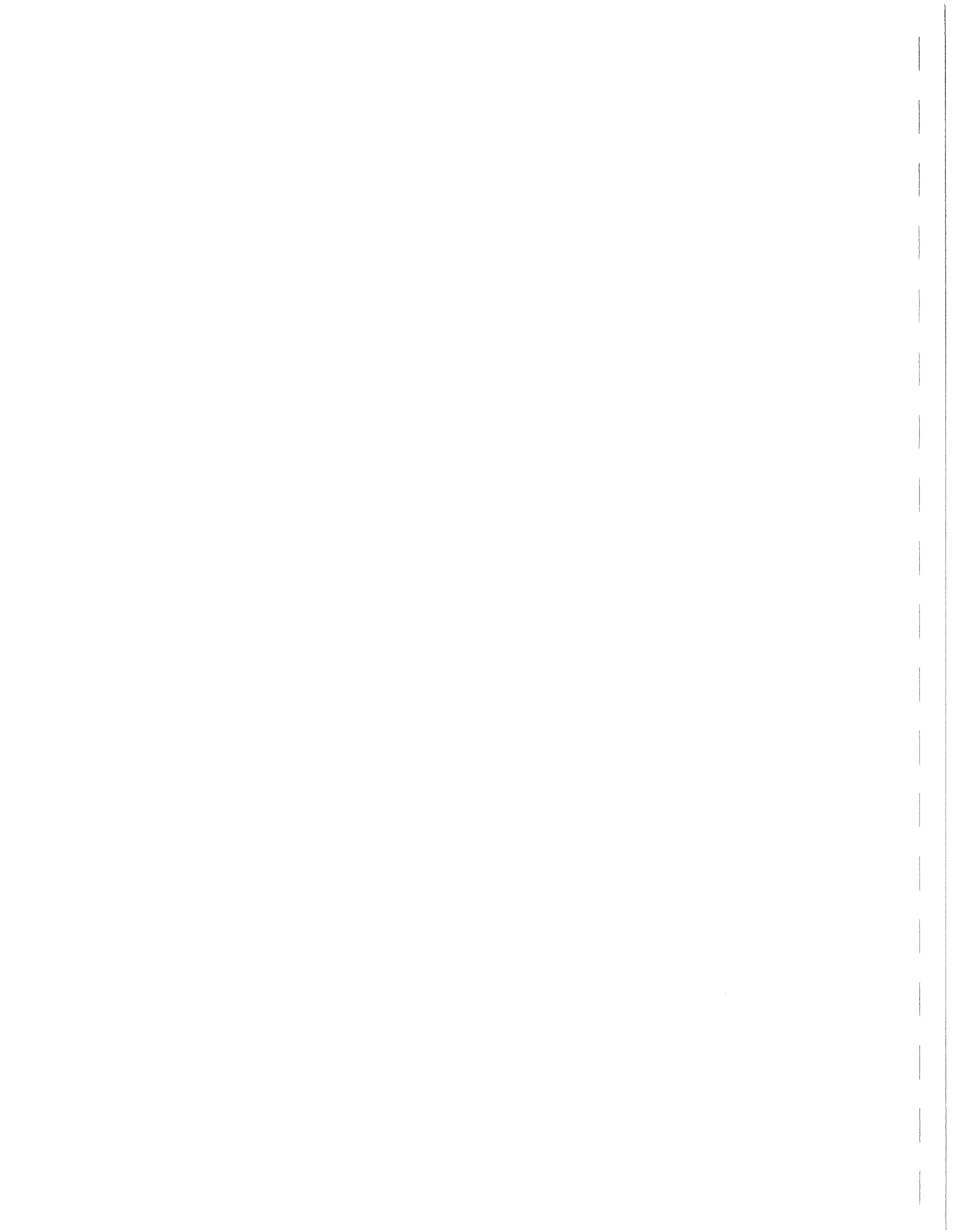
When corrected copies are resubmitted, Contractor shall in writing direct specific attention to all revisions and shall list separately any revisions made other than those called for by Engineer on previous submissions.

Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the resubmittal.

Re-submittals shall be made within 30 days of the date of the letter returning the material to be modified or corrected, unless within 14 days Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

Any need for more than one resubmission, or any other delay in obtaining Engineer 's review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is directly caused by a change in the Work authorized by a Change Order or by failure of Owner to review any submittal within the submittal review period specified herein and to return the submittal to Contractor.

END OF SECTION



SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 TESTING SERVICES

- A. All tests to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to Owner. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards.
- B. Testing services provided by Owner are for the sole benefit of Owner; however, test results shall be available to Contractor. Testing necessary to satisfy Contractor's internal quality control procedures shall be the sole responsibility of Contractor.

1.02 SPECIAL INSPECTIONS/TESTING SERVICES FURNISHED BY OWNER

- A. Unless otherwise specified, Owner shall provide all testing services in connection with Chapter 17 of the Kentucky Building Code, including:
 - 1. Concrete materials, mix designs and cylinder tests.
 - 2. Asphaltic concrete materials and mix designs.
 - 3. Embedment, fill, and backfill materials.
 - 4. Geotechnical engineering services for caisson installation. Owner shall utilize the same firm that performed the site investigations.
 - 5. Reinforcing steel placement.
 - 6. Masonry reinforcement, mix designs, joints and anchorage.
- B. Contractor shall furnish all sample materials and cooperate in the testing activities. Contractor shall interrupt the Work when necessary to allow testing to be performed. Contractor shall have no claim for an increase in Contract Price or Contract Times due to such interruption.
- C. If testing shows workmanship and/or materials does not meet established requirements, the Contractor shall be responsible for all additional testing cost to ensure compliance.
- D. For additional inspection requirements, refer to requirement outlined on the structural drawings.

1.03 CONTRACTOR NOTIFICATION

Contractor will provide 48 hours notification prior to the commencement of work requiring special inspections.

1.04 TRANSMITTAL OF TEST REPORTS

Written reports of tests and engineering data furnished by Contractor for Owner's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.

END OF SECTION



SECTION 01450 - SERVICES OF MANUFACTURER'S REPRESENTATIVE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. **General:** The Equipment Supplier shall provide a qualified service technician to perform the duties herein described. All costs shall be included in the Contract price. Coordinate all site visits with the Owner and Installation Contractor to ensure equipment is ready and Owner is available.
- B. **Field Investigation:** Control, status, and interlocking requirements are based on specific manufacturers of equipment. Manufacturer representatives and/or electrical contractor shall field verify accuracy of the contract drawings and shall modify as needed to incorporate their equipment into the existing pump control scheme.
- C. **Supervision of Installation:** Supervision of the workers and advice to the Owner to insure that proper procedures are followed during equipment installation.
- D. **Equipment Check-out:**
 - 1. After installation of the listed equipment has been completed and the equipment is presumably ready for operation but before it is operated by others, a qualified service technician shall inspect, operate, test and adjust the equipment. The inspection shall include but shall not be limited to, the following points as applicable:
 - a. Soundness (without cracked or otherwise damaged parts).
 - b. Completeness in all details as specified.
 - c. Correctness of configurable parameters.
 - 2. The operation, testing and adjustment shall be as required to prove that the equipment has been installed properly and is capable of satisfactory operation under the conditions specified. On completion of his work, the manufacturer's qualified service technician shall submit in triplicate to the Engineer a complete signed report of the result of his inspection, operation, adjustments and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that the equipment conforms to the requirements of the Equipment Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.
- E. **Field Acceptance Tests:** After the Engineer has reviewed the reports from the manufacturer's qualified service technician, the Installation Contractor shall coordinate arrangements to have the Equipment Supply Contractor(s)' technician(s) present when the field acceptance tests are made.

- F. Post Startup and Operation Training: Provision of **on-site** training to maintenance personnel in the operation and maintenance of the equipment after placing the equipment in full operation. Post startup and operation training shall be performed by a qualified service technician. For additional requirements on training, refer to Section 16480, Paragraph 3.02
- G. Post Startup Services: Provision of assistance to the Owner in the calibration, tuning and troubleshooting, plus any additional training which may be required during the year after the equipment is accepted by the Owner.
- H. The required minimum number of on-site manhours required for pre-startup operator training and for post-startup services are listed in Table A.

Spec. No.	Spec. Section	Tasks and Manhours	
		Pre-Startup Operator Training	Post-Startup Services
11249	Metering Pumps	4	4
11352	Dry Chemical Feeders	4	4
11356	Powder Activated Carbon Feed System	8	8
15700	HVAC Equipment	2	4
13400	Instrumentation/SCADA System	4	8

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES

1. OFFICE AT SITE OF WORK. During the performance of this Contract, Contractor shall maintain a suitable office at or near the Site of the Work, which shall be the headquarters of its representative, authorized to receive drawings, instructions, or other communication or article. Any communication given to the said representative or delivered at Contractor's office at the Site of the Work in its absence shall be deemed to have been delivered to Contractor.

Copies of the Drawings, Specifications, and other Contract Documents shall be kept at Contractor's office at the Site of the Work and available for use at all times.

2. WATER. Water in reasonable amounts required for and in connection with the Work to be performed will be furnished at existing fire hydrants by Owner without charge to Contractor. All water used in testing and disinfection of mains will be furnished by the Owner for the first test only. Contractor shall furnish necessary pipe, hose, nozzles, tanks and tools and shall perform all necessary labor. Contractor shall make arrangements with Owner (who will fix the time, rate, and duration of each withdrawal from the distribution system) as to the amount of water required and the time when the water will be needed. Unnecessary waste of water will not be tolerated. Special hydrant wrenches shall be used for opening and closing fire hydrants. In no case shall pipe wrenches be used for this purpose.

3. POWER. Contractor shall provide all power for heating, lighting, operation of Contractor's plant or equipment, or for any other use by Contractor.

4. TELEPHONE SERVICE. Contractor shall make all necessary arrangement and pay all installation charges for telephone lines in its offices at the Site and shall provide all telephone instruments.

5. SANITARY FACILITIES. Contractor shall furnish temporary sanitary facilities at the Site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.

Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

6. MAINTENANCE OF TRAFFIC. Contractor shall conduct his work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when Contractor has obtained permission from the owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.

In making open cut street crossings, Contractor shall not block more than one-half of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side to facilitate traffic flow. Temporary surfacing shall be provided as necessary on shoulders.

The Contractor shall wherever necessary or as required by the Owner or the authority having jurisdiction provide, erect and maintain proper lights, signs, barricades, temporary guardrail, other traffic control devices, and furnish watchmen and flagmen as may be necessary to maintain safe traffic conditions in accordance with the Manual of Uniform Traffic Control Devices.

The Contractor shall be liable for and hold the Owner free and harmless from all damages occasioned in any way by its actions or neglect or those of its agents, employees, or workmen.

Work that requires the Contractor to shut down the road on weekends or at nights is considered an incidental to the project.

The Contractor at all times shall conduct the work in such manner as to cause as little interference as possible with private business or with private and public travel on the public highway. All damage (other than that resulting from normal wear and tear) to existing roads or pavements shall be repaired to withstand traffic in a safe condition.

Where the Contractor finds it necessary to remove excavated material to some other location, care should be taken not to overload trucks, which would in turn spill material out upon highways. Any such material spilled upon highways shall be immediately cleaned up from the location and properly disposed of per applicable regulation.

Where it is necessary and is agreeable with public and private property owners, excavated materials may be temporarily piled in the streets or roadways, however, one lane of traffic must be maintained at all times.

After excavated materials have been removed, all hard surface streets or roadways shall be thoroughly cleaned and left free of dirt, gravel and dust. Streets or roadways, which do not have hard surfaces, must be restored to their original condition at the expense of the Contractor. Streets and roadways shall be kept in a safe and passable condition at all times.

6.01 Temporary Bridges. Contractor shall construct substantial bridges at all points where it is necessary to maintain traffic across pipeline construction. Bridges in public streets, roads, and highways shall be acceptable to the authority having jurisdiction thereover. Bridges erected in private roads and driveways shall be adequate for the service to which they will be subjected. Bridges shall be provided with substantial guardrails and with suitably protected approaches. Footbridges shall be at least 4 feet wide, provided with handrails and uprights of dressed lumber.

6.02 Detours. Where required by the authority having jurisdiction thereover that traffic be maintained over any construction work in a public street, road, or highway, and the traffic cannot be maintained on the alignment of the original roadbed or pavement, Contractor

shall, at its own expense, construct and maintain a detour around the construction work. Each detour shall include a bridge across the pipe trench and all necessary barricades, guardrails, approaches, lights, signals, signs, and other devices and precautions necessary for protection of the Work and safety of the public.

7. BARRICADES AND LIGHTS. All streets, roads, highways, and other public thoroughfares, which are closed to traffic, shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall be located at the nearest intersecting public highway or street on each side of the blocked section.

All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to the public. Obstructions, such as material piles and equipment, shall be provided with similar warning signs and lights.

All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the Work on or alongside public streets and highways shall cause the minimum obstruction and inconvenience to the traveling public.

All barricades, signs, lights, and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and, where within railroad and highway rights-of-way, as required by the authority having jurisdiction thereover.

8. TRAFFIC CONTROL. In addition to the requirements of the maintenance of traffic and barricades and lights paragraphs in this section, traffic control shall be as set forth herein.

During periods of inclement weather, rush-hour traffic, or during periods of unusually heavy traffic, the Owner may require the Contractor to cease operations in order to adequately handle the traffic. The Owner reserves the right to require the suspension or delay of certain operations, or the expediting of other operations, at no additional cost to the Owner, to provide a proper sequence of operations which will promote the satisfactory movement of traffic. The Owner may require additional barricades, lights, or flagmen at any time or at any place necessary for proper protection of traffic, but approval by the Owner of the Contractor's method of operation shall not relieve the Contractor of his responsibility to protect traffic.

The use and duration of using heavy steel plates to convey traffic across open excavations shall be kept to a minimum. Steel plates shall be secured in an appropriate manner to prevent them from moving. The purpose of this requirement is to minimize the sound to the residents, institutions, commercial establishments, etc. The Owner reserves the right, at no additional cost to the Owner, to require the Contractor to complete certain operations and street re-paving so steel plates are not required.

Contractor shall take extra precautions to provide and maintain emergency access on all streets and roads and to all residential, commercial, and other properties for police and fire departments and emergency medical service throughout the construction operations.

Contractor shall maintain the use of existing walks for pedestrians at all times. Additional requirements are specified in the temporary bridge subparagraph in this section.

9. TRAFFIC CONTROL PLAN. To obtain a permit to work within public rights-of-way, Contractor may be required to prepare and submit to the appropriate agencies, a traffic control plan in conformance with the requirements of the authority having jurisdiction thereover.

10. FENCES. All existing fences affected by the Work shall be maintained by Contractor until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. A copy of all written permissions shall be submitted to Owner. Where fences must be maintained across the construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use.

On completion of the Work across any tract of land, Contractor shall restore all fences to their original or to a better condition and to their original location.

11. PROTECTION OF PUBLIC AND PRIVATE PROPERTY, DAMAGE TO EXISTING PROPERTY. Contractor shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by his construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod, shrubs, trees in yards, parkways, and medians shall be restored to their original or better condition, whether within or outside the easement. Unless otherwise specified, all replacements shall be made with new materials.

Sodded and landscaped areas on improved property (yards) shall be disturbed only to the extent required to permit construction. Such areas shall not be used as storage sites for construction supplies and, insofar as practicable, shall be kept free from stockpiles or excavated materials.

No trees shall be removed outside the permanent easement, except where authorized by Owner. Hand excavation shall be employed as necessary to prevent injury to trees. Trees left standing shall be adequately protected against damage from construction operations.

Contractor shall be responsible for all damage to streets, curbs/gutters, roads, sidewalks, shoulders, ditches, embankments, culverts, bridges, traffic loops and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by him or his Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage and shall furnish a written verification of all agreements.

Should the Contractor's operations damage any existing underground or aboveground utility, installation, structure, or other construction, Contractor shall immediately notify the authority owning or having jurisdiction over and control of the utility, installation, structure, or other construction, and make a report of such damage. A copy of the report shall be submitted to the Owner. The damaged item shall be repaired immediately by and at the expense of the Contractor unless otherwise specified or acceptable to the authority or owner having jurisdiction over, or to the Owner.

The utility, installation, structure, or other structures damaged by Contractor's operations shall be repaired, replaced, or otherwise restored in accordance with the local ordinances, standards, and requirements of the applicable authority or owner having jurisdiction thereover and shall be subject to acceptance by the Owner. Special precaution shall be taken by the Contractor to avoid damage to existing overhead and underground utilities owned and operated by the Owner or other public or private utility companies.

With particular respect to existing underground utilities, all available information concerning their location has been shown on the drawings. While it is believed that the locations shown are reasonably correct, the Owner cannot guarantee the accuracy or adequacy of this information.

Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies, property owners, or departments that own and operate utilities in the vicinity of the construction work. The purpose of this conference or conferences shall be to notify said companies, agencies or departments of the proposed construction schedule, verify the location of and possible interference with the existing utilities, fire protection systems, lawn irrigation systems, etc., that are shown on the plans, arrange for necessary suspensions of service, and make arrangements to locate and avoid interference with all other utilities (including house connections) that are not shown on the plans. The Owner has no objection to the Contractor arranging for said utility companies, agencies, or departments to locate and uncover their own utilities, however, insofar as the Owner is concerned, the Contractor shall bear entire responsibility for locating and avoiding or repairing damage to said existing utilities.

Where existing utilities or other underground structures are encountered, they shall not be displaced or molested unless necessary, and in such case they shall be replaced in as good or better condition than found as quickly as possible. All such utilities that are so damaged or molested shall be replaced at the Contractor's expense unless in the opinion of the Owner such damage was caused through no fault or action of the Contractor.

It is expected that the Contractor will be diligent in its efforts and use every possible means to locate existing utilities. Any claims for unavoidable damage based on improper or unknown locations will be thoroughly examined in the light of the Contractor's efforts to locate the said utilities or obstructions prior to beginning.

When construction is completed, the private property owner's facilities and grounds shall be restored to as good or better condition than found and as quickly as possible at the Contractor's expense.

All water mains, and water service connections damaged by Contractor's operations will be repaired by the Owner at the expense of the Contractor unless other arrangements are made. Customer irrigation piping damaged by Contractor's operations shall be repaired by and at the cost of the Contractor.

All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

12. TREE AND PLANT PROTECTION. Tree and plant protection is of prime importance. Except where otherwise authorized, indicated, or specified, no trees or plants shall be

removed. Activities near trees that are to be protected shall be kept to a minimum. Tree protection shall also include trimming, when necessary, to prevent damage by construction equipment.

Trees and plants to be removed shall be removed in such a manner as to avoid injury to surrounding trees and plants. Contractor shall be responsible for disposal of all trees and plants removed or damaged.

13. HAUL ROUTES. Contractor shall obtain and pay for all necessary permits from the applicable authority having jurisdiction thereover to allow use of public streets to transport equipment and material to and from the Site. At such time the Contractor shall request the agency having jurisdiction to establish the haul routes. A copy of the permit and designated haul routes shall be provided to the Owner prior to commencement of Work in that area.

14. PARKING. Contractor shall provide and maintain suitable parking areas for the use of all construction workers and others performing work or furnishing services in connection with the Project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, Owner's operations, or construction activities.

Contractor shall clean up all parking areas used and return them to their original state.

The location of the Contractor's parking areas shall be acceptable to Owner, and the owner and tenant of private property or to the authority having jurisdiction over public property upon which the parking area will be located.

15. RESIDENTIAL PARKING. Contractor shall provide appropriate areas for residents to park their vehicles during the construction operations adjacent to their properties, if require. This shall include making the appropriate areas available to the residents by not storing construction materials or equipment in these areas and providing signs and other notification methods acceptable to the Owner for instruction the residents on the location of the temporary parking and its intended use.

Additional requirements for notifying property owners and tenants of available temporary parking are covered in the project requirements section.

16. ACCESS ROADS. Contractor shall establish and maintain temporary access roads to various parts of the Site as required to complete the Project. Such roads shall be available for the use of all others performing work or furnishing services in connection with the Project.

17. NOISE CONTROL. Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

During construction activities on or adjacent to occupied buildings, and when appropriate, Contractor shall erect screens or barriers effective in reducing noise in the building and shall conduct his operations to avoid unnecessary noise which might interfere with the activities of building occupants.

18. DUST CONTROL. Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing dust.

Buildings or operating facilities, which may be affected adversely by dust, shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

19. TEMPORARY DRAINAGE PROVISIONS. Contractor shall provide for the drainage of storm water and such water as may be applied or discharged on the Site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the Site, and adjacent property.

Existing drainage channels and conduits shall be cleaned, enlarged, or supplemented as necessary to carry all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect Owner's facilities and the Work, and to direct water to drainage channels or conduits. Ponding shall be provided as necessary to prevent downstream flooding.

20. EROSION CONTROL. Contractor shall prevent erosion of soil on the Site and adjacent property resulting from his construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operation that will disturb the natural protection.

Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation shall be preserved to the greatest extent practicable. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion. Temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff.

21. POLLUTION CONTROL. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. No sanitary wastes will be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance will be permitted to enter sanitary sewers, and reasonable measures shall be taken to prevent such materials from entering any drain or watercourse.

22. CUSTOMER NOTIFICATION. The Contractor after approval by the Owner's representative shall notify all affected Owner customers 24 hours prior to interrupting water service. Notification shall be made by the Contractor using the Northern Kentucky Water District "Interruption of Service Notice". All Owner customers shall be notified prior to having their water turned-off to have ample time to draw water for use until service is restored. Under no circumstance shall a customer of the Owner be without water service overnight. If water service or existing water system cannot be interrupt during normal daytime hours due to water needs or high demands, the contractor may be required to conduct the work at night or on the weekend. This work is considered an incidental to the project.

22. UNSAFE CONDITIONS. The Owner reserves the right to take whatever action is necessary to correct an unsafe condition created by the Contractor at the Contractor's expense.

23. SECURITY. CONTRACTOR shall be responsible for protection of the Site, and all the Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

No Claim shall be made against OWNER by reason of any act of an employee or trespasser, and CONTRACTOR shall make good all damage to OWNER's property resulting from CONTRACTOR's failure to provide security measures as specified. Security measures shall be at least equal to those usually provided by OWNER to protect OWNER's existing facilities during normal operation, but shall also include such additional security fencing, barricades, lighting, and other measures as required to protect the Site.

End of Section

SECTION 01540 - SECURITY

PART 1 - GENERAL

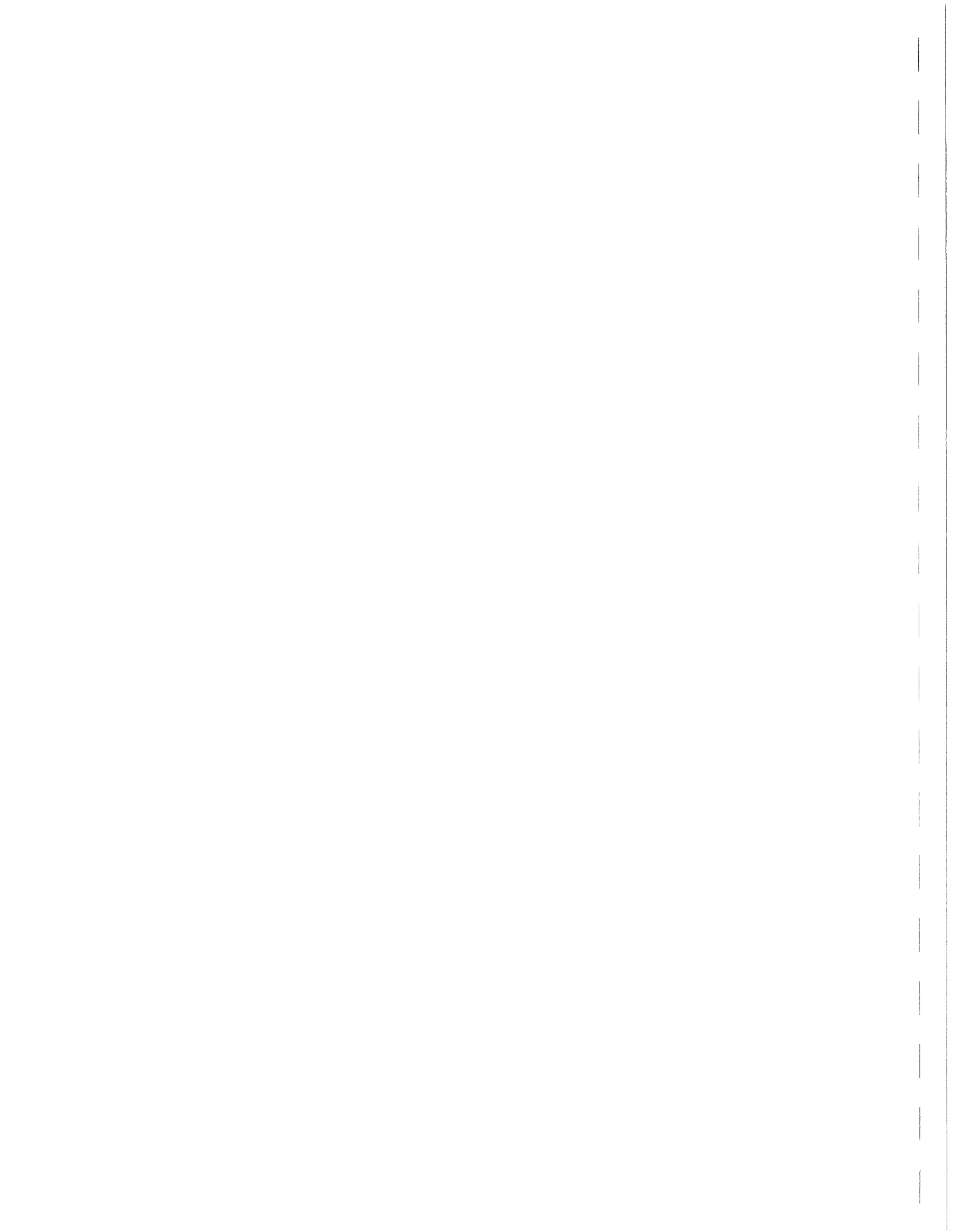
1.01 WORK INCLUDED

- A. The Project area has to remain safely accessible to Owner's personnel; however, the Contractor will provide any non-interfering security he deems necessary to protect his work, equipment, etc.
- B. Provide an adequate system to secure the Project area at all times, especially during non-construction periods; the Contractor shall be solely responsible for taking proper security measures.

1.02 COSTS

Contractor shall pay for all costs for protection and security systems.

END OF SECTION 01540



SECTION 01640 – GENERAL EQUIPMENT STIPULATIONS

PART 1 – GENERAL

1.01 SCOPE

These general equipment stipulations apply, in general, to all equipment and piping. They supplement the detailed equipment Specifications, but in case of conflict, the detailed equipment Specifications shall govern.

1.02 COORDINATION

The Contractor shall assume full responsibility for the coordination of the installation of all equipment, materials and products furnished under these Contract Documents. The Contractor shall be completely responsible for verification that all structures, piping and equipment components furnished by the Contractor and/or subcontractors and suppliers are compatible. The Contractor shall start-up each equipment system and shall make all necessary alterations. All such alterations shall be made at the Contractor's expense.

1.03 UNIT RESPONSIBILITY

Equipment manufacturers assigned unit responsibility for systems comprised of several components shall be responsible for furnishing a complete system in accordance with the requirements of these Specifications. The manufacturer shall be responsible for all coordination between component manufacturers and shall provide all submittals, installation and start-up services and certifications on the system as a unit.

1.04 ADAPTATION AND LOCATION OF EQUIPMENT

- A. No responsibility for alteration of a planned structure to accommodate other types of equipment will be assumed by the Owner. Equipment which requires alteration of the structures will be considered only if the Contractor assumes all responsibility for making and coordinating all necessary alterations. All such alterations shall be made at the Contractor's expense.
- B. The Contractor shall install the work in such manner that the equipment, piping, vents, conduit, panels, ductwork and appurtenances be as neatly installed with adequate space for maintenance and passage of personnel.

1.05 EQUIPMENT WARRANTY

The Contractor shall warrant all equipment against faulty or inadequate design, improper assembly or erection, defective materials, breakage or other failure. The warranty period shall be defined in Section 01740 of these Specifications.

1.06 WORKMANSHIP AND MATERIALS

- A. All equipment shall be designed, fabricated and assembled in accordance with the most modern engineering and shop practice. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall be new and shall not have been in service at any time prior to delivery, except as required by tests.
- B. Materials shall be suitable for service conditions. Iron castings shall be tough, close grained, gray iron free from blowholes, flaws or excessive shrinkage and shall conform to ASTM A 48, Class 30 minimum. Plugging of defective castings shall not be permitted. Castings shall be annealed to remove internal stresses prior to machining and shall have the mark number and heat number cast on them.
- C. Except where otherwise specified, structural and miscellaneous fabricated steel used in items of equipment shall conform to the Standards of the American Institute of Steel Construction. All structural members shall be considered as subject to shock or vibratory loads.
- D. All replaceable or expendable elements such as filters, screens, drive belts, fuses and lamps shall be easily accessible and replaceable without need of dismantling equipment or piping. All such items shall be of a standard type that is readily available from multiple suppliers.
- E. Threaded openings for drains or vents in pump volutes, compressor or fan scrolls, air receivers, and heat exchangers which are plugged during normal operation shall be provided with stainless steel plugs.
- F. All equipment delivered to the Project site shall include detailed installation instructions and a parts list.

1.07 EQUIPMENT SPECIFICATIONS

The use of singular or plural terminology in the Specifications is not intended to define the number of units required to fulfill Contract requirements. Bidders must consult the Drawings and Specifications to determine how many units of a particular piece of equipment are required. This does not relieve the Contractor of the responsibility to provide all equipment specified when multiple units are specifically required in the Specifications.

1.08 OPERATING FLUIDS AND GASES

All operating fluids and gases recommended by the manufacturer and required for operation of the equipment shall be provided in sufficient quantity by the Contractor to fill all equipment and to replace all fluids and gases consumed during testing and start-up.

1.09 LUBRICATION AND LUBRICATION FITTINGS

- A. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during start-up or shutdown and shall not waste lubricants.
- B. Lubricants of the type recommended by the equipment manufacturer shall be provided in sufficient quantity by the Contractor to fill all lubricant reservoirs and to replace all lubricants consumed during testing, start-up and initial operation. The Contractor shall provide sufficient quantities of lubricants to lubricate all equipment for one year of normal service before final acceptance of the equipment will be made by the Owner.
- C. Where special run-in oil or storage lubricants are used, they shall be flushed out and replaced with the required service lubricant by the Contractor.
- D. Tag each piece of equipment with a cloth tag showing proper type lubricant, period between lubrications, date of lubrication and worker's initials. Have space for 10 lubrication notations.
- E. Except for rotating shaft couplings, all lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings or guards. Fittings shall be accessible from safe, permanent platforms or walk areas. Fittings shall be of the bull-neck, check type for use with a portable high pressure grease gun. Connection from a remote fitting to the point of use shall be with minimum 3/16-inch stainless steel tubing, securely mounted parallel to equipment lines and protected where exposed to damage.

1.10 SAFETY GUARDS

All belt or chain drives, fan blades, couplings and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gauge or heavier galvanized or aluminum-clad sheet steel or 1/2-inch mesh galvanized expanded metal. Expanded metal safety guards shall be banded to eliminate sharp edges. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water. All safety guards shall comply with OSHA General Industry Standards, Part 1910, Subpart O, Machinery and Machine Guarding. Provide tachometer access on shaft ends.

1.11 EQUIPMENT BASES

- A. Where shown on the Drawings, equipment shall be installed on a raised, reinforced concrete base. The base shall be a minimum of 4-inches in height and shall extend beyond the equipment baseplate approximately 2-inches on all sides.
- B. The Engineer shall be consulted concerning electrical conduit locations prior to pouring the concrete base.

- C. Unless otherwise specified, a cast iron or welded steel baseplate shall be provided for each pump, compressor and any other item of equipment which is to be installed on a concrete base. Each unit and drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a raised lip all around and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with epoxy or non-shrink grout as specified in the grouting section.
- D. On direct coupled equipment, motor and driven equipment shall be doweled to a common base with a minimum of two dowels each.

1.12 ALIGNMENT OF MOTORS AND EQUIPMENT

- A. In every case where a drive motor is connected to a driven piece of equipment by a flexible coupling, the coupling halves shall be disconnected and the alignment between the motor and the equipment checked and corrected. Machinery shall first be properly aligned and leveled by means of steel wedges and shims or jacking screws near anchor bolts. Anchor bolts shall be tightened against the shims on wedges or jacking screws and the equipment shall again be checked for level and alignment before placing grout. Wedges shall not be placed between machined surfaces.
- B. In general, checking and correcting the alignment shall follow the procedures set up in the Standards of the Hydraulic Institute, Instructions for Installation, Operation, and Maintenance of Centrifugal Pumps. Equipment shall be properly leveled and brought into angular and parallel alignment.
- C. Equipment shall be installed in such a way that no strain is transmitted to the equipment by piping systems or adjacent equipment.

1.13 GROUTING

A special epoxy, non-shrink, or sand-cement grout shall be used in the placement of all pump, motor and equipment baseplates or bedplates, column baseplates, other miscellaneous baseplates and other grouting applications as shown on the Drawings

1.14 WELDING AND BRAZING

- A. All welds shall be sound and free from embedded scale and slag. All butt welds shall be continuous, and where exposed to view, shall be ground smooth. All continuous welds shall be gas and liquid-tight. Welds in piping shall have full penetration and shall be smooth on the inside of the pipe. Intermittent welds shall have an effective length of at least 2-inches and shall be spaced not more than 6-inches apart.
- B. All welding of steel and aluminum, including materials, welding techniques, general safety practices, appearance and quality of welds, and methods of correcting defective work, shall conform to the latest requirements of AWS Specifications. Structural steel welding shall conform to the requirements of the AWS Structural Welding Code. The general recommendations and requirements of the AWS Structural Welding Code shall also apply to welded aluminum structures. The welding process and welding operators shall meet qualification tests and welding

performance tests in accordance with the latest provisions of ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications. Welding process and qualification procedures for welding of pipe shall conform to the latest requirements of ANSI B31.1, Section 327, Welding, and Section 328, Brazing and Soldering. All welding qualification tests shall be witnessed by the Engineer, except as provided herein. All costs associated with the qualification or testing of welders and welding operators shall be borne by the Contractor.

- C. Reports certifying that the welding procedures, welders and welding operators that the Contractor intends to use meet the requirements specified above. These reports shall be submitted to the Engineer prior to beginning the Work. In the case of welder qualifications for shop welding and for carbon steel field welding, welders presenting certified qualification papers validated within the preceding 6-month period will not be required to take the qualification tests. In the case of field welding of stainless steel or aluminum, all welders shall be required to take the qualification tests regardless of past experience or availability of certified qualification papers.
- D. Field welding practices shall conform to OSHA construction standards, Part 1926, Subpart J, Welding and Cutting. Shop welding practices shall conform to OSHA General Industry Standards, Part 1910, Subpart Q, Welding, Cutting, and Brazing.
- E. Welding electrodes for structural steel shall conform to the standard recommendations of the AISC. Welding electrodes for stainless steel shall conform to applicable AWS Specifications and shall be as recommended by ~Welded Austenitic Chromium-Nickel Stainless Steels, Techniques and Properties~, published by the International Nickel Company, New York, New York. Welding electrodes for aluminum shall conform to applicable AWS Specifications.
- F. Each welder and welding operator must identify all welds with welder's assigned symbol.
- G. Welders performing unsatisfactory work shall be removed from the welding process.
- H. The Owner may inspect any weld by radiographic or other means. Welds not in accordance with the requirements specified herein shall be repaired or replaced at the Contractor's expense. Excessive porosity, nonmetallic inclusions, lack of fusion, incomplete penetration and cracking shall constitute grounds for rejection of welds.

1.15 ERECTION AND SETTING

- A. In the erection and setting of all fabricated equipment, the Contractor shall exercise care to ensure that each item of equipment is adequately supported so as not to bend or distort under its own weight until adequate foundation support and anchorage are provided. Where lifting lugs, angles or clips are provided on equipment, they shall be used in erecting and setting the equipment. Erection and setting of equipment and structural steel shall conform to the requirements of OSHA Construction Standards, Part 1926, Subpart R, Steel Erection, Subpart H, Material Handling, Storage, Use, and Disposal, and Subpart N, Cranes, Derricks, Hoists, and Conveyors. Erection of structural steel shall conform to the latest requirements of the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.

- B. During placement and prior to any grouting or connection of adjacent piping, the equipment shall be leveled and aligned true to level, plumb, alignment and grade with all parts bearing or fitting the structure or equipment accurately and securely. It shall not be permitted to cock out of alignment, nor shall the Contractor redrill, reshape or force fit any fabricated items.
- C. The Contractor shall take all measurements necessary to properly fit Contractor's work in the field, and Contractor shall be governed by and responsible for these measurements and the proper working out of all details. The Contractor shall be responsible for the correct fitting of all work in the field and the accurate placement of all anchor bolts installed by Contractor.
- D. The Contractor shall bring all parts to be erected or assembled into close contact. Before assembly, all surfaces to be in contact with each other shall be thoroughly cleaned. Drift pins may be used only for bringing members into position, never to enlarge or distort holes. Torching or burning of holes or cutting of fabricated items to correct misalignment or shop errors shall not be permitted. Enlargement of holes necessary to make field connections shall be done only with the Engineer's approval by reaming with twist drills and in a manner acceptable to Engineer.
- E. All equipment shall be furnished with suitable eyebolt lifting lugs or lifting angles to facilitate handling.

1.16 SPECIAL TOOLS AND ACCESSORIES

Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments and accessories required for proper maintenance. Special tools and accessories shall include those tools and accessories not normally available in an industrial hardware or mill supply house. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

1.17 GALVANIZING

- A. All galvanizing shall be done by the hot-dip process after fabrication in conformity with requirements of ASTM A 123, Grade 100; ASTM A 153, ASTM A 384 and ASTM A 385. Articles to be galvanized shall be pickled before galvanizing. Articles to be painted shall not be quenched.
- B. Where galvanized bolts are specified or required by the Drawings, zinc plated bolts will be acceptable provided zinc plating conforms to ASTM B 633, Type II.
- C. Areas of galvanizing damaged at the factory by welding or burning or otherwise damaged shall be thoroughly stripped and cleaned and recoated with zinc to the required thickness by the hot dip process. Areas of galvanizing damaged in the field during transportation, handling or installation shall be stripped, cleaned, and recoated with zinc to the required thickness in accordance with ASTM A 780, Annex A3.
- D. Galvanized articles shall be free from uncoated spots, blisters, flux, black spots, dross, projections and other defects not consistent with acceptable galvanizing practice.

- E. Zinc and cadmium plating shall be subject to visual examination to determine uniformity of coating. The Engineer may require that the coating uniformity be tested in accordance with ASTM A 239 or ASTM E 376. General Equipment Stipulations detailed equipment specifications. All field tests shall be running tests with the equipment operating on the product for which it is intended or a substitute acceptable to the Engineer. The term displacement, as used herein, shall mean total peak-to-peak movement of vibrating equipment, in mils; velocity shall mean the peak velocity or speed of the vibrating equipment, in inches per second; acceleration shall mean the maximum acceleration which occurs during the vibration cycle, measured in G's. Displacement and velocity shall be measured by a meter equal to IRD Mechanalysis Vibration Meter Model 306, or Bently-Nevada Model TK-8. Acceleration shall be measured by suitable equipment equal to IRD Mechanalysis, Bently-Nevada, subject to approval of the Engineer. Frequency of vibration, in cycles per minute (cpm), shall be determined when vibration exceeds specified levels or as otherwise necessary. Vibration shall be measured on the bearing housing, unless other locations are deemed necessary by the vibration analysis expert and Engineer.
- E. For all equipment tested, vibration shall be checked in the radial and axial directions. For pumps, vibration shall not exceed that permitted by the Hydraulic Institute.
- F. Critical speeds of all rotating equipment shall meet the following:
 - 1. For stiff shaft designs, the first critical speed of the rotating equipment shall be at least 25 percent above the maximum design operating speed.
 - 2. For flexible shaft designs, critical speeds shall be at least 2 percent above or below normal design operating speeds.
- G. The Contractor shall be responsible for unit and system assembly vibration testing and their results, which shall be within the specified limits. Copies of test results shall be submitted to the Engineer for review. Should the vibration field test results exceed shop test results or the limits specified herein, the Contractor shall correct the deficiencies within 30 days. After corrections have been completed, the vibration testing shall be rerun and the results resubmitted to the Engineer for review.

1.18 NOISE CRITERIA

- A. Unless otherwise specified, noise levels for all operating equipment shall not exceed 90 dB at 5 feet from the equipment when measured on the A scale of a calibrated sound level meter at slow response.
- B. Noise criteria shall be met without the use of special external barriers or enclosures.

1.19 IDENTIFICATION OF PIPING AND EQUIPMENT

- A. General: All equipment and piping specified to be painted shall be color coded as specified in Section 09900 of these Specifications.
- B. Equipment: All major items of equipment shall have an identification nameplate and dataplate.

1. Nameplates: The Contractor shall submit a suitable list of all items of major equipment to the Engineer, who will furnish the Contractor with an identification numbering system. The nameplates shall be of Type 304 stainless steel, No. 6 finish, and not less than No. 16 gauge with indented stamped lettering. Nameplates shall be attached to equipment bases in easily visible and accessible locations. Nameplates shall be fastened in a permanent manner, arranged not to damage the equipment, with not less than four stainless steel fasteners.
 2. Dataplates: Each item of mechanical equipment shall be provided with a stainless steel dataplate. Separate dataplates shall be provided for motors, engines and driven equipment. Dataplates shall include the following minimum information:
 - a. Name of equipment (from equipment specifications)
 - b. Manufacturer
 - c. Model designation
 - d. Serial number
 - e. Rated horsepower
 - f. Service factor
 - g. Electrical and insulation data
 - h. Speed (rpm)
 - i. Capacity and head (discharge pressure)
 - j. Net weight
 - k. Lettering shall be upper case, block style in size and spacing to suit the nameplate. The identification nameplates shall not be painted.
- C. Valves: All valves shall be identified with a round brass disc, approximately 1-1/2-inches in diameter and not less than No. 14 gauge, coated with a clear lacquer. Discs shall be fastened to valves in a permanent manner; attachment by chain to handwheels or other operators shall not be acceptable. Discs shall be stamped using indented numerals and/or letters with a valve number corresponding to its identification number in the valve schedule to be included in the operation and maintenance manual.
- D. All pushbutton stations, switches, motor controllers, transmitters and other control equipment shall have identification nameplates of the engraved, laminated plastic type affixed to or adjacent to the switch, pushbutton station, etc.
- E. All manufacturer's nameplates, identification nameplates and ASME code plates located on areas of equipment to be insulated shall be removed and reattached on uninsulated areas in a manner acceptable to the Engineer.

1.20 SAFETY SIGNS

- A. Permanent safety signs shall be furnished and installed on all mechanical and electrical equipment where a hazard may exist. Signs shall be made in accordance with current OSHA requirements and shall be suitable for exterior use. Mounting details shall be in accordance with manufacturer's recommendations; location in accordance with governing agency regulations. Fasteners shall be stainless steel.
- B. Safety signs shall be approximately 10-inches high by 14-inches wide, colored yellow and black on minimum 0.080-inch aluminum stock.
- C. Safety signs shall be furnished and will include, but not be limited to, the following:
 - 1. The following sign shall be affixed to all equipment which may be started automatically from a remote location:

CAUTION
THIS EQUIPMENT MAY START AUTOMATICALLY BY REMOTE CONTROL

- 2. The following sign shall be affixed to all electrical equipment or instrument panels, as applicable:

CAUTION - SHOCK HAZARD
THIS EQUIPMENT IS POWERED BY MULTIPLE SOURCES
CONTACTS MAY BE ENERGIZED AFTER LOCAL POWER IS DISCONNECTED

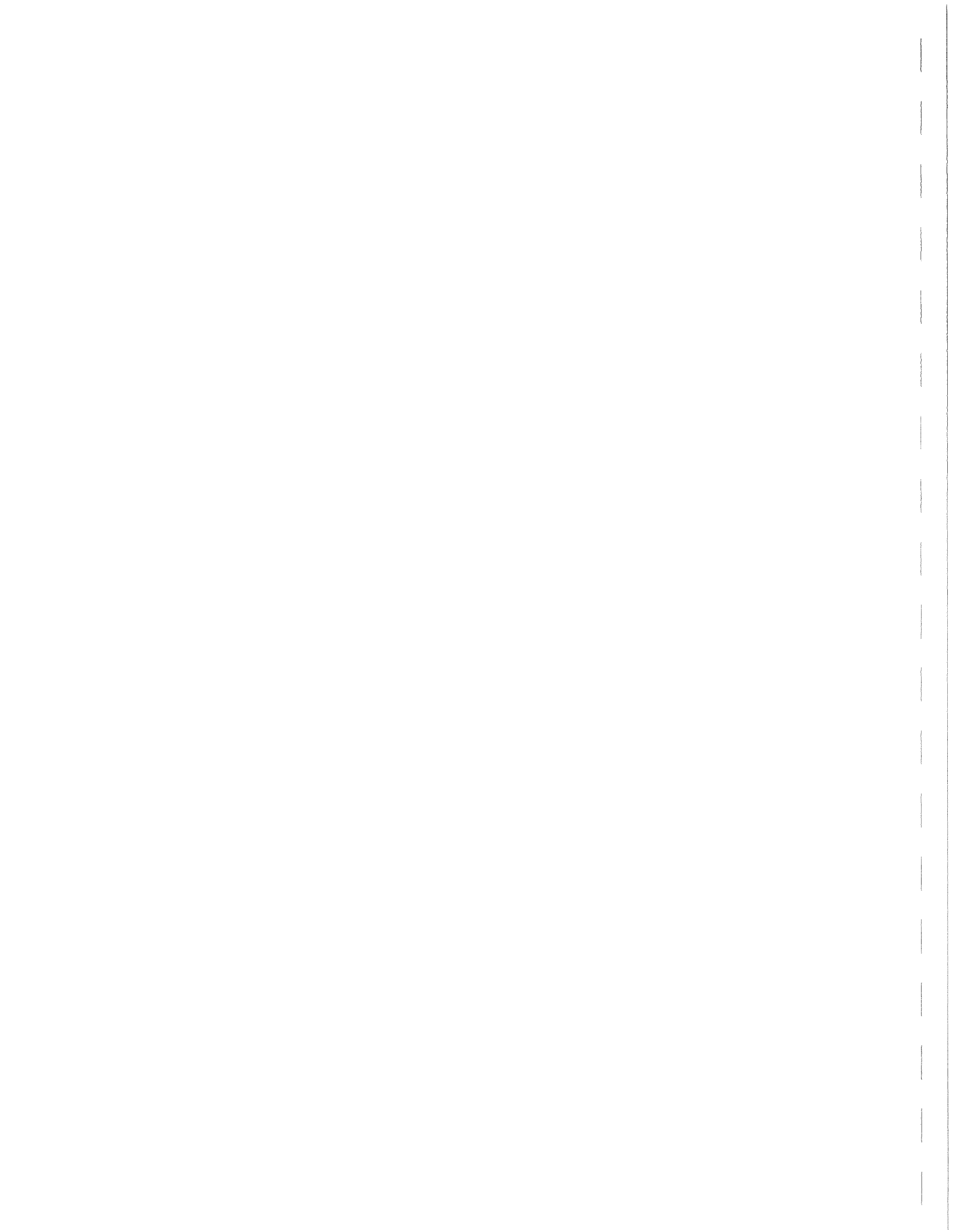
- 3. The following sign shall be provided at all areas where oxygen or flammable materials are stored or used (colored red, white and black):

DANGER
NO SMOKING, MATCHES, OR OPEN FLAMES

- 4. The following sign shall be affixed to all entrance hatches or access manways on covered tanks and vessels:

CAUTION
OXYGEN DEFICIENT OR TOXIC CONDITIONS MAY EXIST
FOLLOW PRESCRIBED PROCEDURES BEFORE ENTRY

END OF SECTION



SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 00710 - General Conditions.
- B. Section 01710 - Cleaning.
- C. Section 01720 - Project Record Documents.

1.02 SUBSTANTIAL COMPLETION

- A. Contractor:
 - 1. Submit written certification to Engineer that project is substantially complete.
 - 2. Submit list of major items to be completed or corrected.
- B. Engineer will make an inspection within seven days after receipt of certification, together with the Owner's representative.
- C. Should Engineer consider that work is substantially complete:
 - 1. Contractor shall prepare, and submit to Engineer, a list of the items to be completed or corrected, as determined by on-site observation.
 - 2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:
 - a. Date of Substantial Completion.
 - b. Contractor's list of items to be completed or corrected, verified and amended by Engineer.
 - c. Responsibilities of Owner and Contractor for:
 - (1) Insurance.
 - (2) Utilities.
 - (3) Operation of mechanical, electrical and other systems.
 - (4) Maintenance and cleaning.
 - (5) Security.
 - d. Signatures of:
 - (1) Engineer.
 - (2) Contractor.
 - (3) Owner.
 - 3. Contractor: Complete work listed for completion or correction, within designated time.
- D. Should Engineer consider that work is not substantially complete:
 - 1. The Engineer shall immediately notify Contractor, in writing, stating reasons.

2. Contractor: Complete work, and send second written notice to Engineer, certifying that Project, or designated portion of project is substantially complete.
3. Engineer will re-review work.

1.03 FINAL INSPECTION

- A. Contractor shall submit written certification that:
 1. Contract Documents have been reviewed.
 2. Project has been inspected for compliance with Contract Documents.
 3. Work has been completed in accordance with Contract Documents.
 4. Equipment and systems have been tested in presence of Owner's representative and are operational.
 5. Project is completed and ready for final inspection.
- B. Engineer will make final on-site observation/review within seven (7) days after receipt of certification.
- C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.
- D. Should Engineer consider that work is not finally complete:
 1. The Engineer shall notify Contractor, in writing, stating reasons.
 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that work is complete.
 3. Engineer will re-review the work.

1.04 FINAL CLEANING UP

The work will not be considered as completed and final payment made until all final cleaning up has been done by the Contractor in a manner satisfactory to the Engineer. See Section 01710 for detailed requirements.

1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents: to requirements of Section 01720.
- B. Operation and Maintenance Data: to requirements of particular technical specifications and Section 01730.
- C. Warranties and Bonds: to requirements of particular technical specifications and Section 01740.

1.06 INSTRUCTION

Instruct Owner's personnel in operation of all systems, mechanical, electrical and other equipment.

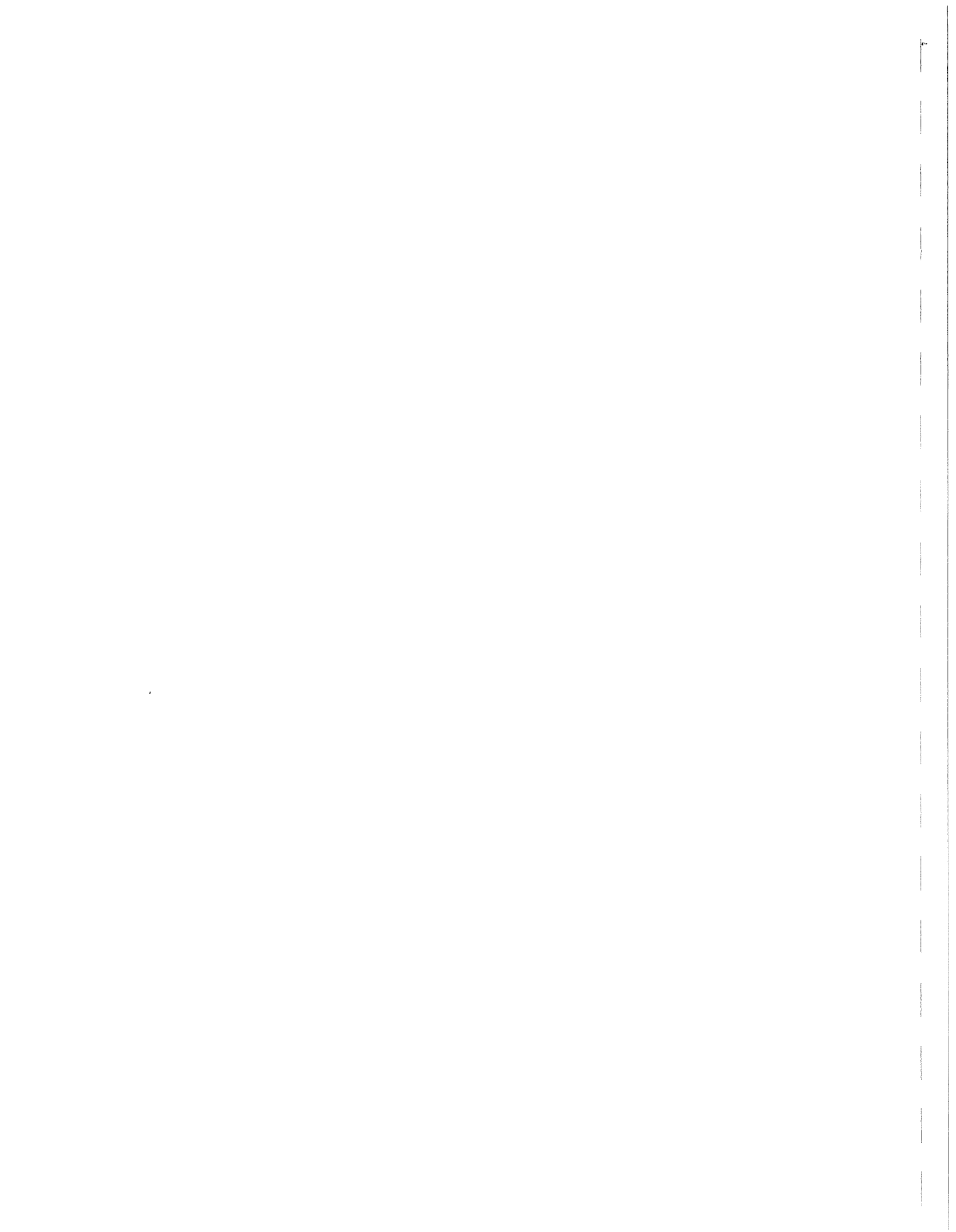
1.07 FINAL APPLICATION FOR PAYMENT

Contractor shall submit final applications in accordance with requirements of General Conditions.

1.08 FINAL CERTIFICATE FOR PAYMENT

- A. Engineer will issue final certificate in accordance with provisions of General Conditions.
- B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Semi-final Certificate for payment.

END OF SECTION 01700



SECTION 01710 - CLEANING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. On a continuous basis, maintain premises free from accumulations of waste, debris, and rubbish, caused by operations.
- B. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project clean and ready for occupancy.

1.02 RELATED REQUIREMENTS

- A. Section 01700 - Project Closeout.
- B. Cleaning for Specific Products or Work: Specification Section for that work.

1.03 SAFETY REQUIREMENTS

- A. Hazards control:
 - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on Project site without written permission from the Owner.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute cleaning to ensure that building, grounds and public properties are maintained free from accumulations of waste materials, trash, and rubbish.
- B. Wet down dry materials and rubbish to allay dust and prevent blowing dust.
- C. At reasonable intervals during progress of Work, clean site and public properties. Provide on-site containers for collection of waste materials, debris, trash, and rubbish.
- D. Remove waste materials, debris, trash, and rubbish from site when containers are full, or when directed by the Engineer or Owner's representative, but not less often than once weekly. Legally dispose of all waste materials, debris, trash, and rubbish at dumping areas off of Project site.
- E. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- F. The Contractor shall thoroughly clean all materials and equipment installed.

3.02 FINAL CLEANING

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. In preparation for substantial completion, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- C. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- D. Broom clean paved surfaces; rake clean other surfaces of grounds.
- E. Maintain cleaning until Project, or portion thereof, is occupied by Owner.
- F. The Contractor shall restore or replace existing property or structures as promptly and practicable as work progresses.

END OF SECTION 01710

SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 00710 - General Conditions.
- B. Section 01300 - Submittals.

1.02 MAINTENANCE OF DOCUMENTS

- A. Maintain at job site, one copy of:
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Reviewed Shop Drawings.
 - 5. Change Orders.
 - 6. Other Modifications to Contract.
- B. Store documents in approved location, apart from documents used for construction.
- C. Provide files and racks for storage of documents.
- D. Maintain documents in clean, dry legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by Engineer and Owner.

1.03 MARKING DEVICES

Provide colored pencil or felt-tip marking pen for all marking.

1.04 RECORDING

- A. Label each document "RECORD DRAWING" in 2-inch high printed letters.
- B. Keep record documents current.
- C. Do not permanently conceal any work until required information has been recorded.
- D. Contract Drawings: Legibly mark to record actual construction:
 - 1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - 2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - 3. Field changes of dimension and detail.

4. Changes made by Change Order or Field Order.
5. Details not on original Contract Drawings.

E. Specifications and Addenda: Legibly mark up each Section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually installed.
2. Changes made by Change Order or Field Order.
3. Other matters not originally specified.

F. Shop Drawings: Maintain as record documents; legibly annotate Shop Drawings to record changes made after review.

1.05 SUBMITTAL

A. At completion of project, deliver record documents to Engineer.

B. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Certification that each document as submitted is complete and accurate.
6. Signature of Contractor or his authorized representative.

END OF SECTION 01720

SECTION 01730 - OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Equipment Supplier shall compile product data and related information appropriate for Owner's maintenance and operation of equipment furnished under the contract. Prepare operating and maintenance data as specified.
- B. Instruct Owner's personnel in the maintenance and operation of equipment and systems as outlined herein.
- C. In addition to maintenance and operations data, the manufacturer's printed recommended installation practice shall also be included. If not part of the operations and maintenance manual, separate written installation instructions shall be provided, serving to assist the Installation Contractor in equipment installation.

1.02 OPERATIONS AND MAINTENANCE MANUAL

- A. The Contractor shall provide to the Engineer the following maintenance and operations manuals:
 - 1. Five (5) final copies, with all required changes, in print format, plus three (3) copies in digital format (.pdf) on compact disc (CD), furnished to the Owner.
- B. The final form of the manuals shall be utilized in instructions of the Owner's personnel.

1.03 FORM OF SUBMITTALS

- A. Prepare data in the form of an instructional manual for use by Owner's personnel.
- B. Format for hard copies:
 - 1. Size: 8-1/2 x 11 in.
 - 2. Drawings:
 - a. Provide reinforced punched binder tab, bind with text.
 - b. Fold drawings to the size of the text pages where feasible.
 - 3. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of product, and major component parts of equipment.
 - b. Provide indexed tabs.
 - 4. Cover: Identify each volume with types or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.

- b. Name, address, website address (if available), and phone number of Contractor.
- c. Identity of general subject matter covered in the manual.

C. Binders:

1. Commercial quality, durable and cleanable, 3-hole, ring-type binders, with oil and moisture resistant hard covers.
2. When multiple binders are used, correlate the data into related consistent grouping.
3. Labeled on the front cover and side of each binder shall be the name of the Contract, and Contract Number.

1.04 CONTENT OF MANUAL

A. Neatly typewritten data sheet for each section of the manual, arranged in systematic order.

1. Supplier name, address and telephone number.
2. A list of each product required to be included, indexed to the content of the volume.
3. List, with each product, the name, address and telephone number of local source of supply for parts and replacement.
4. Complete model #, serial #, ratings, description and part # of accessories, if any.
5. The value of any programmable parameters that have been changed from the factory default setting.

B. Product Data: Provide manufacturer's standard user manual and installation manual for the particular product.

C. Drawings: Supplement product data with drawings as necessary to clearly illustrate:

1. Relations of component parts of equipment and systems.
2. Control diagrams.

E. Copy of each warranty, bond and service contract issued: Provide information sheet for Owner's personnel.

1. Proper procedures in the event of failure.
2. Instances which might affect the validity of warranties or bonds.

F. Preliminary copies of the manuals shall be submitted to the Engineer for review and approval. The manuals must be approved by the Engineer before the first completed motor starter is placed in service.

END OF SECTION 01730

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Compile specified warranties and bonds.
- B. Co-execute submittals when required.
- C. Review submittals to verify compliance with Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Performance and Payment Bonds.
- B. Guaranty.
- C. General Warranty of Construction.
- D. Warranties and Bonds required for specific products: As listed in other Specification sections.

1.03 WARRANTY BONDS OR CORPORATE GUARANTEES IN LIEU OF EXPERIENCE RECORD

- A. When specifically requested in the products and installation general provisions of a Specification section for a particular piece of equipment or product, a record of five (5) years of successful full-scale operation shall be required from the equipment manufacturer. This record of full-scale operation shall be from existing facilities utilizing the equipment or product specified, in an application similar to the application intended for this Project.
- B. The manufacturer shall certify in writing to the Contractor that it has the required record of successful full-scale operation. This certification shall be submitted by the Contractor with his construction materials and/or equipment data list. In the event the manufacturer cannot provide the five (5) year certification of experience to the Contractor, the Contractor shall furnish within thirty (30) days after the Notice of Award, a Warranty Bond or Corporation Guarantee from the equipment manufacturer written in the name of the Contractor and acceptable to the Owner. The Warranty Bond or Corporate Guarantee shall be kept in force for five (5) years from the Date of Substantial Completion of the Contract less the number of years of experience the manufacturer may be able to certify to the Engineer. As a minimum, the Bond or Guarantee shall be in force for one (1) year after the Date of Substantial Completion of the Contract. The Warranty Bond shall be written in an amount equivalent to the manufacturer's quotation, the Contractor's installation cost plus 100 percent (100%). The Warranty Bond or Corporate Guarantee will assure the Owner that, if in the judgment of the Engineer, the equipment does not perform its specified function, the Contractor shall remove the equipment and install equipment that will perform the specified function and the work by the Contractor shall be paid for by the Warranty Bond or Corporate Guarantee.

1.04 SUBMITTALS REQUIREMENTS

- A. Assemble warranties and bonds executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Furnish two (2) original signed copies.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product, equipment or work item.
 - 2. Firm name, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service and maintenance contract.
 - 6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 7. Contractor name, address and telephone number.

1.05 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8 1/2-inch x 11 inches, punch sheets for 3-ring binder. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.06 TIME OF SUBMITTALS

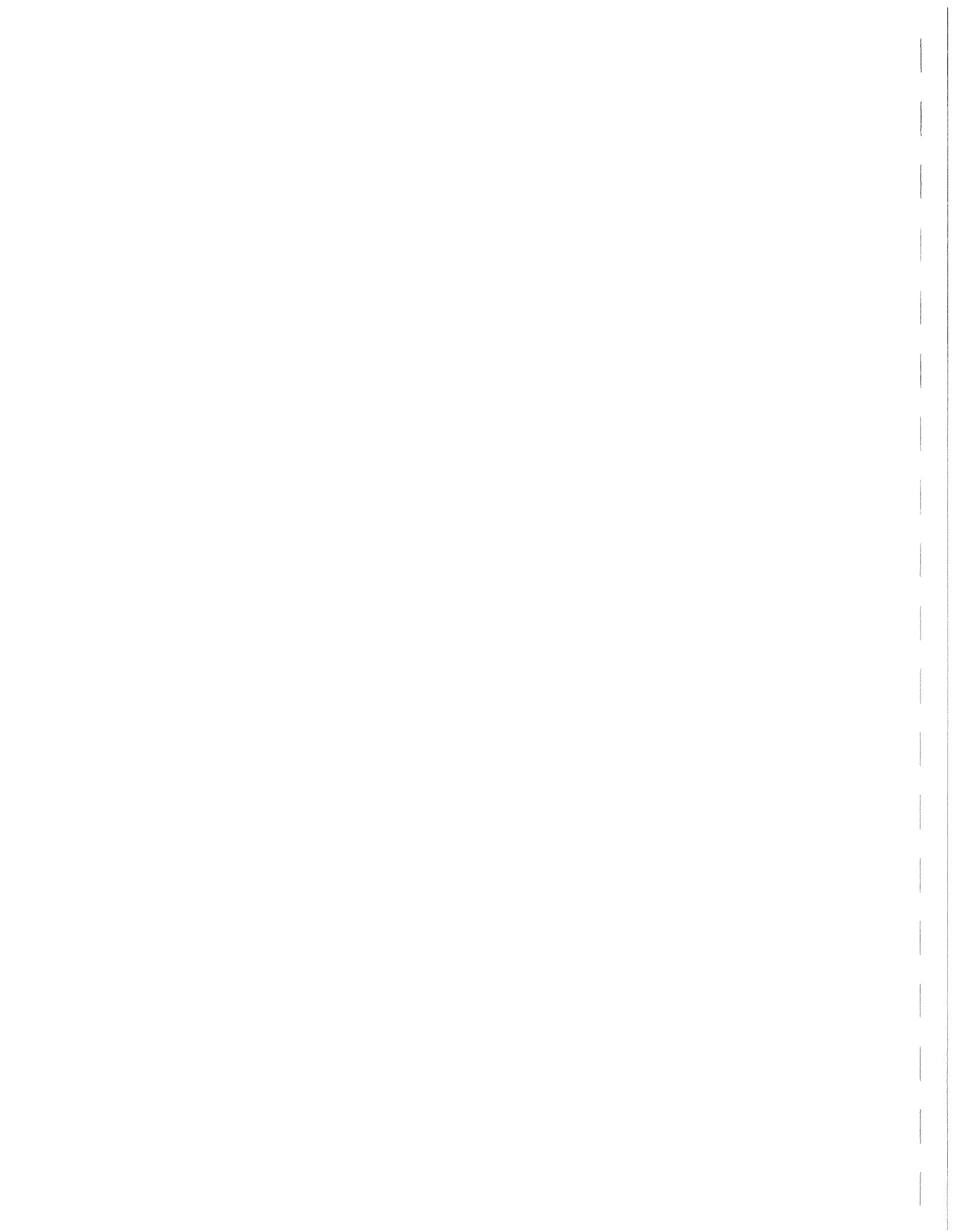
- A. Make submittals within ten (10) days after date of substantial completion, prior to final request for payment.
- B. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

1.07 SUBMITTALS REQUIRED

Submit warranties and bonds as specified in the respective sections of the Specifications. Additionally, the Contractor shall warrant the entire contract to be free from defects in installation for one (1) year from the date of startup. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Contractor shall repair the defect without cost to the Owner.

END OF SECTION 01740

Division 2 - Site Work



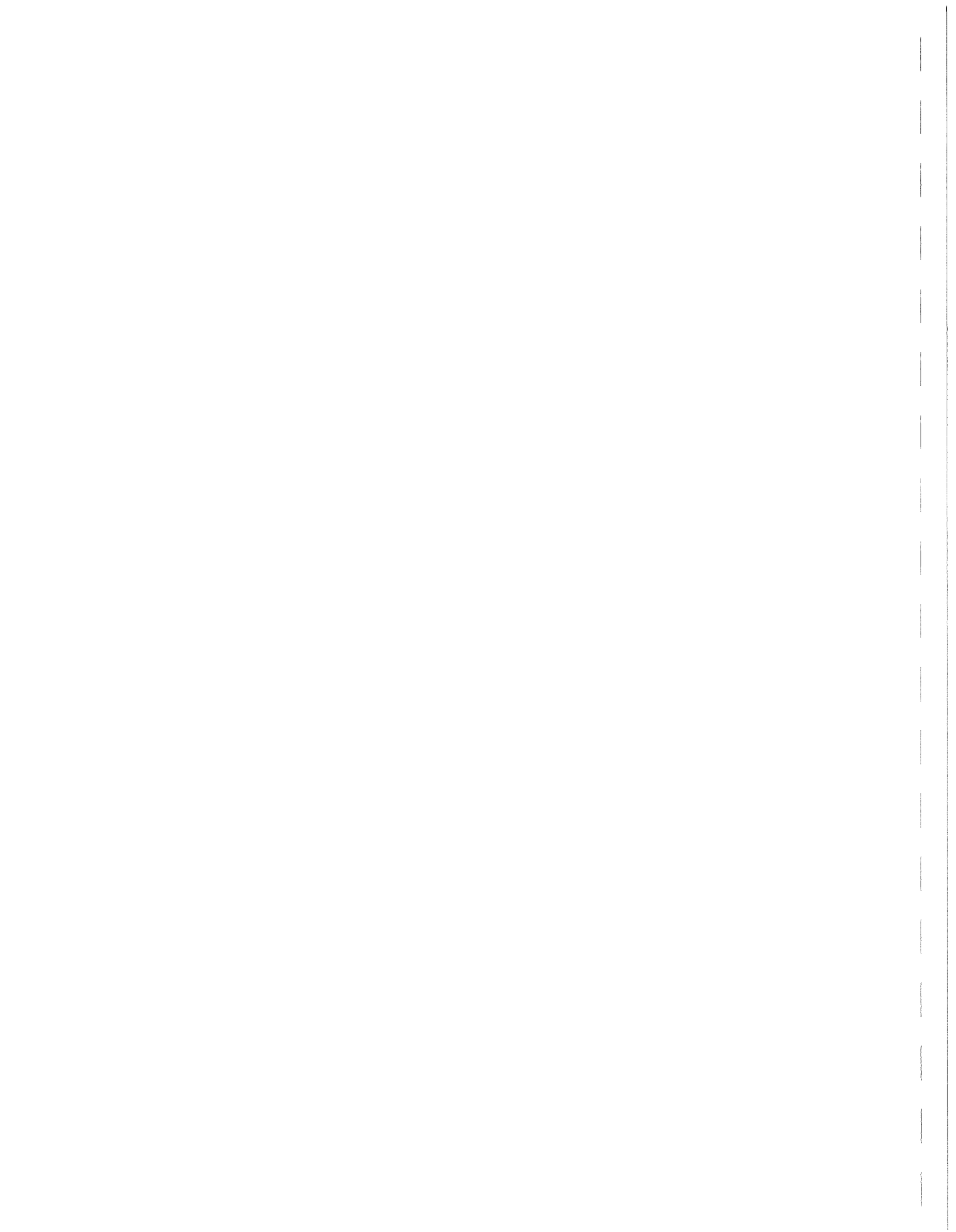
SECTION 02010 – SUBSURFACE CONDITIONS

Part 1 GENERAL

1.01 DESCRIPTION

- A. Soil boring logs are shown in the Thelen Associates, Inc. report entitled “Geotechnical Exploration, Pretreatment Chemical Building, Northern Kentucky Water District, Ft. Thomas Treatment Plant, Ft. Thomas, Kentucky” dated November 14, 2005, (Job Number 061091E). This information may be obtained upon request at the offices of the Engineer.
- B. This soil investigation information is offered as an aid in bidding only and is not a part of the Contract Documents. The boring logs are available for the Contractor's information, but are not a warranty of subsurface conditions. The Owner, Engineer and geotechnical engineer assume no responsibility for any variation between materials encountered during construction and those indicated on the boring logs, nor for any variation between the location of the water table encountered and that indicated on the boring logs at the date borings were taken.
- C. Additional Investigation: The Contractor shall visit the site and become acquainted with site conditions. Prior to bidding, prospective Contractors may make their own site and subsurface investigations to satisfy themselves with site and subsurface conditions. The Contractor shall be responsible for obtaining rights of ingress and egress to private property for site and subsurface investigation and shall assume all responsibility for any damage to property caused as a result of the Contractor's investigation.
- D. Location of Borings: Contractors shall be responsible for making their own determination of the location of the soil borings on this Project.

END OF SECTION



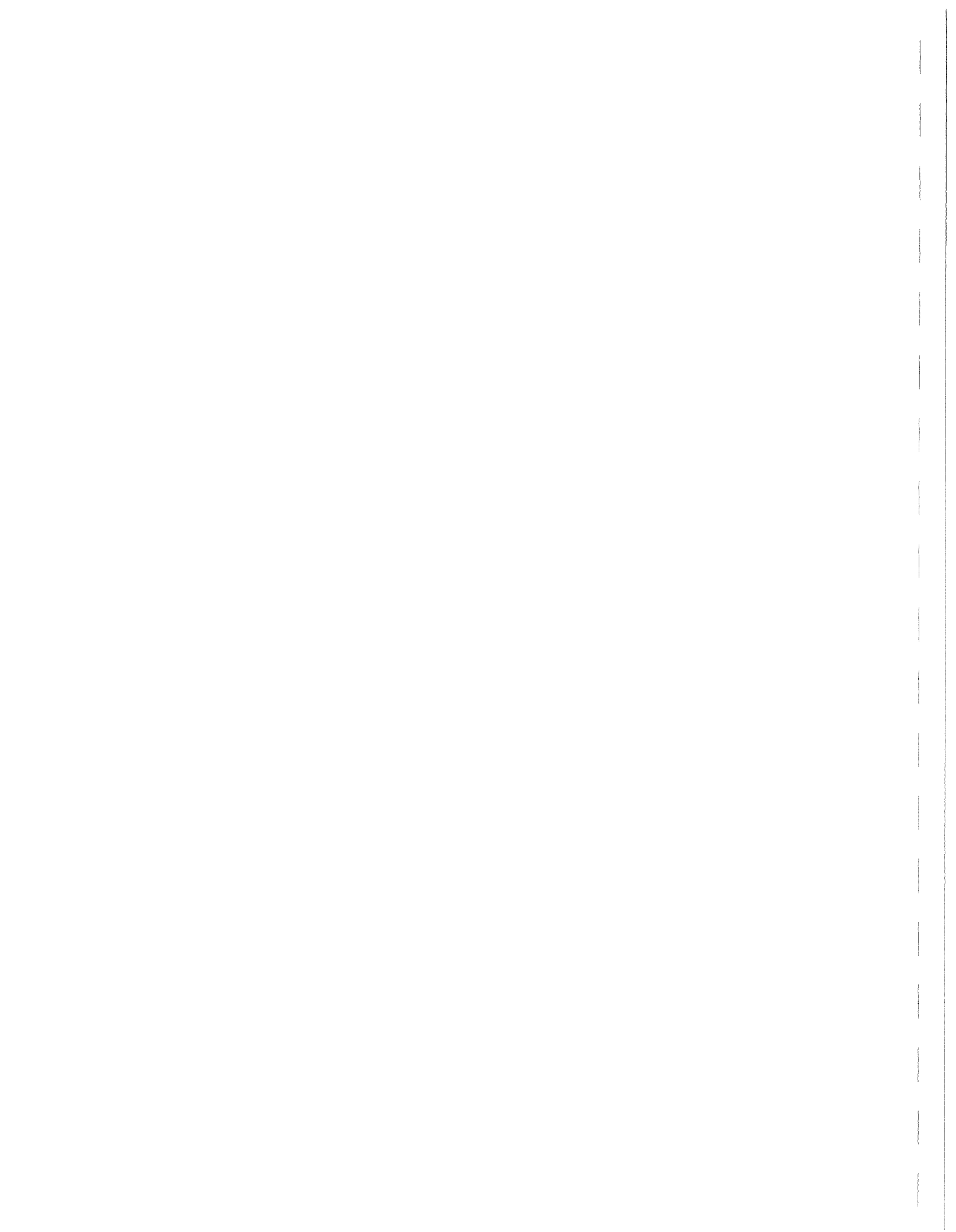
SECTION 02011 – DRAWINGS OF EXISTING FACILITIES

Part 1- GENERAL

1.01 DESCRIPTION

- A. Copies of various drawings of existing facilities from previous construction projects are available for the Contractor's use in evaluating the magnitude of demolition required by the Contract Documents. This information may be obtained upon request at the offices of the Engineer.
- B. Details of the extent of demolition are shown on the Drawings and in Section 02060 and Section 02073 of these Specifications.
- C. These drawings are offered as a convenience and an aid in bidding only and are not a part of the Contract Documents. The Owner and Engineer make no warranty that these drawings are record drawings or accurately depict the actual construction or subsequent modifications, nor do they represent that the drawings cover all areas of demolition required in the Contract Documents. Furthermore, the Owner and Engineer assume no responsibility for any variation between conditions and obstructions encountered during construction and those indicated on these drawings.
- D. If these drawings contain a stamp indicating that they are record drawings, they are accurate only to the extent of information provided to the Owner by the original contractor.
- E. Additional Investigation: The Contractor shall visit the site and become acquainted with the physical conditions in or relating to existing surface and subsurface structures at or contiguous to the site. Prior to bidding, prospective Contractors may make their own site and subsurface investigations to satisfy themselves with site and subsurface conditions. The Contractor shall be responsible for obtaining rights of ingress and egress to property for site and subsurface investigation and shall assume all responsibility for any damage to property caused as a result of the Contractor's investigation.

END OF SECTION



SECTION 02050 – DEMOLITION

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

- A. Demolition work shall be included in the Contract.
- B. Prior to demolition of structures the following procedures shall be accomplished.
 - 1. Owner release of such structure.
 - 2. All electrical and mechanical services rerouted or shut off outside the area of demolition.
 - 3. Coordinate sequencing with Subcontractors.
 - 4. Survey and record the condition of existing facilities to remain in place that may be affected by the demolition operations. After demolition operations are completed, survey the conditions again and restore existing facilities to the pre-demolition condition, at no additional cost to the Owner.
- C. Demolition work shall include all items indicated on the Drawings.

1.02 SCHEDULE

- A. Perform demolition and removal work at such a time and in such a manner, so as not to interfere with the Owner's operations, the work of other trades and other Contracts. Follow the Progress Schedule as agreed to and worked out with the Owner.
- B. Coordinate demolition and removal work with the work of other Contractors, so that the new construction work installed before, during and after the work of this Section may commence without undue delay.

1.03 PROTECTION

- A. Do not close or obstruct streets, walks, and other facilities occupied and used by the Owner and the public, without prior written permission from the Owner and local authorities having jurisdiction.
- B. The structural stability of structures adjacent to, or affected by the work of this Contract will be the responsibility of the Contractor. Provide temporary shoring, and bracing where required.
- C. Provide all necessary shielding of existing materials and equipment, which are to remain, within or adjacent to work areas.
- D. Maintain in service and protect from damage the existing utilities that are indicated to remain.

1.04 UTILITIES

Notify all utilities in sufficient time prior to razing operations to permit them to disconnect and remove and/or relocate the respective utility.

1.05 SEWER SEALING

Plug and seal, using concrete, piping as shown on the drawings or as directed by the Engineer.

1.06 SALVAGEABLE MATERIALS

- A. The Owner shall have first right to salvage material.
- B. Salvage material and equipment to be retained by the Owner shall be located as directed by the Engineer.

1.07 DEMOLITION OPERATIONS

- A. Demolition of existing structures shall be conducted to one of the following standards:
 - 1. As shown on the Contract Drawings, or if not detailed on the Contract Drawings,
 - 2. Removed to a minimum of 36 inches below the finished grade, or
 - 3. Removed to 36 inches below the location of a new structure.
- B. Remove existing concrete using an abrasive saw to make initial cuts not less than 2 inches deep, between areas to be removed and areas to remain, providing a smooth, straight joint or cut line. Make cut lines in floor slabs parallel with walls.
- C. If existing abandoned utility lines extend into the area of construction being removed, remove abandoned lines to elevations shown on the drawings, or as directed by the Engineer outside of demolition area and plug permanently with steel cap or concrete.
- D. Adequate drainage of all structures demolished shall be provided by providing openings in the floors and walls of the portion of the structures remaining in place. The Contractor shall notify the Engineer, prior to backfilling the structures remaining in place, in order for him to inspect the drainage provision provided.
- E. Provide all temporary shoring and bracing as required to transfer loads of existing construction to remain from construction being removed. Remove and dispose of temporary support measures when new construction has been installed by other contractors.

END OF SECTION

SECTION 02060 – DEMOLITION OF EXISTING FACILITIES

PART 1 - GENERAL

1.01 SCOPE

The work in this Section consists of furnishing all material and equipment and performing all labor necessary for demolishing and disposing of designated facilities indicated on the Drawings.

1.02 SUBMITTALS

The Contractor shall submit a written request, to include a detailed demolition procedure, to the Owner for approval at least 10 days before demolition is started. The demolition procedure shall include a detailed description of the methods and equipment to be used for each operation and the sequence of work. The demolition procedures shall provide for safe conduct of work, protection of the property, which is to remain undisturbed and coordination with other work or operation which may be in progress.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DEMOLITION

- A. All material shall be removed as necessary for construction, or in any event, to a minimum depth of three feet below finished grades as shown on the Drawings.
- B. Any structure, or part thereof, remaining below grade shall be mechanically fractured so that subsurface water will freely pass through the slab or floor of the structure, and so that no void will remain after backfilling the work site to grade as shown on the Drawings.
- C. The Contractor shall be responsible for removing all existing service connections to the buildings or site and permanently plugging the pipes where required in accordance with requirements of the utility companies concerned.
- D. The Contractor will be responsible for any damage caused to other structures, and shall be held liable for any and all repairs, replacement of parts or renovations required to restore any structure, portion of structure, equipment or items, not intended for demolition. The Contractor shall restore any damaged facilities to their condition prior to demolition provided the damage was result of the demolition. If the Contractor does not repair any such damage immediately, or if the repairs are not suitable to the Owner, the Owner reserves the right to have such repairs made by another party and deduct the cost of required repairs from money due Contractor.
- E. Dust-tight, weathertight partitions shall be erected to protect existing facilities from dust and weather while wrecking is in progress and until such time as closures have

beenmade. Partitions may be constructed of wood and shall have a covering of tarred roofing felt on the weather side.

- F. All salvageable metal materials shall remain the property of the Owner and shall be cleaned and stored on the Owner's property as directed by the Owner.

3.02 DISPOSAL

- A. All materials, which are not delivered to the Owner as specified above, shall become the property of the Contractor, and shall be demolished, moved or otherwise disposed of at the option of the Contractor by a method approved by the Owner.
- B. All demolished structures, equipment and materials shall be removed from the work site by the Contractor.
- C. All demolished structures, equipment and materials which are either left in place or removed to the disposal site shall be in a non-hazardous condition.
- D. Manhole frames and covers to be removed are the property of the Owner and shall be delivered to a place designated by the Owner.

END OF SECTION

SECTION 02073 – REMOVAL OF EXISTING EQUIPMENT AND PIPING

PART 1 - GENERAL

1.01 SCOPE

- A. The work covered under this Section includes furnishing all labor, equipment and material required to remove, handle, store and dispose of all materials from existing structures and piping as shown on the Drawings, directed by the Engineer or required for the completion of the work, including all necessary excavation and backfilling.
- B. The Contractor shall remove from existing structures and store as directed or dispose of in an approved manner, all valves and piping, mechanical equipment, plumbing, heating, electrical and ventilating fixtures, pipes, ducts, wires and equipment, doors and windows, floor grating and cover plates, steel stairs, pipe railing and the like which are not to remain in service in the finished work, whether or not shown on the Drawings and/or specified herein.
- C. The work specified herein and shown on the Drawings is intended to give a general idea of the scope of this work but must not be construed as covering it entirely. The Contractor shall visit the site and judge the amount of work required and the problems Contractor might encounter in the performance of the work.

1.02 EQUIPMENT AND PIPING TO BE REMOVED

The existing equipment and piping to be removed and disposed of shall include, but not be limited to, that shown on the Drawings to be removed.

PART 2 - PRODUCTS

2.01 MATERIALS

All concrete, mortar, grout, steel reinforcement and backfill used in patching, plugging or repairing shall comply in all respects with the applicable material requirements of these Specifications.

PART 3 - EXECUTION

3.01 REMOVAL

- A. The Contractor shall exercise full care and shall use such methods and equipment during removal as will maintain the usefulness of the various materials and equipment removed. The sequence and order of removal and the method of storing and disposal of removed equipment and piping shall be at all times subject to the direction and approval of the Engineer.

- B. Any damage done to structures or equipment during removal and any patching, plugging of holes or repairs necessitated because of removal of equipment and piping shall be repaired as directed by, and to the satisfaction of, the Engineer and the cost thereof shall be included in the Contract Price.
- C. Equipment specified to be removed shall be removed completely, including all related accessories and concrete bases. Any embedded items such as anchor bolts, steel reinforcement, conduit and piping shall be cut off 1-inch below adjacent finished surfaces. The surface shall then be repaired to match adjacent surfaces in finish and appearance.
- D. Prior to removing any electrical equipment, all power to the equipment shall be shut off and properly locked out. All power and control wiring for the equipment shall then be disconnected at the starter or circuit breaker, as applicable, and removed from the conduit. Unused conduits shall be plugged.
- E. Blemishes or unsightly areas on walls and floors left after removal of equipment shall be cleaned and refinished as necessary to match adjacent surfaces.
- F. All holes and openings left after removal of equipment shall be filled or plugged to provide a neat and workmanlike appearance.
- G. Where piping designated for removal passes through concrete walls, the openings shall be suitably plugged or capped. Wall pipes and wall sleeves shall be sealed with blind flanges or mechanical joint plugs. Steel pipe sleeves shall be filled with nonshrink grout.
- H. Where equipment or piping designated for removal serves to support other equipment or piping designated to remain in service, the Contractor shall provide permanent supports in place of the removed equipment and piping. Where it is necessary to temporarily remove other equipment, piping or electrical work in order to gain access to an item of equipment or piping designated for removal, the Contractor shall restore all such equipment, piping or electrical work to its original condition.
- I. Abandoned Piping: Existing vitrified clay, concrete, PVC, cast iron and steel piping to be abandoned shall be cut and plugged or capped at each end. Where existing piping interferes with new piping or construction, it shall be removed beyond the limits required for the proper completion of the work and the open ends plugged or capped Unless otherwise shown, lines shall be plugged or capped at least 1-inch behind or below finished building surfaces and at least 12-inches below outside grade surfaces.
- J. Piping and Valving Reinstallation: The Contractor shall include in the Contract Price the cost of removing, refitting, and reinstalling certain pipe, fittings and valves as shown on the Drawings or as deemed by the Engineer to be satisfactory for reuse.
- K. Removal of Existing Concrete and Masonry: Existing concrete and masonry shall be removed and disposed of in accordance with the requirements of Section 02075 of these Specifications.

- L. Storage: All materials removed shall remain the property of the Owner and shall be carefully moved and stored on the plant site where directed by the Engineer. Mechanical and electrical equipment shall be stored indoors. If the equipment is too large to store indoors, it shall be stored outdoors above ground and under cover.

- M. Disposal: The Engineer will direct the Contractor to assume ownership of and dispose of off site any removed equipment, piping and materials which the Engineer deems worthless. The cost of disposing of any or all of the removed equipment, piping and materials shall be included in the lump sum prices bid and no separate payment will be made therefore.

END OF SECTION



SECTION 02110 - SITE CLEARING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Clear site within construction limits of plant life and grass.
- B. Remove root system of trees and shrubs.
- C. Remove surface debris.

1.02 REGULATORY REQUIREMENTS

Conform to applicable local codes and ordinances for disposal of debris.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXISTING TREES AND OTHER VEGETATION

- A. The Contractor shall not cut or injure any trees or other vegetation outside right-of-way or easement lines and outside areas to be cleared, as indicated on the Drawings, without written permission from the Engineer. The Contractor shall be responsible for all damage done outside these lines.
- B. The Engineer shall designate which trees are to be removed within permanent and temporary easement lines or right-of-way lines.

3.02 CLEARING

- A. From areas to be cleared, the Contractor shall cut or otherwise remove all trees, brush, and other vegetable matter such as snags, bark and refuse. The ground shall be cleared to the width of the permanent easement or right-of-way unless otherwise directed by the Engineer.
- B. Except where clearing is done by uprooting with machinery, trees, stumps, and stubs to be cleared shall be cut as close to the ground surface as practicable, but no more than 6 inches above the ground surface for small trees and 12 inches for larger trees.
- C. Elm bark shall be either buried at least 1 foot deep or burned in suitable incinerators off site with satisfactory antipollution controls and fire prevention controls, to prevent the spread of Dutch Elm disease and as required by applicable laws.

3.03 GRUBBING

From areas to be grubbed, the Contractor shall remove completely all stumps, remove to a depth of 12 inches all roots larger than 3-inch diameter, and remove to a depth of 6 inches all roots larger than 1/2-inch diameter. Such depths shall be measured from the existing ground surface or the proposed finished grade, whichever is lower.

3.04 STRIPPING OF TOPSOIL

Prior to starting general excavation, strip topsoil to a depth of 6 inches or to depths required by the Engineer. Do not strip topsoil in a muddy condition and avoid mixture of subsoil. Stockpile the stripped topsoil within easement or right-of-way lines for use in finish grading and site restoration. Topsoil stockpiled shall be free from trash, brush, stones over 2 inches in diameter and other extraneous material.

3.05 PROTECTION

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

3.06 REMOVAL

- A. All material resulting from clearing and grubbing and not scheduled for reuse shall become the property of the Contractor and shall be suitably disposed of off-site, unless otherwise directed by the Engineer, in accordance with all applicable laws, ordinances, rules and regulations.
- B. Such disposal shall be performed as soon as possible after removal of the material and shall not be left until the final period of cleaning up.

END OF SECTION

SECTION 02150 - SHORING AND BRACING

PART 1 - GENERAL

1.01 SUMMARY

- A. Shore and brace sidewalls in excavations with steel sheet piles with wale systems or soldier piles with timber lagging and tie back system as required to protect existing buildings, utilities, roadways, and improvements.
- B. Maintain shoring and bracing during construction activities, and remove shoring and bracing if practical when construction and filling is complete.
- C. Geotechnical investigation borings, if applicable, were drilled for this project where indicated on the drawings in the report. The geotechnical report was not prepared for purposes of bid development and the accuracy of the report is limited. The Contractor should confer with a geotechnical engineer and/or conduct additional study in the area to obtain the specific type of geotechnical information required for construction and for preparation of bids.

1.02 SUBMITTALS

Provide copies of information on methods of the shoring and bracing system proposed for the work, design basis, calculations where applicable, and copies of shop drawings for inclusion in the project and job-site record files.

1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Shoring and bracing system design shall be prepared and sealed by a registered professional engineer or structural engineer. The system design shall provide the sequence and method of installation and removal. Shoring and bracing system design shall be in accordance with Occupational Safety and Health Administration (OSHA) requirements 29 CFR Section 1926.652.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Sheet Piles: Heavy-gauge steel sheet.
- B. Soldier Piles: Steel H-beams.
- C. Timber Lagging: Heavy timber. Pressure treated with wood preservative for use below water table for extended time period.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in proper relation with adjacent construction. Coordinate with work of other sections.
- B. Locate shoring and bracing to avoid permanent construction. Anchor and brace to prevent collapse.

END OF SECTION

SECTION 02221 - ROCK REMOVAL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall excavate rock, if encountered, as required to perform the required work, and shall dispose of the excavated material, and shall furnish acceptable material for backfill in place of the excavated rock.
- B. In general, rock in pipe trenches shall be excavated so as to be not less than 6 inches from the pipe after it has been laid.

1.02 REFERENCES

- A. NFPA 495 - Code for the Manufacture, Transportation, Storage and use of Explosive Materials.
- B. Commonwealth of Kentucky Department of Mines and Minerals, Laws and Regulations Governing Explosives and Blasting.

1.03 REGULATORY REQUIREMENTS

- A. Conform to Kentucky Department of Mines and Minerals code for explosive disintegration of rock.
- B. Obtain permits from local authorities having jurisdiction before explosives are brought to site or drilling is started.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Rock definition: Solid mineral material that cannot be removed with a power shovel.
- B. Explosives: Type recommended by explosives firm and required by authorities having jurisdiction.
- C. Delay devices: Type recommended by explosives firm and conforming to state regulations.
- D. Blasting mat materials: Type recommended by explosives firm and conforming to state regulations.

PART 3 - EXECUTION

3.01 EXPLOSIVES

- A. The Contractor shall keep explosives on the site only in such quantity as may be needed for the Work under way and only during such time as they are being used. He shall notify the Engineer, in advance, of his intention to store and use explosives. Explosives shall be stored in a secure manner and separate from all tools. Caps or detonators shall be safely stored at a point over 100 feet distance from the explosives. When the need for explosives has ended, all such materials remaining on the Work shall be promptly removed from the premises.
- B. The Contractor shall observe all state, federal and municipal laws, ordinances and regulations relating to the transportation, storage, handling and use of explosives. In the event that any of the above-mentioned laws, ordinances or regulations require a licensed blaster to perform or supervise the Work of blasting, said licensed blaster shall, at all times have his license on the Work and shall permit examination thereof by the Engineer or other officials having jurisdiction.

3.02 BLASTING PRECAUTIONS

- A. No explosives shall be used within 20 feet of:
 - 1. Building and/or structures existing, constructed or under construction.
 - 2. Underground and/or overhead utilities whether existing or partially constructed.
- B. Permission for any deviation from the restriction set forth above shall be secured from the Engineer, in writing; however, permission for any such deviations shall not relieve the Contractor from any responsibility in the event of damage to buildings, structures or utilities.
- C. All operations involving explosives shall be conducted with all possible care to avoid injury to persons and property. Blasting shall be done only with such quantities and strengths of explosives and in such a manner as will break the rock approximately to the intended lines and grades and yet will leave the rock not to be excavated in an unshattered condition. Care shall be taken to avoid excessive cracking of the rock upon or against which any structure will be built, and to prevent injury to existing pipes or other structures and property above or below ground. Rock shall be well covered with logs or mats, or both, where required. Sufficient warning shall be given to all persons in the vicinity of the Work before a charge is exploded.
- D. The Contractor shall be solely responsible for his blasting operations. The Contractor shall not hold the Owner and/or the Engineer liable for any damages resulting from his blasting operations on this project.

3.03 PAYMENT

Rock excavation shall be bid as unclassified and will **not** be paid for separately.

END OF SECTION

SECTION 02222 - EXCAVATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Structure excavation.
- B. Shoring excavations.

1.02 RELATED REQUIREMENTS

- A. Section 02221 - Rock Removal.
- B. Section 02223 - Embankments.
- C. Section 02225 - Excavating, Backfilling and Compacting for Utilities.

1.03 PROTECTION

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- C. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- E. Grade excavation top perimeter to prevent surface water run-off into excavation.
- F. Contractor shall provide ample means and devices with which to intercept any water entering the excavation area.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Subsoil: Excavated material, graded free of lumps larger than 12 inches, rocks larger than 12 inches, and debris.
- B. Pea Gravel: Mineral aggregate graded 1/4 inch to 5/8 inch, free of soil, subsoil, clay, shale, or foreign matter.

PART 3 - EXECUTION

3.01 PREPARATION

Identify required lines, levels, contours, and datum.

3.02 EXCAVATION

- A. Excavate subsoil required for structure foundations, construction operations, and other work.
- B. Contractor is responsible to adequately brace open cuts and protect workmen and equipment from cave-in.
- C. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume.
- D. Correct unauthorized excavation at no cost to Owner.
- E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Engineer.
- F. Stockpile excavated material in area designated on site.

3.03 EXCAVATION FOR STRUCTURES

- A. For structures, excavate to elevations and dimensions indicated, plus ample space for construction operations and inspection of foundations.
- B. Excavate for foundation bearing a minimum of 24 inches below existing grade.
- C. Structure foundations shall bear entirely in original subsoil, entirely on rock, or entirely on compacted earth or granular fill, unless otherwise directed by the geotechnical representatives inspecting the excavation as required by Section 01400 - Quality Control.
 - 1. Where structures are to be soil bearing and rock is encountered, undercut rock 24 inches and backfill with compacted earth material.
 - 2. Where structures are to be rock bearing, rock surface shall be inspected to verify that material is bedrock and has sufficient strength to support the structure.
 - 3. Prior to placement of any granular fill, forms, reinforcing steel, or concrete, schedule and provide site visit services by the same firm which provided geotechnical investigations utilized in the structural design of the foundations for the project, as per Section 01400, Quality Control. Said visits shall be for the sole purpose of confirming that the conditions described in the geotechnical report are present over the foundation areas extending beyond the investigational borings.
 - 4. If material unsuitable for foundation (in the opinion of the geotechnical Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, screened gravel, select bank-run gravel, fine aggregate or concrete as directed, in order to provide a suitable bearing for the foundation.
 - 5. Structure foundations shall be installed immediately after excavation is completed, or if this cannot be done, the last 4 to 6 inches of material should not be removed

until preparations for installing the foundation are complete. In no case should foundations be installed in excavations which contain water. Any soft, saturated areas in the bottom of excavations shall be removed or stabilized using granular material.

6. Make no excavation to the full depth indicated when freezing temperatures may be expected unless foundations can be installed after the excavation has been completed. Protect the bottom so excavated from frost if foundation installation is delayed.

3.04 REMOVAL OF WATER

- A. The Contractor, at his own expense, shall provide adequate facilities for promptly and continuously removing water from all excavation.
- B. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to remove promptly and dispose properly of all water entering trenches and other excavations. Such excavation shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.
- C. All water pumped or drained from the Work shall be disposed of in a suitable manner without undue interference with other work, damage to pavements, other surfaces, or property. Suitable temporary pipes, flumes, or channels shall be provided for water that may flow along or across the site of the Work.
- D. If necessary, the Contractor shall dewater the excavations by means of an efficient drainage wellpoint system which will drain the soil and prevent saturated soil from flowing into the excavation. The wellpoints shall be designed especially for this type of service. The pumping unit shall be designed for use with the wellpoints, and shall be capable of maintaining a high vacuum and of handling large volumes of air and water at the same time.
- E. The installation of the wellpoints and pump shall be done under the supervision of a competent representative of the manufacturer. The Contractor shall do all special work such as surrounding the wellpoints with sand or gravel or other work which is necessary for the wellpoint system to operate for the successful dewatering of the excavation.

3.05 UNAUTHORIZED EXCAVATION

If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled at the Contractor's expense with thoroughly compacted granular material, or with 3,000 psi concrete, if the excavation was for a structure, unless otherwise directed by the geotechnical representative inspecting the excavation.

3.06 EXCESS MATERIAL

- A. No excavated materials shall be removed from the site of the work or disposed of by the Contractor except as directed or permitted.

- B. Surplus excavated materials suitable for backfill shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill; shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions. All work shall be as directed or permitted and without additional compensation.
- C. Surplus excavated materials not needed as specified above shall be disposed of by the Contractor, who shall obtain all permits and make all arrangements required.

3.07 EXISTING UTILITIES AND OTHER OBSTRUCTIONS

Prior to the commencement of construction on the project, the Contractor shall contact the utility companies whose lines, above and below ground, may be affected during construction and verify the locations of the utilities as shown on the Contract Drawings. The Contractor shall ascertain from said companies if he will be allowed to displace or alter, by necessity, those lines encountered or replace those lines disturbed by accident during construction, or if the companies themselves are only permitted by policy to perform such work. If the Contractor is permitted to perform such work, he shall leave the lines in as good condition as were originally encountered and complete the Work as quickly as possible. All such lines or underground structures damaged or molested in the construction shall be replaced at the Contractor's expense, unless in the opinion of the Engineer, such damage was caused through no fault of the Contractor.

3.08 FIELD QUALITY CONTROL

Provide for visual inspection of rock surfaces and foundation sub-grades under provisions of Section 01400.

END OF SECTION 02222

SECTION 02223 - EMBANKMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Structure perimeter backfilling to subgrade elevations.
- B. Site backfilling.
- C. Compaction requirements.
- D. Access road subgrade preparation.

1.02 RELATED WORK

- A. Section 01300 - Submittals.
- B. Section 01400 - Quality Control: Compaction requirements of backfill.
- C. Section 02222 - Excavation.
- D. Section 02225 - Excavation, Backfilling and Compacting for Utilities.

1.03 REFERENCES

- A. Commonwealth of Kentucky, Standard Specifications for Road and Bridge Construction.
- B. ANSI/ASTM D698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 5.5 lb Rammer and 12 inch Drop.
- C. ANSI/ASTM D1556 - Density of Soil in Place by the Sand-Cone Method.
- D. ASTM 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.
- E. ASTM 3017 - Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.04 TESTS

- A. Tests and analysis of fill materials will be performed in accordance with ANSI/ASTM D698 and under provisions of Section 01400. Tests shall include but not be limited to gradation analysis and moisture/density relationships.
- B. Test will be performed by an approved independent testing laboratory and shall be the responsibility of the Contractor at no additional cost to the Owner.
- C. Density test shall be performed in sufficient number to insure the specified densities are being obtained.

- D. When ASTM D2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D2922 results in a wet unit weight of soil; and when using this method, ASTM D3017 shall be used to determine content of the soil. The calibration checks of both the density and moisture gages shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the testing laboratory.

1.05 SUBMITTALS

Results of soil moisture and density tests by an approved testing laboratory shall be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.01 SELECT FILL MATERIALS

- A. The on-site residual soils may be suitable for use as compacted fill. Fill that will support foundation elements should be placed in 6- to 8-inch loose lifts and compacted to a minimum of 100 percent of its maximum dry density and within plus or minus 2 percent of optimum moisture content as determined by standard Proctor moisture density test. A minimum of 95 percent of the maximum dry density and plus or minus 2 percent of optimum moisture content should be obtained for fill soils supporting floor slabs, sidewalks or pavements. Field density tests should be performed on each lift placed to determine if proper compaction is being achieved. If sufficient suitable material is not available from the excavations, the backfill material shall be screened gravel, crushed stone or selected borrow as directed.
- B. Frozen material shall not be placed in the backfill nor shall backfill be placed upon frozen material. Previously frozen material shall be removed or shall be otherwise treated as required before new backfill is placed.
- C. All material, whether from the excavations or from borrow, shall be of such nature that after it has been placed and properly compacted, it will make a dense, suitable fill. It shall not contain vegetation, masses of roots, individual roots more than 18 inches long or more than 1/2-inch in diameter, stones over 6 inches in diameter, or porous matter.

2.02 COMPACTED FILL

- A. Soil used for compacted fill should be inorganic clayey soils free of deleterious debris or rocks whose largest dimension is no greater than 3-inches. The soil should have a liquid limit (LL) of less than 50, a plasticity index (PI) of less than 30, and a maximum dry density according to the standard Proctor compaction test of at least 100 pcf. The fill should be compacted to at least 95 percent of the SPMDD. The top foot of structural fill shall be compacted to 100 percent of the SPMDD.
- B. The moisture content of the compacted fill material shall be within 2% of the optimum moisture content as determined by ASTM D-698.

2.03 STRUCTURAL BACKFILL

- A. Where shown on the Drawings, an underdrain system shall be provided for the soil bearing structures. The underdrain should be constructed of a free draining material and designed in a manner that would promote positive drainage away from the foundation elements. Final site grading should be accomplished in such a manner as to divert surface runoff and roof drains away from all foundation elements.
- B. All structures, unless otherwise noted on the Drawings, shall be supported entirely by well compacted crushed stone consisting of Kentucky No. 610 size aggregate. Any building supported by stone should have a minimum of 12 inches of compacted crushed stone beneath the bottom of the slab (i.e. foundation elements). Structures should not be supported on a combination of crushed stone and bedrock. The geotechnical representative inspecting the excavation shall provide direction when bedrock is encountered.
- C. Crushed stone used as a bearing medium should be placed in uniform, loose lifts not exceeding 8 inches in thickness. It is recommended that each lift be compacted by a minimum of five (5) passes of a smooth drum vibratory roller having a total static weight of not less than 20,000 pounds. The diameter of the drum should be between 5.0 and 5.5 feet and 6.0 and 6.5 feet wide.
- D. Walls below final grade should be backfilled with a minimum 12-inch thick layer of free draining material up to two feet below final grade. The two feet above this free draining material should be backfilled with an impervious material that would retard surface water infiltration. The free draining material should extend down to a rock blanket beneath the bottom slab.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify foundation perimeter drainage installation has been inspected.
- B. Verify areas to be backfilled are free of debris, snow, ice, or water, and ground surfaces are not frozen.

3.02 PREPARATION

- A. When necessary, compact subgrade surfaces to density requirements for the backfill material and prepare subgrade or previous layer of compacted fill prior to placement of additional fill by scarifying or disking.
- B. Cut out soft areas of subgrade not readily capable of in situ compaction. Backfill with subsoil and compact to density equal to requirements for subsequent backfill material.

3.03 BACKFILLING - GENERAL

- A. Backfill areas to contours and elevations. Use unfrozen materials. The Contractor shall keep the foundation and subgrade free from water or unacceptable materials after the fill operations have started.

- B. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.
- C. Place and compact fill materials in continuous layers not exceeding 8 inches loose depth. Field density tests shall be performed on each lift.
- D. Employ a placement method so not to disturb or damage foundation drainage.
- E. Maintain optimum moisture content of backfill material to attain required compaction density as specified. Material deposited on the fill that is too wet shall be removed or spread and permitted to dry, assisted by disking or blading, if necessary, until the moisture content is reduced to the specified limits.
- F. All crushed stone fill and crushed stone backfill under structures and pavements adjacent to structures shall be DGA per crushed stone per Kentucky Highway Department Standard Specifications for Road and Bridge Construction, unless indicated otherwise. Fill and backfill materials shall be placed in layers not exceeding six (6) inches in thickness and compacted to 95 percent of maximum dry density.
- G. Backfill shall not be placed against or on structures until they have attained sufficient strength to support all loads to which subjected without distortion, cracking, or damage. Deposit soil evenly around the structure.
- H. Slope grade away from structures minimum 2 inches in 10 feet, unless noted otherwise.
- I. Make changes in grade gradual. Blend slopes into level areas.
- J. Remove surplus excavation materials to designated areas.

3.04 TOLERANCES

Top Surface of Backfilling: Plus or minus 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1556 or ASTM D2922 and under provisions of Sections 01400.
- B. Tests shall be performed on each 100 square feet of surface area and on each lift of the surface area, where more than one lift is required to achieve the required bearing or backfill surface.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

END OF SECTION

SECTION 02225 - EXCAVATING, BACKFILLING, AND
COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall make excavations in such widths and depths as will give suitable room for below grade vaults, pump stations, etc., laying pipe to the lines, grades and elevations, furnish, place and compact all backfill materials specified herein or denoted on the Drawings. The materials, equipment, labor, etc., required herein are to be considered as part of the requirements and costs for installing the various pipes, structures and other items they are incidental to.

1.02 RELATED WORK

Section 02610 - Water Pipe and Fittings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Crushed stone material shall conform with the requirements of the applicable sections of the Kentucky Bureau of Highways Standard Specifications and shall consist of clean, hard, and durable particles or fragments, free from dirt, vegetation or objectionable materials.
- B. Two classes of crushed stone material are used in this Section. The type of material in each class is as follows:
 - 1. Class I - No. 9 Aggregate.
 - 2. Class II - Dense Graded Aggregate (DGA).

PART 3 - EXECUTION

3.01 EXCAVATION OF TRENCHES

- A. Unless otherwise directed by the Engineer, trenches are to be excavated in open cuts.
 - 1. Where pipe is to be laid in gravel bedding or concrete cradle, the trench may be excavated by machinery to, or just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed.
 - 2. Where pipe is to be laid directly on the trench bottom, the lower part of trenches in earth shall not be excavated to subgrade by machinery. However, just before the pipe is to be placed, the last of the material to be excavated shall be removed by means of hand tools to form a flat or shaped bottom, true to grade, so that the pipe will have a uniform and continuous bearing and support on firm and

undisturbed material between joints except for limited areas where the use of pipe slings may have disturbed the bottom.

- B. Trenches shall be sufficient width to provide working space on each side of the pipe and to permit proper backfilling around the pipe.
 - 1. The Contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the Work. The pavement shall be cut with pneumatic tools, without extra compensation to the Contractor, to prevent damage to the remaining road surface. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
- C. All excavated materials shall be placed a safe distance back from the edge of the trench.
- D. Trench excavation shall include the removal of earth, rock, or other materials encountered in the excavating to the depth and extent shown or indicated on the Drawings.

3.02 WATER PIPE BEDDING

- A. Piping for water mains shall be supported as follows: The trench bottom for water main piping shall be stable, continuous, relatively smooth and free of frozen material, clodded dirt, foreign material and rock or granular material larger than 1/2 inch in diameter. The foundation for water main piping shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. Any uneven areas in the trench bottom shall be shaved-off or filled-in with Class I granular bedding. When the trench is made through rock, the bottom shall be lowered to provide 6 inches of clearance around the pipe. Class I granular bedding shall be used to bring the trench bottom to grade.
- B. After each pipe has been brought to grade, aligned, and placed in final position, earth material for water main piping in areas not subject to vehicular traffic and Class I material for water mains in paved areas, shall be deposited and densified under the pipe haunches and on each side of the pipe up to the spring line of the pipe to prevent lateral displacement and hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations.
- C. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective.
- D. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate.
- E. The depth of the foundation is dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required Class I bedding material can be placed.

- F. It should be noted that no pipe shall be laid on solid or blasted rock.
- G. Pipe bedding as required in Paragraphs A, B, C, and D of this Section is **not** considered a separate pay item.

3.03 WATER PIPE BACKFILLING

A. Initial Backfill:

1. This backfill is defined as that material which is placed over the pipe from the spring line to a point 6 inches above the top of the pipe. For water main piping in areas not subject to vehicular traffic, initial backfill material shall be earth material free of rocks, acceptable to the Engineer or with Class I material when a condition exists mentioned in Paragraph A, 3. below. For water main piping in paved areas, initial backfill shall be Class I material.
2. Material used, whether earth or Class I, in the initial backfilling is **not** a separate pay item. Payment for the material is included in the unit price per linear foot of water main.
3. In areas where large quantities of rock are excavated and the available excavated earth in the immediate vicinity is insufficient for placing the required amount of backfill over the top of the pipe as set forth in Paragraph A.1, the Contractor shall either haul in earth or order Class I material for backfilling over the pipe. Neither the hauling and placement of earth nor the ordering and placement of Class I material to fulfill the backfill requirements set forth herein is considered a separate pay item.

B. Final Backfill:

1. There are two cases where the method of final backfilling varies. The various cases and their trench situations are as follows:
 - a. Case I - Areas not subject to vehicular traffic.
 - b. Case II - Paved areas including streets, drives, parking areas, and walks.
2. In all cases, walking or working on the completed pipelines, except as may be necessary in backfilling, will not be permitted until the trench has been backfilled to a point 6 inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:
 - a. Case I - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 8 inches below the surface of the ground with earth material free from large rock (greater than 6 inches in the longest dimension), acceptable to the Engineer. The remainder of the trench shall be backfilled with earth material reasonably free of any rocks.
 - b. Case II - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 12 inches below the existing pavement surface with Class I (No. 9 crushed stone aggregate) material. The backfill shall be mechanically tamped in approximately 6-inch layers to obtain the maximum possible compaction. The remaining backfill shall be as follows:

For gravel surfaces - Class II (dense graded aggregate) material mechanically tamped to maximum possible compaction. The trench may be left with a slight mound if permitted by the Engineer.

For bituminous and concrete surfaces - Bituminous and concrete pavement sections as detailed on the Drawings and as specified for Bituminous Pavement Replacement and Concrete Pavement Replacement.

3. Earth and Class I material used in final backfill is not a separate pay item. Payment shall be included in the price of water main.
 4. Class II material used in final backfill shall be included in the unit price of the pipe.
- C. A sufficient amount of Class II material shall be stockpiled to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling in of settled or washed areas by the Contractor.
- D. Excavated materials from trenches, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. It shall be the responsibility of the Contractor to obtain location or permits for its disposal, unless specific waste areas have been designated on the Drawings or noted in these Specifications. The cost of disposal of excess excavated materials, as set forth herein, no additional compensation being allowed for hauling or overhaul.

END OF SECTION

SECTION 02370 - CAISSONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Extent of caissons is shown on drawings, including locations, diameters of shafts, estimated bottom elevations, top elevations, and details of construction.
- B. Related work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Division I of these Specifications.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of American Concrete Institute (ACI) "Standard Specification for the Construction of End Bearing Drilled Piers" (ACI 336.1), and as herein specified.
- B. Caisson Installer Qualifications: Not less than three successfully completed contracts with similar soil conditions, shaft sizes, depths and volumes of work contained in this project. Submit satisfactory proof of compliance to Engineer.
- C. Concrete Testing Services:
 - 1. The owner will engage a testing laboratory acceptable to Engineer to perform material evaluation tests and to design concrete mixes.
 - 2. The owner will engage testing laboratory to perform sampling and testing during placement of concrete.
 - 3. The owner will engage a testing laboratory to conduct tests of compression test specimens.
 - 4. Materials and installed work may require testing and retesting as directed by Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Re-testing of rejected materials and installed work, shall be done at Contractor's expense.

1.03 SUBMITTALS

- A. Certified Caisson Report for each caisson, recording actual elevation at bottom and top, elevation of rock (if any), final centerline location at top, variation of shaft from plumb, result of tests performed, actual allowable bearing capacity of bottom, levelness of bottom, seepage of water, still water level (if allowed to flood), elevation of bottom and top of any casing left in place, any unusual conditions, dates of starting excavation, completion of excavation, inspection, testing, and placement of concrete (including any delays in concreting and location of construction joints in shafts).
- 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, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

- C. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified.
- D. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.04 JOB CONDITIONS

Existing Utilities: Locate existing underground utilities by careful hand excavation before starting caisson excavation operations. If utilities are to remain in place, provide protection from damage during caisson operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Engineer immediately for directions as to procedure. Cooperate with Owner, and public or private utility companies in keeping their respective service and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

Concrete materials as specified in Section 03310.

2.02 REINFORCING MATERIALS

Reinforcing materials as specified in Section 03210.

2.03 PROPORTIONING AND DESIGN OF MIXES

- A. Proportioning and design of concrete mixes as specified in Section 03310 and as noted.
- B. Design mix to produce concrete for caissons with minimum 28-day compressive strength of 3000 PSI.
- C. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement of not less than 3" and not more than 5".

PART 3 - EXECUTION

3.01 CAISSON EXCAVATION

- A. General: Excavate holes for caissons to required bearing strata or elevation as shown on drawings.

- B. Caisson design dimensions shown are minimums. The design of caissons is based on assumed strata bearing capacity. If bearing strata is not capable of maintaining bearing capacity assumed, foundation system will be revised as directed by Engineer. Revisions will be paid for in accordance with contract conditions relative to changes in work.
- C. If required, install casings as excavation proceeds so that earth walls are maintained without spilling into shaft.
- D. Construction Tolerances: Locate centerline of caissons within the following tolerances:
1. Maximum permissible variation of location not more than 1/24th of shaft diameter or 3", whichever is less.
 2. Shafts out of plumb, not more than 1.5% of length nor exceeding 12.5% of shaft diameter or 15", whichever is less.
 3. Concrete cut-off elevation, plus 1" to minus 3".
 4. If above tolerances are exceeded, provide corrective construction to compensate for excessive eccentricity, Submit proposed corrective construction methods to Engineer for review before proceeding.
- E. Obstructions:
1. If rock, boulders, or other unforeseen obstruction are encountered which cannot be removed by standard caisson excavation methods, and if such obstructions are not indicated by available subsurface data, removal of such obstructions will be paid for in accordance with terms of contract relative to changes in work.
 2. Remove such obstructions by hand labor using air-powered tools, or by other safe methods recognized in construction industry.
- F. Classification of Rock:
1. Rock is defined as material which cannot be drilled with a conventional earth auger or under reaming tool, and requires use of special rock augers, core barrels, air tools, blasting, or other methods of hand excavation. Earth seams, rock fragments, and voids included in rock excavation area will be considered rock for full volume of shaft from initial contract with rock for pay purposes, unless otherwise noted.
 2. The work of this section includes demolition and removal of rock, boulders, concrete, masonry, and other subsurface obstructions which are clearly indicated by contract documents, or by available subsurface exploration data, and such work will not be considered a change in work.
 3. Rock excavation for caissons is unclassified on this project, and shall be included in the appropriate lump sum bid.
- G. Dewatering:
1. Provide and maintain pumping equipment to keep excavations free of water before placing concrete. If excessive water is encountered and drilling operations must be halted, consult with Engineer before using alternate methods of construction.

2. Conduct water to general site run-off ditches and disposal areas with discharge lines. Provide ditching as required to conduct water to site drainage facilities.
- H. Inspection:
1. Each caisson must be inspected and tested before placing concrete.
 2. Provided facilities as required to assist inspection and testing of excavations, and cooperate with inspecting and testing personnel to expedite work.
 3. Notify Engineer and testing facility at least 6 hours prior to time excavations will be ready for inspection and tests.
- I. Depth of Bearing Strata:
1. If indicated depth of shaft excavation is reached without developing required strata bearing capacity, immediately suspend excavation operations and inform Engineer. Engineer will determine procedures to be followed in each instance.
 2. Where changes in indicated depth or dimensions are required, or additional soil borings are required, proceed with such work when directed in writing by Engineer.
- J. Overexcavation: No payment will be made for extra length, when caisson shafts are excavated to a greater depth than required or authorized by Engineer, due to overdrilling by Contractor. Complete caisson and fill extra depth with concrete, if other conditions are satisfactory. Overexcavated shafts will be measured and paid for to original design authorized depth.
- K. Excavated Material: Deposit and spread excavated material on site at locations as directed by Engineer.

3.02 REINFORCING STEEL AND DOWELS

Fabricate and erect reinforcing cages in shafts as one continuous unit. Place reinforcement accurately and symmetrically about axis of hole and hold securely in position during concrete placement.

3.03 CONCRETE PLACEMENT

- A. General: Fill caissons with concrete immediately after inspection and approval by testing laboratory. Use protection sheets (cut out to receive concrete) over excavation openings, extending at least 12" beyond edge.
- B. Place concrete continuously and in a smooth flow without segregating and mixed materials. Provide mechanical vibration for consolidation of at least top 25' of each shaft.
- C. Place concrete by means of bottom discharge bucket, flexible drop chute, elephant truck hopper, or tremie. Use chutes or tremies for placing concrete where a drop of more than 25' is required, or pump concrete into place.

- D. Place concrete in-the-dry unless placing underwater is acceptable to Engineer. If water occurs, and it is impracticable to dewater caisson excavation, and reasonable attempts to seal off water flow have failed, allow water level to attain its normal level and place concrete by tremie method. Control placement operations to ensure that tremie is not broken during continuous placing from bottom to top. Other methods of depositing concrete underwater may be used, if acceptable to Engineer.
- E. Maintain a sufficient head of concrete to prevent reduction in diameter of caisson shaft by earth pressure and to prevent extraneous material from mixing with fresh concrete. Coordinate withdrawal of temporary casings with concrete placement operations to maintain a head of concrete approximately 5' above casing bottom.
- F. Stop concrete placement at cut-off elevation shown, screed level, and apply a scoured, rough finish.
- G. Interrupted placing operations of over one hour duration will require a cold joint installation. Leave resulting shaft surface approximately level and insert steel dowels. At resumption of concrete placing, clean off surface laitance, roughen as required, and slush with a 1-to-1 cement grout or commercial bonding agent before remainder of concrete is placed.

3.04 FIELD QUALITY CONTROL

- A. Field quality control for concrete as specified in Section 03310.
- B. Inspection and Tests for Caissons: Soil testing facility shall perform and report specified tests, and additional tests which may be required. Conduct tests and provide reports as soon as possible to not delay concreting operations for acceptable excavations.
 - 1. Bottom elevations and bearing capacities and lengths of caissons as shown on drawings are estimated from available soil data. Actual elevations, caisson lengths, and bearing capacities will be determined by soil testing facility from conditions found in excavations. Final evaluations and acceptance of data will be determined by Engineer.
 - 2. Caissons Bearing on Rock: A qualified geotechnical engineer shall inspect each caisson bottom to a minimum depth of five feet to determine whether voids, clay seams, or solution channels exist.

3.05 MEASUREMENT AND PAYMENT

- A. Basis of Bids: Bids shall be based on number of caissons, total length with each caisson penetrating 6 inches into bedrock and diameter of shaft as shown on drawings.
- B. Basis for Payment: Payment for caissons will be made on actual length of caissons in place and accepted. The actual length may vary to coincide with elevation where satisfactory bearing strata is encountered. Adjustments will be made on variation of total quantities, based on design dimensions for shafts.

- C. There will be no additional compensation for excavation, concrete fill, reinforcing, casings, or other costs due to unauthorized overexcavating. No payment will be made for rejected caissons.
- D. Prices quoted include full compensation for labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete, and other items for complete installation.

END OF SECTION

SECTION 02510 - BITUMINOUS PAVEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide bituminous pavement for following applications, with prepared subbase and compacted base.
 - 1. Roads.
 - 2. Driveways.

1.02 SUBMITTALS

Submit for approval product data, test reports.

1.03 QUALITY ASSURANCE

Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Prime coat: Cut-back asphalt.
- B. Tack coat: Emulsified asphalt.
- C. Asphaltic cement: AASHTO M226 and as required by local authorities.
- D. Aggregate: Crushed stone or crushed gravel.

PART 3 - EXECUTION

3.01 NEW PAVEMENT INSTALLATION AND FULL WIDTH PAVEMENT OVERLAY

- A. Asphalt/aggregate Mixture: Comply with local DPW Standard Specifications for Highways and Bridges. Class as required by loading and use.
- B. Remove loose material from compacted subbase and existing pavement. Proof roll and check for areas requiring additional compaction in the new area of pavement. Report unsatisfactory conditions in writing. Beginning of work means acceptance of compacted subbase and condition of existing pavement.

- C. Apply prime coat to prepared surface. Apply tack coat to previous laid work and adjacent in-place concrete surfaces.
- D. Place bituminous concrete at minimum temperature of 225 degrees F in strips not less than 10' wide overlapping joints in previous courses. Complete entire base course thickness before beginning surface course.
- E. Construct curbs, where required, to dimensions indicated or if not indicated to standard shapes. Provide tack coat between curb and pavement.
- F. Begin rolling when pavement can withstand weight of roller. Roll while still hot to obtain maximum density and to eliminate roller marks.
- G. Test in-place asphalt work for thickness and smoothness. Remove and replace defective work and patch to eliminate evidence of patching. Provide the following minimum thickness and smoothness unless otherwise greater thickness is required on the Drawings:
 - 1. Subbase course: 5-inch No. 2 stone and 5-inch DGA.
 - 2. Base course: 5-inch.
 - 3. Surface course: 2-inch plus or minus 1/4-inch at drives and parking.
 - 4. Surface course smoothness: Plus or minus 1/8-inch in 10 feet. No ponding of water is acceptable.
- H. Thickness of bituminous surface and base shall be determined by coring of the newly constructed pavement in accordance with Kentucky Method 64-420-04, Paragraphs 1.2, 1.3, 2, and 3, with the following exceptions:
 - 1. A minimum of two (2) cores shall be taken.
 - 2. Exploratory cores for a deficiency shall be spaced at 100 foot intervals.
 - 3. Excess thickness will be considered as included in the Contract price per unit.
 - 4. Deficient thickness of greater than 1/4-inch will require an additional 1-inch layer of surface to be overlaid over the area of the deficiency.
- I. Bituminous surface and base shall each be one course construction of an appropriate surface JMF prepared and installed in accordance with the requirements of the Kentucky Department of Highways.
 - 1. Placement and compaction of surface and base courses shall be in accordance with the Kentucky Department of Highways Standard Specifications. Minimum thickness after compaction shall be as detailed on the Drawings.
- J. Aggregate base of dense graded aggregate and No. 2 stone shall each be one course construction and shall conform to the applicable provisions of the Kentucky Department of Highways Standard Specifications Section 302. Minimum thickness after compaction shall be as detailed on the Drawings.

END OF SECTION

SECTION 02520 - PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide Portland cement concrete paving at following locations, with prepared subbase and compacted base.
 - 1. Driveways and vehicular entrances.
 - 2. Walkways.
 - 3. Curbs.

1.02 SUBMITTALS

Submit for approval product data, mix design, mock-ups, test reports.

1.03 QUALITY ASSURANCE

Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete mix design: Specific mixes as required for sidewalks, curbs, and vehicular ways. Submit mix proposed for use, for approval, as detailed in Division 3.
- B. Exposed aggregate paving:
 - 1. Aggregate to match approved sample.
 - 2. Retarder.
- C. Reinforcing: 4 x 4, 2.1 x 2.1 welded flat wire mesh and ASTM A36 deformed steel bars.
- D. Joints: Preformed joint fillers/sealers.
- E. Finish:
 - 1. Paving: Fine bristled stiff broom.
 - 2. Exposed aggregate finish: Match approved sample.
 - 3. Imprinting: Tools and hardeners by Bomanite Corp.
 - 4. Curbs: Steel form finish.

F. Thickness (Unless shown otherwise on the drawings):

1. Driveways and vehicular entrances - 8 inches.
2. Walkways - 4 inches.
3. Curbs - 6 inches.

G. Aggregate Subgrade: 4-inch dense grade aggregate.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Proof roll subbase and check for unstable areas. Report unsatisfactory conditions in writing. Beginning paving work means acceptance of subbase.
- B. Comply with Division 3 for concrete mix, testing, placement, joints, tolerances, curing, repairs, and protection.

END OF SECTION

SECTION 02610 - WATER PIPE AND FITTINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, material, and equipment necessary to install water main piping together with all appurtenances as shown and detailed on the Drawings and specified herein.

1.02 RELATED WORK

- A. Section 02222 - Excavation.
- B. Section 02225 - Excavating, Backfilling and Compacting for Utilities.
- C. Section 02640 - Water Valves and Gates.
- D. Section 02675 - Disinfection of Potable Water Pipe.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE (DIP) AND FITTINGS

- A. Ductile iron pipe (DIP) shall conform to ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51 Standard. The pipe shall conform to pressure class 350 minimum unless noted otherwise. All fittings and joints should be capable of accommodating pressure of not less than 250 psi.
- B. Fittings shall be ductile iron in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 or ANSI A21.53 for compact fittings and shall conform to the details and dimensions shown therein. Fittings shall have rubber gasket joints meeting the requirements of AWWA C111. Fittings shall be cement-mortar lined and bituminous coated to conform to the latest revision of ANSI/AWWA standards.
- C. Ductile iron flanged joint pipe shall conform to ANSI/AWWA C115/A 21.15 Standard and have a thickness Class of 53. The pipe shall have a rated working pressure of 250 psi with Class 125 flanges. Gaskets shall be ring gaskets with a thickness of 1/8 inch. Flange bolts shall conform to ANSI B 16.1.
- D. Flanged fittings shall meet all requirements of ANSI/AWWA C110/A21.10 (or A21.53 for compact fittings) and have Class 125 flanges. Fittings shall accommodate a working pressure up to 250 psi and be supplied with all accessories.
- E. Ductile iron mechanical joint fittings shall be in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 (or A21.53 for compact fittings) and have joints in accordance with ANSI/AWWA C111/A21.11. Fittings and joints shall be supplied with all accessories.

- F. Restrained joint pipe and fittings shall be a boltless system equal to "Field- Lok" restraining gaskets or "TRFLEX Joint" as manufactured by US Pipe & Foundry Company.
- G. All ductile fittings shall be rated at 250 psi water working pressure plus water hammer. Ductile iron fittings shall be ductile cast-iron grade 70-50-05 per ASTM Specification A339-55.
- H. Cement mortar lining and seal coating for pipe and fittings, where applicable shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
- I. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.
- J. Ductile iron pipe and fittings shall be as manufactured by U.S. Pipe & Foundry Company, American Cast Iron Pipe Company, or approved equivalent.

2.02 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. Polyvinyl chloride (PVC) pipe for water mains shall be Class 200 (SDR 21) or Class 250 (SDR 17) PVC pressure rated pipe with either twin gasket joints or integral bell joints with rubber O-ring seals. All class 200 pipe shall meet the requirements of SDR 21 and all class 250 pipe shall meet the requirement of SDR 17.
- B. All PVC pipe shall conform to the latest revisions of ASTM D-1784 (PVC Compounds), ASTM D-2241 (PVC Plastic Pipe, SDR), and ASTM D-2672 (Bell-end PVC Pipe). PVC pipe shall have a minimum cell classification of 12454B or 12454C as defined in ASTM D-1784. Rubber gasketed joints shall conform to ASTM D-3139. The gaskets for the PVC pipe joint shall conform to ASTM F-477 and D-1869.
- C. Fittings for all lines 4 inches in diameter or larger shall be ductile iron and in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 or ANSI A21.53 for compact fittings. Cement mortar lining and seal coating shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C110/A21.10. All fittings shall be rated at 250 psi water working pressure plus water hammer and be ductile cast-iron grade 70-50-05 per ASTM Specification A339.
- D. Fittings for all lines less than 4 inches in diameter shall be PVC gasketed push-on type or socket glue-type manufactured specifically for the pipe class being utilized. All socket-glue type connections shall be joined with PVC solvent cement conforming to ASTM D2564. Product and viscosity shall be as recommended by the pipe and fitting manufacturer to assure compatibility. Solvent cement joints shall be made up in accordance with the requirements of ASTM D2855. Appropriate thrust blocks shall be provided for the fittings.

- E. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor during the bidding phase shall determine the number of fittings required and include the cost of the fittings and installation in the unit price for pipe.
- F. Rubber gasket joints shall provide adequate expansion to allow for a 50 degree change in temperature on one length of pipe. Lubrication for rubber connected couplings shall be water soluble, non-toxic, be non-objectionable in taste and odor and have no deteriorating affect on the PVC or rubber gaskets and shall be as supplied by the pipe manufacturer.
- G. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner what will not reduce the strength of the pipe or the coupling or otherwise damage them. Pipe and coupling markings shall include the nominal size and OD base, material code designation, dimension ratio number, ASTM Pressure Class, ASTM designation number for this standard, manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 5 feet for the pipe and shall be marked on each coupling.

PART 3 - EXECUTION

3.01 LAYING DEPTHS

In general, water mains shall be laid with a minimum cover of 30 inches, except as otherwise indicated on the Drawings.

3.02 SEWER/CONTAMINANT PIPE CROSSING CONCRETE ENCASEMENT

- A. At locations shown on the Drawings, required by the Specifications, or as directed by the Engineer, concrete encasement shall be used when the clearance between the proposed water pipe and any existing sewer or contaminant carrying pipe is 18 inches or less. Contaminant carrying pipe includes underground petroleum, slurry, food processing, and other pipe as determined by the Engineer.
- B. Whether the proposed water pipe is above or below the existing sewer/contaminant pipe, the concrete shall fully encase the sewer/contaminant pipe and extend to the spring line of the water pipe. Encasement shall extend in each direction along the sewer/contaminant pipe until the encased sewer/contaminant pipe is 10 feet from the proposed water main, measured perpendicular to the water main.
- C. Concrete shall be 3,000 psi and shall be mixed sufficiently wet to permit it to flow between and under the pipes to form a continuous bridge. In tamping the concrete, care shall be taken not to disturb the grade or line of either pipe or damage the joints.
- D. Concrete for this Work is not a separate pay item and will be considered incidental to water pipe installation.

3.03 PIPE LAYING

A. Slip Jointed and Heat-Fusion Welded Pipe:

1. All pipe shall be laid with ends abutting and true to the lines and grades indicated on the plans. Pipe shall be fitted and matched so that when laid in the Work, it will provide a smooth and uniform invert. Supporting of pipe shall be as set out in Section 02225 and in no case shall the supporting of pipe on blocks be permitted.
2. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure it being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fittings shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe. Bevel can be made with hand or power tools.
3. The interior of the pipe, as the Work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted so as to exclude earth or other material and precautions taken to prevent floatation of pipe by runoff into trench.
4. Anchorage of Bends:
 - a. At all tees, plugs, caps and bends of 11-1/4 degrees and over, and at reducers or in fittings where changes in pipe diameter occur, movement shall be prevented by using suitable harness, thrust blocks or ballast. Thrust blocks shall be as shown on the Drawings, with sufficient volumes of concrete being provided; however, care shall be taken to leave weep holes unobstructed and allow for future tightening of all nearby joints. Unless otherwise directed by the Engineer, thrust blocks shall be placed so that pipe and fitting joints will be accessible for repair.
 - b. Bridles, harness or pipe ballasting shall meet with the approval of the Engineer. Steel rods and clamps shall be galvanized or otherwise rust-proofed or painted.
 - c. No extra pay shall be allowed for work on proper anchorage of pipe, fittings or other appurtenances. Such items shall be included in the price bid for the supported item.
5. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has the opportunity to make an inspection of the joints, alignment and grade in the section laid, but such inspection shall not relieve the Contractor of further liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are noted later.
6. All joint surfaces shall be cleaned immediately before jointing the pipe. The joint shall be lubricated in accordance with the pipe manufacturer's recommendations. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. All pipe shall be provided with home marks to insure proper gasket seating. Details of gasket installation and joint assembly shall follow the manufacturer's direction for the joint type and material of the pipe. The resulting joints shall be watertight and flexible.

B. Solvent Welded Pipe:

1. All rigid plastic pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations. When installed exposed, the pipe shall be supported or hung in accordance with the manufacturer's recommendations.
2. Containers of solvent cement shall be completely closed except when cement is being applied to pipe components. Should the solvent cement become lumpy or thickened, it shall be discarded, and a new container opened.
3. Schedule 80 threaded adapters shall be used where necessary to connect to a threaded valve or fitting.
4. Only strap wrenches shall be used for tightening threaded plastic joints, and care shall be taken not to overtighten those joints.
5. Solvent welded pipe shall not be laid or installed when the ambient temperature is below 40 degrees F, nor above 90 degrees F when exposed to direct sunlight. Ends to be joined shall be shielded from direct sunlight prior to and during the laying operation.
6. Provide adequate ventilation when working with pipe joint solvent cement.

3.05 TESTING OF WATER PIPE

- A. The completed work shall comply with the provisions listed herein, or similar requirements which will insure equal or better results. Suitable test plugs, water pump or other equipment and apparatus, and all labor required to properly conduct the tests shall be furnished by the Contractor at no expense to the Owner.
- B. Water main piping shall be pressure tested to 250 percent of the normal system operating pressure or to 100 percent of the rated working pressure of the pipe, whichever is less. At no time shall the test pressure exceed 100 percent of the pipe's rated working pressure. A pipe section shall be accepted if the test pressure does not fall more than 5 psi during the minimum 2-hour test period. The pipe shall be tested for allowable leakage according to AWWA C-600 or C-605, as applicable, concurrently with the pressure test.
- C. Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 6,000 feet. Testing shall proceed from the source of water toward the termination of the line. The line shall be tested upon the completion of the first 6,000 feet. After the completion of two (2) consecutive tests without failure, the Contractor, at his option and with the Engineer's approval, may discontinue testing until the system is complete.
- D. All pipe, fittings and other materials found to be defective under test shall be removed and replaced at the Contractor's expense.
- E. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves and hydrants. If permanent air vents are not located at high points within the test section, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water.
- F. All piping shall be tested for leakage at a pressure no less than that specified for the pressure test. The leakage shall be defined as the quantity of water that must be supplied to the tested section to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with

water. The leakage shall be less than an allowable amount determined by the following equation:

$$L = \frac{SD (P)^{1/2}}{133,200}$$

Where: L =allowable leakage (gallons/hour)
S =length of pipe tested, in feet
D =nominal diameter of pipe (inches)
P =test pressure (psig)

- G. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation. All visible leaks are to be repaired regardless of the amount of leakage.
- H. If in the judgement of the Engineer, it is impracticable to follow the foregoing procedures for any reason, modifications in the procedures shall be made as required and as acceptable to the Engineer, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

END OF SECTION

SECTION 02640 - WATER VALVES AND GATES

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, material, and equipment necessary to install valves together with all appurtenances as shown and detailed on the Drawings and specified herein.

1.02 RELATED WORK

- A. Section 02225 - Excavating, Backfilling and Compacting for Utilities.
- B. Section 02610 - Water Pipe and Fittings.
- C. Section 02645 - Hydrants.

1.03 SUBMITTALS

- A. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer in accordance with the requirements of Section 01300.
- B. The manufacturer shall furnish the Engineer two (2) copies of an affidavit stating that the valve and all materials used in its construction conform to the applicable requirements of the latest revision of the applicable AWWA Standard, and that all tests specified therein have been performed and that all test requirements have been met.
- C. The Engineer shall be furnished two (2) copies of an affidavit that the "Valve Protection Testing" has been done and that all test requirements have been met.
- D. The Engineer shall be furnished with two (2) copies of an affidavit that inspection, testing and rejection are in accordance with the latest revision of the applicable AWWA Standard.

PART 2 - PRODUCTS

2.01 BUTTERFLY VALVES

For Valves 4-inch through 24-inch: The butterfly valve shall be DeZurik or M&H Valve Company AWWA C504 series (or approvable equivalent), mechanical joint, resilient seat, cast iron body and disk, stainless steel shaft and seating edge (ring), Chloroprene seat, Class 150B, cast iron housing with 2-inch operator nut in vertical position for use with a valve box. The valve shall be fully coated, inside and out, with fusion bonded epoxy in accordance with the latest revision of AWWA C550 Standard.

2.02 VALVE BOXES

- A. Each buried stop and valve shall be provided with a suitable valve box. Boxes shall be of the adjustable, telescoping, heavy-pattern type with the lower part of cast iron and the upper part of steel or cast iron. They shall be so designed and constructed as to prevent the direct transmission of traffic loads to the pipe or valve.
- B. The upper or sliding section of the box shall be provided with a flange having sufficient bearing area to prevent undue settlement. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and rest on the valve bonnet.
- C. The boxes shall be adjustable through at least 6 inches vertically without reduction of the lap between sections to less than 4 inches.
- D. The inside diameter of boxes for valves shall be at least 4-1/2 inches, and the lengths shall be as necessary for the depths of the valves or stops with which the boxes are to be used.
- E. Covers for valves shall be close fitting and substantially dirt-tight.
- F. The top of the cover shall be flush with the top of the box rim. An arrow and the word OPEN to indicate the direction of turning to open the valve shall be cast in the top of the valve covers.

2.03 COUPLING ADAPTER

- A. The pipe couplings shall be of a gasketed, sleeve-type with diameter to properly fit the pipe. Each coupling shall consist of one (1) steel middle ring, of thickness and length specified, two (2) steel followers, two (2) rubber-compounded wedge section gaskets and sufficient track-head steel bolts to properly compress the gaskets. Field joints shall be made with this type of coupling. The middle ring and followers of the coupling shall be true circular sections free from irregularities, flat spots, or surface defects. They shall be formed from mill sections with the follower-ring section of such design as to provide confinement of the gasket. After welding, they shall be tested by cold expanding a minimum of 1 percent beyond the yield point. The coupling bolts shall be of the elliptic-neck, track-head design with rolled threads. The manufacturer shall supply information as to the recommended torque to which the bolts shall be tightened. All bolt holes in the followers shall be oval for greater strength. The gaskets of the coupling shall be composed of a crude or synthetic rubber base compounded with other products to produce a material which will not deteriorate from age, from heat, or exposure to air under normal storage conditions. It shall also possess the quality of resilience and ability to resist cold flow of the material so that the joint will remain sealed and tight indefinitely when subjected to shock, vibration, pulsation and temperature or other adjustments of the pipe line. The couplings shall be assembled on the job in a manner to insure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement, unavoidable variations in trench gradient, etc.
- B. Nuts and bolts shall be in accordance with AWWA C111.

- C. Couplings shall be shop primed and field painted in accordance with Division 9 (or one coat of coal tar epoxy if not specified in Division 9).
- D. Compression couplings shall be equivalent to Style 38 manufactured by Dresser. Flanged couplings shall have flanges in accordance with AWWA C207 and be equivalent to Style 128 manufactured by Dresser.

2.04 PRESSURE GAUGES

- A. Pressure gauges shall have cast brass cases with bourdon tubes and precision rotary movements of bronze, nickel, or other material suitable to the environment in which they will be located. Dials shall be 6 inches in diameter with a pressure range of 0 to 100 psi. Provide female quick coupler for connection to corporation stop. Each gauge shall be provided with snuffer.
- B. Corporation stops shall be similar to Ford Products and shall have iron pipe threads with pack joint connection outlets. Provide male quick coupler for attachment of pressure gauge.

2.05 MECHANICAL PIPE COUPLINGS

- A. Grooved and flexible-type couplings shall be Gustin-Bacon 100, Victaulic Style 77, or equivalent. Grooved end rigid-type couplings shall be Gustin-Bacon 120 Rigi-Grip, Victaulic Style 07 Zero-Flex, or equivalent. Flexible-type couplings shall be used for all piping greater than 12 inches in diameter and for pipe 12 inches in diameter and less in rack-mounted tunnel piping applications. All other applications for piping 12 inches in diameter and less shall utilize rigid-type couplings. Grooved end flanged coupling adapters shall be either Gustin-Bacon 154, Victaulic Style 741, or equivalent. Snap-joint grooved end couplings shall be Gustin-Bacon 115, Victaulic Style 78, or equivalent. Cut grooves are not permitted on fabricated or lightwall pipe. Unless otherwise specified, bolts and nuts shall comply with AWWA C606.
- B. Fittings for grooved end piping systems shall be full flow cast fittings, steel fittings, or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings. Cast fittings shall be cast of ductile iron conforming to ASTM A-536 or malleable iron conforming to ASTM A47. Standard steel fittings, including large size elbows, shall be forged steel conforming to ASTM A-106. Standard segmentally welded fittings shall be fabricated of schedule 40 carbon steel pipe.
- C. Unless otherwise specified, all fittings shall be rated for pressure and loadings equivalent to the pipe.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Valves shall be installed as nearly as possible in the positions indicated on the Drawings consistent with conveniences of operating the handwheel or wrench. All valves shall be carefully erected and supported in their respective positions free from all distortion and strain on appurtenances during handling and installation.

- B. All material shall be carefully inspected for defects in workmanship and material, all debris and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness.
- C. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.
- D. Valves shall not be installed with stems below the horizontal.
- E. Valves shall be set plumb and supported adequately in conformance with the instructions of the manufacturer. Valves mounted on the face of concrete shall be shimmed vertically and grouted in place. Valves in the control piping shall be installed so as to be easily accessible.
- F. Valves shall be provided with extension stems where required for convenience of operation. Extension stems shall be provided for valves installed underground and elsewhere so that the operating wrench does not exceed 3 feet in length.
- G. A permanent type gasket of uniform thickness shall be provided between flanges of valves and sluice gates and their wall thimble.
- H. Wall thimbles shall be accurately set in the concrete walls so that the gates can be mounted in their respective positions without distortion or strain.

3.02 PAINTING

- A. Valves shall be factory primed and fully coated, inside and out, with fusion bonded epoxy in accordance with the latest revision of AWWA C550 Standard.
- B. Other painting is specified in Division 9.

END OF SECTION

SECTION 02675 - DISINFECTION OF POTABLE WATER PIPE

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, material and water necessary to disinfect the potable water pipe as shown on the Drawings and specified herein.

1.02 RELATED WORK

- A. Section 02225 - Excavating, Backfilling and Compacting for Utilities.
- B. Section 02610 - Water Pipe and Fittings.
- C. Section 02640 - Water Valves and Gates

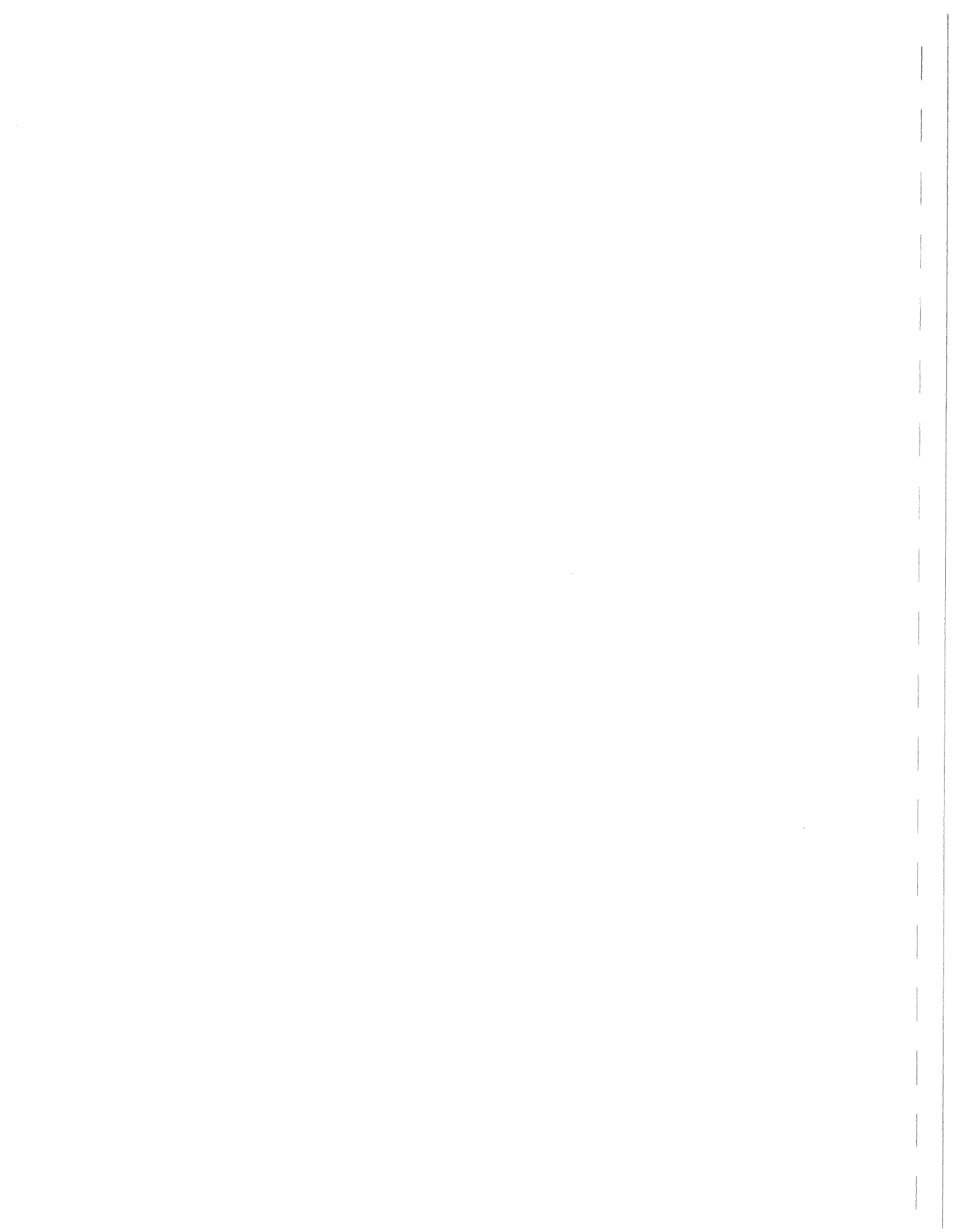
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DISINFECTION OF WATER LINES

- A. Only the finished water lines shown on the plans require disinfection. The raw water mains do not require disinfection.
- B. Sterilization of pipe line shall be in accordance with the American Water Works Association Specification C601-68 using liquid chlorine. The pipe line shall be disinfected by using a 50 mg/l chlorine solution for a contact period of 24 hours. At the end of the 24 hour retention period, the required residual shall be 25 ppm. Pipes shall be thoroughly flushed upon meeting the chlorine residual requirements.
- C. Before the pipes are placed in service, samples of the water must be taken by the Contractor and submitted to the public health agency for testing. No pipes shall be placed in service until the samples have been approved by the agency. The Contractor shall bear all the cost of sampling, testing, and postage.
- D. Sampling locations shall be approved by the Engineer and the public health agency having jurisdiction.
- E. A satisfactory report for the section(s) under test must be submitted to the owner and the Engineer before authorizing domestic consumption of the water.
- F. Sterilization procedures shall be continued until approved samples have been obtained.

END OF SECTION



SECTION 02930 - SEEDING

PART 1 - WORK INCLUDED

1.01 CLEAN-UP

Upon completion of the Project, the Contractor shall remove all debris and surplus construction materials resulting from his work. The Contractor shall grade the ground along each side of the pipe trenches and/or structures in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line, or as shown on the Drawings.

PART 2 - PRODUCTS

2.01 SEED

Grass seed shall be mixed and guaranteed by the supplier to consist of the following:

Annual Rye	60 percent
Kentucky Bluegrass	20 percent
Falcon Fescue	20 percent

2.02 TOPSOIL

Topsoil shall be material stripped and stored under work of Section 02110 and shall be used for all work under this Section. If the quantity of stored topsoil is inadequate or if none has been salvaged from the Project site, the Contractor shall furnish at his own expense sufficient topsoil to properly install all work as specified herein. Topsoil shall be original surface loam obtained from well drained areas from which topsoil has not been removed previously, either by erosion, clearing and removal of trees or mechanical means. It shall not contain subsoil material and shall be clean and free of clay lumps, roots, stones or similar substances more than 2 inches in any dimension, debris, discarded fragments of building materials or weeds and weed seeds.

2.03 SOIL IMPROVEMENTS

- A. Commercial fertilizers shall be of analyses specified, or as recommended by the Agricultural Extension Service for treatment of topsoil in the area from which removed, and shall conform to the applicable state fertilizer laws. Fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.
- B. Lime, if recommended for soil treatment by the Agricultural Extension Service, shall be ground limestone (Dolomite) containing not less than 85 percent of total carbonates, and shall be ground to such a fineness that 50 percent will pass through a 100-mesh sieve, and 90 percent will pass through a 20-mesh sieve. Coarser material shall be acceptable

provided that required rates of application are increased proportionally on the basis of quantities passing the 100-mesh sieve.

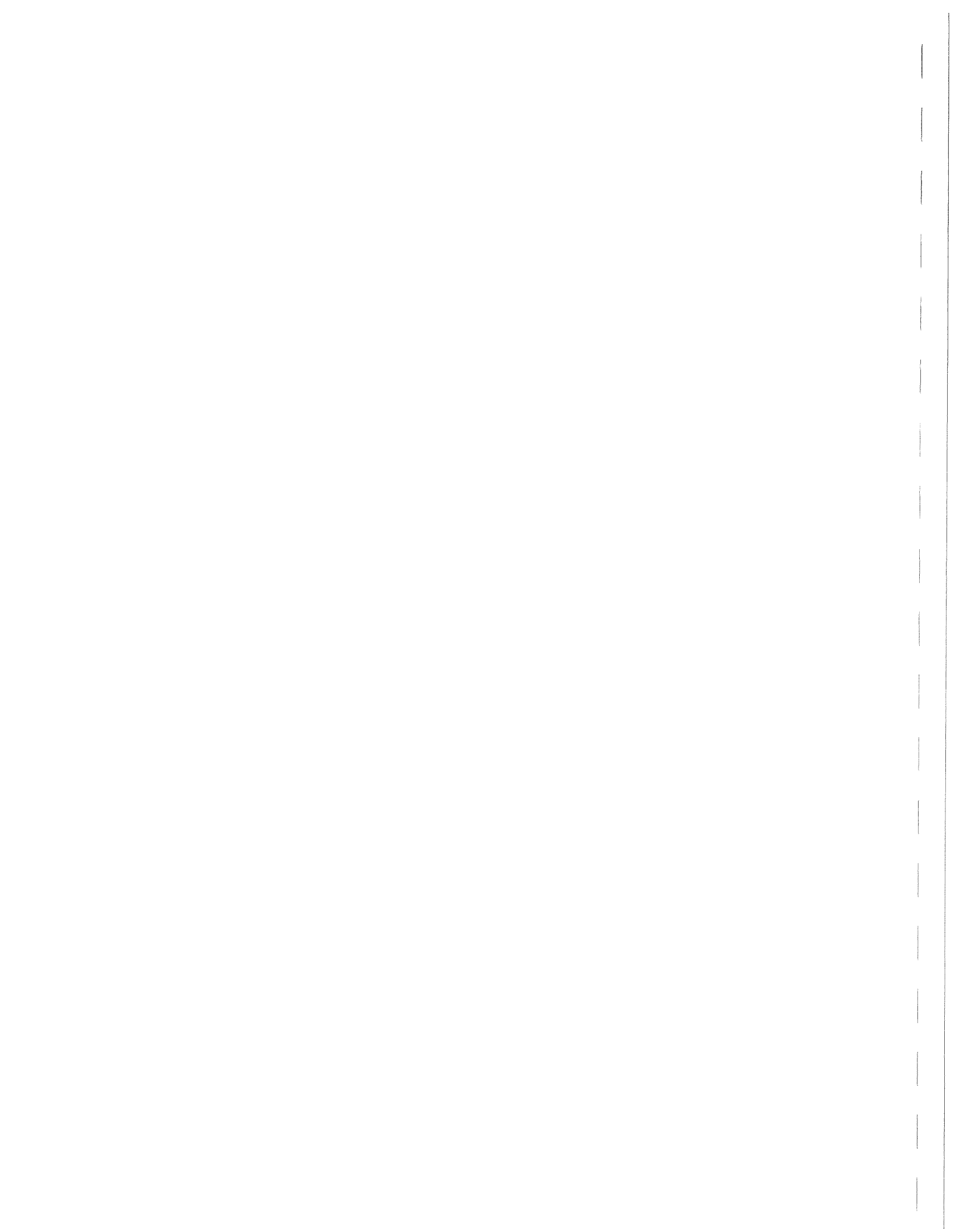
PART 3 - EXECUTION

3.01 SEEDING

- A. After installation of the Project, topsoil shall be spread evenly to a minimum 4-inch depth and lightly compacted. No topsoil shall be spread in a frozen or muddy condition.
 - 1. Any stored topsoil remaining after work is in place shall be disposed of by the Contractor as directed by the Engineer.
- B. Soil improvement shall be made if and as recommended by the Agricultural Extension Service prior to seeding.
 - 1. Ground limestone, if required, shall be applied at the recommended rates per square yard and shall be thoroughly mixed into the topsoil.
 - 2. Fertilizers, if required shall be of analysis and rates per square yard as recommended in the topsoil analysis and shall be mixed lightly in the top few inches of topsoil.
- C. Immediately before any seed is to be sown, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable and of a uniformly fine texture. Areas shall be seeded evenly with a mechanical spreader at a rate of 2 pounds per 1,000 square feet, lightly raked and watered with a fine spray.
- D. After seed has been distributed, the Contractor shall cover areas that are likely to washout with straw to a depth of 1-1/2 inches.
- E. Seeded areas shall be protected and maintained by watering, regular mowing and reseeded as may be necessary to produce a uniform stand of grass. Maintenance shall continue throughout the guarantee period until a dense, uniform turf is established.
- F. All paved streets, roads, sidewalks, curbs, fences, stonewalls, lawns, etc., disturbed during construction shall be restored, repaired, or replaced to as good a condition as existed prior to construction. All materials and workmanship shall conform to standard practices and specifications of the Owner and/or the Kentucky Department of Highways, whichever applies.
- G. The Contractor shall remove from the site all equipment, unused materials and other items at his expense. The construction site shall be left in a neat, orderly condition, clear of all unsightly items, before the Work is finally accepted.

END OF SECTION 02930

Division 3 - Concrete



SECTION 03100 - CONCRETE FORMWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
- B. Openings for other affected work.
- C. Form accessories.
- D. Stripping forms.

1.02 RELATED WORK

- A. Section 03210 - Reinforcing Steel.
- B. Section 03251 - Expansion and Contraction Joints.
- C. Section 03310 – Cast-in-Place Structural Concrete.

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI 347 - Recommended Practice for Concrete Formwork.
- C. PS 1 - Construction and Industrial Plywood.
- D. ACI 318 - Building Code Requirements for Reinforced Concrete.
- E. ACI 350 R - Environmental Engineering Concrete Structures.

1.04 SYSTEM DESCRIPTION

Design, engineer and construct formwork, shoring, bracing to meet design and code requirements so that resultant concrete conforms to required shapes, lines, dimensions and tolerances.

1.05 QUALITY ASSURANCE

Construct and erect concrete formwork in accordance with ACI 301 and 347, latest revisions.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Plywood; Douglas Fir species; medium density overlaid one side grade; sound, undamaged sheets with straight edges.

- B. Glass fiber fabric reinforced plastic forms; matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.
- C. Forms shall be sufficiently rigid to prevent displacement or sagging between supports and so constructed that the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for their adequacy.
- D. For surfaces to be given a rubbed finish, the form surface in contact with the concrete shall be made of heavy gage metal, new plywood (used plywood may not be used), tempered wood fiberboards with smooth surface, or similar material. Metal forms or form linings shall have square edges so that the concrete will not have fins or fluting. Forms shall not be pieced out by use of material different from those in the adjacent form or in such manner as will detract from the uniformity of the finished surface.
- E. For surfaces other than those to be given a rubbed finish, forms shall be made of wood, metal, or other acceptable material. Wooden forms shall be constructed of sound lumber or plywood of suitable dimensions, free from knotholes and loose knots. Plywood shall be reasonably good as accepted. Metal forms shall be of an acceptable type for the work involved. Edges of forms in contact with concrete shall be flush within 1/16-inch.
- F. Forms for walls, columns, or piers shall have removable panels at the bottom for cleaning, inspection, and scrubbing in of bonding grout. Forms for thin sections (such as walls or columns) of considerable height shall be arranged with suitable openings so that the concrete can be placed in a manner that will prevent segregation and accumulations of hardened concrete on the forms or reinforcement above the fresh concrete, unless special spouts are used to place concrete, and so that construction joints can be properly keyed and treated.
- G. Forms for exposed surfaces shall be built with 3/4-inch chamfer strips attached to produce smooth, straight chamfers at all sharp edges of concrete.
- H. All forms shall be oiled with an acceptable nonstaining oil or liquid form coating before reinforcement is placed.
- I. Before form material is reused, all surfaces that are in contact with the concrete shall be thoroughly cleaned, all damaged places repaired, and all projecting nails withdrawn.

2.02 FORMWORK ACCESSORIES

- A. Form ties to be encased in concrete shall not be made of through bolts or common wire, but shall be made and installed as to embody the following features:
 - 1. After removal of the protruding part of the tie, there shall be no metal nearer than 1 inch to the face of the concrete.
 - 2. That part of the tie which is to be removed shall be at least 1/2-inch in diameter, or if smaller, it shall be provided with a wood or metal cone 1 inch long placed against the inside of the forms. Cones shall be carefully removed from the concrete after the forms have been stripped.
 - 3. Ties which pass through walls subject to hydrostatic pressure shall be provided with acceptable water stops, such as washers, securely fastened to the ties.

- B. **Form Release Agent:** Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete. Form oil shall be placed prior to reinforcing steel when possible and surplus oil on form surfaces or reinforcing steel shall be removed.
- C. **Fillets for Chamfered Corners:** Wood strip type to the size and shape as shown on the Drawings (or 3/4-inch if not shown).
- D. **Dovetail Anchor Slots:** Heavy duty, minimum 24 gage thick galvanized steel; foam filled; release tape sealed slots; secure anchoring system for attachment to concrete formwork.
- E. **Nails, spikes, lag bolts, through bolts, anchorages:** Sized as required of strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.01 INSPECTION

Verify lines, levels and measurements before proceeding with formwork.

3.02 PREPARATION

Earth forms not permitted except for continuous strip footings of buildings.

3.03 ERECTION

- A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- B. Camber slabs and beams to achieve ACI 301 tolerances.
- C. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.
- D. Concrete surfaces not exposed to view shall be formed with sound tight lumber or other material producing equivalent finish.
- E. Concrete surfaces to be exposed to view shall be formed with material that is not reactive with concrete surfaces and shall be equivalent in smoothness and appearance to that produced by new plywood panels conforming to PS 1, exterior type Grade B-B.

3.04 APPLICATION OF RELEASE AGENT

Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for work embedded in or passing through concrete.

- B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.06 FORM REMOVAL

- A. Do not remove forms and bracing until concrete has sufficient strength to support its own weight and construction and design loads which may be imposed upon it. Remove load supporting forms when concrete has attained 75 percent of required 28-day compressive strength, provided construction is reshored.
- B. Reshore structural members due to design requirements or construction conditions to permit successive construction.
- C. Remove formwork progressively so that no unbalanced loads are imposed on structure.
- D. Do not damage concrete surfaces during form removal.

3.07 CLEANING

- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean out ports.
- C. During cold weather, remove ice and snow from forms. Do not use deicing salts. Do not use water to clean out completed forms unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

END OF SECTION

SECTION 03210 - REINFORCING STEEL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Reinforcing steel.
- B. Shop Drawings.

1.02 RELATED WORK

- A. Section 03100 - Concrete Formwork.
- B. Section 03251 - Expansion and Contraction Joints.
- C. Section 03310 – Cast-in-Place Structural Concrete.

1.03 REFERENCES

- A. ASTM A-615.
- B. ASTM A-616.
- C. ASTM A-617.
- D. ACI 351.
- E. ASTM A-120.
- F. ASTM A-185.

1.04 SUBMITTALS

- A. Shop Drawings: The Contractor shall submit a complete set of shop drawings including schedules and bending drawings for all reinforcement used in the work in accordance with the "Manual of Standard Practice for Detailing Concrete Structures" (ACI 351).
- B. Submittals: The Contractor shall submit the shop drawings in accordance with Section 00710 and Section 01300.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A-615. All bar reinforcement shall be deformed.

- B. Smooth dowels shall be plain steel bars conforming to ASTM A-615, Grade 40, or steel pipe conforming to ASTM A-120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap.
- C. Welded wire fabric shall conform to ASTM 185, welded steel wire fabric for concrete reinforcement.
- D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall have approved high density polyethylene tips so that the metal portion shall be at least 1/4-inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks.

2.02 FABRICATION

- A. Reinforcement shall be bent cold. It shall be bent accurately to the dimensions and shapes shown on the plans and to within tolerances specified in the CRSI Manual of Standard Practice.
- B. Reinforcing shall be shipped with bars of the same size and shape, fastened securely with wire and with metal identification tags giving size and mark.

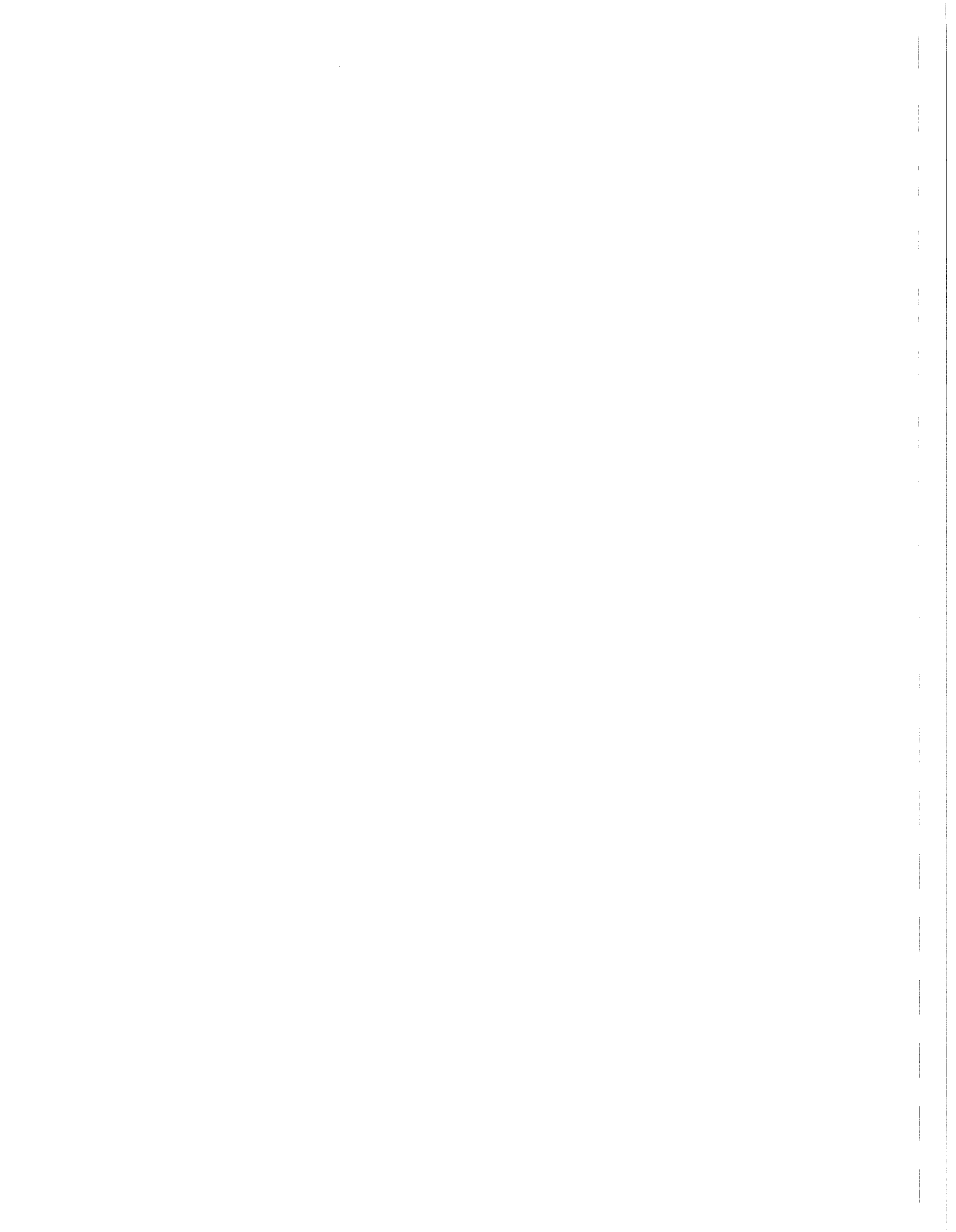
PART 3 - EXECUTION

3.01 PLACING AND FASTENING

- A. Before being placed in position, reinforcement shall be cleaned of loose mill and rust scale, dirt and other coatings that will interfere with development of proper bond.
- B. Reinforcement shall be accurately placed in positions shown on the Drawings and firmly held in place during placement and hardening of concrete by using annealed wire ties. Bars shall be tied at all intersections except where spacing is less than 1 foot in both directions, then alternate intersections may be tied.
- C. Distance from the forms shall be maintained by means of stays, blocks, ties, hangers or other approved supports. If fabric reinforcement is shipped in rolls, it shall be straightened into flat sheets before being placed.
- D. **Before any concrete is placed, the Engineer shall have inspected the placing of the steel reinforcement and given permission to deposit the concrete. Concrete placed in violation of this provision will be rejected and thereupon shall be removed.**
- E. Unless otherwise specified, reinforcement shall be furnished in the full lengths indicated on the Drawings. Splicing of bars, except where shown on the Drawings, will not be permitted without the approval of the Engineer. Where splices are made, they shall be staggered insofar as possible.
- F. Wire mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction and securely wired or clipped with standard clips.

- G. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.

END OF SECTION



SECTION 03251 - EXPANSION AND CONTRACTION JOINTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Forming integral contraction and control joints in concrete.
- B. Visually concealing expansion joints in concrete.

1.02 RELATED WORK

- A. Section 03100 - Concrete Formwork.
- B. Section 03310 - Structural Concrete.
- C. Section 01300 - Submittals.

1.03 SUBMITTALS

The Contractor shall submit shop drawings and/or cut sheets for review in accordance with Specification Section 01300.

PART 2 - PRODUCTS

2.01 INTEGRAL JOINT MATERIALS

- A. Waterstop: PVC, minimum 1750 PSI tensile strength, -51 degrees F to +175 degrees F working temperature range; flat profile; corrugated flaps, large split center bulb; size as noted on the Drawings (or 6 inches if not shown).
- B. Formed Construction Joints: Galvanized steel, tongue and groove type; with removable top strip exposing sealant trough knockout holes spaced at 6 inches on center, ribbed steel spikes with tongue to fit top screed edge.
- C. Joint Filler: ANSI/ASTM D994, bituminous impregnated fiberboard; closed cell neoprene; self-expanding cork; of the sizes detailed and in the locations indicated on the Drawings. Bituminous impregnated fiberboard shall not be used to fill joints in liquid retaining structures.

2.02 EXTERNAL JOINT COVERS

Joint covers: ANSI/ASTM B221; alloy extruded aluminum retainers with resilient neoprene filler strip; extruded aluminum cover plate; 25 shore hardness; to permit plus or minus 50 percent joint movement; of longest manufactured length; mounted where shown on the Drawings as detailed; with anchors.

2.03 SEALANTS

Sealant and Caulking: Specified in Section 07900.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Locate and form expansion control and contraction joints.
- B. Install waterstops continuous without displacing reinforcement. All joints between adjacent continuing and intersecting sections of waterstop including butt joints, tee joints, and other angled joints shall be heat fused to form a watertight seal. Waterstops shall not be lapped.
- C. Place formed construction joints in slabs or walls as detailed on the Drawings or as directed by the Engineer. Set top screed to required elevations. Secure to resist movement of wet concrete.
- D. Install joint cover anchorage in accordance with manufacturer's instructions. Set cover as detailed in the Drawings or as directed by the Engineer.
- E. Install joint fillers and sealants in accordance with manufacturer's instructions. Use primers of type recommended by joint filler and sealant manufacturer.
- F. Apply sealants in accordance with Section 07900.
- G. Install joint covers after adjacent construction activity is complete.

END OF SECTION

SECTION 03310 - CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

The work in this section shall include all formwork, shoring, bracing, anchorage, concrete reinforcement and accessories for cast-in-place concrete.

1.02 GENERAL REQUIREMENT

All concrete construction shall conform to all applicable requirements of ACI 301, ACI 318 and ACI 350 R, except as modified by the supplemental requirements specified herein.

1.03 RELATED WORK

- A. Section 02222 - Excavation.
- B. Section 03100 - Concrete Formwork.
- C. Section 03370 - Concrete Curing.
- D. Section 04230 - Reinforced Unit Masonry.
- E. Section 04270 - Glass Unit Masonry.
- F. Section 04813 - Masonry Vender.
- G. Section 05500 - Metal Fabrications and Castings.

1.04 REFERENCES

- A. The Contractor shall obtain and have available in the field office at all times the following references:
 - 1. Specifications for Structural Concrete for Building ACI 301 (latest revision).
 - 2. Field Reference Manual: Specifications for Structural Concrete for Buildings ACI Sp-15.
 - 3. Manual of Standard Practice - CRSI (latest revision).
 - 4. Placing Reinforcing Bars - CRSI (latest revision).
 - 5. Building Code Requirements for Reinforced Concrete ACI 318.
 - 6. Environmental Engineering Concrete Structures ACI 350R.
- B. The following standard shall also apply to this work:
 - 1. ASTM C-143.
 - 2. ASTM C-150.
 - 3. ASTM C-33.

4. ASTM C-260.
5. ASTM C-494.
6. ASTM A-615.
7. ASTM D-638.
8. ASTM D-695.
9. ASTM D-570.
10. ASTM D-1252.
11. ASNI A-116.1.
12. ASTM A-120.
13. ASTM C-94.
14. ASTM D-2146.
15. Federal Specifications FF-S-325.

1.05 SUBMITTALS

- A. The Contractor shall submit the following data to the Engineer for review:
 1. Proposed mix designs, test results, plotted curves and all other substantiating data as required by ACI 301.
 2. Mix designs for all mixes proposed or required to be used, including all mixes containing admixtures.
 3. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in ACI 301.
- B. Certification attesting that admixtures equal or exceed the physical requirements of ASTM C-494 for Type A admixture and when required, for Type D admixture.
- C. Notarized certifications by the manufacturer that epoxy bonding adhesive meets the specification contained herein.
- D. Drawings showing locations of all proposed construction joints.
- E. Shop drawing for reinforcing steel showing bar schedules, location, and splices.

1.06 QUALITY ASSURANCE

- A. Consistency:
 1. Concrete shall be of such consistency that it can be worked readily into all parts of the forms and around embedded work, without permitting the materials to segregate, or free water to collect on the surface. Consistency shall be measured by the ASTM Standard Test Method for Slump of Portland Cement Concrete, Designation C143. The consistency of concrete shall be as given in Table I, of the standard.
 2. Slump tests shall be made in the field by the testing agency.
- B. Compression Tests:
 1. During the progress of the work, at least one set of four compression test cylinders shall be made for each 50 cubic yards of concrete or major fraction thereof, and not less than one such set for each type of concrete for each days' pouring. Cylinders

made in the field shall be made and cured in accordance with ASTM Standard Method of Making and Curing Concrete Test Specimens in the Field, Designation C31, except that wherever possible molds shall be left on cylinders until they have reached the laboratory.

2. One (1) cylinder of each set shall be broken in accordance with ASTM C-39 at seven (7) days and two (2) at twenty-eight (28) days. Two (2) copies of these test results shall be submitted to the Engineer on the same day of the tests. The remaining cylinder shall be reserved for future testing if required.
3. On evidence of these tests, any concrete that fails to meet the specified strength requirements shall be strengthened or replaced as directed by the Engineer at the Contractor's expense.

C. Inserts in Concrete by Other Trades:

1. All trades shall be notified, at the proper time, to install items to be embedded in concrete.
2. All castings, inserts, conduits, and other metalwork shall be accurately built into or encased in the concrete by the Contractor as directed and all necessary precautions shall be taken to prevent the metalwork from being displaced or deformed.
3. Anchor bolts shall be set by means of substantial templates.
4. The Contractor shall build into new concrete against which facing brick or tile is to be laid, suitable, acceptable, non-corrodible metal, dovetail grooves for ties for securing the brickwork to the concrete.

D. Testing:

1. All testing shall be in accordance with provisions of ACI 301.
2. Testing services listed in ACI 301 shall be performed by a testing agency acceptable to the Engineer. Testing services to meet the requirements of ACI shall be paid for by the owner. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed.

E. Additional Requirements:

1. Unless otherwise directed by the Engineer, the vertical surfaces of all footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.
2. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Division 2. Unless shown otherwise, porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Where indicated, waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene coated burlap shall be laid over surfaces receiving concrete.

F. Hot Weather Requirements: Placing of concrete under conditions of high temperatures, low humidity or wind shall be done in accordance with the American Concrete Institute "Hot Weather Concreting" (ACI 305R).

- G. Cold Weather Requirements: Cold weather concreting procedures and precautions shall conform with American Concrete Institute "Cold Weather Concreting" (ACI 306R).

PART 2 - PRODUCTS

2.01 Contractor shall supply concrete only from an approved ready mixed concrete supplier.

2.02 CONCRETE MIX WITHOUT FLY ASH

Structural concrete of the various classes required shall be proportioned by ACI 301, in addition to the limitation herein listed, to produce the following minimum 28-day compressive strengths:

A. Selection of Proportions for Class A Concrete:

1. 4,500 psi compressive for strength at 28 days.
2. Type II cement plus water reducing, dispersing agent and air. Type IP cement may be used in place of Type II.
3. Maximum water/cement plus water reducing dispersing agent ratio = 0.42.
4. Minimum cement content = 564 pounds (6.0 bags)/cubic yards concrete.
5. Nominal maximum size coarse aggregate = No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
6. Air content = 6 percent plus or minus 2 percent by volume.
7. Slump = 2 inches to 3 inches in accordance with ASTM C-143.

B. Selection of proportions for Class B concrete:

1. 3,000 psi compressive strength at 28 days.
2. Type I cement plus water reducing dispersing agent and air.
3. Maximum (water)/(cement plus water reducing dispersing agent) ratio = 0.50.
4. Minimum cement content = 432 pounds (4.5 bags)/cubic yards concrete.
5. Nominal maximum size coarse aggregate = No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
6. Air content = 6 percent plus or minus 2 percent by volume.
7. Slump = 3 inches to 4 inches in accordance with ASTM C-143.

2.03 OPTIONAL CONCRETE MIX USING FLY ASH

A. Selection of Proportions for Class A Concrete:

1. 4,500 psi compressive for strength at 28 days.
2. Type II cement plus water reducing dispersing agent and air.
3. Maximum (water)/(cement plus water reducing dispersing agent) ratio = 0.42.
4. Minimum cement content = 517 pounds (5.5 bags)/cubic yards concrete.
5. Maximum Fly Ash Content = 71 pounds/cubic yards
6. Nominal maximum size coarse aggregate = No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
7. Air content = 6 percent plus or minus 2 percent by volume.
8. Slump = 2 inches to 3 inches in accordance with ASTM C-143.

B. Selection of Proportions for Class B Concrete:

1. 3,000 psi compressive strength at 28 days.
2. Type II cement plus water reducing dispersing agent and air.
3. Maximum (water)/(cement plus water reducing dispersing agent) ratio = 0.50.
4. Minimum cement content = 376 pounds (4.0 bags)/cubic yards concrete.
5. Maximum Fly Ash Content = 94 pounds/cubic yards.
6. Nominal maximum size coarse aggregate = No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
7. Air content = 6 percent plus or minus 2 percent by volume.
8. Slump = 3 inches to 4 inches in accordance with ASTM C-143.

C. Applicable Standards:

1. ANSI C 311, "Standard Methods of Sampling and Testing Fly Ash for Use as an Admixture in Portland Cement Concrete".
2. ANSI C 618, "Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete".

D. Concrete shall be used as follows:

1. Class A concrete for all concrete work except as noted below.
2. Class B concrete for fill concrete, thrust blocks, drilled piers, and where indicated on the Drawings.

E. All testing shall be or have been performed by an approved independent testing laboratory.

F. Cement for exposed concrete shall have a uniform color classification.

G. Type II cement conforming to ASTM C-150 shall be used in all structural concrete. The alkali content shall not exceed 0.6 percent calculated as sodium oxide. Type IP Cement may be used in place of Type II cement, for mix designs not using fly ash.

H. Coarse aggregate shall conform to all requirements of ASTM C-33.

I. Manufactured sand shall not be used as fine aggregate in concrete.

2.04 FLY ASH CONCRETE

A. In the absence of a verified and acceptable history of fly ash concrete mixes, the following procedure is required to establish the quality of the concrete mix.

B. Trial batches must be made starting thirty (30) days ahead of initial concrete pour. Four (4) mixes shall be designed and produced at no cost to the Owner or the Engineer as follows:

1. Mix using Type II cement with water reducing admixture for normal temperatures (Class A).
2. Mix using Type II cement with water reducing admixture for cold weather temperatures (Class A).
3. Mix using Type II cement with water reducing admixture for hot weather temperatures (Class A).

4. Mix using Type II cement with water reducing admixture for normal weather temperatures (Class B).
- C. Four (4) test cylinders shall be cast for each of the four (4) mixes. Two (2) cylinders shall be broken at 7 days, and two (2) cylinders shall be broken at 28 days, for each of the four (4) mixes. The trial batch design report shall include strength breaks at 7 days and 28 days, air content, etc.
- D. The water-reducing, cement dispersing admixture (such as Master Builders Pozzolith 344-N, Nox-Crete Plastiflow, Plastocrete 161 by SIKA Chemical Company, or approved equivalent) used in fly ash concrete, shall be a normal, accelerated, or retarded hardening admixture. The admixture shall be used at optimum dosage to offset the slow strength development and setting characteristics of the fly ash. Only those brands of admixture that can provide readily available field service on short notice to provide field services, inspection, and assistance, will be acceptable.
- E. Recent mill reports shall be submitted prior to the use of fly ash concrete, with continuing reports on a regular basis during the project. Maximum loss on ignition (LOI) shall be 6 percent.
- F. Tests for air content shall be made twice a day at the jobsite prior to placement, for all mixes containing fly ash.

2.05 ADMIXTURES

- A. An air entraining admixture shall be used on all concrete and shall be the neutralized vinsol resin type such as Master Builders MB-VR, or Euclid Chemical Co. AIR-MIX or equivalent. The admixture shall meet the requirements of ASTM C-260. Certification attesting to the percent of effective solids and compliance of the material with ASTM C-260 shall be furnished, if requested.
- B. A water reducing, set controlling admixture (non-lignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.
- C. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C-494, Type A, water reducing and normal setting admixture, and when required, for ASTM C-494, Type D, water reducing and retarding admixture when used with local materials with which the subject concrete is composed.
- D. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He also will be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.
- E. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met.

- F. The admixture shall conform to ASTM C-494 except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C-494.
- G. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion require the use of a set retardant admixture for mass concrete greater than 2.5 feet thick and for all concrete whenever the temperature at the time concrete is cast exceeds 80 degrees F. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.
- H. Admixtures shall be used in concrete design mixes in the same manner and proportions as in the field so that the effects of the admixtures are included in preliminary tests submitted to the Engineer for review prior to the start of construction.
- I. When more than one admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.
- J. Calcium chloride will not be permitted as an admixture in any concrete.

2.06 WATER

The water for concrete shall be potable water. Site added mix water, where allowed, shall also be potable.

2.07 AGGREGATES

- A. Fine aggregates shall be natural sand having clean, hard, uncoated grains, free from injurious amounts of clay, dust, organic matter or other deleterious substances, and shall conform to ASTM C-33.
- B. Coarse aggregates shall be crushed stone having clean, hard, uncoated particles, and shall be free from injurious amounts of soft, friable, thin, elongated or laminated pieces. Shale may not be used as aggregate. Coarse aggregates shall conform to ASTM C-33 and shall not exceed the following maximum sizes:
 - 1. 3/4-inch for slabs, beams, girders, and walls.
 - 2. 1-inch for all other concrete.

2.08 TESTING AGGREGATES AND DETERMINING PROPORTIONS

- A. No concrete shall be used in the work until the materials and mix design have been accepted by the Engineer.
- B. The conformity of aggregates to the specifications hereinbefore given shall be demonstrated and determined by tests per ASTM C-33 made with representative samples of the materials to be used on the work.
- C. The actual proportions of cement, aggregates, admixtures and water necessary to produce concrete conforming to the requirements set forth shall be determined by making test cylinders using representative samples of the materials to be used in the work. A set

of four (4) standard 6-inch cylinders shall be made and cured per ASTM C-31. Two (2) shall be tested at 7 days and two (2) at 28 days per ASTM C-39. The slump shall not be less than the greatest slump expected to be used in the work.

- D. Reports on the tests and a statement of the proportions proposed for the concrete mixture, shall be submitted in triplicate to the Engineer for review as soon as possible, but not less than five (5) days prior to the proposed beginning of the concrete work. If the Contractor furnishes in writing, similar, reliable detailed information from an acceptable source, and of date not more than four (4) months prior to the time when concrete will be used on this project, the above requirements for laboratory tests may be modified by the Engineer. Such data shall derive from mixtures containing constituents, including the admixtures where used, of the same types and from the same sources as will be used on this project.
- E. The Engineer shall have the right to make check tests of aggregates and concrete, using the same materials, and to order changes as may be necessary to meet the specified requirements.
- F. The Contractor may request permission to add water at the job site, and when the addition of water is permitted by the Engineer, the quantity added shall be the responsibility of the Contractor and in no case shall the total water per bag of cement exceed that determined by the designed mix.
- G. All concrete exposed to weather, such as foundations, walls, exterior steps and retaining walls, etc. shall be air entrained.
- H. If concrete of the required characteristics is not being produced as the work progresses, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure concrete of the specified quality. The Contractor shall make such changes at his own expense and no extra compensation will be allowed because of such changes.

2.09 MIXING

All central plant and rolling stock equipment and methods shall conform to the Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready Mixed Concrete Assn., as well as the ACI Standards for Measuring, Mixing and Placing Concrete (ACI 614), and with Sections 7 to 14, inclusive, of the ASTM Standard Specification for Ready Mixed Concrete, Designation C94-78a, insofar as applicable.

2.10 WATERSTOPS

See Section 03251 - Expansion and Contraction Joints.

PART 3 - EXECUTION

3.01 PLACING AND COMPACTING CONCRETE

- A. At least 20 hours before the Contractor proposes to make any placement of concrete, he shall notify the Engineer of his intention and planned procedure. Unless otherwise permitted, the work shall be so executed that a section begun on any day shall be completed during daylight of the same day.

- B. Ready mixed concrete shall be transported to the site in watertight agitator or mixer trucks. The quantity of concrete to be mixed or delivered in any one batch shall not exceed the rated capacity of the mixer or agitator for the respective conditions as stated on the nameplates.
- C. Central mixed concrete shall be plant mixed a minimum of 1-1/2 minutes per batch, and then shall be truck mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the premixed concrete is placed in the truck and shall continue without interruption until discharge. For transit mixed concrete, the major portion of the mixing water shall be added and mixing started immediately after the truck is charged.
- D. The amount of water initially added shall be recorded on the delivery slip for the Engineer's information, no additional water shall be added, either in transit or at the site, except as directed. Mixing (at mixing speed) shall be continued for at least 10 minutes followed by agitation without interruption until discharge. Concrete shall be discharged at the site within 1-1/2 hours after water was first added to the mix, and shall be mixed at least 5 minutes after all water has been added.
- E. Concrete which has become compacted or segregated during transportation to or on the site of the work shall be satisfactorily remixed just prior to being placed in the forms.
- F. Partially hardened concrete shall not be deposited in the forms. The retempering of concrete which has partially hardened (that is, the remixing of concrete with or without additional cement, aggregate, or water) will not be permitted.
- G. The concrete shall be mixed only in the quantity required for immediate use. Concrete that has developed an initial set shall not be used. The Contractor shall have sufficient plant capacity and transporting apparatus to insure continuous delivery at the rate required.
- H. The temperature of the concrete mixture immediately before placement shall be between 50 degrees F and 90 degrees F.
- I. Concrete mixed in stationary mixers and transported by nonagitating equipment shall be placed in the forms within 45 minutes from the time ingredients are charged into the mixing drum. Concrete that is truck mixed or transported in truck mixers or truck agitators shall be delivered to the site of the work and discharge completed in the forms within the time specified in paragraph 10.7 of ASTM C-94, except that when the concrete temperature exceeds 85 degrees F, the time shall be reduced to 30 minutes. Transit mixed concrete that is completely mixed at the site of concrete placement or batched cement and aggregates transported to mixers shall be placed in the forms within 1-1/2 hours after cement has been added. Concrete shall be placed in the forms within 15 minutes after discharge from the mixer at the job site.
- J. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.
- K. No concrete shall be placed until the subgrade has been accepted in accordance with the requirements of Section 01400, Quality Control, nor shall it be placed on frozen subgrade or in water. Placement of concrete shall not be scheduled until the forms, , reinforcing, and preliminary work have been accepted. No concrete shall be placed until all materials

to be built into the concrete have been set and have been accepted by the various trades and by the Engineer. All such materials shall be thoroughly clean and free from rust, scale, oil, or any other foreign matter.

- L. Forms and excavations shall be free from water and all dirt, debris, and foreign matter when concrete is placed. Except as otherwise directed, wood forms and embedded wood called for or allowed shall be thoroughly wetted just prior to placement of concrete.
- M. Concrete placed at air temperatures below 40 degrees F shall have a minimum temperature of 50 degrees F and a maximum of 70 degrees F when placed.
- N. Chutes for conveying concrete shall be metal or metal lined and of such size, design, and slope as to ensure a continuous flow of concrete without segregation. The slope of chutes shall have approximately the same slope. The discharge end of the chute shall be provided with a baffle, or if required, a spout and the end of the chute. The spout shall be kept as close as practicable to, but in no event more than 5 feet above the surface of the fresh concrete. When the operation is intermittent, the chute shall discharge into a hopper.
- O. In thin sections of considerable height (such as walls and columns), concrete shall be placed in such manner as will prevent segregation and accumulations of hardened concrete on the forms or reinforcement above the mass of concrete being placed. To achieve this end, suitable hoppers spouts with restricted outlets, etc. shall be used as required or permitted unless the forms are provided with suitable openings.
- P. Chutes, hoppers, spouts, etc. shall be thoroughly cleaned before and after each run and the water and debris shall not be discharged inside the form.
- Q. For any one placement, concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section, and so as to maintain until the completion of the unit, an approximately horizontal plastic surface.
- R. No wooden spreaders shall be left in the concrete.
- S. During and immediately after being deposited, concrete shall be thoroughly compacted by means of suitable tools and methods, such as internal type mechanical vibrators operating at not less than 5,000 rpm. or other tool spading to produce the required density and quality of finish. Vibration shall be done only by experienced operators and shall be carried in such manner and only long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents, "pumping" of air, or other objectionable results.
- T. The concrete shall be thoroughly rodded and tamped about embedded materials so as to secure proper adhesion and prevent leakage. Care shall be taken to prevent the displacement of such materials during concreting.
- U. The distance between construction joints shall not exceed 25 feet for all concrete construction and not less than 48 hours shall elapse between casting of adjoining units unless these requirements are waived by the Engineer. Provision shall be made for jointing successive units as indicated or required. Where joints are not shown on the Drawings, they are required to be made at a spacing of approximately 25 feet. Additional construction joints required to satisfy the 25 foot spacing requirement shall be located by

the Contractor subject to the review of the Engineer. The Contractor shall submit for review Drawings separate from the steel reinforcing Drawings, showing the location of all proposed construction joints. All construction joints shall be prepared for bonding as specified in ACI Standard 301. Joints in walls and columns shall be maintained level.

- V. Formwork for beam soffits and slabs and other parts that support the weight of concrete shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

3.02 BONDING CONCRETE AT CONSTRUCTION JOINTS

- A. In order to secure full bond at construction joints, the surface of the concrete previously placed (including vertical, inclined, and substantially horizontal areas) shall be thoroughly cleaned of foreign materials and laitance, if any, and then roughened.
- B. The previously placed concrete at the joint shall be free of standing water.
- C. Waterstops shall be used on all construction joints below water level.

3.03 CURING AND PROTECTION

- A. All concrete, particularly slabs and including finished surfaces, shall be treated immediately after concreting or cement finishing is completed, to provide continuous moist curing for at least seven days, regardless of the adjacent air temperature. Walls and vertical surfaces may be covered with continuously saturated burlap, or kept moist by other acceptable means. Horizontal surfaces, slabs, etc., shall be ponded to a depth of 1/2-inch wherever practicable, or kept continuously wet by the use of lawn sprinklers, a complete covering of continuously saturated burlap, or by other acceptable means.
- B. For at least seven days after having been placed, all concrete shall be so protected that the temperature at the surface will not fall below 45 degrees F. The methods of protecting the concrete shall be subject to the review of the Engineer.
- C. No manure, salt, or other chemicals shall be used for protection.
- D. The above mentioned 7-day periods may be reduced to 3 days in each case if high-early-strength cement is allowed to be used in the concrete.
- E. Wherever practicable, finished slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

3.04 TRIMMING AND REPAIRS

- A. The Contractor shall use suitable forms, mixture of concrete, and workmanship so that concrete surfaces, when exposed, will not require patching. Concrete which, in the opinion of the Engineer has excessive honeycomb, aggregate pockets, or depressions will be rejected and the Contractor shall, at his own expense remove the entire section containing such defects and replace it with acceptable concrete.
- B. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed, recesses left by the removal of form ties shall be filled and surface defects which do not impair structural strength shall be repaired.

- C. Defective concrete shall be cut perpendicular to the surface until sound concrete is reached, but not less than 1-inch deep. The remaining concrete shall be thoroughly roughened and cleaned. Concrete around the cavity or the form tie recess shall be thoroughly wetted and promptly painted with a 1/16-inch brush coat of neat cement mixed to the consistency of thick paint. The hole shall then be filled with mortar.
- D. Mortar shall be 1:1-1/2 cement and sand mix with sufficient white cement, or fine limestone screening in lieu of sand, to produce a surface matching the adjoining work. Cement and sand shall be from the same sources as in the parent concrete.
- E. Mortar in patches shall be applied so that after partial set it can be compressed and rubbed to produce a finish flush and uniform in texture with the adjoining work. All patches shall be warm-moist cured as above specified.
- F. The use of mortar patching as above specified shall be confined to the repair of small defects in relatively green concrete. If substantial repairs are required, the defective portions shall be cut out to sound concrete and the defective concrete replaced by means of a cement gun, or the structure shall be taken down and rebuilt, all as the Engineer may decide or direct.

3.05 FINISHES

A. Exposed to View Concrete Surfaces:

1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of ACI shall apply to all exposed to view concrete surfaces (limited to 1 foot below grade and 1 foot below the minimum liquid level for structures that will contain liquids).
2. Forms for exposed concrete surfaces shall be exterior grade, high density overlay plywood, steel, or wood forms with smooth tempered hard board form liners.
3. Forms shall be coated with Nox-Crete Form Coating Release Agent, Debond Form Coating by L & M Construction Chemicals, Inc. or an approved equivalent, before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet with water prior to placing concrete.
4. Recessed joints in concrete shall be formed using lacquer coated wooden battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
5. Chamfer strips shall be 1-inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Cor., Vinylex Corp., or equivalent.
6. Particular attention is directed to the requirements of ACI 301. Form panels shall be provided in the maximum sizes compatible with the form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.
7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be

damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.

8. Form ties shall remain in the walls and shall be equipped with a waterseal to prevent passage of water through the walls. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends to tie wires project toward or touch formwork. Minimum set back of form ties shall be 1 inch from faces of wall. The hole left by removal of tie ends shall be sealed and grouted as per ACI and in accordance with procedure described hereinafter. Form ties will be permitted to fall within as cast areas of architecturally treated wall surfaces; this does not apply to walls receiving textured decorative waterproof masonry coating.
 9. All formed exposed to view concrete shall be prepared as required, then rubbed and coated with Thoroseal or other Engineer approved product. The manufacturer's recommendations for surface preparation, application procedures and rates, and temperature and moisture conditions shall be followed. Exterior vertical surfaces shall be finished to one foot below grade. Interior exposed to view vertical surfaces of dry pits shall be finished full height, interior vertical surfaces of liquid containers shall be finished to one foot below the minimum liquid level that will occur during normal operations.
 10. Slope all slabs to prevent water pocketing.
- B. All vertical surfaces below minimum liquid level in liquid containing structures shall have a smooth form finish.
 - C. All smooth form concrete vertical surfaces shall be true plane within 1/4-inch in 10 feet as determined by a 10 foot straight edge place anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8-inch.
 - D. Basin, flume, conduit and tank floors shall have a "troweled" finish unless shown otherwise on Drawings.
 - E. Weirs and overflow surfaces shall be given a troweled finish.
 - F. Exterior platforms, steps and landings shall be given a broom finish. Broom finish shall be applied to surfaces which have been steel troweled to an even smooth finish. The troweled surface shall then be broomed with a fiber bristle brush in the direction transverse to that of the main traffic.
 - G. Walking surfaces of slabs shall have a troweled finish unless shown otherwise on Drawings.
 - H. Patching of holes due to removal of tie ends and other repairable defective areas shall be as follows: Entire contact area of hole shall be coated with two part moisture insensitive epoxy bonding compound in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Patching mortar shall be mixed and placed in general accordance with ACI.
 - I. Nox-Crete Harbeton, L & M Construction Chemicals Chem Hard, or an approved equivalent shall be applied to all exposed concrete floors in occupied spaces. The floors

shall be thoroughly cured, cleaned, and perfectly dry with all work above them completed. The hardener shall be applied evenly and freely and in conformance with manufacturer's instructions, using not less than three (3) coats, allowing 24 hours between coats. One gallon of hardener shall cover not more than 100 square feet. After the final coat is completed and dry, surplus hardener shall be removed from the surface of the concrete by scrubbing and mopping with water.

3.06 CONCRETE WALKS AND CURBS:

- A. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with properly compacted, approved material. Concrete walks shall be placed upon 4-inch crushed stone fill unless noted otherwise on the Drawings.
- B. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each direction, formed in the fresh concrete by cutting a groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately 40 feet. Sidewalks shall receive a broomed finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6-inch. Sidewalks adjacent to curbs shall have a slope of 1/4-inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a transverse slope of 1/4-inch per foot or shall be crowned as directed by the Engineer. The surface of the concrete shall show no variation in cross section in excess of 1/4-inch in 5 feet. Concrete walks shall be reinforced with 6 x 6 - W1.4 x W1.4 welded wire fabric unless noted otherwise on the Drawings.
- C. Concrete curbs shall be constructed to the section indicated on the Drawings, and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel or as approved by the Engineer. At the option of the Contractor, the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into Sections 8 to 10 feet in length using steel divider plates. The divider plates shall extend through the concrete and shall be removed. Precast curbs shall be finished smooth. Dividers shall be installed where the curb crosses pipe trenches or other insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.

3.07 WATERTIGHTNESS

- A. The structures which are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that when completed and tested, there shall be no loss of water and no wet spots shall show.
- B. As soon as practicable after the completion of the structures, the Contractor shall fill such structures with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks which appear in the concrete shall be dug out and suitably repaired. Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.

- C. After repairs, if any are required, the structures shall be tested again and further repaired if necessary until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
- D. Waterstops shall be placed in all locations as indicated on the Drawings and as may be required to assure the watertightness of all containers of liquids. Special shop fabricated ells, tees and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, waterstops shall be turned up to be made continuous with waterstops at bottom of walls or in walls. All joints between adjacent, continuing, and intersecting sections of waterstop including butt joints, tee joints, and other angled joints shall be heat fused to form a watertight seal. Waterstops shall not be lapped. Waterstops shall be secured in place to maintain proper position during placement of concrete. Care shall be taken to avoid folding while concrete is being placed and to prevent voids in the concrete surrounding the waterstop. All materials shall be installed in accordance with the manufacturer's recommendations.
- E. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed as required by the Drawings.
- F. The top surface of all concrete decks (except slabs on grade) shall be coated with Sikagard-70 water-repellant penetrating sealer as manufactured by the Sika Corporation, Nox-Crete Stifel, or another approved equivalent. The manufacturer's recommendations shall be followed in all areas of application.

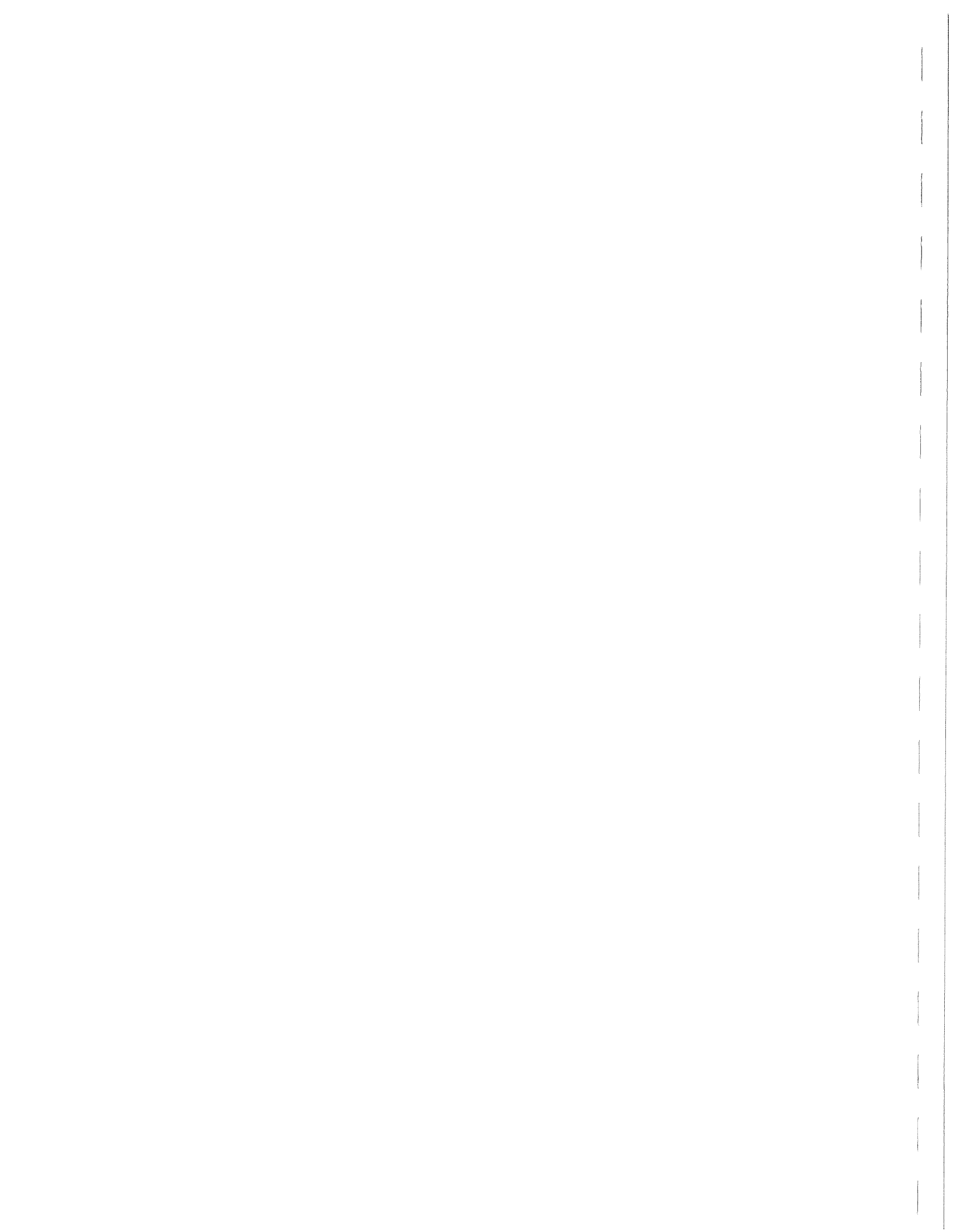
3.08 GROUTING BASE PLATES, BEARING PLATES AND MACHINE BASES

- A. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing on epoxy nonshrink grout, as described in Section 03610, Precision Grouting. Concrete surfaces shall be rough, clean, free of oil, grease and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions.
- B. Grout fill which is formed in place by using rotating equipment as a screed, such as for clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.

3.09 EQUIPMENT PADS

Unless otherwise shown or directed, all equipment and items such as lockers, motor control centers, etc., shall be installed on concrete bases. The bases shall be constructed to the dimensions shown on the Drawings or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the equipment base. In general, the concrete bases shall be placed up to 1-inch below the base. The equipment shall then be properly shimmed to grade and the 1-inch void filled with nonshrink epoxy grout as described in Section 03610, Precision Grouting.

END OF SECTION



SECTION 03350 - CONCRETE FINISHES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide processed concrete surface finishes:

1. Floor Slabs - Steel Troweled
2. Exposed Surfaces - Rubbed

1.02 SUBMITTALS

Submit for approval samples, product data, 4' by 4' mock-ups.

1.03 QUALITY ASSURANCE

Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

Concrete design mixes based on application and surface integrity.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Floor Slabs: Steel trowel to hard finish without adding cement or other additives (Conform to ACI Code).
- B. Exposed Surfaces: All formed concrete surfaces, exposed to view, interior and exterior, shall have a finish conforming to ACI 301 Specifications for Structural Concrete for Buildings; Grout Cleaned Finish (Limited to one foot below grade and one foot below the minimum liquid level for structures that will contain liquids).

END OF SECTION



SECTION 03370 - CONCRETE CURING

PART 1 - GENERAL

1.01 WORK INCLUDED

Concrete curing materials and methods.

1.02 RELATED WORK

Section 03310 - Structural Concrete.

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete Buildings.
- B. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- C. ASTM D2103 - Polyethylene Film and Sheeting.
- D. FS TT-C-800 - Curing Compound, Concrete for New and Existing Surfaces.

1.04 QUALITY ASSURANCE

Conform to requirements of ACI 301.

1.05 SUBMITTALS

Submit manufacturer's product data and installation instruction in accordance with the requirements of Section 01300.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Water: Clean and not detrimental to concrete curing.
- B. Absorptive Mat: Burlap fabric of clean, roll goods.
- C. Membrane Curing Compound: Clear finish, conforming to ASTM C-309, Type 1-D, Class A or B.
- D. Impervious sheet conforming to ASTM C-171, polyethylene film shall be white opaque.

PART 3 - EXECUTION

3.01 GENERAL

Protect freshly placed concrete from premature drying and excessive temperatures. Begin curing immediately after free water has disappeared from exposed surface. Keep exposed surface continuously moist for not less than seven (7) days.

3.02 MEMBRANE CURING COMPOUND

- A. Apply curing compound in two (2) coats with second coat at right angles to the first.
- B. Apply in accordance with manufacturer's instructions.

3.03 SPRAYING

Spray water over slab areas; maintain continuously moist for seven (7) days.

3.04 ABSORPTIVE MAT

Spread absorptive mat over slab areas. Lap edges and ends 12 inches. Spray with water until mat saturation. Maintain saturation for seven (7) days.

3.05 CURING COMPOUNDS

- A. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.
- B. 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.
- C. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing compound.

END OF SECTION

SECTION 03610 - PRECISION GROUTING

PART 1 - GENERAL

1.01 WORK INCLUDED

Provide all labor, material, equipment and services required for grouting of equipment, machinery, structural steel, handrails, anchor bolts and other items or work for which grouting is specified or required. All unnecessary holes, openings and cracks in existing concrete shall be filled and patched.

1.02 DESCRIPTION OF WORK

Provide labor and materials to set anchor bolts and provide high-strength, precision support of machine bases and soleplates, including supporting equipment subject to thermal movement and repetitive dynamic loading by means of a non-shrink, ready-to-use, precision grout material.

1.03 RELATED WORK

- A. Section 03310 - Cast-in-Place Structural Concrete.
- B. Review all divisions and sections for equipment, machinery and other items to be grouted.

1.04 QUALITY ASSURANCE

- A. Comply with the following codes, standards, test and recommended practices for foundation concrete as apply to precision grouting:
 - 1. ACI 347 "Recommended Practice for Concrete Formwork".
 - 2. ASTM C 309 "Standard Specifications for Liquid Membrane Forming Compounds for Curing Concrete".
- B. Manufacturer's Information on Use of Grout: Attached to each bag of grout.

1.05 SUBMITTALS

Manufacturer's data of grout to be used shall be submitted to Engineer for review in accordance with the requirements of the General Conditions and Section 01300.

PART 2 - PRODUCTS

2.01 GROUT

- A. Precision-support grout shall consist of a non-shrink, ready-to-use, precision grout material; proportioned, pre-mixed and packaged at the factory; delivered to the job site to place with only the addition of water; forming, placing and curing as stipulated by the manufacturer.
- B. Grouts which depend upon aluminum powders, chemicals, or other agents which produce gas for expansion are not acceptable.

C. Precision-support grout shall also meet the following requirements:

1. Free of gas producing agents.
2. Free of oxidizing catalysts.
3. Free of inorganic accelerators, including chlorides.

2.02 WATER

Water shall be suitable for drinking.

PART 3 - EXECUTION

3.01 PREPARATION FOR GROUTING

- A. Remove laitance down to sound concrete.
- B. Surface to receive grout shall be rough and reasonably level.
- C. Surface shall be properly cured. DO NOT USE CURING COMPOUNDS.
- D. Clean surface of oil, grease, dirt, and loose particles.
- E. Clean bolt holes, bolts and underside of equipment base.
- F. Install per manufacturer's recommendations.

3.02 FORMWORK

- A. Formwork shall be compatible with proposed method of placing grout. Design for rapid, continuous and complete filling of space to be grouted.
- B. Build strong, tight forms braced so they will not leak or buckle under weight of fluid grout.

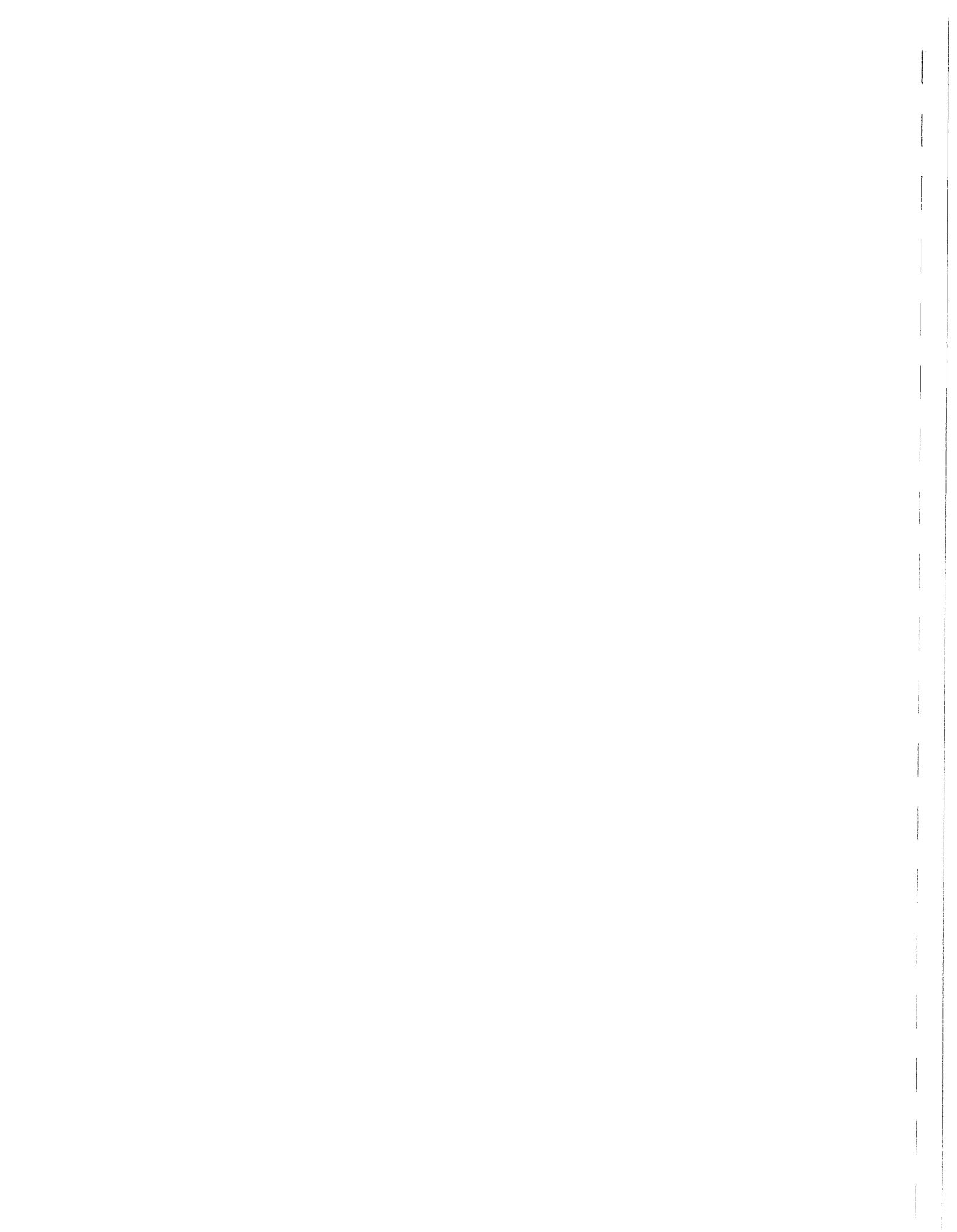
3.03 FINISHING AND CURING

- A. Follow manufacturer's printed instructions for the brand and type of grout being used.
- B. The grout shall meet the following compressive strength standards:

	Plastic Mix	Flowable Mix
1 day	4,000 psi	2,000 psi
3 days	6,000 psi	3,000 psi
7 days	8,000 psi	5,000 psi
28 days	10,000 psi	7,000 psi

END OF SECTION

Division 4 - Masonry



SECTION 04230 - REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI): 530.1/ASCE 6/TMS 602, Building Code Requirements for Masonry Structures and Specifications for Masonry Structures and Related Commentaries.
2. ASTM International (ASTM):
 - a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - b. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - c. C33, Standard Specification for Concrete Aggregates.
 - d. C90, Standard Specification for Loadbearing Concrete Masonry Units.
 - e. C140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - f. C144, Standard Specification for Aggregate for Masonry Mortar.
 - g. C150, Standard Specification for Portland Cement.
 - h. C207, Standard Specification for Hydrated Lime for Masonry Purposes.
 - i. C216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
 - j. C270, Standard Specification for Mortar for Unit Masonry.
 - k. C404, Standard Specification for Aggregates for Masonry Grout.
 - l. C476, Standard Specification for Grout for Masonry.
 - m. C652, Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale).
 - n. C744, Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
 - o. C1314, Standard Test Method for Compressive Strength of Masonry Prisms.
 - p. E514, Standard Test Method for Water Penetration and Leakage through Masonry.
3. Brick Institute of America (BIA).
4. International Building Code (IBC), Chapter 21.
5. National Concrete Masonry Association (NCMA).

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

- a. Information illustrating horizontal joint reinforcement and preformed control joint materials proposed.
- b. Grout proportions.
- c. Mortar proportions.
- d. Letter of certification stating grout aggregates and mortar sand meet requirements of ASTM C33, including nonreactivity.

2. Samples:

- a. One of each type of masonry unit to be used on Project.
- b. Mortar colors for color selection.

B. Informational Submittals:

1. Method of placing grout.
2. Certified field test results within 5 days of performing specified tests.
3. Letter of certification from masonry unit manufacturer stating that units comply with IBC Table 2105.2.2.1.2
4. Letter from water repellent admixture manufacturer verifying masonry unit manufacturer's proper use of product.
5. Certified test reports showing compliance with specified performance tests.
6. Statement of acknowledgement of Quality Assurance Plan in accordance with IBC Section 1705.3
7. Method and materials for removal of efflorescence.

1.03 QUALITY ASSURANCE

A. Masonry Unit Manufacturer: Qualified by manufacturer of water repellent admixture to use product.

B. Mockups:

1. Lay up Sample panel for each type of masonry at Site.
2. Dimensions: Minimum 4 feet high by 4 feet long.
3. May be part of permanent construction.
4. Approved panels shall serve as basis of color, texture, bond, quality of finished joints, and for acceptance of permanent construction.
5. Demonstrate ability to keep insulation and grout isolated and in certain cells during any sequence of placement, and to demonstrate materials will be restricted to cells and bond beams intended to receive each material.
6. Construction shall show areas required to receive mortar, including webs on each side of each cell to prevent insulation from entering cells to receive grout or to prevent grout from entering cells to receive insulation.
7. Where bond beams are to be used, demonstrate proper placement of both insulation and grout to bond beam level, and proper placement of bond beam prior to placement of insulation and grout above bond beam level.
8. Demonstrate proper use of running bond or stacked bond.

- C. Efflorescence: Protect masonry construction to prevent efflorescence. Provide measures to prevent moisture from entering incomplete walls. Remove all efflorescence prior to applying water repellents.
- D. Comply with the requirements and criteria of the National Concrete Masonry Association (NCMA), Brick Institute of America (BIA), ASTM C90, ASTM C216, and ACI 530.1 for masonry finish and appearance, dimension tolerances, tolerances of construction, joint tolerances, and wall plumb tolerances.

1.04 DELIVERY, STORAGE, AND HANDLING

Storage and Protection: Keep lime and other ingredients dry.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Temperature: Do not lay masonry when ambient temperature is below 32 degrees F on a rising temperature, or below 40 degrees F on a falling temperature, or when there is a probability of such conditions occurring within 48 hours, unless written approval of procedures for protection from freezing is obtained from Engineer.
- B. Moisture Protection: Protect masonry construction from loss of moisture during curing period of 7 days when ambient air temperature is 90 degrees F or greater and when relative humidity is less than 50 percent.

PART 2 - PRODUCTS

2.01 COMPRESSIVE STRENGTH OF MASONRY

Minimum 28-Day Compressive Field Strength (f'm) of Completed Assemblage:
1,500 psi.

2.02 MASONRY UNITS

- A. General:
 - 1. Furnish or cut special shapes for corners, jambs, lintels, and other areas shown or required.
 - 2. Special units shall match color and texture of standard units.
 - 3. Where units are placed so end of unit is exposed, such as at a corner or intersection, exposed end of that block shall have surface to match color and texture of sides of other units.
 - 4. Furnish sound, dry, clean units free of cracks, prior to placing in structure.
 - 5. Vertical Cells to be Grouted: Capable of alignment sufficient to maintain clear, unobstructed continuous vertical cell dimensions in accordance with ACI 530.1, Table 7.
 - 6. Masonry unit size and shape shall allow for all placement patterns to prevent materials, such as grout or poured insulation, from escaping from cell being filled to adjacent cells where material is not intended to be placed.

B. Concrete Masonry Units (CMU):

1. ASTM C90: Normal weight.
2. Nominal Size: 16 inches long by 8 inches high by thickness shown on Drawings.
3. Compressive Strength: 1,900 psi minimum, in accordance with ASTM C90, Table 2.
4. Color of Units: Natural.
5. Surface Texture on Exposed Surfaces: Smooth.
6. Surface Texture: Smooth on interior, concealed exterior, and surface 1 foot below finished grade.

2.03 MORTAR AND GROUT MATERIALS

A. Cement: ASTM C150, Type II, portland cement.

B. Lime: ASTM C207, Type S hydrated.

C. Aggregates:

1. Mortar: ASTM C144, sand.
2. Grout: ASTM C404.

D. Water: Fresh, clean, and potable.

E. Grout Admixture:

1. Controlled expansion additive.
2. Manufacturer and Product: Sika Corporation, Lyndhurst, NJ; Grout Aid.

2.04 REINFORCEMENT

A. Horizontal Joint Reinforcement:

1. Two parallel, ASTM A82, No. 9 wires, galvanized in accordance with ASTM A153/A153M, weld connected to No. 9 perpendicular cross wire at 16 inches, maximum, on center.
2. Reinforcement: Clean and free from loose rust, scale, and coatings that reduce bond.
3. Furnish special manufactured corner and wall intersection pieces.
4. Manufacturer: Dur-O-Wal, Inc., Aurora, IL.

B. Deformed Bars: As specified in Section 03210, Reinforcing Steel.

2.05 PREFORMED CONTROL JOINTS

A. Solid rubber cross-shape extrusions as manufactured by:

1. Dur-O-Wal, Inc., Aurora, IL; Regular Rapid Control Joint.
2. Sonneborn-Contech Co., Oakland, CA; Sonneborn Control Joint.
3. Hohmann and Barnard, Inc; #RS-Standard.

2.06 MORTAR MIXES

- A. Minimum average mortar 28-day compressive strength 1,800 psi.
- B. Proportions:
 - 1. In accordance with ASTM C270, Type S.
 - 2. Mortar plasticizer admixture may be substituted for lime. Batch in accordance with ICC, ICBO, BOCA, or Standard Building Code Current Reports for specified mortar type and strength.
- C. Mixing:
 - 1. Machine mix in approved mixers.
 - 2. Keep mixer drums clean and free of debris and dried mortar.
 - 3. Mix by placing 1/2 water and 1/2 aggregate in operating mixer.
 - 4. Add cement.
 - 5. Add remaining aggregate and water and mix for at least 2 minutes.
 - 6. Add lime and continue mixing as long as needed to secure a uniform mass, but no less than 3 minutes after addition of lime.
 - 7. Time addition of admixture in accordance with manufacturer's instructions. Procedure used for adding it to mix shall provide good dispersion.
 - 8. Follow manufacturer's instructions for mortar plasticizer admixture.

2.07 GROUT MIXES

- A. Proportions: Conform to ASTM C476 for coarse grout and as follows:
 - 1. Compressive Strength: Minimum 2,000 psi at 28 days.
 - 2. For Pouring:
 - a. Fluid consistency (suitable for pouring without segregation) meeting requirements of ASTM C476.
 - b. Conform to IBC Table 2103.10, except as noted.
 - 3. For Pumping: Fluid consistency with minimum seven sacks of cement in each cubic yard.
- B. Mixing:
 - 1. Onsite: Follow procedure specified in Article Mortar Production.
 - 2. Transit-Mixed Grout: Meet requirements of ASTM C476.
 - 3. Add approved grout expansion admixture in accordance with manufacturer's recommendations. Premix admixture with water and add resulting solution to grout mix and thoroughly mix. Do not exceed quantity of admixture recommended by manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prepare surface contact area of foundation concrete for initial mortar placement by one of following methods:
 - 1. Sandblasting foundation and reinforcing dowels after concrete has fully cured to remove laitance and spillage and to expose sound aggregate.
 - 2. Water blasting foundation and reinforcing dowels after concrete has partially cured to remove laitance and spillage and to expose sound aggregate.
 - 3. Green cutting fresh concrete with high pressure water and hand tools to remove laitance and spillage from foundation and reinforcing dowels and to expose sound aggregate.
- B. Clean surfaces of loose material prior to initial mortar placement.
- C. Prevent surface damage to foundation concrete that will be exposed to view outside of contact area.

3.02 LAYING MASONRY UNITS

- A. General:
 - 1. Conform to building code applicable to this Project and as supplemented by these Specifications.
 - 2. Do not start laying masonry units unless foundation wall is plumb within 1/4 inch in 10 feet or not straight within 5/16 inch in 10 feet.
 - 3. Finish Tolerances (Measured on Interior Surfaces):
 - a. Maximum permissible variation from plumb of masonry wall or of line of joints in masonry wall: 1/16 inch per foot of height and 1/4 inch in total height of wall.
 - b. Maximum permissible variation from horizontal line along base of wall or for lines of horizontal joints: 1/16 inch per block and 1/4 inch per 50 feet of wall with proportionately greater tolerance for longer walls up to 1/2 inch in total length of wall.
 - 4. Place units with chipped edges or corners such that chipped area is not exposed to view.
- B. Wall Units:
 - 1. General:
 - a. If necessary to move a unit after once set in-place, remove from wall, clean, and set in fresh mortar.
 - b. Tothing of masonry units is not permitted.
 - 2. Running Bond:

- a. Unless otherwise shown, lay up walls in straight, level, and uniform courses using a running bond pattern.
 - b. Place units for continuous vertical cells and mortar joints to prevent materials, such as grout or poured insulation, from escaping from cell being filled to adjacent cells where material is not intended to be placed.
- 3. Corners: Lay standard masonry bond for overlapping units and grout solid.
 - 4. Intersecting Walls: Bond with reinforcement, not with masonry bond.
- C. Special Shapes:
- 1. Provide and place such special units as corner block, doorjamb block, lintel block fillers, and similar blocks as may be required.
 - 2. Use required shapes and sizes to work to corners and openings, maintaining proper bond throughout wall.

3.03 BUILT-IN ITEMS

- A. Position door frames, windows, vents, louvers, and other items to be built in wall, and construct wall around them.
- B. Install masonry anchors to secure items to wall.
- C. Fill spaces around items with mortar or grout.
- D. Do not place electrical, instrumentation, or water conduits in a cell containing reinforcement, unless approved in writing by Engineer. Pipes, sleeves, and conduits shall not be placed closer than three diameters, center-to-center, nor shall they impair strength of construction.

3.04 MORTAR JOINTS

- A. General:
 - 1. Straight, clean, with uniform thickness of 3/8 inch.
 - 2. Horizontal and vertical mortar joints shall have full mortar coverage on face shells.
 - 3. Vertical Head Joints:
 - a. Butter well on each unit for a width equal to face shell of unit, shove tightly so mortar bonds well to both units.
 - b. Solidly fill joints from face of block to at least depth of face shell.
 - 4. As units are laid, remove excess mortar from grout space of cells to be filled.
 - 5. Place mortar before initial setting of cement takes place. Do not retemper mortar that has started to set or is not used within one hour. Retempering of colored mortar is not allowed.

B. Exposed Joints:

1. Tool joints exposed to view after final construction, unless otherwise noted or shown.
2. Cut joints flush and as mortar takes its initial set tool to provide a concave joint.
3. Perform tooling when mortar is partially set but still sufficiently plastic to bond.
4. Perform tooling with tool that compacts mortar, pressing excess mortar out rather than dragging it out.
5. Rake out joints that are not tight at time of tooling, point, and then tool.
6. Rake and tool joints at split-face surfaces, interior and exterior.

C. Concealed Joints: Strike flush with no further treatment required.

3.05 CONTROL JOINTS

A. Preformed Control Joints:

1. Omit mortar from vertical joints.
2. Place rubber control joint material as wall is built.
3. After wall is grouted, cured, and cleaned, install backing rod and sealant as specified in Section 07900, Joint Sealants.
4. Place and tool sealant to match depth of typical joint.

3.06 REINFORCING

A. Foundation Dowels:

1. Size, number, and location of foundation dowels shall match vertical wall reinforcing, unless otherwise noted.
2. When foundation dowel does not line up as intended, with vertical core, do not slope more than 1 horizontal to 6 vertical to bring it into alignment.

B. Vertical Reinforcing:

1. Use deformed bars.
2. Hold in position near the ends of bars by wire ties to dowels or by reinforcing positioners.
3. Lap reinforcing bars as shown, where spliced and wire tie together.
4. Minimum Bar Clearance: One bar diameter from masonry and from additional parallel bars in same grout space.

C. Horizontal Reinforcing:

1. Use deformed bars.
2. Lay on webs of bond beam units and place as wall is built.
3. Lap reinforcing bars as shown, where spliced and wire tie together.
4. Minimum Bar Clearance: One bar diameter from masonry and from additional parallel bars in same grout space.
5. Terminate reinforcing bars 2 inches clear from control joints as shown.

3.07 MORTAR PRODUCTION

A. General:

1. Mix ingredients 3 to 5 minutes after all ingredients are introduced.
2. Provide volumetric control by using batching box or similar measuring device. Do not use shovel to introduce materials directly into batch.
3. Keep sand damp and loose.
4. Use cool mix water.

3.08 GROUTING

A. General:

1. Do not mix, convey, or place with equipment constructed of aluminum.
2. Secure vertical and horizontal reinforcement, ties, bolts, anchors, and other required embedments in place; inspect and verify before placing grout.
3. Grout beams over openings in one continuous operation.
4. Maintain vertical alignment in ACI 530.1, Table 7.
5. Place grout as soon as possible after mortar has set to reduce shrinkage cracking of vertical joints.
6. Vertical Reinforcement:
 - a. First wire tie to foundation dowels, then build wall around it.
 - b. Provide reinforcing positioners or approved cross bracing to secure top of steel in place.
 - c. Do not drop in vertical steel after block is laid, unless reinforcing positioners are provided in the course above previously grouted course.

B. Grouting Requirements:

1. Slump: 8 inches to 11 inches.
2. Do not start grouting until wall has cured for 24 hours, minimum.
3. Partial Grouting Requirements:
 - a. Walls Not Requiring Solid Grouting: Fill cells containing reinforcing steel, anchor bolts, and other embedded items as shown with grout.
 - b. Construct cells to be filled to confine grout within cell.
 - c. Cover tops of unfilled vertical cells under a bond beam with metal lath to confine grout fill to bond beam section.
4. Form horizontal construction joints between pours by stopping grout pour 1-1/2 inches below a mortar joint, except at a bond beam; stop pour 1/2 inch below top of masonry unit.
5. Partial Grouting with Insulation Fill:
 - a. Where cells of masonry units are to receive masonry fill insulation in some cells and to receive grout in some cells,

- provide continuous mortar on block webs on each side of cells to be filled with grout to ensure insulation will not enter grout cells.
- b. Where bond beams are required with masonry fill insulation and grout, limit pours to less than 6 feet in height.
6. Fully embed horizontal steel with grout in an uninterrupted pour.
 7. Do not construct wall more than one course above top of grout pour prior to placing grout.
 8. Vibration:
 - a. Use internal "pencil" type, low energy vibrator to thoroughly consolidate grout and reduce amount of air voids. Do not use concrete vibrators.
 - b. After waiting sufficient time to permit grout to become plastic, but before it has taken any set, reconsolidate grout.
 - c. Waiting period will vary depending upon weather conditions and block absorption rates, but under "normal" weather conditions with average masonry units the waiting period should be between 30 to 60 minutes.
 9. Cleanouts:
 - a. Provide for grout pours over 5 feet in height.
 - b. Provide of sufficient size to permit cleaning of cell, positioning of reinforcing, and inspection at bottom of every vertical cell containing reinforcing.
 - c. Location: Concealed from view after final construction, unless otherwise approved by Engineer.
 - d. After wall has been inspected and approved and prior to grouting, cap cleanouts in a manner that will seal them from grout leakage and provide a flush finish.

3.09 FIELD QUALITY CONTROL

- A. Special Inspection of masonry in accordance with IBC Section 1704.5.
- B. Masonry shall be tested by testing agency retained by Owner, in accordance with ASTM C1314, Method B, as modified by ACI 530.1/ASCE 6.
- C. Masonry test prisms, when required, shall be constructed onsite with same materials and workmanship to be used for Project.
- D. Provide adequate facilities for safe storage and proper curing of masonry prisms, mortar samples, and grout samples, as applicable, onsite for first 24 hours, and for additional time as may be required before transporting to test lab.
- E. Masonry Testing:
 1. Prism Testing:
 - a. Method and frequency of sampling and testing in accordance with: IBC Section 2105.2.2.2.

- b. Prior to start of construction, construct and test a set of three prisms.
 - c. During construction, construct and test an additional set of three prisms for each 5,000 square feet of wall area.
 - d. Prepare and submit test report for each set of prisms which includes name of testing lab and individual, dimensions, descriptions of materials, age of prism, maximum test load, net area, and compressive strength for each prism and for the set.
2. Unit Strength Method:
- a. Method and frequency for mortar, grout, and masonry unit sampling and testing in accordance with IBC 2105.2.2.1.
 - b. Provide masonry units for test samples required.

F. Corrective Action:

- 1. If compressive strength tests made prior to construction of permanent structure fail to meet Specifications, adjustments shall be made to mix designs for mortar, or grout, or both, as needed to produce specified strength. Masonry units shall also be tested to verify compliance to requirements of ASTM C90, Type 1.
- 2. If strength tests performed on materials representative of in-place construction fail to meet Specifications, prisms or cores shall be cut from constructed walls in sufficient locations to adequately determine strength in accordance with IBC 2105.3.

3.10 CLEANING

- A. Immediately after completion of grouting, clean masonry surfaces of excess mortar, grout spillage, scum, stains, dirt, and other foreign substances using clean water and fiber brushes.
- B. Clean walls not requiring painting or sealing so there are no visible stains.

3.11 PROTECTION OF INSTALLED WORK

- A. Do not allow grout and mortar stains to dry on face of exposed masonry.
- B. Protect tops of walls at all times. Cover tops of walls with waterproof paper when rain or snow is imminent and when the Work is discontinued.
- C. Adequately brace walls until walls and roof are completed.
- D. Provide sufficient bracing to protect walls against damage from elements, including wind and snow.
- E. Protect masonry against freezing for minimum 72 hours after being laid.
- F. Protect masonry from damage until final acceptance of the Work. Damaged units will not be accepted.

END OF SECTION



SECTION 04270 - GLASS UNIT MASONRY

PART 1 - GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Welding Society (AWS): D1.1, Structural Welding Code-Steel.
 2. ASTM International (ASTM):
 - a. A36, Standard Specification for Structural Steel.
 - b. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - c. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - d. A580, Standard Specification for Stainless and Heat-Resisting Steel Wire.
 - e. A641, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - f. C144, Standard Specification for Aggregate for Masonry Mortar.
 - g. C150, Standard Specification for Portland Cement.
 - h. C207, Standard Specification for Hydrated Lime For Masonry Purposes.
 - i. C270, Standard Specification for Mortar for Unit Masonry.
 - j. E163, Method of Fire Tests of Window Assemblies.

1.02 SUBMITTALS

- A. Action Submittals:
1. Manufacturer's technical data for glass block, cementitious materials, waterproofing admixtures for mortar, and glass unit masonry accessories.
 2. Samples:
 - a. Glass block for each form, pattern, and color.
 - b. Manufacturer's standard color chart showing range of mortar colors.

1.03 QUALITY ASSURANCE

Field Constructed Mockups: Erect mockup of typical exterior panel using the same materials for final Work. Locate mockups on Project Site in locations directed by Engineer. Obtain Engineer's acceptance of panels' visual qualities before starting Work of glass unit masonry. Retain and maintain mockups in undisturbed condition during construction as standard for judging completed Work.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store unopened cartons of glass block in a clean, cool, dry area.

- B. Protect glass block, aggregate, cementitious materials and metal accessories during storage and construction from damage, soiling, moisture, and deterioration.

1.05 ENVIRONMENTAL REQUIREMENTS

Temperature Limitations: Do not install glass unit masonry when atmospheric temperature is 40 degrees F and below.

1.06 SEQUENCING AND SCHEDULING

Sequence and coordinate completion of glass unit masonry so that sealants and joint fillers can be installed immediately after mortar has attained final set.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Materials, and accessories specified in this section shall be products of:

- 1. Hollow Glass Block:
 - a. Circle Redmont Corp.
 - b. Hollander Glass East, Inc.
 - c. New High Glass.
 - d. Pittsburgh Corning Corp.
 - e. Saint-Gobain, Euroglass Corp.
 - f. Solaris U.S.A.
 - g. Westerwald A.G.
 - h. Weck, Glashaus Division

2.02 GLASS BLOCK

- A. Hollow Glass Block: Nonloadbearing blocks made by fusing together two halves of clear, colorless pressed glass to produce a partial vacuum; with manufacturer's standard coating factory applied on edge surfaces.

- 1. Solar Reflective Pattern: Smooth outer and inner faces with metal oxide coating applied on one outer face.
- 2. Edge Coating Color: Manufacturer's standard white color.
- 3. Square Unit Sizes: 3-7/8 inches thick by 7-3/4 inches square.
- 4. Fibrous Inserts: Hollow units with cavities containing manufacturer's standard insulating and light transmitting glass fiber inserts.

2.03 MORTAR MATERIALS

- A. Portland Cement: ASTM C150, Type I.

- 1. Cement Color: White.
- 2. Cement Color: Color pigmented, factory prepackaged standard product consisting of white cement combined with color fast mineral pigments.

- B. Hydrated Lime: ASTM C207, Type S.

- C. Aggregate for Mortar: ASTM C144.
 - 1. Joints 1/4 inch or less in thickness furnish aggregate graded for thin joints.
 - 2. Joints of hollow glass block with solar reflective pattern, furnish aggregate free of iron compounds.
 - 3. Colored Aggregate Mortar: Natural sand or sand manufactured from ground marble, granite or other sound, in combination with other mortar materials, to produce mortar color.
- D. Water: Potable, free of substances capable of having a deleterious effect on mortar or glass unit masonry.
- E. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use pigments that are nonstaining to glass block.

2.04 ACCESSORIES

- A. Panel (Joint) Reinforcement: Ladder type welded wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet.
 - 1. Zinc-Coated (Galvanized) Steel Wire: ASTM A82 for uncoated wire and ASTM A641 for Class 3 zinc coating (0.80 ounce per square foot of uncoated wire surface).
 - 2. Hot-Dip Galvanized Steel Wire: ASTM A82 for uncoated wire and ASTM A153 for zinc coating applied by hot-dip process to products after fabrication and assembly.
 - 3. Austenitic Stainless Steel Wire: ASTM A580, AISI Type 304 (UNS S30400) alloy.
 - 4. Wire Size: 0.1483-inch diameter.
- B. Panel Anchors: Glass unit masonry manufacturer's standard perforated steel strips, 0.0359-inch uncoated thickness by 1-3/4 inches wide by 24 inches long, hot-dip galvanized after perforating, conforming with ASTM A153, Class B.
- C. Asphalt Emulsion: Water based, of type recommended by glass unit masonry manufacturer.
- D. Backer rod and sealant are specified in Section 07900, Joint Sealants.
- E. Glass Fiber Expansion Strips: 4-pound density, 3/8 inch thick by 24 inches long by 4 inches wide for panels with channel or chase construction.
- F. Plastic Foam Expansion Strips: Black polyethylene foam, 3/8 inch thick by 24 inches long by 4 inches wide for panels with channel or chase construction.
- G. Dovetail Wire Ties: Trapezoidal shaped ties fabricated from 3/16-inch steel wire in conformance with ASTM A82 for uncoated wire and ASTM A641 for

Class 3 zinc coating, attached to 0.0146-inch thick galvanized strap shaped to engage dovetail slot.

- H. Dovetail Slots: Fabricated from 0.0329-inch galvanized steel, with filler strips.

2.05 MORTAR MIXES

- A. Do not lower the freezing point of mortar by use of admixtures or antifreeze agents. Do not use calcium chloride.
- B. Mortar for Glass Unit Masonry: ASTM C270, proportion specification, for Type S portland cement lime mortar.
 - 1. For mortar in exterior panels, include waterproofing admixture in mortar mix in accordance with directions of admixture manufacturer.
 - 2. Colored Aggregate Mortar: Produce mortar of color required by use of colored aggregates in combination with selected cementitious materials.
- C. Mix mortar in a mechanical batch mixer to produce a stiff but workable consistency which is drier than mortar for ordinary unit masonry; do not retemper mortar after it has taken its initial set.

PART 3 - EXECUTION

3.01 EXAMINATION

Examine sills, jambs, and heads surrounding glass unit masonry panels to verify that they are complete and of correct size and location to receive glass unit masonry.

3.02 INSTALLATION

- A. Sill, Head, and Jamb Preparation: Apply a heavy coat of asphalt emulsion to sill; allow to dry before placing mortar. Adhere expansion strips to jambs and heads with asphalt emulsion, taking care to extend expansion strips to sill.
- B. Setting Glass Unit Masonry: Set first and succeeding courses of glass unit masonry with completely filled bed and head mortar joints with no furrowing.
 - 1. Lay-up glass unit masonry plumb with courses level, accurately spaced. Joint width 1/4 inch.
 - 2. Use rubber mallet to tap units into position; do not use steel tools and do not allow units to come into contact with metal accessories and frames.
 - 3. Use wedges in mortar joints of lower courses to prevent mortar from being squeezed out of joints.
 - 4. Keep expansion joints free of mortar.
 - 5. Rake out mortar from joints in exterior panels to a uniform depth equal to joint width to accommodate pointing material.

6. Fill raked joints and voids with pointing mortar. Apply in layers; fully compact each layer and allow to become thumbprint hard before applying next layer.
 7. Pointing of joints in exterior walls with sealant, including installation of joint sealants after final mortar set; in accordance with Section 07900, Joint Sealants.
 8. Tool exposed joints slightly concave using a jointer larger than joint width; perform tooling while mortar is still plastic and before it takes final set.
 9. Remove wedges, if used, and fill voids with mortar.
 10. Remove surplus mortar from face of glass block at time joints are tooled.
- C. Install panel reinforcing in horizontal joints, to run continuously from end to end of panels.
1. Application of Austenitic Stainless Steel Wire: Use for reinforcement of exterior panels.
 2. Spacing of Side Rods: 2 inches center to center.
 3. Spacing of Cross Rods: Not more than 16 inches apart.
 4. Vertical Spacing of Panel Reinforcing: Not more than 24 inches on center for units over 3-1/8 inches thick.
 5. Do not bridge expansion joints with panel reinforcing.
 6. Place panel reinforcing in joints immediately above and below all openings within glass unit masonry panels.
 7. Lap panel reinforcing not less than 6 inches where more than one length is necessary.
 8. Embed panel reinforcing in mortar bed by placing lower half of mortar bed first, then pressing panel reinforcing into place and covering with upper half of mortar bed and then troweling it smooth.
- D. Install panel anchors at locations shown on Drawings and in same horizontal joints where panel reinforcing occurs. Extend panel anchors at least 12 inches into joints and bend within expansion joints at edges of panels.
- E. For installation of dovetail slots furnished under this section, see Division 3; advise concrete installer of specific requirements regarding placement of slots to support glass unit masonry Work.

3.03 CLEANING

- A. Remove surplus mortar from the faces of the glass block at the time joints are struck or tooled. Remove mortar while it is still plastic using a clean, wet sponge or an ordinary household scrub brush having stiff fiber bristles. Do not use harsh cleaners, acids, abrasives, or alkaline materials while cleaning glass block surfaces.
- B. Final mortar removal is accomplished with a clean, wet sponge or cloth. Rinse sponge or cloth frequently in clean water to remove abrasive particles. Allow any remaining film on the block to dry to a powder.

- C. After sealants and caulking have been applied, remove excess caulking with commercial solvents such as xylene, toluene, mineral spirits, or naphtha and follow with normal wash and rinse. Ensure not to damage caulking by over generous application of strong solvents. Comply with solvent manufacturers' directions on label for toxicity and flammability warnings.
- D. Exercise special care when cleaning solar reflective glass block. It is possible to scratch the oxide coating. Fingerprints, grease stains, dirt, scum, sealant residue, scratches, and abrasion are more noticeable on solar reflective glass block than on nonreflective glass block.

END OF SECTION

SECTION 04813 - MASONRY VENEER

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. B370, Standard Specification for Copper Sheet and Strip for Building Construction.
 - b. C91, Standard Specification for Masonry Cement.
 - c. C126, Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
 - d. C144, Standard Specification for Aggregate for Masonry Mortar.
 - e. C150, Standard Specification for Portland Cement.
 - f. C207, Standard Specification for Hydrated Lime for Masonry Purposes.
 - g. C216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
 - h. C270, Standard Specification for Mortar for Unit Masonry.
 - i. C404, Standard Specification for Aggregates for Masonry Grout.
 - j. C476, Standard Specification for Grout for Masonry.
 - k. C652, Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale).
 - l. D1056, Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
 - a. Manufacturer's product information.
 - b. Mix designs for mortar and grout.
 - c. Details for cast stone units and special brick shapes and assemblies.
2. Samples:
 - a. Full-size units for each different exposed masonry unit required showing full range of exposed color, texture, and dimensions to be expected in completed construction. Match selected Samples at Engineer's office or listed in Finish Schedule.
 - 1) Include size variation data verifying that actual range of sizes for brick falls within ASTM C216 dimension tolerances for brick where modular dimensioning is indicated.

- b. Colored masonry mortar Samples for each color required showing the full range of colors expected in the finished construction. Label Samples to indicate type and amount of colorant used.
- c. Stone trim Samples not less than 12 inches in length showing full range of colors and textures expected in finished construction.
- d. Accessories embedded in the masonry.

B. Informational Submittals:

- 1. Experience record of mortar color pigment proposed for use.
- 2. Manufacturer's certificate of compliance for the masonry units specified herein.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: For masonry construction meet requirements of the International Building Code and as supplemented by these Specifications.
- B. Mockups: Lay up a Sample panel for each type of masonry at the Site to show the bond pattern and method of finishing joints. Make Sample panels 4 feet high and 4 feet long, and may be a part of the permanent construction. The acceptable Sample panel serves as a basis of color, texture, pattern, and workmanship for acceptance of the permanent construction.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection:
 - 1. Store all masonry materials off ground and protected from precipitation.
 - 2. Protect veneer materials from mud splatters and staining.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Temperature: Do not lay masonry when the ambient temperature is below 32 degrees F on a rising temperature or below 40 degrees F on a falling temperature, or when there is a probability of such conditions occurring within 48 hours, unless express approval of Engineer is obtained. In such case, make special provisions for heating materials and protecting the finished Work. Protect masonry against freezing for a minimum of 48 hours after being laid. Protect the tops of walls from precipitation at all times. Cover with waterproof paper when rain or snow is imminent and the Work is discontinued.
- B. Humidity: Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 99 degrees F (37 degrees C) in the shade with relative humidity less than 50 percent.

PART 2 - PRODUCTS

2.01 MASONRY UNITS

- A. Color, Texture, and Pattern: Match the submitted Samples approved by the Engineer.
- B. Facing Brick: ASTM C216, Grade SW, Type FBX. Minimum compressive strength for individual brick: 2,500 psi; size: 8 inches by 4 inches by 2-2/3 inches.
- C. Stone: Type color, texture, and pattern similar to Samples selected by the Engineer; thickness range: 4 inches.

2.02 CAST STONE

- A. Homogeneous, manufactured from portland cement concrete, precast, and of the same composition throughout each piece. The use of selected aggregates for the faces only is expressly prohibited.
- B. Sound and perfect, with sharp and true corners.
- C. Furnish with holes, reglets, rebates, and other features as required by the design and for installation.
- D. Aggregate: Known durability; proportioned to produce maximum density.
- E. Properties:
 - 1. Minimum Compressive Strength: 7,000 psi.
 - 2. Maximum Average Water Absorption: 5 percent.
- F. Reinforcing: By manufacturer as required for strength of unit.
- G. Properly cure prior to delivery.
- H. Coating:
 - 1. Coat each stone with an acrylic textured coating.
 - 2. Manufacturer/Product: Thoro System Products; Thorocoat.
- I. Manufacturers:
 - 1. Art Cement Products, Wilbrahram, MA.
 - 2. Durastone Co., Inc., Lincoln, RI.
 - 3. Londino Stone Company, Inc., Bronx, NY.
 - 4. Pennsylvania Stone Products, York, PA.
 - 5. W.N. Russell and Company, Westmont, NJ.

2.03 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91, low alkali content (0.03 percent maximum).

- B. Portland Cement: ASTM C150, Type I, low alkali content (0.60 percent maximum).
- C. Lime: ASTM C207, Type S.
- D. Mortar: ASTM C270, Type S. Consisting of one part portland cement, from 1/4 to 1/2 part lime putty or hydrated lime, and clean well-graded sand in the proportion of three times the sum of the cementitious material; or 1/2 part portland cement, one part masonry cement, and clean well-graded sand in the proportion of three times the sum of the cementitious material.
 - 1. If color is added, add in a consistent manner to provide final uniformity.
 - 2. No antifreeze liquid, salts, or other substances are allowed to lower the freezing point. No calcium chloride is allowed in the mortar.
- E. Tuck-Pointing Mortar: Prehydrated Type N, one part portland cement, one part Type S hydrated lime, and six parts sand, by volume.
- F. Sand: ASTM C144, in addition not less than 5 percent passes the No. 100 sieve.
- G. Water: Fresh, clean, and free of deleterious acids, alkalies, chlorides, and organic materials.

2.04 COMPRESSIBLE PADS

ASTM D1056, closed cell neoprene sponge, 3 inches wide by 1/4 inch thick, with pressure sensitive adhesive applied on one side.

2.05 CAVITY WALL INSULATION, AIR BARRIER, AIR SEAL, AND DAMPPROOF FLASHING

As specified in Section 07210, Building Insulation.

2.06 ACCESSORIES

- A. Vent Weep-holes: Flexible ultraviolet resistant polypropylene cell vent weep-hole ventilator as manufactured by Dur O-Wall.
- B. Expansion/Control Joint Filler: Closed cell expanded polyethylene, Kono Bord by Goodco Ltd.
- C. Prefabricated Control Joint: As manufactured by Dur O-Wall.
- D. Metal Lath: 0.64 mm thick min. galvanized expanded lath with opening size maximum 4 mm weighing 1.85 kg/m² min.
- E. Firestop: Refer to Section 07900, Joint Sealants.
- F. Bond Breaker: 0.15 mm polyethylene.
- G. Mortar Dropping Control Device: Mor-control by Dur-O-Wall or Mortar Maze supplied by Form & Build Supply Inc.

2.07 MASONRY ACCESSORIES AND ANCILLARY MATERIALS

- A. Manufacturers, unless noted otherwise:
 - 1. Dur-O-Wal, Inc.
 - 2. Hohmann and Barnard, Inc.
 - 3. Heckmann Building Products.

- B. Dovetail Slots and Anchor Ties: 20-gauge galvanized steel anchor slots and mating anchors. Minimum 16-gauge corrugated type of suitable length for proper embedment in the masonry joints.
 - 1. Manufacturers:
 - a. Gateway Building Products, Los Angeles, CA.
 - b. Burke Concrete Accessories, Inc., San Mateo, CA.

- C. Corrugated Wall Ties: Form of 20-gauge minimum galvanized sheet steel. Length as required by 7/8 inch wide.

- D. Horizontal Joint Reinforcement:
 - 1. Two parallel No. 9 wires, galvanized, weld connected to No. 9 perpendicular cross wire at 15 inches on center.
 - 2. Reinforcement: Clean and free from loose rust, scale, and any coatings that reduce bond.
 - 3. Furnish special manufactured corner and wall intersection pieces at these locations.

- E. Dovetail Slots and Anchor Ties:
 - 1. 20-gauge stainless steel anchor slots.
 - 2. 16-gauge stainless steel anchor tie. Length as required by 7/8-inch minimum width.
 - 3. Engage or enclose joint reinforcement with anchor tie.
 - 4. Manufacturer and Product: Dur-O-Wal, Inc., Arlington Heights, IL; seismic dovetail anchor.

- F. Adjustable Anchor Ties:
 - 1. 16-gauge stainless steel plate with slot.
 - 2. Anchor Tie: 12-gauge stainless steel pintle plate capable of being inserted into slotted plate.
 - 3. Engage or enclose No. 9 gauge wire joint reinforcing with anchor tie.
 - 4. Manufacturer and Product: Dur-O-Wal, Inc., Arlington Heights, IL; seismic Ladur-eye.

- G. Reglets for Masonry:
 - 1. Manufacturers and Products:
 - a. Superior Concrete Accessories, Franklin Park, IL; Superior Cushion Lock reglets Type B-3.

- b. Fry Reglet Corp., Glendale, CA; Fry Springlok Type MA.
- H. Paperbacked Mesh for Stone Veneer: Waterproof paper or membrane equivalent to asphalt-saturated felt free from holes and breaks and weighing not less than 14 pounds per 100 square feet. Wire mesh not less than 16 gauge at 2 inches on center with provisions for furring the mesh from the membrane, for embedment of wires.
- I. Felt: ASTM D226, Type I (No. 15) plain, unperforated asphalt saturated felt.

2.08 MORTAR PREPARATION

- A. Place one-half the water and aggregate in the operating mixer; add cement; add the remaining aggregate and water and mix for at least 2 minutes. Add lime and continue mixing as long as needed to secure a uniform mass, but no less than 3 minutes after the addition of lime. Time the addition of admixture in strict accordance with the manufacturer's instructions and the procedure used for adding it to the mix shall provide good dispersion.
- B. Mix mortar in machine with mixing drums clean and free of debris and dried mortar. Use mortar before the initial setting of the cement has taken place. Do not retemper mortar in which the cement has started to set.
- C. Retemper mortar boards by adding water within a basin formed with the mortar and the mortar reworked into the water. Dashing or pouring water over mortar and retempering of harsh, nonplastic mortar is not permitted.
- D. Where color tinting of mortar is required, add sufficient lime-proof color-fast mineral pigment to the mortar.

2.09 GROUT PREPARATION

- A. Mix grout as specified for mortar preparation if onsite mixing is performed or use transit-mixed grout, meeting the requirements of ASTM C476.
- B. Add grout admixtures at the Site, following manufacturer's recommendation. Premix the admixture with water and add resulting solution to the grout and thoroughly mix. Do not exceed quantity of admixture recommended by the manufacturer.

PART 3 -EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of masonry veneer.
- B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Provide or cut special shapes for corners, jambs, lintels, and other areas as shown or as required. Match color and texture of standard units.
- B. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.

3.03 BRICK VENEER INSTALLATION

- A. General: Do not install cracked, broken, or chipped masonry units exceeding ASTM C216 allowances. Thoroughly wet brick just before laying except in freezing weather where bricks are laid dry. Prewetting may also be omitted if the brick at the time of laying has a rate of absorption not exceeding 0.025 ounce of water per square inch of surface after being placed in 1/8 inch of water for 1 minute.
 - 1. Coordinate installation with backup walls, through wall flashing, and other construction. Use masonry saws to cut and fit exposed units. Lay brick plumb, true to line, with level courses accurately spaced, and do not furrow bed joints.
 - 2. Finish horizontal run by racking back in each course; toothing not permitted. Adjust all units to final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar, and relay with fresh mortar.
 - 3. Bond unexposed units in wythe by lapping a minimum of 2 inches. Adjust shelf angles to keep Work level at proper elevation. Provide pressure relieving joints by placing a continuous compressible pad under the shelf angle.
 - 4. When joining fresh masonry to set or partially set masonry:
 - a. Remove loose brick and mortar.
 - b. Clean and lightly wet exposed surface of set masonry prior to laying fresh masonry.
- B. Pattern: Lay brick in running bond and in pattern shown on Drawings.
- C. Mortar Beds: Lay brick with full mortar coverage on horizontal and vertical joints. Rock closures into place with head joints thrown against two adjacent bricks in-place. Do not pound corners or jambs to fit stretcher units after setting in-place. Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.
- D. Horizontal and Vertical Face Joints:
 - 1. Nominal Thickness: 3/8 inch.
 - 2. Construct uniform joints.
 - 3. Shove vertical joints tight.
 - 4. Tool joints concave in exposed surfaces when thumbprint hard using jointing tool.
 - 5. Flush cut all joints not tooled.

6. Fill horizontal joints between top of masonry partition and underside of concrete beams with mortar.
- E. Movement Joints: Keep clean of all mortar and debris.
- F. Masonry Control Joints:
1. Provide continuous vertical control joints in masonry as shown on Drawings.
 2. Omit mortar from the vertical joints. Place the control joint material as the wall is built.
 3. Provide backup rods and sealant as detailed.
- G. Flashing Dampproofing: Install as per manufacturer's recommendation.
- H. Flashing: Clean surface of masonry smooth and free from projections that might puncture, gouge, or otherwise damage flashing material.
- I. Vent Weep-Holes: Provide weep holes and where indicated in head joints in first course immediately above all flashing leaving head joint free and clean of mortar.
1. Maximum Spacing: 24 inches OC.
 2. Keep weep holes and area above flashing free of mortar droppings.
- J. Sealant Joints: Retain sealant joints around outside perimeters of exterior doors, window frames, and other wall openings:
1. Uniform Depth: 3/4 inch.
 2. Uniform Width: 1/4 inch.
- K. Nonreinforced Brick Masonry: Fill vertical, longitudinal joints by parging. Keep cavity in cavity walls clean:
1. Slightly bevel mortar bed to incline toward cavity. Place wood strips with attached wire pulls on metal ties.
 2. Remove and clean wood strips prior to placing each succeeding row of metal ties.
 3. As the Work progresses, trowel all protruding fins in cavity flat on inner surface of wythe.
- L. Anchoring: Anchor brick veneer to concrete backing with dovetail anchor ties and to CMU backing with adjustable anchor ties.
1. Maintain a space not less than 1 inch wide between masonry wall and concrete members.
 2. Keep space free of mortar or other rigid material to permit differential movement between concrete and masonry.
 3. Attach brick veneer to backing with anchor ties.
 - a. Use one dovetail anchor tie for each 2 square feet of wall area and one adjustable anchor tie for each 1.77 square feet of wall area.

- b. Maximum Space Between Adjacent Ties:
 - 1) Vertically: 16 inches.
 - 2) Horizontally: 24 inches for dovetail anchor ties. 16 inches for adjustable anchor ties.
- c. Embed ties at least 2 inches in horizontal joint of brick veneer.
- d. Provide additional ties at openings:
 - 1) Maximum Spacing Around Perimeter: 24 inches.
 - 2) Install within 12 inches of opening.
- M. Pointing: Cut out defective joints and holes in exposed masonry and repoint with mortar. Dry brush masonry surface after mortar has set at end of each day's Work and after final pointing.
- N. Air Barrier, Air Seal:
 - 1. Use material specified in Section 07210, Building Insulation.
 - 2. Prime full surface of concrete block substrate in accordance with manufacturer's instructions.
 - 3. Install continuously with 2-inch minimum lap at joints.
 - 4. Extend membrane at peripheries minimum 6 inches to join and seal air barriers provided in adjacent construction.
 - 5. Extend membrane minimum 12 inches into adjacent concrete substrates which are indicated to have no applied barrier.
 - 6. Cut and tightly seal around penetrations.
 - 7. At expansion joints install 6-inch wide strip of air barrier material looped into joint to allow for movement.
 - 8. Apply continuous uniform air barrier.
- O. Cavity Wall Insulation:
 - 1. Use material specified in Section 07210, Building Insulation.
 - 2. Install tight to face of backup material.
 - 3. Fit edge joints tightly together.
 - 4. Fit snugly between anchor ties.
 - 5. Install as brick veneer work progresses and after installation of air barrier.

3.04 SETTING CAST STONE

- A. Clean stone immediately before setting.
- B. Set each piece accurately, true to line, level, and plumb, in full bed of fresh mortar. Completely fill all joints and beds with fresh mortar.
- C. Install anchor system as shown.
- D. After stones are set in mortar, do not move or disturb in any manner that might destroy bond between cast stone and mortar. Cast stones that have been disturbed shall be removed and reset in fresh mortar.

- E. Keep faces of cast stone free of mortar. Promptly remove mortar splashed on stone faces and other surfaces. Rake joints and ends 3/4 inch deep for pointing or sealants at horizontal wash.
- F. Upon completion, clean face of stone with stiff fiber brushes and detergent and water. Rinse thoroughly with fresh water.

3.05 CLEANING

- A. Remove mortar stains with clear water as Work progresses. Upon completion, clean all exposed surfaces with a 10 percent solution of commercial muriatic acid, removing all stains with fiber brushes and rinse with clean water.
- B. Cleaning Agents: Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.
- C. Clean exposed unglazed masonry with stiff brush and clear water. If cleaning by water does not produce satisfactory results, apply cleaning agent to sample wall area of 20 square feet in location acceptable to Engineer. Do not proceed with cleaning until sample area is acceptable to Engineer.
- D. Follow manufacturer's recommendations for use of cleaning agents.
- E. Application:
 - 1. Thoroughly wet surface of masonry on which no efflorescence appears before using cleaning agent.
 - 2. Scrub with acceptable cleaning agent.
 - 3. Immediately rinse with clear water.
 - 4. Work small sections at a time.
 - 5. Work from top to bottom.
 - 6. Protect sash, metal lintels, and other materials, which may corrode when masonry is cleaned with acid solution.
 - 7. Remove efflorescence in accordance with brick manufacturer's recommendations.
- F. Leave Work area and surrounding surfaces clean and free of mortar spots, droppings, and broken masonry.

3.06 FIELD QUALITY CONTROL

- A. At least once a week while installation of masonry veneer is in progress, take mortar and grout Samples for testing. Continue on that basis for duration of installation of masonry veneer at the discretion of Engineer.
- B. Take Samples in accordance with ASTM C270 and ASTM C476, as applicable.

3.07 PROTECTION

- A. Wall Covering: During erection, cover top of wall with strong waterproof membrane at end of each day or shutdown and as follows:
 - 1. Cover partially completed walls when Work is not in progress.
 - 2. Extend cover minimum of 24 inches down both sides.
 - 3. Hold cover securely in-place.

- B. Protect sills, ledges, and offsets from mortar drippings or other damage during construction. Remove misplaced mortar or grout immediately. Protect face materials against staining. Protect the door jambs and corners from damage during construction.

END OF SECTION



Division 5 - Metals



SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide structural steel for building construction including sub-framing units which are part of the general framing system. Include anchors, bases, bearing plates, bracing, lintels when part of structural framing, and detail fittings.
- B. Modify existing structural steel systems and components to accommodate remodeling and new work.

1.02 SUBMITTALS

Submit for approval shop drawings, product data, test reports.

1.03 QUALITY ASSURANCE

Comply with governing codes and regulations. Provide products of acceptable manufacturers. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel shapes, plates and bars: ASTM A 36, or ASTM A 572, Grade 50.
- B. Steel pipe: ASTM A 53.
- C. Anchor bolts: ASTM A 307.
- D. High strength threaded fasteners: ASTM A 325.
- E. Non-metallic shrinkage resistant grout: as per requirements of Section 03610.
- F. Shop finish for structural steel in accordance to Section 09900.
- G. Galvanized lintels: Hot dip galvanized ASTM A 123.
- H. Welding: AWS D1.1.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with AISC codes and specifications, and with AWS "Structural Welding Code."

- B. Employ a registered engineer to check elevations and plumb and level tolerances; certify that installed work is within AISC Standards. Owner may engage testing/inspection agency to inspect welded and bolted connections.
- C. Architecturally exposed steel: Fabricate with special care using materials carefully selected for best appearance. Store materials off ground and keep clean. Cut, fit and assemble work with surfaces smooth, square and with complete contact at joints. Set all cambers up. Weld all work continuously; grind smooth and flush to make seams invisible after priming. Prepare surfaces to comply with SSPC-SP6; apply prime coat within 24 hours after cleaning.
- D. Touch-up field welds and abraded areas in accordance with Section 09900.

END OF SECTION

SECTION 05425 - PRE-ENGINEERED, PRE-FABRICATED
LIGHT GAUGE STEEL ROOF AND FLOOR TRUSSES

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes pre-engineered, pre-fabricated light gauge cold formed steel framing elements. Work includes:
1. Light Gauge Cold formed steel roof trusses.
 2. Anchorage, bracing and bridging.
- B. Related work:
1. Drywall attachment.
 2. Roofing, fascia, soffit.

1.02 REFERENCES

- A. Reference standards:
1. ASTM:
 - a. ASTM A653/A653M-94 "Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot Dip Process."
 - b. ASTM A780-93a "Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings."
 2. American Welding Society (AWS)
 - a. AWS D1.1 "Structural Welding Code - Steel."
 - b. AWS D1.3 "Structural Welding Code - Sheet Steel."

1.03 PERFORMANCE REQUIREMENTS

- A. AISI "Specifications": Calculate structural characteristics of cold-formed steel truss members according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members, 1986 (1990)."
- B. Structural Performance: Design, engineer, fabricate, and erect cold-formed steel trusses to withstand specified design loads within limits and under conditions required.
1. Design Loads: As specified.
 2. Deflections: Live load deflection meeting the following (unless otherwise specified):
 - a. Roof Trusses: Vertical deflection less than or equal to 1/360 of the span.
 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on

fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F (67 deg C).

1.04 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for each type of cold formed steel framing and accessory required.
- B. Submit shop drawings showing member, type, location, spacing, size and gage of members, method of attachment to supporting members and all necessary erection details. Indicate supplemental bracing, strapping, splices, bridging, accessories and details required for proper installation.
- C. Submit detailed roof truss layouts.
- D. Submit truss drawings, sealed and signed by a qualified registered Professional Engineer, verifying truss' ability to meet local code and design requirements. Include:
 - 1. Description of design criteria.
 - 2. Engineering analysis depicting member stresses and truss deflection.
 - 3. Truss member sizes and gauges and connections at truss joints.
 - 4. Truss support reactions.
 - 5. Top chord, Bottom chord and Web bracing requirements.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Fabrication shall be performed by a cold-formed steel truss fabricator with experience designing and fabricating cold-formed steel truss systems equal in material, design, and extent to the systems required for this Project.
 - 1. Cold Formed steel truss system installation shall be performed by an experienced installer approved by the steel truss system fabricator.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and erection.
- B. Store trusses on blocking, pallets, platforms or other supports off the ground and in an upright position sufficiently braced to avoid damage from excessive bending.
- C. Protect trusses and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.

1.07 PROJECT CONDITIONS

During construction, adequately distribute all loads applied to trusses so as not to exceed the carrying capacity of any one joist, truss or other component.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

Tremco Incorporated
3735 Green Road
Beachwood, OH 44122

Or approved equivalent.

2.02 COMPONENTS

- A. System components: Aegis Metal Framing, LLC ULTRA-SPAN® and POSI-STRUT® light gauge steel floor truss and roof truss components.
- B. Provide manufacturer's standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated and as needed to provide a complete light gauge cold formed steel truss system.

2.03 MATERIALS

- A. Materials:
 - 1. All component gauges: Fabricate components of structural quality steel sheet per ASTM A653 with a minimum yield strength of 40,000 psi.
 - 2. Bracing, bridging and blocking members: Fabricate components of commercial quality steel sheet per ASTM A653 with a minimum yield strength of 33,000 psi.
- B. Ultra-Span steel truss components: Provide sizes, shapes and gages indicated.
 - 1. Design Uncoated-Steel Thickness: 20 ga., 0.0350 inch (0.91 mm).
 - 2. Design Uncoated-Steel Thickness: 18 ga., 0.0460 inch (1.20 mm).
 - 3. Design Uncoated-Steel Thickness: 16 ga., 0.0570 inch (1.52 mm).
 - 4. Design Uncoated-Steel Thickness: 14 ga., 0.0730 inch (1.90 mm).
- C. Finish: Provide components with protective zinc coating complying with ASTM A653, minimum G60 coating.
- D. Fastenings:
 - 1. Manufacturer recommended self-drilling, self-tapping screws with corrosion-resistant plated finish. Fasteners shall be of sufficient size and number to ensure the strength of the connection.
 - 2. Welding: Comply with AWS D1.1 when applicable and AWS D1.3 for welding base metals less than 1/8" thick.

3. Other fasteners as accepted by truss engineer.

2.04 FABRICATION

- A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 1. Fabricate truss assemblies in jig templates.
 2. Cut truss members by sawing or shearing or plasma cutting.
 3. Fasten cold-formed steel truss members by welding or screw fastening, or other methods as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-formed steel truss component manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- B. Care shall be taken during handling, delivery and erection. Brace, block, or reinforce truss as necessary to minimize member and connection stresses.
- C. Fabrication Tolerances: Fabricate trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 1. Spacing: Space individual trusses no more than plus or minus 1/8 inch (3mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel truss to a maximum out-of-square tolerance of 1/8 inch (3mm).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel truss installation until unsatisfactory conditions have been corrected.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION, GENERAL

- A. General:
 1. Erection of trusses, including proper handling, safety precautions, temporary bracing and other safeguards or procedures are the responsibility of the Contractor and Contractor's installer.
 2. Exercise care and provide erection bracing required to prevent toppling of trusses during erection.

- B. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at design spacing indicated.
- C. Provide proper lifting equipment suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.
- D. Provide framing anchors as indicated or accepted on the engineering design drawing or erection drawings. Anchor trusses securely at bearing points.
- E. Install roof framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.
 - 1. DO NOT cut truss members without prior approval of truss engineer.
 - 2. Fasten cold-formed steel roof framing by welding or screw fastening, as standard with fabricator. Wire tying of roof framing is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-formed roof framing Manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
 - c. Install roof framing in one-piece lengths, unless splice connections are indicated.
 - d. Provide temporary bracing and leave in place until trusses are permanently stabilized.
- F. Erection Tolerances: Install trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.03 ROOF TRUSS INSTALLATION

- A. Install, bridge, and brace trusses according to manufacturer's recommendations and requirements of this Section.
- B. Space trusses as follows:
 - 1. Truss Spacing: 48 inches (1220 mm).
- C. Do not alter, cut, or remove truss members or connections of truss members.
- D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacing indicated.
- E. Erect trusses without damaging truss members or connections.

- F. Align truss bottom chords with load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.
- G. Install continuous bridging and permanent truss bracing per truss design requirements.
- H. Install necessary roof cross and diagonal bracing per design professional recommendations.
- I. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists where indicated.
- J. Install miscellaneous truss framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.04 REPAIRS AND PROTECTION

Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS AND CASTINGS

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. The Aluminum Association, Inc. (AA): The Aluminum Design Manual.
2. American Galvanizers Association (AGA): Inspection of Products Hot-Dip Galvanized After Fabrication.
3. American Institute of Steel Construction (AISC): S329, Allowable Stress Design Specification for Structural Joints using ASTM A325 or A490 Bolts.
4. American Iron and Steel Institute (AISI): Stainless Steel Types.
5. American National Standards Institute (ANSI):
 - a. A10.11, Safety Requirements for Personnel and Debris Nets.
 - b. A14.3, Ladders - Fixed - Safety Requirements.
6. American Society of Mechanical Engineers (ASME): B1.1, Unified-inch Screw Threads (UN and UNR Thread Form).
7. American Welding Society (AWS):
 - a. D1.1, Structural Welding Code - Steel.
 - b. D1.2, Structural Welding Code - Aluminum.
 - c. D1.6, Structural Welding Code - Stainless Steel.
8. ASTM International (ASTM):
 - a. A36/A36M, Specification for Carbon Structural Steel.
 - b. A48, Specification for Gray Iron Castings.
 - c. A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - d. A108, Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
 - e. A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - f. A143, Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - g. A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - h. A193/A193M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - i. A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
 - j. A240/A240M, Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
 - k. A276, Specification for Stainless Steel Bars and Shapes.
 - l. A278, Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650 Degree.
 - m. A283/A283M, Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

- n. A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile.
 - o. A325, Specification for Structural Bolts, Steel, Heat Treated 120/105 ksi Minimum Tensile Strength.
 - p. A380, Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 - q. A384, Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
 - r. A385, Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
 - s. A489, Specification for Carbon Steel Lifting Eyes.
 - t. A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - u. A501, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - v. A563, Specification for Carbon and Alloy Steel Nuts.
 - w. A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - x. A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - y. A786/A786M, Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
 - z. A793, Specification for Rolled Floor Plate, Stainless Steel.
 - aa. A967, Specification for Chemical Passivation Treatments for Stainless Steel Parts.
 - bb. A992/A992M, Specification for Steel for Structural Shapes for Use in Building Framing
 - cc. B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - dd. B308/B308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
 - ee. B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 - ff. B632/B632M, Specification for Aluminum-Alloy Rolled Tread Plate.
 - gg. D1056, Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
 - hh. F436, Specification for Hardened Steel Washers.
 - ii. F468, Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
 - jj. F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - kk. F594, Specification for Stainless Steel Nuts.
 - ll. F844, Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
 - mm. F1554, Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- 9. International Code Council (ICC): Evaluation Reports for Concrete and Masonry Anchors.
 - 10. NSF International (NSF).
 - 11. Occupational Safety and Health Administration (OSHA):
 - a. 29 CFR 1910.27, Fixed Ladders.
 - b. 29 CFR 1926.105, Safety Nets.

- c. 29 CFR 1926.502, Fall Protection Systems Criteria and Practices.
- 12. Specialty Steel Industry of North America (SSINA):
 - a. Specifications for Stainless Steel.
 - b. Design Guidelines for the Selection and Use of Stainless Steel.
 - c. Stainless Steel Fabrication.
 - d. Stainless Steel Fasteners.

1.02 DEFINITIONS

- A. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.
- B. Exterior Area: Location not protected from the weather by a building or other enclosed structure.
- C. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or washdown, nor where wall or roof slab is common to a water-holding or earth-retaining structure.
- D. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or washdown, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.
- E. Submerged: Location at or below top of wall of open water-holding structure, such as a basin or channel, or wall, ceiling or floor surface inside a covered water-holding structure, or exterior belowgrade wall or roof surface of water-holding structure, open or covered.

1.03 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Metal fabrications, including welding and fastener information.
 - b. Specific instructions for concrete anchor installation, including drilled hole size, preparation, placement, procedures, and instructions for safe handling of anchoring systems.
 - 2. Samples: Color samples of abrasive stair nosings.
- B. Informational Submittals:
 - 1. Concrete and Masonry Drilled Anchors:
 - a. Manufacturer's product description and installation procedures.
 - b. Current test data or ICC Evaluation Report.
 - c. Adhesive Anchor Installer Certification.
 - 2. U-Channel Concrete Inserts:
 - a. Manufacturer's product description.
 - b. Allowable load tables.
 - 3. Ladders: Certification of load and fatigue tests.
 - 4. Passivation method for stainless steel members.

- 5. Hot-Dip Galvanizing: Certificate of compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

1.04 QUALITY ASSURANCE

A. Qualifications:

- 1. Adhesive Anchor Installers: Trained and certified by manufacturer.
- 2. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Insofar as practical, factory assemble items specified herein. Assemblies that due to necessity have to be shipped unassembled shall be packaged and tagged in manner that will protect materials from damage and will facilitate identification and field assembly.
- B. Package stainless steel items in a manner to provide protection from carbon impregnation.
- C. Protect painted coatings and hot-dip galvanized finishes from damage due to metal banding and rough handling. Use padded slings and straps.
- D. Store fabricated items in dry area, not in direct contact with ground.

1.06 SPECIAL GUARANTEE

Manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at option of Owner, removal and replacement of sidewalk doors and floor hatches found defective during a period of 5 years after date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work as specified in General Conditions.

1.07 EXTRA MATERIALS

- A. Furnish, tag, and box for shipment and storage the following extra materials:

<u>Item</u>	<u>Quantity</u>
Neoprene Gasket	Two for each location requiring neoprene gaskets.
Four-inch wide by 50-foot long neoprene gasket material	One roll for each location requiring neoprene gaskets.
Neoprene Gasket Adhesive	One (manufacturer's recommended) for each location requiring neoprene gaskets.

- B. Delivery: In accordance with General Conditions.

PART 2 - PRODUCTS

2.01 GENERAL

A. Unless otherwise indicated, meet the following requirements:

Item	ASTM Reference
Steel Shapes and Plates	A36/A36M
Steel Pipe	A501 or A53/A53M, Type E or S, Grade B
Structural Steel Tubing	A500, Grade B
Stainless Steel:	
Bars and Angles	A276, AISI Type 316 (316L for welded connections)
Shapes	A276, AISI Type 304 (304L for welded connections)
Steel Plate, Sheet, and Strip	A240/A240M, AISI Type 316 (316L for welded connections)
Bolts, Threaded Rods, Anchor Bolts, and Anchor Studs	F593, AISI Type 316, Condition CW
Nuts	F594, AISI Type 316, Condition CW
Steel Bolts and Nuts:	
Carbon Steel	A307 bolts, with A563 nuts
High-Strength	A325, Type 1 bolts, with A563 nuts
Anchor Bolts and Rods	F1554, Grade 55, with weldability supplement S1.
Eyebolts	A489
Threaded Rods	A36/A36M
Flat Washers (Unhardened)	F844
Flat and Beveled Washers (Hardened)	F436
Thrust Ties for Steel Pipe:	
Threaded Rods	A193/A193M, Grade B7
Nuts	A194/A194M, Grade 2H
Plate	A283/A283M, Grade D
Welded Anchor Studs	A108, Grades C-1010 through C-1020
Aluminum Plates and Structural Shapes	B209 and B308/B308M, Alloy 6061-T6

Item	ASTM Reference
Aluminum Bolts and Nuts	F468, Alloy 2024-T4
Cast Iron	A48, Class 35

- B. Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, zinc-plated steel, and aluminum material types as indicated in Fastener Schedule at end of this section.

2.02 ANCHOR BOLTS AND ANCHOR BOLT SLEEVES

A. Cast-In-Place Anchor Bolts:

1. Headed type, unless otherwise shown on Drawings.
2. Material type and protective coating as shown in Fastener Schedule at end of this section.

B. Anchor Bolt Sleeves:

1. Plastic:
 - a. Single unit construction with corrugated sleeve.
 - b. Top of sleeve shall be self-threading to provide adjustment of threaded anchor bolt projection.
 - c. Material: High density polyethylene.
 - d. Manufacturer: Sinco Products, Inc., Middletown, CT, (800) 243-6753.
2. Fabricated Steel: ASTM A36/A36M.

2.03 CONCRETE AND MASONRY DRILLED ANCHORS

A. General:

1. AISI Type 316 stainless, hot-dip galvanized, or zinc-plated steel, as shown in Fastener Schedule at end of this section.
2. Current evaluation and acceptance reports by ICC or other similar code organization.
3. Acceptable for use in potable water structures by EPA and local health agencies or NSF.

B. Wedge Anchors:

1. Manufacturers and Products:
 - a. ITW Ramset/Red Head, Wood Dale, IL; Trubolt Wedge Anchor.
 - b. Hilti, Inc., Tulsa, OK; Kwik-Bolt-3 (KB-3) Anchor.
 - c. Powers Rawl, New Rochelle, NY; Power-Stud Anchor.
 - d. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Wedge-All Anchor.
 - e. Wej-It Corp., Tulsa, OK; ANKRtite Wedge Anchor.
 - f. U.S. Anchor, Pompano Beach, FL; Kingpin Wedge Anchor.
 - g. Unitex, Kansas City, MO; Pro-Poxy 300 and Pro-Poxy 300 Fast Epoxy Adhesive Anchors.

C. Expansion Anchors:

1. Self-drilling anchors, snap-off or flush type, zinc-plated.
2. Nondrilling Anchors: Flush type for use with zinc-plated or stainless steel bolt, or stud type with projecting threaded stud.
3. Manufacturers and Products:
 - a. ITW Ramset/Red Head, Wood Dale, IL; Multi-Set II Drop-In and Self Drill Anchor.
 - b. Hilti, Inc., Tulsa, OK; Hilti HDI Drop-In Anchor.
 - c. Powers Rawl, New Rochelle, NY; Steel Drop-In Anchor.
 - d. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Drop-In Anchor.

D. Sleeve Anchors:

1. Manufacturers and Products:
 - a. ITW Ramset/Red Head, Wood Dale, IL; Dynabolt Hex Nut Sleeve Anchor.
 - b. Powers Rawl, New Rochelle, NY; Hex Head Power-Bolt Anchor.
 - c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Sleeve-All Hex Head Anchor.
 - d. Wej-It Corp., Tulsa, OK; Wej-It Sleeve Anchor.
 - e. Hilti, Inc., Tulsa, OK; HSL-3 Heavy Duty Sleeve Anchor.

E. Adhesive Anchors:

1. Threaded Rod:
 - a. ASTM F593 stainless steel threaded rod, diameter as shown on Drawings.
 - b. Length as required, to provide minimum depth of embedment.
 - c. Clean and free of grease, oil, or other deleterious material.
 - d. For hollow-unit masonry, provide galvanized or stainless steel wire cloth screen tube to fit threaded rod.
2. Adhesive:
 - a. Two-component, designed to be used in adverse freeze/thaw environments, with gray color after mixing.
 - b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
 - c. Nonsag, with selected viscosity base on installation temperature and overhead application where applicable.
3. Packaging and Storage:
 - a. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
 - b. Store adhesive cartridges on pallets or shelving in covered storage area, in accordance with manufacturer's written instructions.
 - c. Cartridge Markings: Include manufacturer's name, product name, material type, batch or serial number, and adhesive expiration date.
 - d. Dispose of cartridges if shelf life has expired.

4. Manufacturers and Products:
 - a. ITW Ramset/Red Head, Wood Dale, IL; Epcon Ceramic 6 Epoxy or A7 Adhesive Anchor System. (Use only Epcon A7 Adhesive System for hollow masonry.)
 - b. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT HY 150 (HIT HY 20 for hollow masonry).
 - c. Powers Rawl, New Rochelle, NY; Power Fast Epoxy Injection Gel Cartridge System.
 - d. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Epoxy-Tie Adhesive ET or Acrylic-Tie Adhesive. (Use only Acrylic-Tie Adhesive for temperatures below 40 degrees F.)
 - e. Covert Operations, Inc., Long Beach, CA; CIA-Gel 7000 Epoxy Anchors.
 - f. U.S. Anchor, Pompano Beach, FL; Ultrabond 1.
 - g. Unitex, Kansas City, MO; Pro-Poxy 300 and Pro-Poxy 300 Fast Epoxy Adhesive Anchors.

F. Adhesive Threaded Inserts:

1. Stainless steel, internally threaded insert.
2. Manufacturer and Product: Hilti, Inc., Tulsa, OK; HIS-R Insert with HIT HY 150 adhesive.

2.04 WELDED ANCHOR STUDS

A. Headed anchor studs (HAS) or threaded anchor studs (TAS), as indicated on Drawings.

1. Carbon Steel: ASTM A108, Standard Quality Grades 1010 through 1020, inclusive either semikilled or killed aluminum or silicon dioxidation, unless indicated otherwise.
2. Stainless Steel: ASTM F593, AISI Type 316, Condition CW, where indicated.

B. Manufacturers:

1. Nelson Stud Welding, FabriSteel Co., Elyria, OH.
2. Stud Welding Associates, Inc., Elyria, OH.

2.05 PIPE SLEEVES

ASTM A53/A53M, Schedule 40 steel pipe sleeves with continuously welded 3/16-inch-thick seep ring with outside diameter 3 inches greater than sleeve outside diameter. Hot-dip galvanize in accordance with ASTM A123/A123M.

2.06 STEEL LINTELS AND SHELF ANGLES

ASTM A36/A36M, hot-dip galvanize after fabrication in accordance with ASTM A123/A123M.

2.07 EMBEDDED STEEL SUPPORT FRAMES FOR FLOOR PLATE AND GRATING

- A. Steel angle support frames to be embedded in concrete shall be stainless steel, ASTM A276, AISI Type 316, unless indicated otherwise.
- B. Welded anchors for stainless steel support frames shall also be stainless steel.

2.08 U-CHANNEL CONCRETE INSERTS

- A. Rolled ASTM A240/A240M, AISI Type 316 stainless steel, 0.105-inch thickness, 1-5/8-inch width by 1-3/8-inch depth, with stainless steel anchors at 10-inch maximum spacing, styrofoam fillers, and end caps.
- B. Nut and Bolt Hardware: Type 316 stainless steel, 5/8-inch minimum diameter unless indicated otherwise, manufacturer's standard to match insert.
- C. Manufacturers and Products:
 - 1. Power-Strut, Wayne, MI; PS 349 Series.
 - 2. B-Line Systems, Inc., Highland, IL; B32 Series.
 - 3. Halfen Anchoring Systems, Converse, TX; Channel Type 4141HTA.

2.09 FLOOR PLATE

- A. Material:
 - 1. Galvanized Steel: Carbon steel, ASTM A786/A786M, commercial grade, hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - 2. Stainless Steel: ASTM A793, AISI Type 304.
 - 3. Aluminum: ASTM B632/B632M, Alloy 6061-T6.
- B. Minimum Thickness:
 - 1. Steel: 1/4 inch, unless shown otherwise on Drawings.
 - 2. Aluminum: 3/8 inch, unless shown otherwise on Drawings.
- C. Surface shall be raised-lug pattern or diamond tread, unless shown otherwise on Drawings.
- D. Slip-Resistant Surface:
 - 1. Provide where indicated on Drawings.
 - 2. Manufacturers and Products:
 - a. IKG/Borden, Clark, NJ; MEBAC 2.
 - b. W.S. Molnar Co., Detroit, MI; SLIPNOT Grade 2–Medium.

2.10 FIRE RATED FLOOR DOORS

- A. Floor hatch shall be Type FR-3 (fire rated), 3'-0" x 2'-6" and as shown on the drawings, as manufactured by the Bilco Company or approved equal.

- B. Load Capacity: 150 psf with maximum deflection of 1/150th.
- C. Component Fabrication:
 - 1. Cover: 1/4 inch aluminum plate, 1 inch deep pan-type construction to receive concrete fill.
 - 2. Angle Frame: 1/4-inch thick aluminum extrusion with continuous anchor flange and integral neoprene gasket strip.
- D. Door Hardware:
 - 1. Hinge: Continuous heavy duty, type 316 stainless steel.
 - 2. Hold-open hydraulic system shall automatically hold door in open position. Compression spring operators enclosed in telescope tubes shall be provided.
 - 3. Latch: Type 316 stainless steel slam latch with gasketed cover plug and removable turn handle (topside) and cable release handle (underside).
- E. Finish: Mill finish with protective coating applied to surface to be in contact with concrete as specified in Section 09900, Painting and Protective Coating.
- F. Door assembly shall be installed in UL listed fire rated floor assembly in accordance with manufacturer's instructions and details. Door and frame assembly shall be tested in accordance with ASTM E 119 and UL listed for 2-hour fire rating when exposed to fire from underside. Manufacturer shall submit a test report certifying this performance.

2.11 ATTIC ACCESS DOORS

Bilco type CD-2A downward opening 14 gauge galvanized frame with 11GA aluminum door. Size (3'-0" x 2'-6").

2.12 LADDERS

- A. Fabricate ladders with rails, rungs, landings, and cages to meet applicable requirements of OSHA, CFR Part 1910.27, and ANSI A14.3.
 - 1. Concentrated load of 250 pounds plus 30 percent impact on rungs.
 - 2. Maximum rung deflection of 1/360.
 - 3. Concentrated load of 250 pounds plus 30 percent impact between consecutive attachments.
 - 4. Self-closing gates at landings.
- B. Aluminum Pre-Engineered Pipe Ladders:
 - 1. Rungs:
 - a. Aluminum extrusions of Alloy 6063-T6.
 - b. Nonslip grip surface, 1-inch wide flat top, and semicircular bottom with mill finish.
 - 2. Side Rails: ASTM B429, Alloy 6063-T6, 1-1/2 inches, Schedule 40 pipe with anodized finish, AA M32-C22-A41.

3. Fasteners for Ladder Attachments and Cage Assembly: Stainless steel.
4. Welded, pop riveted, or glued construction is not acceptable.
5. Fabricate to longest length as practical but not to exceed 24 feet.
6. Furnish support attachments to side rails at 6 feet maximum spacing.
7. Manufacturer: Thompson Fabricating Co. Inc., Tarrant, AL.

C. Ladder Safety Post:

1. Telescoping tubular, spring balanced and automatically locking in raised position, with release lever for unlocking.
2. Post: Aluminum.
3. Spring Mechanism: Stainless steel.
4. Furnish dissimilar metal protective coatings at connections.
5. Manufacturer and Product: Bilco Co., New Haven, CT; "Ladder Up" to fit ladder rungs.

2.13 LADDER CLIMB PREVENTION SHIELD

- A. Eight feet long with angled sides to within 2 inches of wall when closed.
- B. Furnish dissimilar metals protective coatings at bolted connections.
- C. Manufacturer and Product: North Safety Products, Specialty Products Division, Toronto, Ontario, Canada; Ladder Gate 770-000-001.

2.14 FALL ARREST ANCHORS

A. General:

1. Conforms to OSHA CFR Part 1926.502.
2. Minimum breaking strength: 5,000 pounds.
3. Material: Stainless steel, AISI Type 304.

B. Components and Accessories:

1. Forged combination eye and base assembly with headed anchor bolt, backer plate, lock washer, and nut.
2. Suitable for embedment in concrete wall or slab.

C. Manufacturers and Products:

1. Thaler Metal Industries, Buffalo, NY; FARA Wall Anchor.
2. Rose Manufacturing Company, Pittsburgh, PA; Anchorage Connector.

2.15 FABRICATION

A. General:

1. Finish exposed surfaces smooth, sharp, and to well-defined lines.
2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in neat, substantial manner.
3. Conceal fastenings where practical; where exposed, flush countersink.

4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Grind cut edges smooth and straight. Round sharp edges to small uniform radius. Grind burrs, jagged edges, and surface defects smooth.
6. Fit and assemble in largest practical sections for delivery to Site.

B. Materials:

1. Use steel shapes, unless otherwise noted.
2. Steel to be hot-dip galvanized: Limit silicon content to less than 0.04 percent or to between 0.15 and 0.25 percent.
3. Fabricate aluminum in accordance with AA Specifications for Aluminum Structures – Allowable Stress Design.

C. Welding:

1. Weld connections and grind exposed welds smooth. When required to be watertight, make welds continuous.
2. Welded fabrications shall be free from twisting or distortion caused by improper welding techniques.
3. Steel: Meet fabrication requirements of AWS D1.1, Section 5.
4. Aluminum: Meet requirements of AWS D1.2.
5. Stainless Steel: Meet requirements of AWS D1.6.
6. Welded Anchor Studs: Prepare surface to be welded and weld with stud welding gun in accordance with AWS D1.1, Section 7, and manufacturer's instructions.
7. Complete welding before applying finish.

D. Painting:

1. Shop prime with rust-inhibitive primer as specified in Section 09900, Painting and Protective Coatings, unless otherwise indicated.
2. Coat surfaces of galvanized steel and aluminum fabricated items to be in direct contact with concrete, grout, masonry, or dissimilar metals, as specified in Section 09900, Painting and Protective Coatings, unless indicated otherwise.
3. Do not apply protective coating to galvanized steel anchor bolts or galvanized steel welded anchor studs, unless indicated otherwise.

E. Galvanizing:

1. Fabricate steel to be galvanized in accordance with ASTM A143, ASTM A384, and ASTM A385. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
2. Provide venting and drain holes for tubular members and fabricated assemblies in accordance with ASTM A385.
3. Remove welding slag, splatter, burrs, grease, oil, paint, lacquer, and other deleterious material prior to delivery for galvanizing.
4. Remove by blast cleaning or other methods surface contaminants and coatings not removable by normal chemical cleaning process in the galvanizing operation.

5. Hot-dip galvanize steel members, fabrications, and assemblies after fabrication in accordance with ASTM A123/A123M.
 6. Hot-dip galvanize bolts, nuts, washers, and hardware components in accordance with ASTM A153/A153M. Oversize holes to allow for zinc alloy growth. Shop assemble bolts and nuts.
 7. Galvanized steel sheets in accordance with ASTM A653.
 8. Galvanize components of bolted assemblies separately before assembly. Galvanizing of tapped holes is not required.
- F. Watertight Seal: Where required or shown, furnish neoprene gasket of a type that is satisfactory for use in contact with sewage. Cover full bearing surfaces.
- G. Fitting: Where movement of fabrications is required or shown, cut, fit, and align items for smooth operation. Make corners square and opposite sides parallel.
- H. Accessories: Furnish as required for a complete installation. Fasten by welding or with stainless steel bolts or screws.

2.16 SOURCE QUALITY CONTROL

- A. Visually inspect all fabrication welds and correct any deficiencies.
1. Steel: AWS D1.1, Section 6 and Table 6.1, Visual Inspection Acceptance Criteria.
 2. Aluminum: AWS D1.2.
 3. Stainless Steel: AWS D1.6.

PART 3 - EXECUTION

3.01 INSTALLATION OF METAL FABRICATIONS

- A. General:
1. Install metal fabrications plumb or level, accurately fitted, free from distortion or defects.
 2. Install rigid, substantial, and neat in appearance.
 3. Install manufactured products in accordance with manufacturer's recommendations.
 4. Obtain Engineer approval prior to field cutting steel members or making adjustments not scheduled.
- B. Aluminum:
1. Do not remove mill markings from concealed surfaces.
 2. Remove inked or painted identification marks on exposed surfaces not otherwise coated after installed material has been inspected and approved.
 3. Fabrication, mechanical connections, and welded construction shall be in accordance with the AA Aluminum Design Manual.

C. Pipe Sleeves:

1. Provide where pipes pass through concrete or masonry.
2. Holes drilled with a rotary drill may be provided in lieu of sleeves in existing walls.
3. Provide a center flange for water stoppage on sleeves in exterior or water-bearing walls.
4. Provide a rubber caulking sealant or a modular mechanical unit to form a watertight seal in the annular space between pipes and sleeves.

D. Steel Lintels and Shelf Angles: Provide as required for support of masonry and other construction not attached to structural steel framing, unless otherwise shown on Drawings.

3.02 CAST-IN-PLACE ANCHOR BOLTS

- A. Accurately locate and hold anchor bolts in place with templates at the time concrete is placed.
- B. Use anchor bolt sleeves for location adjustment and provide two nuts and one washer per bolt of same material as bolt.
- C. Minimum Bolt Size: 1/2-inch diameter by 12 inches long, unless otherwise shown.

3.03 CONCRETE AND MASONRY DRILLED ANCHORS

- A. Begin installation only after concrete or masonry to receive anchors has attained design strength.
- B. Install in accordance with manufacturer's instructions.
- C. Provide minimum embedment, edge distance, and spacing as follows, unless indicated otherwise by anchor manufacturer's instructions or shown otherwise on Drawings:

Anchor Type	Min. Embedment (bolt diameters)	Min. Edge Distance (bolt diameters)	Min. Spacing (bolt diameters)
Wedge	9	6	12
Expansion and Sleeve	4	6	12
Undercut	9	12	16
Adhesive	9	9	13.5

- D. Use only drill type and bit type and diameter recommended by anchor manufacturer. Clean hole of debris and dust with brush and compressed air.
- E. For undercut anchors, use special undercutting drill bit and rotary hammer drill and apply final torque as recommended by anchor manufacturer.

- F. When embedded steel or rebar is encountered in the drill path, slant drill to clear obstruction. If drill must be slanted more than 10 degrees to clear obstruction, notify Engineer for direction on how to proceed.
- G. Adhesive Anchors:
 1. Do not install adhesive anchors when temperature of concrete is below 40 degrees F (25 degrees F for Simpson Strong-Tie Acrylic-Tie Adhesive) or above 100 degrees F.
 2. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry where required by manufacturer's instructions.
 3. For hollow-unit masonry, install screen tube in accordance with manufacturer's instructions.
 4. Do not disturb anchor during recommended curing time.
 5. Do not exceed maximum torque as specified in manufacturer's instructions.
- H. Prestressed Concrete: Do not use drilled-in anchors in prestressed or post-tensioned concrete members without Engineer's prior approval unless specifically shown on Drawings.

3.04 U-CHANNEL CONCRETE INSERTS

- A. Provide as indicated for pipe supports and where otherwise shown on Drawings.
- B. Except for interior dry areas, use plastic clips or similar dielectric material to isolate channel anchors from concrete reinforcing steel.

3.05 ACCESS COVERS

- A. Install access covers, including sidewalk doors, floor hatches, and hinged manhole covers in accordance with manufacturer's instructions.
- B. Accurately position prior to placing concrete, such that covers are flush with floor surface.
- C. Protect from damage resulting from concrete placement. Thoroughly clean exposed surfaces of concrete spillage to obtain a clean, uniform appearance.

3.06 SAFETY CLIMB DEVICE SYSTEM

- A. Provide for each ladder where unbroken height between levels exceeds 20 feet, or at lesser height where indicated on Drawings.
- B. Install in accordance with manufacturer's instructions.
- C. Furnish additional accessories required to complete the system for each ladder.
- D. Furnish one harness for each ladder equipped with a safety climb device.
- E. Furnish pivot section at platforms, landings, and roofs.

- F. When installed to required height, fall prevention system shall be rigid and an integral part of the structure.

3.07 ELECTROLYTIC PROTECTION

A. Aluminum and Galvanized Steel:

1. Coat surfaces of galvanized steel and aluminum fabricated items to be in direct contact with concrete, grout, masonry, or dissimilar metals, as specified in Section 09900, Painting and Protective Coatings, unless indicated otherwise.
2. Do not apply protective coating to galvanized steel anchor bolts or galvanized steel welded anchor studs, unless indicated otherwise.
3. Allow coating to dry before installation of the material.
4. Protect coated surfaces during installation.
5. Should coating become marred, prepare and touch up in accordance with paint manufacturer's written instructions.

- #### B. Titanium: Where titanium equipment is in contact with concrete or dissimilar metal, provide full-face neoprene insulation gasket, 3/32-inch minimum thickness and 70-durometer hardness.

C. Stainless Steel:

1. During handling and installation, take necessary precautions to prevent carbon impregnation of stainless steel members.
2. After installation, visually inspect stainless steel surfaces for evidence of iron rust, oil, paint, and other forms of contamination.
3. Remove contamination in accordance with requirements of ASTM A380 and ASTM A967.
4. Brushes used to remove foreign substances shall utilize only stainless steel or nonmetallic bristles.
5. After treatment, visually inspect surfaces for compliance.

3.08 PAINTING AND REPAIR OF GALVANIZED STEEL

- #### A. Painted Galvanized Surfaces: Prepare as specified in Section 09900, Painting and Protective Coatings.

B. Repair of Damaged Hot-Dip Galvanized Coating:

1. Conform to ASTM A780.
2. For minor repairs at abraded areas, use sprayed zinc conforming to ASTM A780.
3. For flame cut or welded areas, use zinc-based solder, or zinc sticks, conforming to ASTM A780.
4. Use magnetic gauge to determine that thickness is equal to or greater than the base galvanized coating.

3.09 MANUFACTURER'S SERVICES

- A. Adhesive Anchors: Conduct site training of installation personnel for proper installation, handling, and storage of adhesive anchor system. Notify Engineer of time and place for sessions.

3.10 FASTENER SCHEDULE

- A. Unless indicated otherwise on the Drawings, provide fasteners as follows:

Service Use and Location	Product	Remarks
1. Anchor Bolts Cast Into Concrete for Structural Steel, Metal Fabrications and Castings		
Interior Dry Areas	Hot-dip galvanized steel headed anchor bolts, unless indicated otherwise.	
Exterior and Interior Wet Areas	Stainless steel headed anchor bolts.	
Submerged and Corrosive Areas	Stainless steel headed anchor bolts with fusion bonded coating	See Section 09900, Painting and Protective Coatings
2. Anchor Bolts Cast Into Concrete for Equipment Bases		
Interior Dry Areas	Stainless steel headed anchor bolts, unless otherwise specified with equipment	
Submerged, Exterior, Interior Wet, and Corrosive Areas	Stainless steel headed anchor bolts with fusion bonded coating, unless otherwise specified with equipment	See Section 09900, Painting and Protective Coatings
3. Drilled Anchors for Metal Components to Cast-in-Place Concrete (e.g., Ladders, Handrail Posts, Electrical Panels, and Equipment)		
Interior Dry Areas	Zinc-plated or stainless steel wedge or expansion anchors	Use zinc-plated undercut anchors for overhead and ceiling installations
Submerged, Exterior, Interior Wet, and Corrosive Areas	Adhesive stainless steel anchors	Use stainless steel undercut anchors for overhead and ceiling installations

Service Use and Location	Product	Remarks
4. Anchors in Grout-Filled Concrete Masonry Units		
Exterior and Interior Wet and Dry Areas	Hot-dip galvanized steel headed anchor bolts, zinc-plated or stainless steel sleeve anchors, or stainless steel adhesive anchors	
5. Anchors in Hollow Concrete Masonry Units		
Exterior and Interior Wet and Dry Areas	Zinc-plated or stainless steel sleeve anchors, or stainless steel adhesive anchors with screen tube	
6. Connections for Structural Steel Framing		
Exterior and Interior Wet and Dry Areas	High-strength steel bolted connections	Use hot-dipped galvanized high-strength bolted connections for galvanized steel framing members
7. Connections for Steel Fabrications and Wood Components		
Exterior and Interior Wet and Dry Areas	Stainless steel bolted connections	
8. Connections of Aluminum Components		
Submerged, Exterior and Interior Wet and Dry Areas	Stainless steel bolted connections, unless otherwise specified with equipment	
9. All Others		
Exterior and Interior Wet and Dry Areas	Stainless steel fasteners	

- B. Antiseizing Lubricant: Use on all stainless steel threads.
- C. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

END OF SECTION

Divisions 6 - Wood and Plastics



SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Forest and Paper Association (AF&PA): 01, National Design Specification for Wood Construction.
2. American Hardboard Association (AHA): A135.4, Basic Hardboard.
3. American Institute of Timber Construction (AITC): 112, Standard for Tongue-and-Groove Heavy Timber Roof Decking.
4. American Lumber Standards Committee's Board of Review (ALSC).
5. APA - The Engineered Wood Association (APA):
 - a. AFG-01, Adhesives for Field-Gluing Plywood to Wood-Framing.
 - b. PRP-108, Performance Standards and Qualification Policy for Structural-Use Panels.
6. American Wood Preservers' Association (AWPA):
 - a. C2, Lumber, Timber, Bridge Ties and Mine Ties, Preservative Treatment by Pressure Processes.
 - b. C9, Plywood—Preservative Treatment by Pressure Process.
 - c. C20, Structural Lumber—Fire-Retardant Treatment by Pressure Processes.
 - d. C27, Plywood—Fire-Retardant Treatment by Pressure Processes.
 - e. M4, Standard for the Care of Preservative-Treated Wood Products.
7. ASTM International (ASTM):
 - a. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - b. A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - c. C1396, Specification for Gypsum Board.
 - d. D226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - e. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - f. F1667, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
8. Composite Panel Association (CPA): A208.1, Standard for Particleboard.
9. National Evaluation Service, Inc. (NER): 272, Power-Driven Staples and Nails for Use in All Types of Building Construction.

10. National Fire Protection Association (NFPA): 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.
11. Southern Pine Inspection Bureau (SPIB): 1003, Grading Rules.
12. Underwriters' Laboratories, Inc. (UL): 723 Test for Surface Burning Characteristics of Building Materials.
13. U.S. Department of Commerce—Product Standards (PS):
 - a. PS 1, Construction and Industrial Plywood.
 - b. PS 2, Performance Standard for Wood-Based Structural-Use Panels.
 - c. PS 20, American Softwood Lumber Standard.
14. Western Wood Products Association (WWPA): G5, Western Lumber Grading Rules.

1.02 SUBMITTALS

A. Informational Submittals:

1. Wood treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material.
 - a. to shipment to Site.
2. Material test reports from testing laboratory showing and interpreting test results in accordance with test methods UL 723, NFPA 255, and ASTM E84, relative to fire-retardant treated wood products.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Immediately upon delivery to Site, place materials in area protected from weather. Do not store seasoned materials in wet or damp areas.
- B. Protect sheet materials from breaking corners and damaging surfaces while unloading.
- C. Store materials a minimum of 6 inches above ground on framework or blocking and cover with waterproof covering, providing for adequate air circulation and ventilation. Store sheet materials flat, not on edge.
- D. Protect fire-retardant materials against high humidity and moisture during storage and erection.
- E. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
- F. Store materials for which a maximum moisture content is specified in areas where humidity can be controlled.

PART 2 - PRODUCTS

2.01 GENERAL

A. Lumber Standards:

1. Lumber manufactured in accordance with DOC PS 20 and with applicable grading rules and wood species certified by ALSC. Design values for wood members equal to those published in supplement to AF&PA's National Design Specification for Wood Construction.
2. Stamp or brand each unexposed piece of lumber with grade, species, and moisture content at time of mill surfacing.
3. Furnish exposed lumber pieces with grade stamps applied to ends or back of each piece. If completely exposed, and permitted by local building jurisdiction, omit grade stamps entirely.

B. Lumber sizes shown on Drawings are nominal, unless shown otherwise. Provide actual sizes as required by DOC PS 20 for use.

C. Dressed lumber S4S, unless shown otherwise on Drawings.

D. Moisture content of lumber not to exceed 19 percent, unless otherwise specified and marked "DRY".

E. Each plywood panel identified with designated grade trademark of APA.

2.02 LUMBER

A. Furnish lumber as follows, unless specified otherwise:

Usage	Minimum Grade
Plates, blocking, furring, braces, & nailers	Douglas Fir-Larch No. 2, Hemlock, Southern Pine Stud grade, non-dense
General framing, studs 2 to 4 inches thick by 2 to 4 inches wide	Douglas Fir-Larch No. 1, or Southern Pine No. 1

2.03 CONSTRUCTION PANELS

A. Plywood:

1. General:

- a. Where construction panels are shown on Drawings for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, and thickness.
- b. Construction Panel Standards: Comply with DOC PS 1 for plywood construction panels and for products not manufactured under DOC PS 1 provisions, in accordance with APA PRP-108.
- c. Trademark: Each construction panel factory-marked with APA trademark evidencing compliance with grade requirements.

2. Roof Sheathing: APA rated sheathing.
 - a. Exposure Durability Classification: EXTERIOR.
 - b. Span Rating: 5/8-inch-thick.
 - c. Grade: Structural I.
- B. Plywood Backing Panels: Mounting electrical, telephone and like equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D Plugged Exposure 1, in thickness shown on Drawings, or, if not shown on Drawings, not less than 15/32 inch.
- C. Gypsum Sheathing:
 1. Water-Resistant Core Board:
 - a. Noncombustible gypsum core incorporating water-resistant material, surfaced on face, back, and long edges with water-repellent paper; complying with ASTM C1396.
 - b. Type: Regular not Type X.
 - c. Edge and End Configuration: V-shaped tongue-and-groove long edges, square ends.
 - d. Thickness: 5/8 inch.
 - e. Size: 4 feet by 8 feet.

2.04 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

- A. General: Where lumber or plywood is indicated as preservative treated wood, in accordance with AWPA C2 (Lumber) and AWPA C9 (Plywood). Mark and grade each treated item in accordance with SPIB 1003 or WWPA G5.
 1. Kiln-dry after treatment to maximum moisture content of 19 percent.
 2. Treat wood in contact with roofing or flashing.
 3. Treat wood in contact with masonry or concrete.
 4. Treat wood less than 18 inches above grade.
- B. Aboveground Materials: Pressure treat items with waterborne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to maximum moisture content, respectively, of 19 percent and 15 percent. Treat the following items:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- C. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.05 HARDWARE

- A. Conforming to ASTM F1667.
- B. Nails:
 - 1. Conforming to ASTM F1667.
 - 2. Steel common nails or alternatives listed in rough carpentry section of the general structural notes found on Drawings.
 - 3. Use hot-dipped zinc-coated nails wherever exposed.
 - 4. Use deformed shank nails for fastening underlayment.
- C. Staples: Conforming to ASTM F1667, galvanized where exposed.
- D. Power Driven Fasteners: Conforming to NER 272.
- E. Bolts and Screws: Conforming to ASTM A307, galvanized where exposed.
- F. Framing Anchors, Joist, and Beam Hangers:
 - 1. Manufacturers:
 - a. Bowman Distribution, Barnes Group, Inc., Cleveland, OH.
 - b. United Steel Products, Kant-Sag Silver, Montgomery, MN.
 - c. KC Metal Products, San Jose, CA.
 - d. Simpson Strong-Tie Co., Pleasanton, CA.
 - e. Cleveland Steel Specialty Co., Bedford Heights, OH; galvanized minimum 18-gauge steel, complete with nails.
- G. Fasteners for Gypsum Sheathing Board:
 - 1. Galvanized roofing nails 3/8-inch-head to 7/16-inch-head, 1-3/4 inches long.
 - 2. Staples No. 11 or No. 16-gauge, 7/16 inch by 1-1/2 inches with divergent points.
- H. Metal Cross Bridging:
 - 1. Cleveland Steel Specialty Co., Bedford Heights, OH; zinc-coated steel compression bridging.
 - 2. Simpson Strong-Tie Co., Inc., Pleasanton, CA; galvanized NC/NCA bridging.
- I. Ply Clips: Extruded 6063-T6 aluminum alloy.
- J. Bar or Strap Anchors: ASTM A653/A653M, zinc-coated steel, 18 gauge minimum.

PART 3 - EXECUTION

3.01 EXAMINATION

Verify that surfaces to receive rough carpentry materials are prepared to exact grades and dimensions.

3.02 GENERAL

- A. Lay out, cut, fit, and install all rough carpentry items. Anchor sufficiently to ensure rigidity and permanence.
- B. Install items accurate to dimension, true to line, level, and square unless shown otherwise on Drawings. Provide for installation and support of other Work.
- C. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.
- D. Countersink nail heads on exposed carpentry work and fill holes.
- E. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- F. Field cuts and holes in pressure-treated lumber shall be field treated with preservative in accordance with AWPA M4.
- G. Holes shall be 1/16 inch larger than nominal bolt diameter, except holes for cast-in-place anchor bolts shall be 3/16 inch larger than nominal bolt diameter. Tight holes requiring forcible driving of bolts shall be enlarged by reaming.
- H. Provide washers under bolt heads and nuts bearing on wood.

3.03 INSTALLATION

- A. Sills and Plates: Set level and flush with outside face of foundation or as shown on Drawings. Unless shown other, anchor with 1/2-inch-diameter bolt embedded at least 7 inches into concrete with a minimum of two bolts per piece and with one bolt located within 12 inches of each end of one piece and spaced not more than 6 feet apart.
- B. Roof Sheathing:
 - 1. Install plywood panels with face grain perpendicular to supports, using panel continuous over two or more spans, with end joints staggered between panels and locate over supports.
 - 2. Allow minimum space of 1/16 inch between end joints and 1/8 inch at edge joints for expansion and contraction of panels.

3. Support edge joints by use of ply clips or lumber blocking, unless noted otherwise on Drawings.
4. Unless noted otherwise on Drawings, minimum nailing shall be 6 inches on center along panel edges and 12 inches on center at intermediate supports.
5. Unless noted otherwise on Drawings, use 8d common nails for panels 3/4-inch-thick and less, and 10d nails for greater thickness. See rough carpentry section of general structural notes found on Drawings for alternate fastener and spacing options.

C. Gypsum Sheathing:

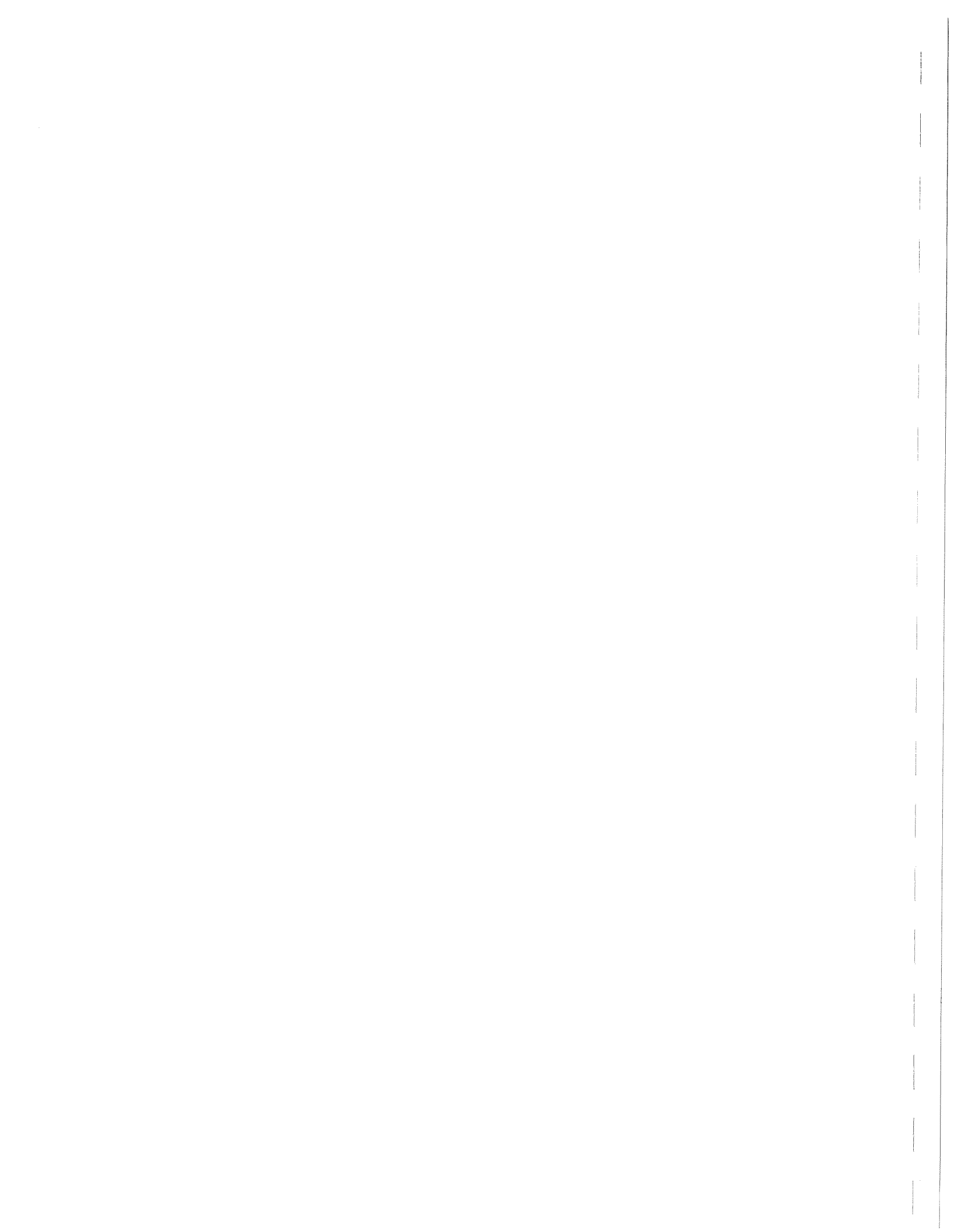
1. Apply tongue-and-groove sheathing with long dimension horizontal and tongue edge up.
2. Abut ends of sheathing at center of supports. Stagger end joints.
3. Attach sheathing using nails spaced at 8 inches on center on all supports, or staple at 6 inches on center at all supports.

D. Air Barrier: In accordance with Section 07210, Building Insulation.

3.04 PRESERVATIVE TREATED WOOD PRODUCTS

- A. Provide preservative treated wood for all framing, blocking, furring, nailing strips built into exterior masonry walls, wood in contact with concrete or masonry and in conjunction with gravel stops, and built-up roofing.
- B. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

END OF SECTION



SECTION 06600 – FIBERGLASS REINFORCED PLASTIC FABRICATIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

Provide all labor, materials, equipment and services required or necessary to furnish and install fiberglass reinforced plastic (FRP) handrails, ladders, and structural shapes where shown on the drawings and as specified herein.

1.02 RELATED DOCUMENTS

- A. Contract drawings, including general drawings and addenda drawings.
- B. Division 1 Specification sections.
- C. Section 05500 - Miscellaneous Metals and Fasteners

1.03 SUMMARY

- A. This section includes specifications for the following fiberglass reinforced plastic items, assemblies, and fabrications:
 - 1. Handrail and toeboard assemblies.
 - 2. Ladders and cages.

1.04 QUALITY ASSURANCE

- A. All FRP products and fabrications shall be supplied by an experienced firm who has continually engaged in the manufacture and fabrication of fiberglass reinforced plastic. All suppliers must document a minimum of five years experience with similar projects with equal scope or design.
- B. The installing contractor shall: assure that all field dimensions are taken accurately and communicated properly to the FRP fabricator, that other trades will not affect a proper installation of the FRP, and that all manufacturer's instructions and recommendations are followed.
- C. No substitution of materials will be allowed unless they are submitted for review as alternates, and the Engineer approves their use.

1.05 DESIGN REQUIREMENTS

- A. OSHA - 29 CFR as it pertains to worker safety and walking-working surfaces for stairs, ladders, handrail, and platforms
- B. FRP Structural Shapes shall be designed into structures that will support all applicable loads. Deflection shall not exceed L/D of 180.

1.06 SUBMITTALS

- A. Submit complete shop drawings and engineering data for all FRP materials and fabrications as required by this scope of work.
- B. Product data:
 - 1. Manufacturer's catalog data for all FRP structural shapes.
- C. Shop drawings:
 - 1. Shop drawings shall indicate all FRP materials required and include all dimensions, connections, fasteners, tolerances, assembly and installation details as required.
 - 2. Coordination with equipment suppliers shall be indicated on the shop drawings where openings for such equipment is required.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All FRP materials shall be manufactured with Vinylester resins.
- B. All pultruded structural shapes shall be constructed of strand roving, transverse mat, and a synthetic surface veil including ultraviolet (UV) light inhibitors.
- C. All pultruded structural shapes shall be flame retardant per ASTM E-84 Class I (flame spread of less than 25).
- D. After fabrication of FRP, all cuts, holes, and abrasion shall be sealed to prevent corrosion.
- E. The FRP materials of the types required shall be the product of one manufacturer, and shall be as manufactured by Seasafe Inc., Lafayette LA, (800-326-8842) or approved equivalent.

2.02 FRP STRUCTURAL FABRICATIONS

- A. FRP structural shapes shall be Vinylester pultruded fiberglass shapes. All shapes shall meet ASTM E-84 Class I (Flame spread of less than 25) and ASTM D-635 (Self-extinguishing).
- B. The minimum physical properties shall be:

Property	ASTM	Longitudinal Direction	Transverse Direction
Tensile Stress	D-638	30,000 psi	7,000 psi
Tensile Modulus	D-638	2.5 x 10 ⁶ psi	0.8 X 10 ⁶ psi
Compressive Stress	D-695	30,000 psi	15,000 psi
Compressive Modulus	D-695	2.5 X 10 ⁶ psi	1.0 x 10 ⁶ psi

Property	ASTM	Longitudinal Direction	Transverse Direction
Flexural Stress	D-790	30,000 psi	10,000 psi
Flexural Modulus	D-790	1.8 x 10 ⁶ psi	0.8 X 10 ⁶ psi
Modulus of Elasticity, E	Full Section	2. 8 X 10 ⁶ psi	

- C. All structural shapes shall be fabricated per the drawings with good workmanship, closely fitted joints, and finished true to line and in accurate position to permit installation and proper joining of parts in the field
- D. Bolts and washers used to assemble or connect to FRP structural fabrications shall be 316 stainless steel.
- E. All joint surfaces to be bonded shall be abraded to remove surface gloss and be free of burrs or other foreign materials that would prevent proper adhesion.
- F. Bonded surfaces shall use high-strength epoxy adhesives designed for FRP use and mechanical fasteners.
- G. All pieces of an assembly shall have easily identified part numbers or piece marks.
- H. For multiple unit assemblies, shop assemble pieces into the largest practical assembly suitable for shipping.

2.03 FRP STAIRS

- A. Fabricate stair structural components from FRP structural shapes as described in section 2.02.
- B. Use OSHA standards for rise and run
- C. Use stair treads as specified in section 2.02.
- D. Use FRP handrail as specified in section 2.02.
- E. Use 316 stainless steel fasteners throughout.

2.04 FRP HANDRAIL

- A. The handrail system shall be manufactured with Vinylester resin.
- B. All handrail components shall be flame retardant per ASTM E-84 Class 1.
- C. Handrail posts and rail shall be 2 x 2 x 1/4 inch square tube. All posts and rails shall use the same tube size. All tubing for handrail shall have a **minimum 1/4-inch** wall thickness.
- D. Handrail toeboards shall be a preformed FRP shape with a minimum height of 4 inches, a minimum thickness of 1/4-inch, and shall be installed with the bottom edge approximately 1/4-inch above the walking surface.

- E. All handrail and toeboards shall be safety yellow.
- F. All post to rail connections shall be fully bonded with an epoxy adhesive and shall have a 1½- inch square solid internal connection plug for added strength and durability. All connections shall have a smooth transition between post and rail.
- G. FRP handrail shall be a standard 2-rail design unless noted otherwise.

2.05 FRP LADDERS AND CAGES

- A. Ladders and cages shall be made from Vinylester resin.
- B. All ladder and cage components shall be flame retardant per ASTM E-84 Class 1.
- C. Ladder rails shall be 2 x 2 x 1/4 inch square tube. Ladder rungs shall be 1 inch diameter solid round.
- D. Ladders and cages shall be safety yellow.
- E. Ladder rungs shall penetrate the inside wall of ladder rail tube and be countersunk into outside wall of ladder rail tube, providing support for the ladder rung in 4 places. This connection shall be fully bonded with epoxy adhesives and pinned to prevent rung rotation.
- F. Ladder rungs shall have a slip-resistant quartz epoxy grit surface.
- G. Ladder stand-off brackets shall be FRP and shall be installed at a maximum of 6'-0" on center. Ladder base mount brackets are to be FRP. All bolts shall be 316 stainless steel.
- H. Ladder cages, if required per OSHA regulations, shall be fabricated from FRP hoops and traps. FRP hoops shall be 3 x 1/4-inch preformed FRP. Hoop spacing shall be a maximum of 4'-0" on center. FRP straps shall be 2 x 1/4-inch FRP and are to be spaced at 9" on center. Hoops and straps shall be bonded with epoxy adhesives and riveted with 316 stainless steel rivets.

2.06 ANTI-SLIP SURFACE FOR FRP COMPONENTS

- A. Where called for in the Specifications, an FRP component shall have an anti-slip top surface of silica grit which shall be molded integral with the glass fiber reinforced substrate.
- B. The silica grit shall be tightly packed with particle to particle contact to a minimum depth of 1/8-inch.

PART 3 - EXECUTION

3.01 HANDLING AND STORAGE

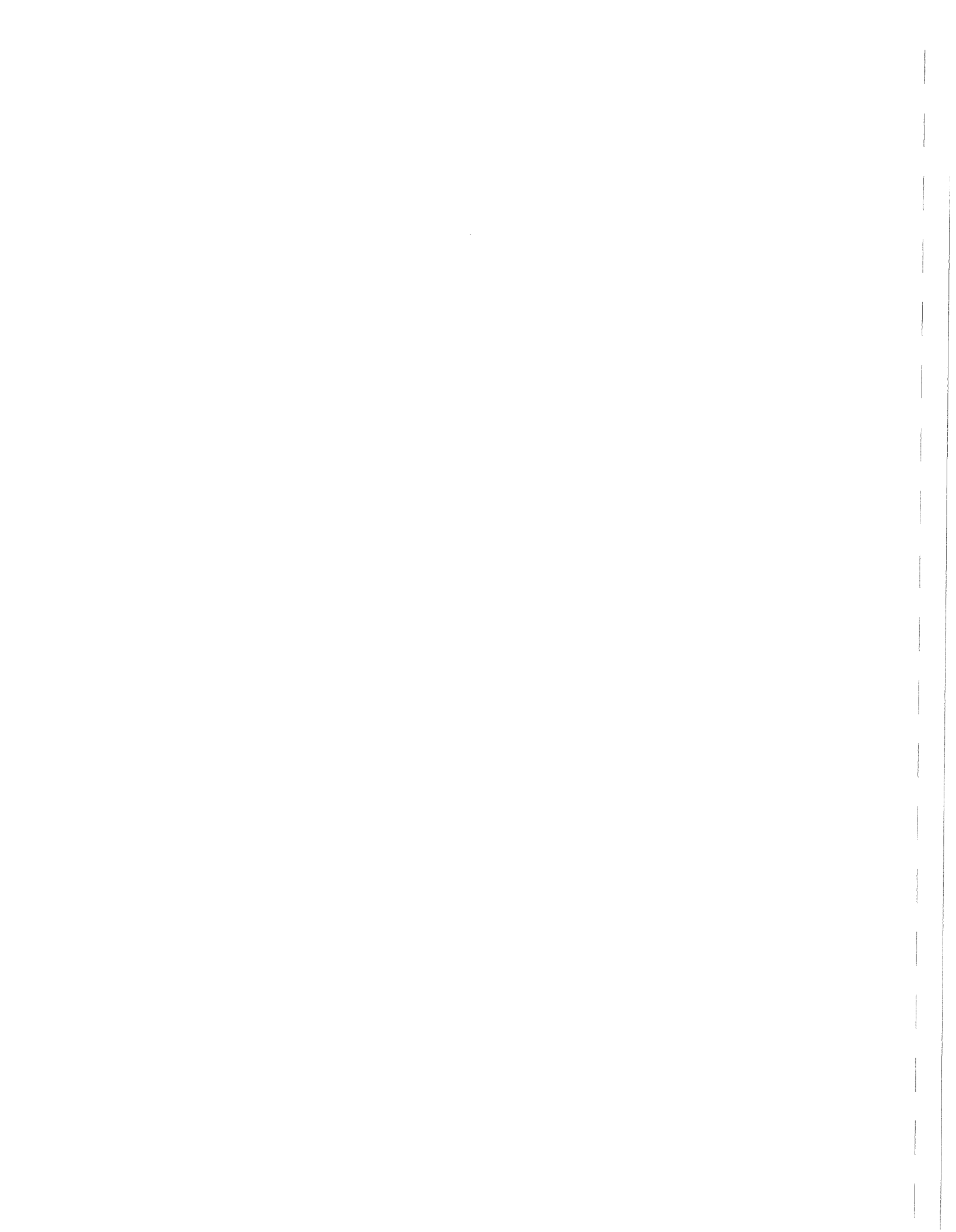
- A. Upon receipt of material at job site, the Contractor shall inspect all materials for shipping damage.

- B. Handle all FRP materials with proper care to prevent damage. Use shipping pallets to move material. Do not drag FRP material.
- C. If FRP materials are not to be installed immediately, then the materials shall be stored in a manner to prevent twisting, bending, breaking, or damage of any kind. Keep material covered to prevent unnecessary exposure to UV.

3.03 INSTALLATION

- A. Installing Contractor to coordinate and verify that other construction trades and materials have been installed per the contract drawings, and that they are accurate in location, alignment, elevation, and are plumb and level.
- B. Install FRP materials in accordance with the installation drawings supplied by the FRP supplier.
- C. Install materials accurately in location and elevation, level, and plumb. Field fabricate as necessary for accurate fit.
- D. All field cuts, holes or abrasions must be sealed with sealing resin to prevent corrosion.

END OF SECTION



Division 7 - Thermal and Moisture Protection



SECTION 07140 - FLUID APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Copies of manufacturer's literature for products proposed.
2. Samples:
 - a. Cured membrane and coating system applied to 12-inch square by 1/4-inch thick plywood or similar rigid base.
 - b. Sample of each color and coating to be used on Project.

B. Informational Submittals:

1. Certification: Compliance with product requirements specified.
2. Sample copy of guarantee to be provided. Upon completion and acceptance of the Work required by this section, submit an executed copy of the guarantee.
3. Applicator approval letter from membrane manufacturer.

1.02 QUALITY ASSURANCE

Applicator: Approved and licensed by fluid applied waterproofing manufacturer.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project Site in sealed, undamaged containers. Identify each container with material name, date of manufacture, and lot number.
- B. Store material in dry area out of direct sunlight. Storage area temperature shall not exceed 90 degrees F.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Perform work only when existing and forecasted weather conditions are within limits established by manufacturer of materials and products used.
- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive waterproofing.

1.05 SPECIAL GUARANTEE

Furnish manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as Special Guarantee. Special Guarantee shall provide for correction or, at the option of Owner, removal and replacement of Work specified in this Specification section found defective during a period of 3 years after date of

Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in the General Conditions.

PART 2 - PRODUCTS

2.01 MEMBRANE

- A. Polyurethane elastomer-based fluid applied waterproofing membrane.
- B. Manufacturers and Product:
 - 1. 3M Co., St. Paul, MN; Scotch-Clad Brand Deck Coating.
 - 2. The Neogard Corp., Dallas, TX; Perma-Gard III.
 - 3. Gaco Western, Seattle, WA; LM-60.
 - 4. Carlisle Coatings and Waterproofing, Sapulpa, OK; CCW-525.
 - 5. Sonneborn, Shakopee, MN; HLM 5000.
 - 6. W.R. Grace & Co., Cambridge, MA; Procor 20.
 - 7. Pecora Corp., Harleyville, PA; Duramem V500.

2.02 COATING

- A. One-component moisture curing polyurethane elastomer.
- B. Color: Gray.
- C. Manufacturers and Products:
 - 1. 3M Co., St. Paul, MN; Scotch-Clad Waterproof Coating.
 - 2. Gaco Western, Seattle, WA; Gacoflex P-50.

2.03 RELATED MATERIALS

- A. As follows, compatible with components produced by membrane manufacturer:
 - 1. Primers: As recommended by membrane manufacturer for type of substrate involved.
 - 2. Sealants: Low modulus, unmodified polyurethane or as recommended by membrane manufacturer.
 - 3. Backer Rod: Expanded polyethylene rod as manufactured by Dow Chemical.
 - 4. Flashing Reinforcement: Woven, uncoated fiberglass mesh on 0.050-inch thick precured neoprene.
 - 5. Protection Board: Approved by membrane manufacturer.

PART 3 - EXECUTION

3.01 CONDITIONS OF SURFACES

Verify curing methods used for concrete are compatible with membrane system.

3.02 PREPARATION

A. Cleaning:

1. Thoroughly clean surfaces to receive membrane following membrane manufacturer's recommendations.
2. Treat as necessary to remove laitance, loose material on surface, grease, oil, and other contaminants that will affect bond of the membrane.
3. Vacuum clean or clear water wash surfaces and allow to dry completely.

B. Fill voids and control joints with sealant and overcoat with nonflow membrane material. Fill or coat visible shrinkage cracks to minimum 2 inches either side of crack.

C. Use drop cloths or masking as required for protection of adjacent surfaces.

3.03 FLASHINGS-FLUID APPLIED

A. Unless Drawings establish more restrictive requirements, the following minimum requirements apply:

1. Fill construction joint voids at intersections of vertical and horizontal walls with backer rod and sealant in accordance with requirements of membrane manufacturer.
2. Nonreinforced Flashing:
 - a. Install nonreinforced flashing at construction joints not subject to movement, at all intersecting surfaces that are structurally and rigidly connected, and at all piping or other penetrations through membraned surface that do not require reinforced flashing.
 - b. Apply 50-mil minimum dry film thickness of membrane for 4 inches minimum onto adjacent surfaces.
 - c. At intersections of membrane with vertical walls, piping penetrations, and at projections through horizontal membrane, extend flashing coat to a height not greater than finished horizontal surface, with due allowance for installation of sealant work. Trowel a 1-inch high, 45-degree cant at meeting angle using nonflowing membrane material.
 - d. At projections through a vertical membrane, extend flashing coat 4 inches minimum onto penetrating element.
3. Reinforced Flashing:
 - a. Apply flashing reinforcement over cracks, expansion and control joints, and at changes of plane where adjacent surfaces are not structurally and rigidly connected and also at penetrations through a membrane surface.
 - b. Apply 50-mil dry film thickness embedment coat of membrane to surfaces to be flashed. Extend 6 inches minimum out onto adjacent deck surface.

- c. Embed reinforcement in wet coating. Embedment coating should extend 2 inches beyond reinforcement.
- d. At intersections of membrane with vertical walls, extend embedment coat and reinforcement to a height not greater than finished horizontal surface with due allowance for installation of sealant work. Trowel a 1-inch high, 45-degree cant at meeting angle using nonflowing coating material.

3.04 MEMBRANE

- A. Install, following safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of federal, state, and local authorities having jurisdiction.
- B. Following manufacturer's instructions, apply membrane material with a calibrated notched squeegee, trowel, or approved spray equipment to produce a 50-mil minimum dry thickness.
- C. Extend membrane over previously flashed areas.
- D. Use self-leveling membrane material up to a 5 percent slope.
- E. Use nonflow membrane material for vertical surfaces and surfaces over a 5 percent slope.
- F. Allow membrane to cure overnight. At temperatures less than 75 degrees F and relative humidities less than 50 percent, extend curing time.

3.05 PROTECTION

- A. Protect cured vertical membranes exposed to backfilling operations with protection board.
- B. Butt all boards; do not overlap.
- C. Adhere or bond protection boards to membrane as recommended by membrane manufacturer.

3.06 COATING

- A. Apply 20-mil (0.020-inch) thick base coat of self-leveling (up to 5 percent pitch) or nonflow (over 5 percent pitch) coating to surfaces as shown. Overcoat previously detailed areas. Allow to cure overnight.
- B. Apply a second 20-mil (0.020-inch) thick topcoat of self-leveling (up to 5 percent pitch) or nonflow (over 5 percent pitch) coating to surfaces previously base coated.

3.07 CLEANING

- A. Clean stains from adjacent surfaces with toluene, 1-1-1, trichloroethane, xylene, commercial tar remover, or as recommended by the membrane manufacturer.

- B. Remove foreign matter from finished membrane surface.

3.08 APPLICATION SCHEDULE

- A. Membrane:

1. Apply waterproofing membrane and protection board to exterior surfaces of cast-in-place concrete structures below finish ground level that enclose spaces that may be occupied, such as stairways, galleries, pump rooms, mechanical and electrical equipment rooms, and other areas shown. Do not include water-holding basins.
2. Apply membrane from top of footings to 6 inches below finished grade.

- B. Coating: Apply waterproof coating to interior surfaces of walls and slabs of hydraulic channels, conduits, wet wells, trenches, tanks, and basins that are common with habitable spaces including stairways, galleries, pump rooms, mechanical and electrical equipment spaces, and other areas as shown.

END OF SECTION



SECTION 07190 - WATER REPELLENTS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Action Submittals: Manufacturer's product data for water repellent.

- B. Informational Submittals:
 - 1. Manufacturer's current application instructions for water repellent.
 - 2. Evidence of applicator certification by product manufacturer.
 - 3. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 4. Manufacturer's Certificate of Compliance in accordance with Section 01300, Submittals.

1.02 QUALITY ASSURANCE

- A. Qualifications: Applicator certified by product manufacturer.

- B. Mockup:
 - 1. Apply water repellent following manufacturer's application instructions to not less than 20 square feet of substrate material that matches actual job conditions. Determine the optimum coverage rate required for application.
 - 2. After sample treatment has cured (approximately 12 to 24 hours), water test to verify that substrate is coated with sufficient water repellent to effectively repel moisture from the surface.
 - 3. Verify that application of water repellent materials will produce no surface stains or discoloration, and obtain Engineer's acceptance.
 - 4. Maintenance: Maintain mockup during construction for workmanship comparison; remove and legally dispose of mockup when no longer required.
 - 5. Incorporation: Mockup may be incorporated into final construction upon Owner's approval.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original sealed containers.

- B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1. Lids must be kept tightly sealed. Do not allow moisture to enter containers.
 - 2. Store containers in a dry place, upright and airtight at temperatures of 45 degrees F (7 degrees C) and not exceeding 100 degrees F (38 degrees C).

1.04 PROJECT CONDITIONS

- A. Surface, air, and material temperatures shall not be lower than 40 degrees F or higher than 95 degrees F during application unless otherwise permitted by manufacturer's instructions. Do not apply when temperature is expected to fall below 40 degrees F within 12 hours following application.
- B. Weather: Clear with no precipitation during application or expected for 4 hours following application.
- C. Provide positive ventilation throughout the application.

1.05 SPECIAL GUARANTEE

- A. Provide manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of Work specified in this Specification section found defective during a period of 10 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in the General Conditions.
- B. Conditions: Applied product will retain its water repellent effects during the Special Guarantee period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Harris Specialty Chemicals; Hydrozo, Enviroseal 40.
- B. Huls America, Inc.; Chem-Trete BSM 40.
- C. Chemprobe Technologies, Inc.; Prime A Pell.
- D. Textured Coatings of America; Tex-Cote Rainstopper Series 140.

2.02 WATER REPELLENT

- A. Active Alkylalkoxysilane Content: By weight, 40 percent.
- B. Not alter appearance of masonry or change the surface texture.
- C. No fillers, stearates, or paraffins.
- D. Clear color.
- E. VOC content: Less than 350 grams per liter using EPA Method 24.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Verify that surfaces are solid, dry, and free of dirt, efflorescence, oil, wax, frozen matter, loose particles, cracks, pits, laitance, curing compounds, and other foreign matter that would block absorption of water repellent.
- B. Verify that curing of sealants is complete.
- C. Clean masonry surfaces to make them acceptable for application.
- D. Protect and mask adjacent surfaces during application.

3.02 APPLICATION

- A. Follow product manufacturer's instructions and recommendations, including application apparatus and techniques, and coverage rates.
- B. Provide uniform coverage over entire surface of face brick on exterior and interior of buildings.

3.03 FIELD QUALITY CONTROL

- A. Notify Engineer 48 hours prior to application.
- B. After water repellent has dried (24 hours, low humidity, medium temperature (70 to 90 degrees F) and 48 hours, high humidity, low temperature (50 to 69 degrees F), test surfaces with a water spray. Recoat areas that indicate water absorption.

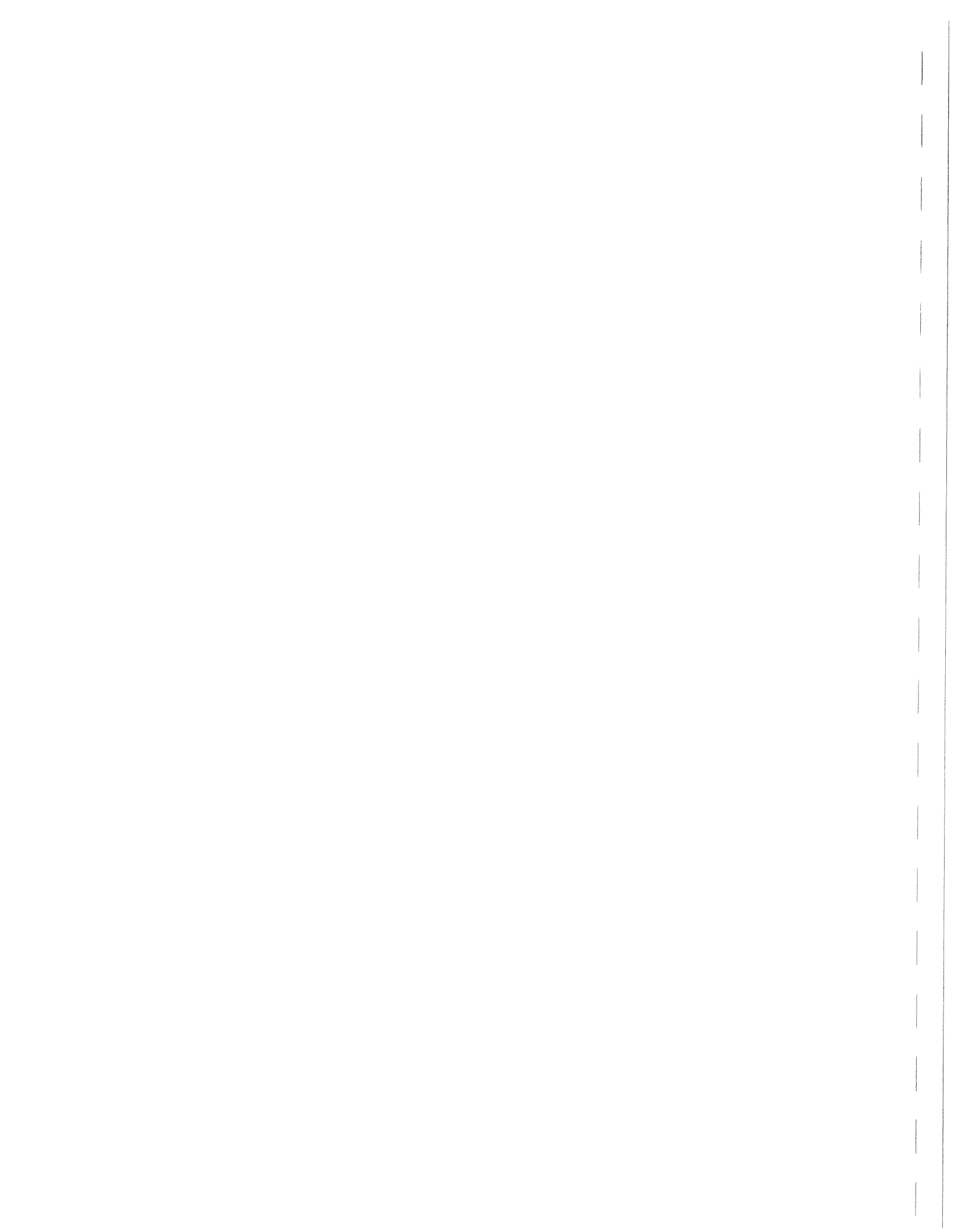
3.04 CLEANING

- A. At completion, remove from the jobsite excess material, debris, and waste. Dispose of water repellent containers according to state and local environmental regulations.
- B. Upon completion of Work, clean window glass and other splattered surfaces.

3.05 PROTECTION

- A. Protect adjacent shrubs, metal, wood trim, glass, asphalt, and other building hardware from overspray. Do not permit spray mist or liquid to drift onto surrounding properties or parking lots. Avoid contact with automobile paint and windshields. Clean up immediately after application using cleaners approved by product manufacturer.
- B. Protect installed product's finish surfaces from damage during construction.

END OF SECTION



SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. C272, Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
 - b. C303, Standard Test Method for Dimensions and Density of Preformed Block-Type Thermal Insulation.
 - c. C516, Standard Specification for Vermiculite Loose Fill Thermal Insulation.
 - d. C549, Standard Specification for Perlite Loose Fill Insulation.
 - e. C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - f. C665, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - g. D4397, Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
 - h. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - i. E96, Standard Test Methods for Water Vapor Transmission of Materials.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. On packaging clearly identify manufacturer, contents, brand name, applicable standard, and R-value.
- B. Store materials off ground and keep them dry at all times. Protect against weather, condensation, and damage.

PART 2 - PRODUCTS

2.01 BATT INSULATION AND FASTENERS

- A. Fiberglass or Mineral Wool Batts:
 1. ASTM C665, Type I, with no vapor retarder with R-values as indicated on Drawings.
 2. Manufacturers:
 - a. CertainTeed Corp.
 - b. Owens-Corning Fiberglas Corp.
 - c. Johns Manville.

- B. Fasteners: As recommended by insulation manufacturer.
- C. Tape: As recommended by insulation manufacturer.
- D. Ventilation Baffles: As recommended by insulation manufacturer for installation between prefabricated trusses.

2.02 VAPOR RETARDER

- A. Plastic Sheeting: ASTM D4397, minimum thickness of 6 mils.
- B. Sealant and Tape: As recommended by vapor retarder manufacturer.

2.03 CAVITY WALL INSULATION

- A. Material: Semi-rigid boards of inorganic glass fiber.
- B. Conformance: ASTM C612.
- C. Flame Spread: Less than 25 when tested in accordance with ASTM E84.
- D. Thickness or R-Value: As shown on Drawings.
- E. Manufacturers and Products:
 - 1. Owens Corning, AF530.
 - 2. Johns Manville, Insul-Shield 300.

2.04 AIR BARRIER AND AIR SEAL

- A. Rubberized Asphalt Composite Wall Membrane:
 - 1. Meeting requirements of ASTM E96, Method B.
 - 2. Rubberized asphalt integrally bonded to a film of high density cross laminated polyethylene.
 - 3. Thickness: Minimum 40 mils.
 - 4. Primer: As recommended by membrane manufacturer.
 - 5. Manufacturer and Product: W.R. Grace Construction Products; Perm-A-Barrier.

2.05 RIGID INSULATION

- A. Extruded polystyrene foam.
- B. ASTM C578, Type IV.
- C. Flame Spread: Less than 25 when tested in accordance with ASTM E84.
- D. Thickness: As shown.
- E. Manufacturers and Products:
 - 1. Dow Chemical Co.; Styrofoam Square Edge.

2. UC Industries; Foamular.

F. Adhesives and Fasteners: As recommended by insulation manufacturer.

PART 3 - EXECUTION

3.01 BATT INSULATION

A. Install in accordance with manufacturer's instructions and as specified below:

1. Install batt insulation in widths required by framing spacing.
2. Fit tightly to ensure continuous seal.
3. Where electrical outlets, ducts, pipes, vents, or other utility items occur, place insulation on cold weather side of obstruction.
4. Protect installed insulation from tears and other damage until covered with finish material.
5. Remove and replace damaged material.
6. Install ventilation baffles between trusses as recommended by manufacturer.

3.02 VAPOR RETARDER

- A. Apply to ceiling framing in sheets as large as possible.
- B. Lap joints 6 inches.
- C. Seal joints with sealant and tape as recommended by vapor retarder manufacturer.
- D. Fit tightly and seal around penetrations.
- E. Repair minor tears or holes with tape.
- F. Replace sheets with tears or holes, which require more than 6 inch length of tape to repair.

3.03 RIGID INSULATION

- A. Install boards in location and in thickness as shown.
- B. Cut insulation with saw, knife, or other sharp tool to fit tightly around obstructions.
- C. Butt insulation boards together tightly at joints.
- D. Where thickness required exceeds 1-1/2 inches, install two layers of boards.
- E. Apply to masonry or concrete with adhesive recommended by insulation manufacturer:
 1. Adhere first layer to substratum, then adhere second layer to first, staggering all joints.

2. Follow manufacturer's recommendations for preparing surfaces and applying adhesive.

3.04 AIR BARRIER AND AIR SEAL

Install as specified in Section 04813, Masonry Veneer.

3.05 CAVITY WALL INSULATION

Install as specified in Section 04813, Masonry Veneer.

END OF SECTION

SECTION 07311 - FIBERGLASS REINFORCED ASPHALT SHINGLES

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. D226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - b. D2178, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
 - c. D3018, Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
 - d. D3462, Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
 - e. D3909, Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules.
 - f. D4586, Standard Specification for Asphalt Roof Cement, Asbestos Free.

1.02 SUBMITTALS

A. Action Submittals:

1. Roofing materials manufacturer's specifications selected for use.
2. Color choices available.

B. Informational Submittals:

1. Manufacturer's Certificate of Compliance.
2. Sample copy of guarantee to be provided.
3. Roofing materials manufacturers' current printed installation instructions.

1.03 SPECIAL GUARANTEE

Furnish manufacturer's extended guarantee or warranty of at least 30 years, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of Work specified in this Specification section found defective during a period of 2 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in the General Conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Shingles: Self-sealing standard fiberglass based asphalt shingles meeting ASTM D3018, Type I and ASTM D3462, and the following:
 - 1. Composition: Fiberglass roofing felt, asphalt, and ceramic-coated rock granules.
 - 2. Minimum Size: Length 36 inches, width 12 inches.
 - 3. Application: Exposure 5 inches, head lap 2 inches.
 - 4. Weight: 225 pounds per square minimum.
 - 5. Features: Self-sealing, three-tab, square butt, self-aligning notches at ends.
 - 6. Compliances: UL Class A, fire- and wind-resistant.
 - 7. Color: As selected from manufacturer's standard color range.
- B. Plastic Cement: ASTM D4586, Type II.
- C. Fastenings: Large headed aluminum roofing nails.
- D. Underlayment: Ice and Water Shield by W.R. Grace Co. Eaveguard by Bakor Inc.
- E. Metal flashing: 0.61 mm base steel nominal thickness, zinc coated Z275 (G90), prefinished in Stelcolor 5000.
- F. Sheet Metal Components:
 - 1. Closures, trim and metal flashing: 0.81 mm thick aluminum Alcan Prefinished Building Sheet painted one side. Colour to later selection.
 - 2. Fasteners: Of same material as sheet metal being used, to suit applicable conditions.
 - 3. Roof drainage components by Hunter Douglas Colour: to later selection from manufacturer's standard colour range.
 - 4. Soffit: 3-panel vented soffit design plain.
 - 5. Fascia: 200 mm high min.
 - 6. Roof drainage system: 127 mm wide x 95 mm deep gutter and 51 mm x 75 mm downpipe.
 - 7. Accessories: As required to complete the installation.

2.02 ACCESSORIES

- A. Attic vents: RV-5 aluminum RV-6 supplied by Gibraltar Construction Products Group.
- B. Ridge Vent: Model #PRV-20 – shingle over ridge vent by Gibraltar Construction Products.
- C. Sealant: As specified in Section 07900 Joint Sealants.
- D. Concrete splash pad: Concrete splash pad by Brooklyn Concrete Products Ltd. Splash block by Pavestone Plus Inc.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspect roof deck for deficiencies and report same to Engineer.
- B. Do not start Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Underlayment and Roofing Shingles: In accordance with roofing material manufacturer's printed instructions. Use closed valley application.
- B. Before placement of each piece, remove protector strip covering self-sealing strip.

3.03 INSTALLATION – METAL FLASHING

- A. Form and install metal flashings as detailed or as required.
- B. Protect intersection of shingle roof and vents with flashing that extends minimum 100 mm each way from intersection.
- C. Form and install fascias as indicated and as required.

3.04 INSTALLATION – ATTIC VENTS AND RIDGE VENTS

- A. Install attic exhaust vents. Fasten to cut-out in plywood sheathing, flash and seal.
- B. Install eavetroughs, downspouts, trim and closures required to complete installation.
- C. Rigidly secure members to wood blocking. Exposed fasteners will not be permitted.

3.05 INSTALLATION – EAVETROUGHES AND DOWNSPOUTS

- A. Form and install eavetroughs and downspouts in maximum lengths possible. Seal joints watertight.
- B. Provide strainer baskets at outlets.
- C. Fasten downspouts with straps at maximum spacing of 10 feet, securely holding downspouts clear of wall in fixed position.

3.06 INSTALLATION – SEALANT

- A. Install sealant necessary to seal between work of this Section and dissimilar materials.
- B. Conform to requirements of Section 07900, Joint Sealants.

3.07 INSTALLATON – SPLASH PAD

Install splash pad on 100 mm of clear gravel or crushed stone. Slope pad away from building.

3.08 CLEANING

Clean roofing areas upon completion, leaving areas free from debris occasioned by installation.

3.09 PROTECTION

- A. Protect the roofing materials before, during, and after installation and protect the installed Work and materials of other trades affected by this Work.
- B. In the event of damage, immediately make repairs and replacements as necessary and acceptable to Engineer.

END OF SECTION

SECTION 07900 - JOINT SEALANTS

PART 1 - GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. ASTM International (ASTM):
 - a. C661, Standard Test Method for Indentation Hardness of Elastomeric Type Sealants by Means of a Durometer.
 - b. C834, Standard Specification for Latex Sealants.
 - c. C920, Standard Specification for Elastomeric Joint Sealants.
 - d. C1193, Standard Guide for Use of Joint Sealants.

1.02 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings: Surface preparation instructions. Indicate where each product is proposed to be used.
 2. Samples: Material proposed for use showing color range available.
- B. Informational Submittals:
1. Installation instructions.
 2. Applicator Qualification: Documentation showing minimum of 5 years' experience installing sealants in projects of similar scope.
 3. Certificate of Compliance: Proposed materials meet Specification requirements.
 4. Special guarantee.

1.03 ENVIRONMENTAL REQUIREMENTS

Ambient Temperature: Between 40 and 80 degrees F (4 and 27 degrees C) when sealant is applied. Consult manufacturer when sealant cannot be applied within these temperature ranges.

1.04 SPECIAL GUARANTEE

- A. Product: Furnish manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction or, at the option of the Owner, removal and replacement of Work specified in this section found defective during a period of 5 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in the General Conditions.
- B. Conditions: No adhesive or cohesive failure of sealant.

- C. Sealed Joints: Watertight and weathertight with normal usage.

PART 2 - PRODUCTS

2.01 SEALANT MATERIALS

A. Sealant Characteristics:

1. Uniform, homogeneous.
2. Free from lumps, skins, and coarse particles when mixed.
3. Nonstaining, nonbleeding.
4. Hardness of 15 minimum and 50 maximum, measured by ASTM C661 method.
5. Immersible may be substituted for nonimmersible.

- B. Sealant Color: Unless specifically noted, match the color of the principal wall material adjoining the area of application.

C. Type 1-Silicone, Nonsag, Nonimmersible:

1. Silicone base, single-component, chemical curing; ASTM C920, Type S, Grade NS, Class 25.
2. Capable of withstanding movement up to 50 percent of joint width.
3. Manufacturers and Products:
 - a. Dow Corning Corp.; No. 790.
 - b. General Electric; Silpruf.
 - c. Sonneborn; Sonolastic Omniseal.

D. Type 2-Multi-Part Polyurethane, Self-Leveling, Immersible:

1. Polyurethane base, multi-component, chemical curing; ASTM C920, Type M, Grade P, Class 25.
2. Capable of being continuously immersed in water.
3. Manufacturers and Products:
 - a. Sonneborn; Sonolastic Paving Joint Sealant.
 - b. Pecora Corp.; Urexspan NR-200.
 - c. H. S. Peterson Co.; Iso-Flex 880GB.
 - d. Mameco International; Vulkem 245.

E. Type 3-Multi-Part Polyurethane, Nonsag, Immersible:

1. Polyurethane base, multicomponent, chemical curing; ASTM C920, Type M, Grade NS, Class 25.
2. Capable of being continuously immersed in water.
3. Manufacturers and Products:
 - a. H. S. Peterson Co.; Iso-Flex 881.
 - b. Mameco International; Vulkem 922.
 - c. Product Research Corp.; PRC 270.

- F. Type 4-Multi-Part Polyurethane, Nonsag, Nonimmersible: Polyurethane base, multicomponent, chemical curing; ASTM C920, Type M, Grade NS, Class 25.
1. Manufacturers and Products:
 - a. Sonneborn; Sonolastic NP-II.
 - b. Pecora Corp.; Dynatrol II.
 - c. Tremco; Dymeric.
 - d. H. S. Peterson Co.; Isoflex 2000.
 - e. Mameco International; Vulkem 227.
 - f. Sika Chemical Corp.; Sikaflex 2C.
- G. Type 5-One-Part Polyurethane, Immersible:
1. Polyurethane base, single-component, moisture curing; ASTM C920, Type S, Grade NS or P, Class 25.
 2. Capable of being continuously immersed in water.
 3. Manufacturers and Products for Nonsag:
 - a. Sika Chemical Corp.; Sikaflex-1a.
 - b. Mameco International; Vulkem 116.
 4. Manufacturers and Products for Self-Leveling:
 - a. Sonneborn; Sonolastic SL-1.
 - b. Mameco International; Vulkem 45.
- H. Type 6-One-Part Polyurethane, Nonimmersible: Polyurethane base, single-component, moisture curing; ASTM C920, Type S, Grade NS, Class 25.
1. Manufacturers and Products:
 - a. Pecora Corp.; Dynatrol I.
 - b. Tremco; Dymonic.
 - c. Sonneborn; Sonolastic NP-I.
- I. Type 7-Multi-Part Polysulfide, Immersible:
1. Polysulfide base, two-component, chemical curing; ASTM C920, Type M, Grade P or NS, Class 25.
 2. Capable of being continuously immersed in water.
 3. Manufacturers and Products:
 - a. W. R. Meadows; CM-60, two-part.
 - b. Sonneborn; Sonolastic, two-part.
- J. Type 8-One-Part Polysulfide, Nonsag, Nonimmersible:
1. Polysulfide base, single-component, moisture curing; ASTM C920, Type S, Grade NS, Class 12 1/2.
 2. Capable of withstanding movement up to 20 percent of joint width.
 3. Manufacturers and Products:

- a. W. R. Meadows; CM-60, one-part.
 - b. Product Research Corp.; PRC 7000.

- K. Type 9-One-Part Acrylic Terpolymer, Nonsag, Nonimmersible:
 - 1. Acrylic base, single-component, solvent curing; ASTM C834 nonsag.
 - 2. Capable of withstanding movement up to 7.5 percent of joint width; Shore "A" hardness of 55 maximum.
 - 3. Manufacturers and Products:
 - a. Pecora Chemical Corp.; 60 + Unicrylic.
 - b. Tremco; Mono.
 - c. Sonneborn; Sonolac Acrylic Latex Caulk.

- L. Type 10-Sanitary Sealant: Silicone sealant similar to Type 1, above, formulated to resist mold growth and repeated exposure to high humidity while retaining adhesion, flexibility, and color.
 - 1. Manufacturers and Products:
 - a. Dow Corning; 786.
 - b. General Electric; Sanitary Sealant.

- M. Type 11-Fire Penetration Seal:
 - 1. Manufacturers and Products:
 - a. Dow Corning Corp.; Fire Stop Sealant or Foam.
 - b. 3M Corp.; Fire Barrier Caulk CP25 and Putty 303.
 - c. General Electric; Pensil Sealant or Foam.
 - d. The Carborundum Co.; Fyre Putty.
 - e. Hilti Construction Chemicals; CS240.

- N. Type 12-One-Part Polycarbonate, Immersible:
 - 1. Polycarbonate base, single-component, moisture curing; ASTM C920, Type S, Grade NS, Class 25.
 - 2. Capable of being continuously immersed in water.
 - 3. Manufacturer and Product: Pro-Seal Products, Inc.; Pro-Seal 34.

- O. Type 13-Tape Sealant: Compressible polyurethane foam impregnated with polybutylene or polymer-modified asphalt.
 - 1. Color: Black.
 - 2. Size: 3/4-inch wide by length required by expanded thickness recommended by manufacturer for particular application.
 - 3. Manufacturers and Products:
 - a. Emseal Joint Systems, Ltd.; 25V.
 - b. Polytite Manufacturing Corp.; Standard.
 - c. Phoenix Building Products; Compriband.
 - d. Koch Protective Treatments, Inc.; Epti 606.
 - e. Illbruck; Willseal.

- f. Williams Products, Inc.; Everlastic.

2.02 BACKUP MATERIAL

- A. Nongassing, extruded, closed-cell round polyethylene foam rod, compatible with sealant used, and as recommended by sealant manufacturer.
- B. Size: As shown or as recommended by sealant material manufacturer. Provide for joints greater than 3/16 inch wide.
- C. Manufacturers and Products:
 - 1. Haveg Industries; Minicel.
 - 2. Dow Corning; Ethafoam SB.
 - 3. Sonneborn; Sonofoam.
 - 4. Hercules, Inc.; HBR.

2.03 ANCILLARY MATERIALS

- A. Bond Breaker: Pressure sensitive tape as recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Noncorrosive and nonstaining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Primer: Nonstaining type recommended by sealant manufacturer to suit application.

2.04 PREFORMED SEALS

- A. Preformed Compressible Joint Seals:
 - 1. Widths Up to 5 Inches: Watson Bowman Acme Corp., Amherst, NY, WABO WA Series; H. S. Peterson Co., Pontiac, MI, Isoflex Neoprene Seal, LS-Series.
 - 2. Other Widths: Series or model recommended by seal manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

- A. Use of more than one material for the same joint is not allowed unless approved by the sealant manufacturer.
- B. Install joint sealants in accordance with ASTM C1193.
- C. Horizontal and Sloping Joints of 1 Percent Maximum Slope: Use self-leveling (Grade P) joint sealant.
- D. Steeper Sloped Joints, Vertical Joints, and Overhead Joints: Use nonsag (Grade NS) joint sealant.

E. Use joint sealant as required for the applicable application and as follows:

Joint Size	Sealant Type
Less than 1"	1,2,3,4,5,6,7,8, or 9
Less than 2"	1,2,3,4, or 7
Over 2"	Follow manufacturer's recommendation

3.02 PREPARATION

- A. Verify that joint dimensions, and physical and environmental conditions, are acceptable to receive sealant.
- B. Surfaces to be sealed shall be clean, dry, sound, and free of dust, loose mortar, oil, and other foreign materials.
 - 1. Mask adjacent surfaces where necessary to maintain neat edge.
 - 2. Starting of work will be construed as acceptance of subsurfaces.
 - 3. Apply primer to dry surfaces as recommended by sealant manufacturer.
- C. Verify that joint shaping materials and release tapes are compatible with sealant.
- D. Examine joint dimensions and size materials to achieve required width/depth ratios.
- E. Carefully follow manufacturer's instructions for mixing multi-component products.

3.03 INSTALLATION

- A. Use joint filler to achieve required joint depths, to allow sealants to perform intended function.
 - 1. Install backup material as recommended by sealant manufacturer.
 - 2. Where possible, provide full length sections without splices; minimize number of splices.
 - 3. Tape sealant may be used as joint filler if approved by sealant manufacturer.
- B. Use bond breaker where recommended by sealant manufacturer.
- C. Seal joints around window, door and louver frames, expansion joints, and elsewhere as indicated.
- D. Joint Sealant Materials: Follow manufacturer's recommendation and instructions, filling joint completely from back to top, without voids.
- E. Joints: Tool slightly concave after sealant is installed.
 - 1. When tooling white or light color sealant, use a water wet tool.

2. Finish joints free of air pockets, foreign embedded matter, ridges, and sags.

F. Tape Sealant: Compress to 50 percent of expanded thickness and install in accordance with manufacturer's instructions.

3.04 PREFORMED SEALS

A. Prepare joint surfaces clean and dry, free from oil, rust, laitance, and other foreign material.

B. Construct joints straight and parallel to each other and at the proper width and depth.

C. Apply joint sealant manufacturer's approved primer and adhesive in accordance with manufacturer's instructions.

D. Install seal in accordance with manufacturer's instructions.

3.05 CLEANING

A. Clean surfaces next to the sealed joints of smears or other soiling resultant of sealing application.

B. Replace damaged surfaces resulting from joint sealing or cleaning activities.

3.06 JOINT SEALANT SCHEDULE

A. This schedule lists the sealant types acceptable for each joint location. Use as few different sealant types as possible to meet the requirements of Project.

Joint Locations	Sealant Type(s)
Expansion/Contraction & Control Joints At:	
Concrete Walls (except water-holding & belowgrade portions of structures)	1,3,4,5,6,7,12
Concrete Floor Slabs (except for water-holding Structures)	2,5
Slabs Subject to Vehicle and Pedestrian Traffic	2,5
Masonry Walls	1,3,4,5,6,7,12,13
Ceramic Tile Floors	1,2,5,10
Ceramic Tile Walls	1,3,5,10
Material Joints At:	
Metal Door, Window, & Louver Frames (Exterior)	1,5,6,8,12
Metal Door, Window, & Louver Frames (Interior)	1,5,6,8,9
Wall Penetrations (Exterior)	1,5,6,8,12
Wall Penetrations (Interior)	1,5,6,8

Joint Locations	Sealant Type(s)
Floor Penetrations	5,6,7
Ceiling Penetrations	1,3,4,5,6,7
Roof Penetrations	5
Sheet Metal Flashings	5,13
Other Joints:	
Threshold Sealant Bed	5
Around Plumbing Fixtures	10
Openings Around Pipes, Conduits, & Ducts Through Fire-Rated Construction	11
Concrete Form Snap-Tie Holes	1,4,5

END OF SECTION

Division 8 - Doors and Windows



SECTION 08110 -STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American National Standards Institute (ANSI):
 - a. A250.6, Hardware on Standard Steel Doors (Reinforcement - Application).
 - b. A250.8, Steel Doors and Frames.
 - c. A250.11, Recommended Erection Instructions for Steel Frames.
 2. ASTM International (ASTM):
 - a. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - b. A366/A366M, Standard Specification for Commercial Steel (CS) Sheet, Carbon (0.15 Maximum Percent), Cold-Rolled.
 - c. A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
 - d. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - e. E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 3. Door and Hardware Institute (DHI): A115, Specifications for Hardware Preparations in Standard Steel Doors and Frames.
 4. National Fire Protection Association (NFPA): 80, Standard for Fire Doors and Fire Windows.
 5. Underwriters Laboratories, Inc. (UL): Building Materials Directory.

1.02 SUBMITTALS

- A. Action Submittals: Applicable information for each type of door and frame, including:
1. Frame conditions and complete anchorage details, supplemented by suitable schedules covering doors and frames.
 2. Glass opening sizes and locations in doors.
 3. Connections of door frames to structural steel framing concealed in frames.
 4. Location and field splice joints for frames too large to ship in one piece; indicate complete instructions for making field splices.
 5. Joints required to accommodate expansion joint movement.
 6. Relate to door numbers used in Contract Drawings.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Properly identify each item with number used in Contract Drawings.
- B. Store doors upright, in protected dry area, at least 1 inch off ground or floor and at least 1/4 inch between individual pieces.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Curries Manufacturing.
- B. The Ceco Corp.
- C. Fenestra Division, Marmon Group.
- D. Mesker Industries, Inc.
- E. Monarch Steelcraft, Ltd.
- F. Overly Manufacturing Co.
- G. Pioneer Industries.
- H. Precision Metals, Inc.
- I. Republic Steel Corp.
- J. Steelcraft Manufacturing Co.
- K. Trussbilt, Inc.
- L. Williamsburg Steel Products Co.
- M. Stiles Custom Metal, Inc.

2.02 MATERIALS

- A. Basic Metal Material:
 - 1. ASTM A366; sheet steel, cold-rolled, stretcher level.
 - 2. ASTM A167, Type 316 stainless steel.
- B. Hollow Metal Frames:
 - 1. Products of hollow metal door manufacturer.
 - 2. ANSI 250.8, except as modified herein.
 - 3. Frames for Doors 16 gauge for interior, welded type, of cross-section shown.
 - 4. Prepare floor and wall anchors, reinforcement, and cutouts for hardware to meet requirements of DHI A115 and ANSI A250.6.

5. Finished size, shape, and profile of frame members as shown.
 6. Concealed fasteners or welding are preferred to through-the-face fasteners.
 7. Identification: Stamp opening number, as shown on Drawings, on center hinge reinforcement of each frame.
- C. Hollow Metal Doors: ANSI A250.8, except as modified herein. DHI A115 and ANSI A250.6 to receive hardware specified in Door and Hardware Schedule.
1. Interior:
 - a. Flush Panel Doors: 18 gauge, Level 2, Model 1.
 - b. Stile and Rail Doors: 16 gauge, Level 3, Model 3.
 - c. Flush end closure at top of doors.
- D. Labeled Fire Doors and Frames:
1. Conform to listing requirements of Underwriters Laboratories, Inc. (UL).
 2. Label each door and frame for class of rating required.
 3. Overlapping astragal on active leaf of double doors.
 4. Label requirements, dimensions, and type of door are indicated in Door and Hardware Schedule on Drawings.
 - a. Modify drawing details if required to secure label.
 - b. Clearly identify modifications on Shop Drawings.
 - c. Maximum temperature rise of 450 degrees F for stairway enclosures.
- E. Glazing:
1. Doors: Furnish with formed flush-type glazing strips with butt corner joints to permit selection of secure side in field.
 2. Glazing Arrangements: Accommodate glass of type and thickness indicated and as specified in Section 08800, Glazing.

2.03 MISCELLANEOUS ITEMS

- A. Filler or Transom Panels: Furnish of same construction and finish as door to include fire-resistive label and sound-retardant construction.
- B. Furnish manufacturer's standard core filler, anchors, fasteners, and other ancillary items.

2.04 FACTORY FINISHING REQUIREMENTS

Galvanized with A60 zinc coating in accordance with ASTM A653/A653M (Wipe Coat galvanized coating is not acceptable).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Frames:

1. Follow ANSI A250.11 and manufacturer's instructions.
 - a. Maintain scheduled dimensions, hold head level, and maintain jambs plumb and square.
 - b. Secure anchorages and connections to adjacent construction.
 - c. Wherever possible, leave frame spreader bars intact until frames are set perfectly square and plumb and anchors are securely attached.

B. Doors:

1. Hollow Metal Doors: ANSI A250.8.
2. Hardware: In accordance with manufacturer's templates and instructions.
 - a. Adjust operable parts for correct function.
 - b. Remove hardware, with exception of prime coated items, tag, box, and reinstall after finish paint work is completed.
3. Labeled Doors: NFPA Pamphlet No. 80.

3.02 FIELD PAINTING

- #### A. Where prime coat has been damaged, sand smooth and touch up with same primer as applied at shop.
1. Remove rust before painting.
 2. Touch Up: Not obvious.
 3. Perform immediately after door and frame installation.

3.03 PROTECTION

Protect installed doors and frames against damage from other construction work.

3.04 SCHEDULES

For tabulation of door and frame characteristics, such as size, type, detail, and finish hardware requirements, see Door and Hardware Schedule on Drawings.

END OF SECTION

SECTION 08410 - ALUMINUM ENTRANCES

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. The Aluminum Association, Incorporated (AA): Designation System for Aluminum Finishes.
2. American Architectural Manufacturers Association (AAMA): 800, Voluntary Specification and Test Method for Sealants.
3. ASTM International (ASTM):
 - a. C509, Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
 - b. D1187, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
 - c. E283, Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.
 - d. E330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - e. E331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.02 SYSTEM DESCRIPTION

A. Design Requirements:

1. Provide a thermally isolated aluminum framing system that utilizes straight-in glazing without projecting stops. Position glass near exterior of frame and provide in-swinging operable vents where shown.
2. System shall have interior flashing to provide continuous flashing to exterior through pressure relieved horizontal weep holes.
3. Face Clip Design:
 - a. Engaged by pushing straight into the clip.
 - b. Easily removed for deglazing.
 - c. Reusable for reglazing.
4. Entrances and glass framing shall be compatible in appearance.

B. Performance Requirements: Meet requirements of Article Performance Tests.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

- a. Details of doors, framing, and anchorage to structure.
- b. Manufacturer's brochures or catalogs, specifications, recommendations, and standard details illustrating and specifying products proposed for use on this Project.
- c. Show field measurements.

2. Samples: At least 3-inch long Samples of anodized extruded aluminum, showing probable range of variation in color.

B. Informational Submittals:

1. Evidence of installer's qualifications.
2. Certified test reports showing compliance with specified performance tests.
3. Manufacturer's Certificate of Compliance: In accordance with Section 01300, Submittals.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Entity specializing in the installation of aluminum glazing systems, with a minimum of 3 years' experience and approved by the system manufacturer.

B. Preinstallation Meeting: Conduct to discuss and verify project requirements, substrate conditions, and manufacturer's installation instructions and warranty requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store materials as recommended by manufacturer, in inside designated areas, free of dust and corrosive fumes, as close as possible to point of installation.

C. Prevent contaminants from contacting aluminum.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Framing systems, entrance doors, and ventilators shall be the products of a single manufacturer.

B. Materials and products specified in this section shall be products of:

1. Kawneer Co.
2. United States Aluminum Corp.
3. Tublite, Inc.

2.02 BASIC MATERIALS

- A. Basic Aluminum Extrusions: 6063-T5 aluminum not less than 0.094 inch thick; door extrusions not less than 0.125 inch thick.
- B. Framing Members: 4-1/2 inches in depth with thermal break.
- C. Swing Entrance Doors:
1. Thickness: 1-3/4 inches.
 2. Stile and Rail Construction:
 - a. Wide (over 6-inch) stiles and top rails, 10-inch bottom rail.
 - b. Mechanically fastened and welded.
 - c. Hook-in type glazing stops.
 - d. Configuration indicated.
 3. Flushline Series by Kawneer Type AVL-3 with 1 inch Insulation Glass Construction:
 - a. Face sheets of plain unpatterned aluminum, 0.062 inch thick.
 - b. Core of froth-in-place urethane foam, free of chlorofluorocarbon (CFC) blowing agents.
 - c. Aluminum framed vision lights.
 - d. Configuration indicated.
- D. Glazing Gaskets: Framing manufacturer's standard elastomeric extrusion, conforming to ASTM C509.
- E. Glass and Glazing: As specified in Section 08800, Glazing.
- F. Concealed Fastening Devices, Reinforcements, and Other Internal Components: Of aluminum alloy, stainless steel, or corrosion-resistant plated.
- G. Screws: Stainless steel, factory finished color to match aluminum finish.
- H. Hardware: As scheduled, and as specified in Section 08710, Door Hardware.
- I. Neoprene Closure: 1/8-inches thick neoprene. Size to suit door opening and monorail.

J. Sealants:

1. AAMA 800, to seal metal to metal, nonworking joints.
2. Color to be compatible with adjacent materials.

K. Isolation Tape:

1. Manufacturers and Products:
 - a. Tremco; 440.
 - b. 3M; EC1202.
 - c. Presstite; 579.6.

L. Isolation Paint: Provide as specified in Section 09900, Painting and Protective Coatings.

2.03 FINISH

- A. Exposed Framing Members: Free of scratches and other serious surface blemishes.
- B. Apply finish to aluminum components after fabrication or forming.
- C. Fluoropolymer Enamel: PPG Duranar two coat system 30 ± 5 microns dry film thickness, colour: to later selection.

2.04 FABRICATION

- A. Methods of Fabrication and Assembly: Manufacturer's discretion, unless otherwise specified.
- B. Reinforcement for Surface Hardware: Manufacturer's standard.
- C. Wind Load: Reinforce mullions as necessary to limit deflection to 1/175 of span when wind load on wall is 30 psf in addition to dead loads.
- D. Assembly: As far as practicable, do fitting and assembly work in shop.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Substrate Conditions: Verify acceptability for product installation in accordance with manufacturer's instructions.
- B. Field Measurements: Verify actual opening sizes prior to fabrication.

3.02 INSTALLATION

- A. In accordance with manufacturer's installation instructions.

- B. Set items straight, level, square, plumb, and at proper elevations and in alignment with other work.
- C. Securely anchor units to surrounding structure to resist wind loads and to withstand the normal loads imposed by the operation of the doors.
- D. Fasten framing members in place using screws and backing, anchor plugs, or straps.
 - 1. Accurately cut and fit framing and moldings to result in tightly closed flush, hairline weathertight joints.
 - 2. No visible unfinished aluminum.
 - 3. Provide concealed attachments and fasteners.
- E. Door Operation:
 - 1. Swing freely, and without rattle when closed.
 - 2. Swing Type Doors: Head and jamb clearance of 3/32 inch, plus or minus 1/32 inch.
- F. Coat aluminum surfaces in contact with concrete, cement plaster, concrete masonry with isolation paint, sealant, or isolation tape cut to neat line.
- G. Seal all joints.
- H. Glazing: As specified in Section 08800, Glazing.

3.03 PERFORMANCE TESTS

- A. Air Leakage Through Assembly: Maximum 0.06 cfm per minute per square foot of wall area at 6.24 psf, as measured in accordance with ASTM E283.
- B. Resistance to Water Infiltration: No leaks in the complete system when tested in accordance with ASTM E331 at test pressure of 8 psf.
- C. Performance Under Uniform Loading:
 - 1. Test in accordance with ASTM E330 for a wind load of 30 psf.
 - 2. Maximum Deflection: Not to exceed 1/175 of member span.
 - 3. When Load is Removed: No permanent deformation or damage.

3.04 MANUFACTURER'S SERVICES

Provide manufacturer's representative at Site for preinstallation meeting, installation assistance, inspection and certification of proper installation, and performance testing of specified equipment.

3.05 CLEANING

- A. After erection, protect exposed portions from damage by machines, plaster, lime, paint, acid, cement, or other harmful compounds.

B. Remove protective materials and clean with plain water, water with soap, or household detergent.

3.06 PROTECTION

Protect adjacent areas and finish surfaces from damage during product installation.

3.07 SCHEDULES

For tabulation of door and frame characteristics, such as size, type, detail, and finish hardware requirements, see Door and Hardware Schedules on Drawings.

END OF SECTION

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American National Standards Institute (ANSI): A117.1, Buildings and Facilities-Providing Accessibility and Usability for Physically Handicapped People.
 2. Builders Hardware Manufacturer's Association (BHMA):
 - a. A156.1, Butts and Hinges.
 - b. A156.2, Bored and Preassembled Locks and Latches.
 - c. A156.3, Exit Devices.
 - d. A156.4, Door Controls - Closers.
 - e. A156.13, Mortise Locks and Latches, Series 1000.
 - f. A156.16, Auxiliary Hardware.
 - g. A156.18, Materials and Finishes.
 3. Door Hardware Institute (DHI): A115.1, Preparation of Mortise Locks in 1-3/8-Inch and 1-3/4-Inch Standard Steel Doors and Frames.
 4. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment List.

1.02 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings:
 - a. Product Data: Manufacturer's literature for each item of finish hardware required herein, clearly marked.
 - b. Finish Hardware Schedule: Furnish complete and detailed schedule, show product items, numbers, and finishes for hardware for each separate opening.
 - c. Special Tools: Provide listing and description of usage.
- B. Informational Submittals:
1. Operation and Maintenance Data.
 2. Manufacturer's Field Service Report.
 3. Certification of Hardware Consultant.
 4. Manufacturer's Certificate of Proper Installation, in accordance with Section 01640, Manufacturers' Services.

1.03 QUALITY ASSURANCE

- A. Qualifications of Supplier: Recognized supplier of architectural finish hardware, with warehousing facilities, who has been furnishing hardware in vicinity of Project for not less than 5 years, and who is, or who employs, architectural hardware consultant.

- B. Qualifications of Architectural Hardware Consultant (AHC): Certified by Door and Hardware Institute.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Before delivery, clearly identify and tag each item of hardware with respect to specified description and location of installation.
- B. Provide secure storage for finish hardware until installation is made.

1.05 EXTRA MATERIALS

Special Tools: Two sets for installation and maintenance of hardware.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide end products of one manufacturer for each product in order to achieve standardization for appearance, maintenance, and replacement.
- B. Finishes: BHMA A156.18.

2.02 FASTENERS

Stainless steel.

2.03 BUTT HINGES

- A. BHMA A156.1.
- B. Quantity per Door Leaf (Minimum):

Door Height	Hinges
Up to 5'-0"	1 pair
5'-1" to 7'-7"	1-1/2 pair
7'-8" to 10'-0"	2 pairs
10'-1" to 12'-6"	2-1/2 pairs

- C. Hinge Height (Minimum):

Door Width	Hinge Height
Up to 3'-0"	4-1/2"
3'-1" to 4'-0"	5"
Over 4'-0"	6"

- D. Width: Minimum for clearance of trim and 180-degree swing.

- E. Exterior Hinges: Nonremoveable pin.
- F. Joint Tolerance: 0.012 inch maximum, gauged in CLOSED position.
- G. Finish: Satin stainless steel No. 630.
- H. Types and Manufacturers:

No.	Type Description	Stanley	Mc-Kinney	Lawrence	BHMA
H1	Regular weight, two ball-races, full mortise, stainless steel	FBB191-32D	TB2314	BB4101-32D	A5112

2.04 LOCKS AND LATCH SETS

- A. Mortise Locks: BHMA A156.13, Series 1000, Grade 1 and DHI A115.1.
 - 1. Materials: Brass or stainless steel.
 - 2. Trim: Wrought or forged lever handles and roses.
 - 3. Core Cylinders: Interchangeable, removable; minimum of six pins.
 - 4. Bolt Throw: 5/8 inch minimum.
 - 5. Lever Backset: 2-3/4 inches.
 - 6. Manufacturers and Products:
 - a. Sargent; LNH.
 - b. Schlage; 03.
- B. Finish:
 - 1. Satin stainless steel No. 630.
- C. Types and Manufacturers:

No.	Type Description	Best	Sargent	Schlage	BHMA
L1	Mortise entrance lock with lever handle	35H7F3H	8245-LNJ	L9456P-03	F12, F13
L5	Mortise utility room lock with lever handle	35H7EW3H	8204-LNJ	L9080-03	F07
L8	Mortise privacy lock with lever handle	35H7LF3H	8265-LNJ	L9040-03	F19, F22
L16	Lock by door manufacturer; furnish cylinders for keying to other locks as required				

D. Keying:

1. Lock Cylinders: Operate by grand master key system that allows for future expansion.
2. Keylocks: Key new locks into existing.
3. Keys: Two per lock; tag with schedule information.
4. Master Keys: Four; send by registered mail to Owner.
5. Furnish lock manufacturer's removable core maximum security keying system.

2.05 CONSTRUCTION KEY SYSTEM

Removable construction core system for locks.

2.06 EXIT DEVICES

- A. BHMA A156.3.
- B. Furnish fire exit devices at fire-rated doors.
- C. Trim: Levers: Sargent LNH; Von Duprin 03.
- D. Finish: Exit Device: Satin chromium-plated No. 626.
- E. Types and Manufacturers:

No.	Type Description	Sargent	VonDuprin	BHMA
X4	Concealed vertical rod type for pairs	8606ETL and 8610	9947L and 9947EO	Type 8 08 and 01

2.07 CLOSERS

- A. BHMA A156.4.
- B. Size closers in accordance with manufacturer's standards. Mount regular arm closers on pull side of doors. Mount parallel arm closers on push side of doors. On pair of doors provide closer on active leaf only, unless noted otherwise.
- C. Finish: Satin chromium-plated No. 626.
- D. Types and Manufacturers:

No.	Type/Description	LCN	Sargent	BHMA
C4	Parallel arm with integral stop	4110 Cush-N-Stop Series	351-PS Series	C02021
C6	Parallel arm with integral stop and hold-open	4110H Cush-N-Stop Series	351-PSH Series	C02061

2.08 KICKPLATES

- A. Solid metal, not plated. Bevel four edges.
- B. Width of door leaf less 1-1/2 inches at single leaf and less 1 inch at pairs.
- C. Finish: Satin stainless steel No. 630.
- D. Types and Manufacturers: Builders Brass Works, Baldwin, or Cipco as follows: K1 - 10 inches high by 0.05 inch thick.

2.09 THRESHOLDS

- A. Thresholds: One-piece full width of opening; extend beyond jamb where indicated.
- B. Provide with stainless steel machine screws in threaded expansion anchors at concrete.
- C. Finish: Dark bronze anodized aluminum, unless indicated otherwise.
- D. Types and Manufacturers:

No.	Type Description	Pemko	Reese
T2	Half Saddle	227A	3284A
T3	Thermal break saddle (6-1/8")	253XDFG	S473D

2.10 STOPS AND HOLDERS

- A. BHMA A156.16.
- B. Machine Screws: In threaded anchors at concrete or masonry.
- C. Self-Tapping Screws: At stud partitions, wood, or metal mountings.
- D. Metal Risers: For mounting at carpet floors.
- E. Finish: Satin chromium-plated No. 626.
- F. Types and Manufacturers for Each Leaf:

No.	Type Description	BBW or GJ	Baldwin
S1	Spring and chain stop	Ives 115	4485

2.11 BOLTS

- A. BHMA A156.16.
- B. Finish: Bright nickel No. 645.

C. Types and Manufacturers:

No.	Type Description	Stanley	Lawrence
B2	Top: 8" bolt w/48" chain	1055	T146
	Bottom: 8" foot-bolt or surface bolt	1056 4060	T145 283

2.12 WEATHERSTRIP

A. Finish: Dark bronze anodized aluminum, unless indicated otherwise.

B. Seal Types and Manufacturers:

No.	Type Description	Pemko	Reese
W5	Weatherstripping furnished by door manufacturer		

2.13 MISCELLANEOUS ITEMS

A. Provide as indicated in Door and Hardware Schedule:

M1	Nameplate as specified in Section 10400, Identifying Devices, in text noted in Door and Hardware Schedule
----	---

2.14 SILENCERS

A. Ives, Glynn-Johnson.

B. At metal frame of each hinged door that does not have seals scheduled.

C. Three at single leaves and two at pairs.

2.15 TEMPLATES

A. Fabricate to template hardware applied to metal doors and frames.

B. Ensure that required templates are furnished to various manufacturers for fabrication purposes.

C. Templates: Make available not more than 10 days after receipt of approved Hardware Schedule.

2.16 EXIT AND FIRE DOORS

A. Exit Doors: Always openable from inside by simple turn of lever handle or push on panic bar without use of key or any special knowledge or effort, to include each leaf of door pairs.

- B. Hardware for Fire Doors: Underwriters Laboratories Inc., Fire Protection Equipment List.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. In accordance with manufacturer's written instructions.
- B. Make Work neat and secure, develop full strength of components, and provide proper function.
- C. Prevent marring, scratching, or otherwise damaging adjacent finishes during hardware installation.
- D. Latchbolts:
 - 1. Install to engage in strikes automatically, whether activated by closers or manually.
 - 2. In no case shall additional manual pressure be required to engage latchbolt in strike.
- E. Stops and Holders: Set to allow doors to open as far as possible.
- F. Thresholds:
 - 1. Cope ends neatly to profile of jamb.
 - 2. Set in sealant and seal ends to jambs.

3.02 MOUNTING DIMENSIONS

- A. Standard Door Hardware Locations: As recommended and published by Door and Hardware Institute, except as noted or detailed otherwise.
- B. Door Silencers: Install 3 inches from top and bottom of jamb and 1 inch above strike at single doors, and 3 inches from edges of doors in head for pairs of doors.
- C. Nameplates: Attach to doors 5 feet 6 inches above floor using removable adhesive.

3.03 MANUFACTURER'S SERVICES

- A. Deliver permanent lock cores to Site.
- B. Remove temporary construction cores and insert permanent cores.
- C. Inspect each lock set to ensure permanent cores are operating satisfactorily.
- D. Deliver to Owner change and control keys for permanent system.
- E. Return temporary construction cores to manufacturer.

F. Furnish manufacturer's representative for the following services at Site or classroom as designated by Owner, for minimum person-days listed below, travel time excluded:

1. One (1) person-days for installation assistance, inspection, and Manufacturer's Certificate of Proper Installation.
2. One (1) person-days for functional and performance testing.

3.04 PROTECTION

- A. Cover and protect exposed surfaces of hardware during installation and until Substantial Completion.
- B. Fit, dismantle, and reinstall finish hardware as required for finish painting work.
- C. Protect and prevent staining of hardware during construction in accordance with manufacturer's recommendations.
- D. Remove protective measures and permanent lock cylinders installed prior to final cleaning.

3.05 DOOR AND HARDWARE SCHEDULE

- A. Door and Hardware Schedule on Drawings is guide to functional requirements of each opening.
- B. Provide finish hardware as scheduled. Sizes omitted shall be as recommended by manufacturer.

END OF SECTION

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Architectural Manufacturers Association (AAMA): 800, Voluntary Specifications and Test Methods for Sealants.
 2. American National Standards Institute (ANSI): Z97.1, Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test.
 3. ASTM International (ASTM):
 - a. C542, Standard Specification for Lock-Strip Gaskets.
 - b. C864, Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - c. C920, Standard Specification for Elastomeric Joint Sealants.
 - d. C1036, Standard Specification for Flat Glass.
 - e. C1048, Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass.
 - f. C1172, Standard Specification for Laminated Architectural Flat Glass.
 - g. E774, Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.
 4. Code of Federal Regulations (CFR): 16 CFR 1201, Safety Standard for Architectural Glazing Materials.
 5. Glass Association of North America (GANA):
 - a. Glazing Manual.
 - b. Sealant Manual.
 6. Insulating Glass Certification Council (IGCC).
 7. Insulating Glass Manufacturer's Alliance (IGMA).
 8. Underwriters Laboratories Inc. (UL):
 - a. 752, Standard for Bullet-Resisting Equipment.
 - b. Automotive Burglary Protection and Mechanical Equipment Directory (ABPMED).

1.02 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings:
 - a. Complete schedule of glass and glazing material to be used for each purpose.
 - b. Catalog cuts of glazing materials with inclusion of glass edge cutting procedures.

2. Samples:
 - a. Two of each different type of glass at least 12 inches by 12 inches properly labeled.
 - b. Two of each different type of glazing materials.

B. Informational Submittals:

1. Manufacturer's Certificate of Compliance for each type of glazing, in accordance with Section 01640, Manufacturers' Services.
2. Details and methods of glazing for each type of glazing condition; include manufacturer's recommendations for setting, sealing materials, and installing each type of glazing.
3. Documentation declaring compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants and other glazing materials.
4. Documentation of glazer's previous experience and manufacturer's approval.

1.03 QUALITY ASSURANCE

A. Glazier:

1. Have previous experience with installation of equal size and requirements that can be inspected by Owner.
2. Have approval of glass and framing manufacturer(s).

B. Factory Label Glass: Nonlabeled glass will be rejected.

C. Single Source Fabrication Responsibility: Fabrication processes, including Low-E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single fabricator.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Storage:

1. Support cases on both sides when stored vertically.
2. After unpacking, place interleaving protection between lites.
3. Keep glass and interleaving dry by storing inside where temperatures are above dewpoint, or if outside storage is necessary, cover the glass interleaving with opaque tarpaulins or plastic and inspect periodically. Wet interleaving can stain glass.
4. Avoid exposing stored glass to direct sunlight.

B. Handling:

1. Stack individual lites on edge and lean them against sturdy uprights at a slope of 5 degrees to 7 degrees from vertical.
2. Cushion bottom edges with soft, firm pads free of dirt, grit, glass chips, or other foreign material.

3. Do not rotate or cartwheel insulating glass units over their corners. Use turning device such as a rolling block if units must be rotated.

1.05 SPECIAL GUARANTEE

Provide manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as Special Guarantee. Special Guarantee shall provide for correction, or at the option of the Owner, removal and replacement of Work specified in this Specification section found defective during a period of 5 years and 10 years for coated glass, 5 years for laminated glass, 10 years for vertical application insulating glass after the date of Substantial Completion. Guarantee to cover deterioration due to normal conditions of use and not due to handling installing and cleaning practices performed contrary to glass manufacturer's published instructions. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in the General Conditions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products of the following manufacturers, that meet these Specifications, may be used on this Project:
 1. Flat Glass:
 - a. AFG Industries, Inc.
 - b. Pilkington Libbey-Owens-Ford Glass Co.
 - c. PPG Industries, Inc.
 - d. Guardian Industries, Corp.
 - e. Monsanto Co.
 - f. Viracon, Inc.
 2. Laminated Safety Glass, Bullet-resistant Glass, Insulated Glass, Tempered and Heat-strengthened Glass, and Spandrel Glass:
 - a. AFG Industries, Inc.
 - b. Arch Aluminum & Glass Co.
 - c. Cardinal LG.
 - d. Interpane Glass Company.
 - e. TPG Technical Glass Products.
 3. Fire-Rated and Safety-Rated Glass: TPG Technical Glass Products.
 4. Plastic and Polycarbonate Sheet:
 - a. Du Pont.
 - b. Rohm and Haas Co.
 - c. General Electric Co.
 - d. CYRO Industries.

5. Sealant, Gasket, Tape, and Compound:

- a. Dow Corning.
- b. General Electric Silicones.
- c. Pecora Corporation.
- d. Tremco.
- e. F. H. Maloney Co.
- f. Standard Products Co.

2.02 GLAZING MATERIALS

- A. (Fire rated doors) Wire Glass (W.G.); ASTM C1036, Type II, Class 1, Form 1, glazing quality, clear float, UL listed, meeting ANSI Z97.1, with 0.020-inch diameter welded wire in square mesh pattern embedded in ¼-inch thickness.
- B. (Exterior aluminum doors) Tempered Tinted Insulating Glass (T.T.I.G.): Insulating glass units with 1/2-inch air space, specified tempered tinted glass outboard and tempered clear glass inboard, each sheet 1/4-inch minimum thickness meeting ASTM E774, Class C, warranted by manufacturer against failure of edge sealing for minimum 5 years from date of manufacture.

2.03 ANCILLARY MATERIALS

- A. Setting Blocks: ASTM C864 Option neoprene, 70 Shore A durometer hardness, chemically compatible with sealant used.
- B. Glazing Tape: Preformed, semisolid, polymeric-based material of proper size and compressibility. Use only where glazing rabbet is designed for tape and tape is recommended by glass or sealant manufacturer.
- C. Glazing Channels: Synthetic Rubber, ASTM C864, not less than 1/4 inch (6 mm) thick (for bullet-resistant glass) Chemically compatible with plastic sheet (for plastic sheet).
- D. Metal Sash Glazing Compounds: AAMA 800, nonskinning type butyl.
- E. Glazing Sealant: One-component nonsag silicone elastomeric sealant ASTM C920, Type S, Grade NS, Class 25, Use G, or AAMA 800.
- F. Compression Gaskets: Preformed dense elastomeric compression glazing gaskets, ozone resistant, meeting ASTM C864, Option 1, Shore A durometer between 65 and 75, of profile required to maintain weathertight seal.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Do not perform glazing work in damp, foggy, or rainy weather, or when temperatures are not within range recommended by GANA "Glazing Manual".
- B. Surfaces: Smooth, even, sound, dry, and clean.

- C. Priming: Complete and cured.
- D. Measure size of frames to receive glass and compute actual glass size allowing for edge clearances.
- E. Use wire glass in all glazed openings in labeled fire doors.
- F. Verify functioning weep system is present.
- G. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.02 GLAZING INSTALLATION

- A. General: Follow recommendations of glass manufacturer GANA "Sealant Manual, GANA "Glazing Manual" and the following:

- 1. Cutting:

- a. Make concealed edges clean, straight cut, and free from chips and fissures.
- b. Shop cut all glass. Nipping glass on job not allowed.
- c. Allow for maximum grip on all edges.

- 2. Positioning Glass:

- a. Set glass with equal bearing on entire width of pane.
- b. Position sheets of glass with setting blocks of hardness, chemically compatible with sealants used, and sizes recommended by glass and sealant manufacturers.
- c. Set tong marks of tempered glass at bottom of installed sheet.
- d. Orient pattern and draw of glass pieces in same direction.
- e. Place glass waves parallel or horizontal to floor.
- f. Set glass with one translucent surface, with smooth surface, on weather side.

- 3. Glass shall not move or rattle.

3.03 CLEANING

- A. Leave glass and glazing in undamaged condition and ready for final cleaning.
- B. Remove excess glazing compound from installed glass.
- C. Remove labels from glass surface at time of final cleaning.
- D. Wash and polish both faces of glass.

3.04 PROTECTION OF COMPLETED WORK

A. Protection:

1. Keep glass free from contamination by materials capable of staining glass.
2. Install tape across lights secured to frames or structure.
3. No tape or marking allowed on glass.

B. Replacements and Repairs:

1. Prior to Substantial Completion, replace broken, defective, or scratched glass and repair damaged compounds.
2. Include patch and repair of existing glass to remain that is damaged or otherwise disturbed due to this Work.

END OF SECTION

Division 9 - Finishes



SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. A641/A641M, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - b. C208, Standard Specification for Cellulosic Fiber Insulating Board.
 - c. C475/C475M, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - d. C514, Standard Specification for Nails for the Application of Gypsum Board.
 - e. C645, Standard Specification for Nonstructural Steel Framing Members.
 - f. C665, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - g. C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - h. C840, Standard Specification for Application and Finishing of Gypsum Board.
 - i. C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - j. C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - k. C1177/C1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - l. C1178/C1178M, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel.
 - m. C1396/C1396M, Standard Specification for Gypsum Board.
 - n. D4977, Standard Test Method for Granule Adhesion to Mineral Surfaced Roofing by Abrasion.
 - o. D5420, Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
 - p. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - q. E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - r. E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - s. E413, Classification for Rating Sound Insulation.

t. E695, Standard Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.

2. Gypsum Association (GA):

- a. 214, Recommended Levels of Gypsum Board Finish.
- b. 216, Application and Finishing of Gypsum Panel Products.

3. Underwriters Laboratories Inc. (UL): UL Fire Resistance Directory.

1.02 SUBMITTALS

A. Submittals:

- 1. Control joint pattern proposed for gypsum board.
- 2. Manufacturer's list of items and materials proposed for use, with descriptive literature for each system used.

1.03 QUALITY ASSURANCE

- A. General: Regardless of the minimum specifications herein, utilize materials and applications recommended by manufacturer.
- B. Applicator's Qualifications: Use only workers regularly employed in this type of work who can show experience in application of similar materials and specific systems specified.
- C. Single Source Responsibility: Use gypsum board and related joint treatment materials from a single manufacturer for each type used.
- D. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested in the assembly indicated or scheduled on Drawings, according to ASTM E119 and UL Fire Resistance Directory.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver fire-rated materials bearing testing agency label and required fire classification numbers.
- B. Storage:
 - 1. Store materials inside, under cover, stacked flat, off floor.
 - 2. Stack gypsum board so that long lengths are not over short lengths.
 - 3. Avoid overloading floor system of storage area.
 - 4. Store adhesives and finishing compounds in dry areas; protect against freezing at all times.

1.05 ENVIRONMENTAL CONDITIONS

- A. Temperature: In areas receiving gypsum board installation, maintain minimum temperature of 40 degrees F for 48 hours before, during, and after gypsum board application. Maintain minimum temperature of 50 degrees F

for 48 hours before, during, and after application of adhesive methods of attachment and finishing compounds until drying is complete.

B. Ventilation:

1. Provide ventilation during and following adhesives and joint treatment applications.
2. Use temporary air circulators in enclosed areas lacking natural ventilation.
3. Under slow drying conditions, allow additional drying time between coats of joint treatment.
4. Protect installed materials from drafts of ambient air during hot, dry weather.
5. Protect materials from drying too rapidly during hot and dry weather.

PART 2 - PRODUCTS

2.01 GYPSUM BOARD

Fire-Rated Board (GWBX): ASTM C1396/C1396M, Type X, moisture resistive 5/8-inch thick.

2.02 FASTENERS

A. Gypsum Board:

1. Annular Ring Nail: ASTM C514, GWB-54, 1-1/4 inches long for 1/2-inch gypsum board, and 1-3/8 inches long for 5/8-inch gypsum board.
2. Smooth Shank Nail: ASTM C514, 1-3/8 inches long for 1/2-inch gypsum board, and 1-1/2 inches long for 5/8-inch gypsum board.
3. Screws: ASTM C1002, self-drilling, self-tapping, bugle head, for use with power-driven tool.
 - a. Type S, 1 inch long for gypsum board to sheet metal.
 - b. Type W, 1-1/4 inches long for gypsum board to wood.

2.03 JOINT TREATMENT MATERIALS

- A. Tape: General Interior Applications: ASTM C475/C475M, perforated paper tape.
- B. Compound: General Interior Applications: ASTM C475/C475M, all-purpose, ready-mixed compound.

2.04 ANCILLARY MATERIALS

- A. Adhesives: As recommended by gypsum board manufacturer for intended use.

B. Insulation and Vapour Retarder: As specified in Section 07210 – Building Insulation.

C. Sealant: As specified in Section 07900, Joint Sealant.

2.05 TRIM ACCESSORIES

A. ASTM C1047, Zinc-Coated Metal.

B. Manufacturers and Products:

1. Corner Bead:

a. 1-1/4 inches by 1-1/4 inches:

- 1) United States Gypsum; Dur-A-Bead.
- 2) Gold Bond; standard corner beads.

2. Edge Trim:

- a. United States Gypsum; 200B metal trim.
- b. Gold Bond; No. 200 casing bead.

3. Metal Control Joint:

- a. United States Gypsum; No. 093.
- b. Gold Bond; E-Z strip control joint.

2.06 NONSTRUCTURAL METAL FRAMING MEMBERS

A. ASTM C645, galvanized C-studs with 1-5/8-inch flanges.

B. Sizes and Gauge: As required to complete installation.

C. Manufacturers:

1. United States Gypsum.
2. Dale/Incor.
3. Gold Bond.
4. Unimast, Inc.

2.07 LIGHT-GAUGE METAL FRAMING ACCESSORIES

Resilient Furring Channels: Roll-formed section of 25-gauge galvanized steel with face width of 1-1/2 inches designed for resilient attachment of gypsum board to framing.

PART 3 - EXECUTION

3.01 EXAMINATION

Inspect surfaces to receive gypsum board and related materials before beginning work and report to Engineer any defects in such work which will adversely affect the quality of work specified herein.

3.02 PREPARATION

- A. General: Provide, install, and maintain necessary scaffold, staging, trestles, planking, and temporary heating, lighting, and ventilation as necessary for duration of gypsum board work.
- B. Protection: Protect work of other trades.
- C. Coordination:
 - 1. Coordinate work with that of other trades. Check specifications and drawings of other trades to determine parts of work requiring coordination.
 - 2. Cut and repair gypsum board systems for installation of omitted work.
- D. Surface Preparation: Repair defective surfaces prior to starting work. Prepare as specified for application of specific materials.

3.03 APPLICATION OF GYPSUM BOARD

- A. Inspection and Preparation:
 - 1. Check framing for accurate spacing and alignment.
 - 2. Verify spacing of installed framing does not exceed maximum allowable for thickness of gypsum board to be used.
 - 3. Verify frames are set for thickness of gypsum board to be used.
 - 4. Do not proceed with installation of gypsum board until deficiencies are corrected and surfaces to receive gypsum board are acceptable.
 - 5. Repair protrusions of framing, twisted framing members, or unaligned members before installation of gypsum board is started.
- B. General:
 - 1. Meet requirements of ASTM C840 and GA 216.
 - 2. Joints: Use gypsum board of maximum lengths to minimize end joints. Stagger end joints when they occur. Locate end joints as far as possible from center of wall or ceiling. Abut gypsum board without forcing. Neatly fit ends and edges of gypsum board. Do not place butt ends against tapered edges.
 - 3. Support ends and edges of gypsum board panels on framing or furring members except for face layer of double layer and where ends are back blocked and floated.
 - 4. Use metal edge trim where gypsum board abuts another material, at corners, and where shown or noted on Drawings.
 - 5. Follow manufacturer's recommendation of good practice.

3.04 JOINT SYSTEM FOR GYPSUM WALLBOARD

- A. Interior Gypsum Board: Conform to ASTM C840.
- B. Required: On exposed gypsum board, under ceramic tile and wall covering, and behind casework.
- C. Taping and Finishing Joints:
 - 1. Taping or Embedding Coat: Apply compound in thin, uniform layer to joints and angles to be reinforced. Apply reinforcing tape immediately. Center tape over joint and seat tape into compound. Leave approximately 1/64-inch to 1/32-inch compound under tape to provide bond. Apply skim coat immediately following tape embedment but not to function as fill or second coat. Fold tape and embed in angles to provide true angle. Dry embedding coat prior to application of fill coat.
 - 2. Filling Coat: Apply joint compound over embedding coat. Fill taper flush with surface. Apply fill coat to cover tape. Feather out fill coat beyond tape and previous joint compound line. For joints with no taper, feather out at least 4 inches on either side of tape. Do not apply fill coat on interior angles. Allow fill coat to dry prior to application of finish coat.
 - 3. Finishing Coat: Spread joint compound evenly over and beyond fill coat on joints. Feather to smooth uniform finish. Apply finish coat to taped angles to cover tape and taping compound. Sand final application of compound to provide surface ready for decoration.
 - 4. Filling and Finishing Depressions: Apply joint compound as first coat to fastener depressions. Apply at least two additional coats of compound after first coat is dry. Leave filled and finished depressions level with plane of surface.
- D. Finishing Beads and Trim:
 - 1. First Fill Coat: Apply joint compound to bead and trim. Feather out from ground to plane of the surface. Dry compound prior to application of second fill coat.
 - 2. Second Fill Coat: Apply joint compound in same manner as first fill coat. Extend beyond first coat onto face of gypsum board. Dry compound prior to application of finish coat.
 - 3. Finish Coat: Apply joint compound to bead and trim. Extend beyond second fill coat. Feather finish coat from ground to plane of surface. Sand finish coat to provide flat surface ready for decoration.

3.05 FINAL FINISHES FOR GYPSUM WALLBOARD

- A. Levels of Finish: Conform to GA 214.
- B. Level 1:
 - 1. Taping or embedding coat only.
 - 2. Use in concealed areas, and where indicated, unless a higher level is required for fire-resistive or sound-rated assemblies.

3.06 ADJUST AND CLEAN

- A. Clean: Remove droppings from walls, windows, and floor, leaving room clean for following trades.
- B. Nail Pop: Repair nail pop by driving new nail approximately 1-1/2 inches from nail pop and reseal nail. When face paper is punctured, drive new nail or screw approximately 1-1/2 inches from defective fastening and remove defective fastening. Fill damaged surface with compound.
- C. Ridging:
 - 1. Do not repair ridging until condition has fully developed, approximately 6 months after installation or one heating season.
 - a. Sand ridges to reinforcing tape without cutting through tape.
 - b. Fill concave areas on both sides of ridge with topping compound.
 - c. After fill is dry, blend in topping compound over repaired area.
 - 2. Fill cracks with compound and finish smooth and flush.

END OF SECTION



SECTION 09300 - TILE

PART 1 - GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

1. American National Standards Institute (ANSI):
 - a. A108.1A, Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
 - b. A108.1B, Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
 - c. A108.1C, Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar - or - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
 - d. A108.4, Ceramic Tile installed with Organic Adhesives or Epoxy Adhesives and Water Cleanable Tile-Setting Epoxy Adhesive.
 - e. A108.5, Ceramic Tile Installed with Dry-Set or Latex Portland Cement Mortar.
 - f. A108.6, Ceramic Tile Installed with Chemical Epoxy Mortar and Grout.
 - g. A108.8, Ceramic Tile Installed with Chemical-Resistant Furan Resin Mortar and Grout.
 - h. A108.9, Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
 - i. A108.10, Installation of Grout in Tilework.
 - j. A108.11, Interior Installation of Cementitious Backer Units.
 - k. A118.1, Dry-Set Portland Cement Mortar.
 - l. A118.3, Chemical Resistant, Water-Cleanable Tile Setting Mortar and Grouting Epoxy, and Water-Cleanable Tile Setting Epoxy Adhesive.
 - m. A118.4, Latex-Portland Cement Mortar.
 - n. A118.5, Chemical Resistant Furan Mortars and Grouts.
 - o. A118.6, Standard Ceramic Tile Grouts for Tile Installation.
 - p. A136.1, Organic Adhesives for Installation of Ceramic Tile.
 - q. A137.1, Specifications for Ceramic Tile.
2. ASTM International (ASTM):
 - a. A497, Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
 - b. C144, Standard Specification for Aggregate for Masonry Mortar.
 - c. C150, Standard Specification for Portland Cement.
 - d. C206, Standard Specification for Finishing Hydrated Lime.
 - e. C207, Standard Specification for Hydrated Lime for Masonry Purposes.

- f. C267, Standard Test Method for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacing.
- g. C395, Standard Specification for Chemical-Resistant Resin Mortars.
- h. C847, Standard Specification for Metal Lath.
- i. C920, Standard Specification for Elastomeric Joint Sealants.
- j. D226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

3. Tile Council of North America (TCA):

- a. Handbook for Ceramic Tile Installation.
- b. Handbook for Limitations.

1.02 SUBMITTALS

A. Action Submittals:

1. Samples:

- a. Two for each color, pattern, and type of tile specified.
- b. Size: Approximately 12 inches square.
- c. Mark Samples clearly to indicate color or shade, location in which to be used, and manufacturer's name.

B. Informational Submittals:

- 1. Certification of Compliance: For tile, mortar, grouts, and adhesives.
- 2. Manufacturer's Instructions: For storage, mixing, application, cleanup, and use of proposed mortars, grouts, and adhesives.
- 3. Tile Manufacturer's Maintenance Guidelines: For Owner's use in maintaining ceramic tilework specified herein.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Set and grout tile in portland cement mortar when ambient temperature is at least 50 degrees F and rising. Follow ANSI A108.1A.
- B. Comply with minimum temperature recommendations of manufacturers for bonding and grouting materials other than portland cement mortar.

1.04 EXTRA MATERIALS

Tile: Furnish extra 2 percent of each tile used in clean, marked cartons for Owner's future use.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Materials and products specified in this section shall be products of:

1. American Olean Tile Co.
2. Dallas Ceramic Co.
3. Summitville Tiles, Inc.
4. United States Ceramic Tile Co.

2.02 MATERIALS

- A. Tile: Standard grade, ANSI A137.1.
- B. Unglazed Ceramic Floor and Wall Tile: ANSI A137.1, Section 5.1, porcelain type, smooth cushion edge, nominal face size , as shown; 12-inches by 12-inches. Color to later selection.
- C. Trim Shapes and Bases: Type , color, and finish to match floor tiles.
- D. Latex-Portland Cement Mortar: ANSI A118.4.
- E. Latex-Portland Cement Grout: Portland cement grout with latex additive, commercial quality, ANSI A118.6.

2.03 ANCILLARY MATERIALS

- A. Expansion Joints:
1. Sealant: Silicone rubber type, meeting ASTM C920, Type S, Grade P, Class 25, Use T, color to match grout, with Shore A hardness of minimum 25 for joints in horizontal surfaces.
 2. Backup Material: Flexible and compressible type, nonstaining and compatible with sealants used.
- B. Edge Strips: Stainless steel, Alloy 316 flat bar, 1/8 inch by depth of tile and mortar.
- C. Sealer: Hillyard Chemical Co., Cemseal II or Thompson's Water Seal 101.
- D. Tile Cleaner: Neutral tile cleaner solution acceptable to tile manufacturer.
- E. Construction Paper: Heavy-duty, nonstaining kraft paper.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine surfaces to receive ceramic tile, setting beds, or accessories prior to tile installation.

- B. Correct defects or adverse conditions affecting quality and execution of tile installation.
- C. Tolerances for Surfaces to Receive Tile:
 - 1. Portland Cement, Dry-Set, Epoxy, and Furan Mortar Methods:
 - a. Maximum Variation in Subfloor Surface: 1/4 inch in 10 feet.
- D. Grounds, anchors, plugs, hangers, bucks, electrical and mechanical work, in or behind tile, to be installed prior to proceeding with tilework.
- E. Protection: Protect adjoining work surfaces before tilework begins.
- F. Make substrate firm, dry, clean, and free of oily or waxy films.

3.02 INSTALLATION

- A. Prepare surfaces, fit, set, or bond tile, grout and clean tile in accordance with applicable requirements of ANSI Standards for setting method specified, except as otherwise noted.
- B. Trim: Provide bases, caps, stops, returns, trimmers, and other shapes to finish installation.
- C. Setting Floor Tile (Thin-Set Application):
 - 1. On Concrete: Meet TCA Method F113 with latex-portland cement grout.
- D. Edge Strips:
 - 1. At openings without thresholds and similar discontinuous edges of thin-set tile floors.
 - 2. Where ceramic tile floors are adjacent to other flooring material at same level.
 - 3. Where ceramic tile cove base is combined with other types of flooring.

3.03 CLEANING AND SEALING

- A. Clean tile surfaces thoroughly on completion of grouting.
- B. Remove grout haze, observing tile manufacturer's recommendations as to use of acid and chemical cleaners.
- C. Rinse tilework thoroughly with clean water before and after using chemical cleaners.
- D. Polish surface of glazed tilework with soft cloth.
- E. After grout has cured for 10 days, clean and seal nonglazed tiles following sealer manufacturer's instructions and recommendations.

3.04 PROTECTION

A. From Construction Dirt:

1. Apply protective coat of neutral cleaner solution, 1 part cleaner to 1 part water, to clean completed tile walls and floors.
2. Cover tile floors with heavy-duty, nonstaining construction paper, masked in-place.
3. Just before substantial completion, remove paper and rinse protective coat of neutral cleaner from tile surfaces.

B. From Traffic:

1. Prohibit foot and wheel traffic from using newly tiled floors for at least 7 days.
2. Place large, flat boards in walkways and wheelways for 7 days where use of newly tiled floor with cement type grout is unavoidable.

END OF SECTION



SECTION 09510 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
1. ASTM International (ASTM):
 - a. A641, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - b. C635, Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - c. C636, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - d. E1264, Standard Classification for Acoustical Ceiling Products.
 2. Underwriters Laboratories Inc.(UL): Fire Resistance.

1.02 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings:
 - a. Detailed layout of grid indicating hanger spacing, fastening and splicing details, change in level details, and access location.
 - b. Manufacturer's recommendation for installation of system.
 2. Samples:
 - a. One 12-inch square of each acoustical unit material to illustrate range of appearance.
 - b. One full-size Sample of each suspension system member and molding.
 - c. Mark with the name of the manufacturer and specific design and technical data.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials with manufacturer's labels indicating brand name, pattern, size, thickness, and fire rating.
- B. Store materials in original protective packaging to prevent soiling, physical damage, or wetting.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Maintain humidity of 65 percent to 75 percent in area where acoustical materials are to be installed for 25 hours before, during, and 25 hours after installation.
- B. Maintain a uniform temperature of 55 to 70 degrees F prior to and during installation of materials.

1.05 EXTRA MATERIAL

Additional acoustical units from the same production run as installed equal to 1 percent of area.

PART 2 - PRODUCTS

2.01 SUSPENSION SYSTEMS

- A. All suspension system components, materials, and accessories shall be the product of a single manufacturer.
- B. ASTM C635, Intermediate Duty:
 - 1. Exposed Tee Grid: Fire-rated spaced to fit lay-in panels.
 - a. Manufacturers:
 - 1) Chicago Metallic Corp.; Fire Front 1265 System.
 - 2) Armstrong; Prelude Plus XL Fire Guard.
 - 2. Main and Cross Members:
 - a. Single web design, cold-rolled steel, minimum thickness of 0.020 inch, electrozinc-coated and factory-painted low-sheen satin white finish.
 - b. Exposed flange width of 15/16 inch.
 - 3. Edge Molding:
 - a. Minimum 0.020-inch steel, channel- or angle-shaped.
 - b. Minimum flange width of 15/16 inch.
 - c. Finish to match main members.
 - 4. Hanger Wire: ASTM A641, minimum 12-gauge, galvanized, soft-annealed, mild steel wire.
 - 5. Wire Ties: ASTM A641, 18-gauge, galvanized, annealed steel wire.
 - 6. Furnish manufacturer's hold down clips and accessories required for a complete system in a seismic zone.

2.02 ACOUSTICAL UNITS

A. Flat Lay-In Panels:

1. Material: Fire-resistive mineral fiber, Class A.
2. Reference Specification: ASTM E1264, Type III, Form 2.
3. Pattern: Random fissured.
4. Noise Reduction Coefficient (NRC): 0.55 to 0.65.
5. Ceiling Attenuation Class (CAC): 35 minimum.
6. Light Reflectance: LR 0.75 or over.
7. Nominal Size: 24 inches by 48 inches by 5/8 inch thick.
8. Edges: Square.
9. Finish and Color: Painted white, unless scheduled otherwise.
10. Manufacturers and Products:
 - a. Armstrong; Item 895, Minaboard, Cortega.
 - b. Celotex; Item PBT-197, Hytone, Baroque.
 - c. U.S.G.; Item 56705, Auratone, Natural Fissured II.

PART 3 - EXECUTION

3.01 SEQUENCING

- A. Lay out grid.
- B. Coordinate with mechanical and electrical equipment in framing and cutting material around ceiling penetrations.
- C. Install suspension systems after mechanical work above is complete.
- D. Install acoustical units.

3.02 INSTALLATION OF SUSPENDED GRID SYSTEM

- A. Hang level and in straight alignment directly from structure in accordance with ASTM C636 and the manufacturer's current printed instructions for type of installation required for this Project.
- B. Hanger Wires:
 1. Space maximum 4 feet on center each direction and securely attach to structure above.
 2. Install additional hangers at ends of each suspension member and at light fixtures, 6 inches from vertical surfaces.
 3. Do not splay wires more than 5 inches in a 4-foot vertical drop.
 4. Provide four-way wire splays at 45 degrees from main runner to support structure for every 144 square feet of ceiling area.
 5. Wrap wire minimum three times horizontally, turning ends upward.
 6. Where hanger wires cannot be hung vertically from structure above because of ducts, pipes, cable trays, or other interferences, provide trapezes of steel channels (minimum 2-inch deep, 16-gauge cold-rolled carrying channels) hung on steel rods or 8-gauge wire from structural

members above. Hang ceiling wires from these trapezes or similar members supporting ducts or pipes. Do not hang directly from ducts or pipes.

7. Follow suspension system manufacturer's instructions for modified installation required in a seismic zone.

C. Edge Molding:

1. Install at intersection of suspended ceiling and vertical surfaces.
2. Miter corners where moldings intersect or install corner caps.
3. Attach to vertical surface with mechanical fasteners.

- D. Provide additional channels, hangers, and trapezes as required to support edges of ceiling around and under mechanical and electrical work.

3.03 INSTALLATION OF ACOUSTICAL UNITS

- A. Install with pattern running in one direction upon completion of suspended grid system and other concealed work.
- B. Place material to bear all around on suspension members.

3.04 CLEANING

- A. Clean soiled or discolored unit surfaces after installation.
- B. Touch up scratches, abrasions, voids, and other defects in painted surfaces.

3.05 SCHEDULE OF CEILING TYPES

Areas to Receive Acoustical Ceilings: Indicated on Finish Schedule.

END OF SECTION

SECTION 09850 - CHEMICAL-RESISTANT COATINGS

PART 1 - GENERAL

1.01 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

- a. List materials in proposed system.
- b. Manufacturer's product specification.
- c. Chemical resistance test results for exposure to service conditions.
- d. Application instructions.
- e. Configuration details of materials at terminations, construction joints, floor drains, and trenches.

2. Samples: 4-inch square complete system proposed for use showing thickness and finish.

B. Informational Submittals:

1. Letter from manufacturer stating applicator is qualified to do the Work and meets the quality assurance minimum experience requirements.
2. Sample of warranty, prior to starting the Work.
3. Installation instructions.
4. Field inspection and test reports.
5. Manufacturer's Certificate of Proper Installation.
6. Special guarantee.

1.02 QUALITY ASSURANCE

- ##### A. Manufacturer's Experience: Minimum 5 years manufacturing proposed products.

- ##### B. Applicator's Experience: Minimum 3 years applying proposed products.

1.03 DELIVERY, STORAGE, AND HANDLING

- ##### A. Deliver materials in manufacturer's original, unopened containers.

- ##### B. Storage: Maintain materials in clean and dry condition. Follow manufacturer's instructions.

1.04 ENVIRONMENTAL REQUIREMENTS

- ##### A. Temperature: Apply coating only when substrate, ambient air, and coating material are 65 degrees F or above.

- ##### B. Substrate: Not wet or have standing water.

- C. Ventilation: Provide during and after application to meet all applicable safety and health regulations.

1.05 EXTRA MATERIALS

Furnish minimum 2 gallons of unopened topcoating material for future use by Owner.

1.06 SPECIAL GUARANTEE

Furnish manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of Work specified in this Specification section found defective during a period of 1 year after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work as specified in the General Conditions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Ceilcote
- B. Stonhard
- C. Duochem Inc.
- D. Chemrex Inc.

2.02 SERVICE CONDITIONS

- A. Location: Covered, ambient temperature conditions.
- B. Surface: Concrete floors, walls, and vault for chemical storage and handling.
- C. Traffic: Foot, light hand truck, forklifts.
- D. Chemicals Stored in Containment Areas:
 - 1. Potassium Permanganate.
 - 2. Copper Sulfate.

2.03 COATING SYSTEMS

- A. Mat-Reinforced Vinyl Ester (CRC): Primer, fiberglass mat, saturant, and two trowel-applied coats of vinyl ester resin with silica fillers. Finished system thickness 150 mils minimum.
- B. Non-skid Surface: Furnish silica aggregate, which has been approved by coating manufacturer, for non-skid finish surface. Apply silica aggregate in accordance with manufacturer's recommendations.

2.04 MIXING

- A. Thoroughly mix until homogeneous following manufacturer's instructions.
- B. Mix only components furnished by coating manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Surface Preparation:
 - 1. Inspect and provide substrate surfaces prepared in accordance with these Specifications and the printed directions and recommendations of the system manufacturer whose product is to be applied.
 - 2. Provide Engineer minimum 3 days' advance notice of start of surface preparation and system application Work.
 - 3. Perform Work only in presence of Engineer, unless Engineer grants prior approval to perform Work in Engineer's absence.
- B. Schedule inspection with Engineer in advance for cleaned surfaces and system application Work.

3.02 PREPARATION

- A. In accordance with the manufacturer's printed directions and recommendations.
- B. Fill holes and cracks with manufacturer's recommended materials to produce even surface for application of systems.
- C. Concrete Surfaces:
 - 1. Do not begin until 30 days after concrete has been placed.
 - 2. Remove grease, oil, dirt, salts or other chemicals, loose materials, or other foreign matter by solvent, detergent, or other suitable cleaning methods.
 - 3. Brushoff blast clean to remove loose concrete and provide a tooth for binding. Upon approval by Engineer, surface may be acid etched with muriatic acid solution. Approval, subject to producing desired profile.
 - 4. Secure coating manufacturer's recommendations for additional preparation if required for excessive bug holes exposed after blasting.
 - 5. Unless otherwise required for proper adhesion, ensure surfaces are dry prior to painting.

3.03 APPLICATION

- A. Install coating systems in accordance with manufacturer's printed instructions.
- B. Install coating systems on vertical and horizontal surfaces, including caps, within containment wall for storage tanks, pumps, and piping.

- C. Extend surfacing completely under structures and equipment located within the containment area. Install at construction joints in substrate and floor drains, trenches, and other components within the containment area.
- D. Install non-skid surface on all horizontal surfaces.

3.04 FIELD QUALITY CONTROL

A. Inspection:

1. Inspect finished system for complete, uniform coverage of specified area. Evidence of defects include improper thickness, hardness, and appearance.
2. Engineer may require electrical spark test or other tests to be performed by Contractor when evidence of incomplete coverage exists.

3.05 MANUFACTURER'S SERVICES

Provide manufacturer's representative at Site for installation assistance, inspection, and Manufacturer's Certificate of Proper Installation.

3.06 APPLICATION SCHEDULE

As shown in Room Finish Schedule.

END OF SECTION

SECTION 09900 - PAINTING AND PROTECTIVE COATINGS

PART 1 - GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Water Works Association (AWWA):
 - a. C203, Coal-Tar Protective Coatings and Linings for Steel Water Pipelines—Enamel and Tape—Hot-Applied.
 - b. C209, Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
 - c. C213, Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
 - d. C214, Tape Coating Systems for the Exterior of Steel Water Pipelines.
 2. Environmental Protection Agency (EPA).
 3. NACE International (NACE): RP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
 4. NSF International (NSF): 61, Drinking Water System Components - Health Effects.
 5. Occupational Safety and Health Act (OSHA).
 6. The Society for Protective Coatings (SSPC):
 - a. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
 - b. PA 3, Guide to Safety in Paint Applications.
 - c. SP 1, Solvent Cleaning.
 - d. SP 2, Hand Tool Cleaning.
 - e. SP 3, Power Tool Cleaning.
 - f. SP 5, White Metal Blast Cleaning.
 - g. SP 6, Commercial Blast Cleaning.
 - h. SP 7, Joint Surface Preparation Standard Brush-Off Blast Cleaning.
 - i. SP 10, Near-White Blast Cleaning.
 - j. SP 11, Power Tool Cleaning to Bare Metal.
 - k. SP 12, Surface Preparation and Cleaning of Metals Waterjetting Prior to Recoating.
 - l. SP 13, Surface Preparation of Concrete.

1.02 DEFINITIONS

- A. Terms used in this section:
1. Coverage: Total minimum dry film thickness in mils or square feet per gallon.
 2. FRP: Fiberglass Reinforced Plastic.
 3. HCl: Hydrochloric Acid.

4. MDFT: Minimum Dry Film Thickness, mils.
5. MDFTPC: Minimum Dry Film Thickness per Coat, mils.
6. Mil: Thousandth of an inch.
7. PDS: Product Data Sheet.
8. PSDS: Paint System Data Sheet.
9. PVC: Polyvinyl Chloride.
10. SFPG: Square Feet per Gallon.
11. SFPGPC: Square Feet per Gallon per Coat.
12. SP: Surface Preparation.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

a. Data Sheets:

- 1) For each product, furnish a Product Data Sheet (PDS), the manufacturer's technical data sheets, and paint colors available (where applicable). The PDS form is appended to the end of this section.
- 2) For each paint system, furnish a Paint System Data Sheet (PSDS). The PSDS form is appended to the end of this section.
- 3) Technical and performance information that demonstrates compliance with Specification.
- 4) Furnish copies of paint system submittals to the coating applicator.
- 5) Indiscriminate submittal of only manufacturer's literature is not acceptable.

b. Detailed chemical and gradation analysis for each proposed abrasive material.

2. Samples:

a. Proposed Abrasive Materials: Minimum 5-pound sample for each type.

b. Reference Panel:

1) Surface Preparation:

- a) Prior to start of surface preparation, furnish a 4-inch by 4-inch steel panel for each grade of sandblast specified herein, prepared to specified requirements.
- b) Provide panel representative of the steel used; prevent deterioration of surface quality.
- c) Panel to be reference source for inspection upon approval by Engineer.

2) Paint:

- a) Unless otherwise specified, before painting work is started, prepare minimum 8-inch by 10-inch sample with type of paint and application specified on similar substrate to which paint is to be applied.
- b) Furnish additional samples as required until colors, finishes, and textures are approved.
- c) Approved samples to be the quality standard for final finishes.

B. Informational Submittals:

1. Applicator's Qualification: List of references substantiating experience.
2. Coating manufacturer's Certificate of Compliance, in accordance with Section 01640, Manufacturers' Services.
3. Factory Applied Coatings: Manufacturer's certification stating factory applied coating system meets or exceeds requirements specified.
4. Manufacturer's written verification that submitted material is suitable for the intended use.
5. If the manufacturer of finish coating differs from that of shop primer, provide finish coating manufacturer's written confirmation that materials are compatible.
6. Manufacturer's written instructions and special details for applying each type of paint.

1.04 QUALITY ASSURANCE

A. Mockup:

1. Before proceeding with Work under this section, finish one complete space or item of each color scheme required showing selected colors, finish texture, materials, quality of work, and special details.
2. After Engineer approval, sample spaces or items shall serve as a standard for similar work throughout the Project.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Shipping:

1. Where precoated items are to be shipped to the Site, protect coating from damage. Batten coated items to prevent abrasion.
2. Protect shop painted surfaces during shipment and handling by suitable provisions including padding, blocking, and use of canvas or nylon slings.

B. Storage:

1. Store products in a protected area that is heated or cooled to maintain temperatures within the range recommended by paint manufacturer.

2. Primed surfaces shall not be exposed to weather for more than 2 months before being topcoated, or less time if recommended by coating manufacturer.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not apply paint in temperatures or moisture conditions outside of manufacturer's recommended maximum or minimum allowable.
2. Do not perform final abrasive blast cleaning whenever relative humidity exceeds 85 percent, or whenever surface temperature is less than 5 degrees F above dew point of ambient air.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Nationally recognized manufacturers of paints and protective coatings who are regularly engaged in the production of such materials for essentially identical service conditions.
- B. Minimum of 5 years' verifiable experience in manufacture of specified product.
- C. Each of the following manufacturers is capable of supplying most of the products specified herein:
 1. Sherwin Williams.
 2. ICI Devoe Coatings.
 3. Carboline Coatings.
 4. Tnemec.

2.02 ABRASIVE MATERIALS

Select abrasive type and size to produce surface profile that meets coating manufacturer's recommendations for specific primer and coating system to be applied.

2.03 PAINT MATERIALS

A. General:

1. Manufacturer's highest quality products suitable for intended service.
2. Compatibility: Only compatible materials from a single manufacturer shall be used in the Work. Particular attention shall be directed to compatibility of primers and finish coats.
3. Thinners, Cleaners, Driers, and Other Additives: As recommended by coating manufacturer.

B. Products:

Product	Definition
Acrylic Latex	Single-component, finish as required
Acrylic Latex (Flat)	Flat latex
Acrylic Sealer	Clear acrylic
Alkyd (Semigloss)	Semigloss alkyd
Alkyd Enamel	Optimum quality, gloss or semigloss finish as required, medium long oil
Alkyd Wood Primer	Flat alkyd
Bituminous Paint	Single-component, coal-tar pitch based
Block Filler	Primer-sealer designed for rough masonry surfaces, 100% acrylic emulsion
Coal-Tar Epoxy	Amine, polyamide, or phenolic epoxy type 70% volume solids minimum, suitable for immersion service
Elastomeric Polyurethane	100% solids, plural component, spray applied, high build, elastomeric polyurethane coating, suitable for the intended service
Epoxy Filler/Surfacer	100% solids epoxy trowel grade filler and surfacer, nonshrinking, suitable for application to concrete and masonry. Approved for potable water contact and conforming to NSF 61, where required
Epoxy Nonskid (Aggregated)	Polyamidoamine or amine converted epoxies aggregated; aggregate may be packaged separately
Epoxy Primer—Ferrous Metal	Anticorrosive, converted epoxy primer containing rust-inhibitive pigments
Epoxy Primer—Other	Epoxy primer, high-build, as recommended by coating manufacturer for specific galvanized metal, copper, or nonferrous metal alloy to be coated
Fusion Bonded Coating	100% solids, thermosetting, fusion bonded, dry powder epoxy or polyurethane resin, suitable for the intended service
Fusion Bonded, TFE Lube or Grease Lube	Tetrafluoroethylene, liquid coating, or open gear grease as supplied by McMaster-Carr Supply Corporation., Elmhurst, IL; RL 736 manufactured by Amrep, Inc., Marietta, GA
High Build Epoxy	Polyamidoamine epoxy, minimum 69% volume solids, capability of 4 to 8 MDFT per coat
Inorganic Zinc Primer	Solvent or water based, having 85% metallic zinc content in the dry film; follow manufacturer's recommendation for topcoating
Latex Primer Sealer	Waterborne vinyl acrylic primer/sealer for interior gypsum board and plaster. Capable of providing uniform seal and suitable for use with specified finish coats

Product	Definition
NSF Epoxy	Polyamidoamine epoxy, approved for potable water contact and conforming to NSF 61
Epoxy, High Solids	Polyamidoamine epoxy, 80% volume solids, minimum, suitable for immersion service
Polyurethane Enamel	Two-component, aliphatic or acrylic based polyurethane; high gloss finish
Rust-Inhibitive Primer	Single-package steel primers with anticorrosive pigment loading
Sanding Sealer	Co-polymer oil, clear, dull luster
Silicone/Silicone Acrylic	Elevated temperature silicone or silicone/acrylic based
Stain, Concrete	Acrylic, water repellent, penetrating stain
Stain, Wood	Satin luster, linseed oil, solid or transparent as required
Varnish	Nonpigmented vehicle based on a variety of resins (alkyd, phenolic, urethane) in gloss, semigloss, or flat finishes, as required
Water Base Epoxy	Two-component, polyamide epoxy emulsion, finish as required

2.04 MIXING

A. Multiple-Component Coatings:

1. Prepare using each component as packaged by paint manufacturer.
2. No partial batches will be permitted.
3. Do not use multiple-component coatings that have been mixed beyond their pot life.
4. Furnish small quantity kits for touchup painting and for painting other small areas.
5. Mix only components specified and furnished by paint manufacturer.
6. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

- B. Colors: Formulate paints with colorants free of lead, lead compounds, or other materials that might be affected by presence of hydrogen sulfide or other gas likely to be present at Site.

2.05 SHOP FINISHES

- A. Shop Blast Cleaning: Reference Paragraph, Shop Coating Requirements.

- B. Surface Preparation: Provide Engineer minimum 7 days' advance notice to start of shop surface preparation work and coating application work.

C. Shop Coating Requirements:

1. When required by equipment Specifications, such equipment shall be primed and finish coated in shop by manufacturer and touched up in field with identical material after installation.