

officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

18.04 *Gratuities*

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.
- B. In the event this Contract is terminated as provided in paragraph 18.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

18.05 *Audit and Access to Records*

- A. For all negotiated contracts and negotiated modifications (except those of \$10,000 or less), Owner, Agency, the Comptroller General, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor, which are pertinent to the Contract, for the purpose of making audits, examinations, excerpts and transcriptions. Contractor shall maintain all required records for three years after final payment is made and all other pending matters are closed.

18.06 *Small, Minority and Women's Businesses*

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women's businesses on solicitation lists; (2) assuring that small, minority and women's businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women's businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

18.07 *Anti-Kickback*

- A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

18.08 *Clean Air and Pollution Control Acts*

- A. If this Contract exceeds \$100,000, Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 USC 7401 *et seq.*) and the Federal Water Pollution Control Act as amended (33 USC 1251 *et seq.*). Contractor will report violations to the Agency and the Regional Office of the EPA.

18.09 *State Energy Policy*

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

18.10 *Equal Opportunity Requirements*

- A. If this Contract exceeds \$10,000, Contractor shall comply with Executive Order 11246, "Equal Employment Opportunity," as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."
- B. Contractor's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor's goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.
- C. Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

18.11 *Restrictions on Lobbying*

- A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

18.12 *Environmental Requirements*

- A. When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:
1. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
 2. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.
 3. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
 4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

EXHIBIT GC - A
Certificate of Owner's Attorney

I, the undersigned, _____, the duly authorized and acting legal representative of _____

I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

Date: _____

DOCUMENT 00800
SUPPLEMENTARY CONDITIONS

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. 1910-8, 1996 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary conditions will have the meanings indicated in the General Conditions. Additional terms used in these supplementary conditions have the meanings indicated below, which are applicable to both the singular and plural thereof.

SC-2.01 Delivery of Bonds

N/A

SC-2.02 Copies of Documents

Delete paragraph 2.02 in its entirety and insert the following paragraph in its place:

OWNER shall furnish CONTRACTOR up to three copies of the Contract Documents.
Additional copies will be furnished upon request at the cost of reproduction.

SC-5.04 CONTRACTOR's Liability Insurance

Add the following new paragraph immediately after paragraph 5.04.B:

C. The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under paragraphs 5.04.A.1 and A.2 of the General Conditions:

(a) State:	Statutory
(b) Applicable Federal (e.g., Longshoreman's):	Statutory
(c) Employer's Liability:	<u>\$100,000</u>

2. Contractor's Liability Insurance under paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Contractor:

(a) General Aggregate	<u>\$ 1,000,000</u>
(b) Products - Completed Operations Aggregate	<u>\$ 1,000,000</u>
(c) Personal and Advertising Injury	<u>\$ 1,000,000</u>

- (d) Each Occurrence \$ 1,000,000
 (Bodily Injury and Property Damage)
- (e) Property Damage liability insurance will provide Explosion, Collapse and Underground coverages where applicable.
- (f) Excess or Umbrella Liability
- (1) General Aggregate \$ 1,000,000
- (2) Each Occurrence \$ 1,000,000

3. Automobile Liability under paragraph 5.04.A.6 of the General Conditions:

- (a) Bodily Injury:
 - Each person \$ 250,000
 - Each Accident \$ 500,000
- (b) Property Damage:
 - Each Accident \$ 250,000
- (c) Combined Single Limit of: \$ 1,000,000

4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:

- (a) Bodily Injury:
 - Each Accident \$ 250,000
 - Annual Aggregate \$ 1,000,000
- (b) Property Damage:
 - Each Accident \$ 250,000
 - Annual Aggregate \$ 1,000,000

SC-5.06.A Property Insurance

Delete Paragraph 5.06.A in its entirety and insert the following in its place:

A. CONTRACTOR shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof. This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
2. be written on a Builder's Risk All-risk or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws

and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions.

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER; and
5. allow for partial utilization of the Work by OWNER;
6. include testing and startup; and
7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. CONTRACTOR shall be responsible for any deductible or self-insured retention.

C. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph SC 5.06 shall comply with the requirements of paragraph 5.06.C of the General Conditions.

SC-5.06.E Property Insurance

Delete Paragraph 5.06.E in its entirety.

SC-6.10 Taxes

Add the following sentence at the end of 6.10.A:

The Owner may obtain rebate on taxes paid by the Contractor on certain Products or items: provide administrative assistance and cooperation to the Owner in this regard.

SC-16 Dispute Resolution

Add the following new paragraph immediately after paragraph 16.01:

SC-16.2 Mediation

A. OWNER and CONTRACTOR agree that they shall submit any and all unsettled Claims or counterclaims, disputes, or other matters in question between them arising out of or relating to the Contract Documents or the breach thereof to mediation prior to either of them initiating against the other a demand for arbitration pursuant to paragraph SC-16.03, unless delay in initiating arbitration would irrevocably prejudice one of the parties. The 30 day time limit within which to file a demand for arbitration as provided in paragraphs SC-16.03.B and 16.03.C shall be

suspended with respect to a dispute submitted to mediation within that time limit and shall remain suspended until 10 days after the termination of the mediation. The mediator of any dispute submitted to mediation under this agreement shall not serve as arbitrator of such dispute unless otherwise agreed.

SC-16 Dispute Resolution

Add the following new paragraph immediately after paragraph 16.02:

SC-16.03 Arbitration

A. All Claims or counterclaims, disputes, or other matters in question between OWNER and CONTRACTOR arising out of or relating to the Contract Documents or the breach thereof (except for Claims which have been waived by the making or acceptance of final payment as provided by paragraph 14.09) not resolved under the provisions of paragraph SC-16.02 will be decided by binding arbitration in accordance with the American Arbitration Association's Construction Rules then obtaining, subject to the limitations of this paragraph SC-16.03. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.

B. No demand for arbitration of any claim or counterclaim, dispute, or other matter that is required to be referred to ENGINEER initially for decision in accordance with paragraph 9.09 will be made until the earlier of: (1) the date on which ENGINEER has rendered a written decision, or (2) the 31st day after the parties have presented their final evidence to ENGINEER if a written decision has not been rendered by ENGINEER before that date. No demand for arbitration of any such Claim or counterclaim, dispute, or other matter will be made later than 30 days after the date on which ENGINEER has rendered a written decision in respect thereof in accordance with paragraph 10.05; and the failure to demand arbitration within said 30 day period will result in ENGINEER's decision being final and binding upon OWNER and CONTRACTOR. If ENGINEER renders a decision after arbitration proceedings have been initiate, such decision may be entered as evidence but will not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

C. Notice of the demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator, and a copy will be sent to ENGINEER for information . The demand for arbitration will be made within the 30 day period specified in paragraph SC-16.03.B, and in all other cases within a reasonable time after the Claim or counterclaim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or other dispute or matter in question would be barred by the applicable statute of limitations.

D. Except as provided in paragraph SC-16.03.E, no arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder, or in any other manner any other individual or entity (including ENGINEER, and ENGINEER's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this

Contract unless:

1. The inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and
2. Such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings; and
3. The written consent of the other individual or entity sought to be included and of OWNER and CONTRACTOR has been obtained for such inclusion, which consent shall make specific reference to this paragraph; but no such consent shall constitute consent to arbitration of any dispute not specifically described in such consent or to arbitration with any party not specifically identified in such consent.

E. Notwithstanding paragraph SC-16.03.D, if a claim or counterclaim, dispute, or other matter in question between OWNER and CONTRACTOR involves the Work of a subcontractor, either OWNER or CONTRACTOR may join such Subcontractor as a party to the arbitration between OWNER and CONTRACTOR hereunder. CONTRACTOR shall include in all subcontracts required by paragraph 6.06.G a specific provision whereby the Subcontractor consents to being joined in an arbitration between OWNER and CONTRACTOR involving the Work of such Subcontractor. Nothing in this paragraph SC-16.03.E nor in the provisions of such subcontract consenting to joinder shall create any claim, right, or cause of action in favor of Subcontractor against OWNER, ENGINEER, or ENGINEER's Consultants that does not otherwise exist.

F. The award rendered by the arbitrators will be final, judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal.

END OF SUPPLEMENTARY CONDITIONS

DOCUMENT 01000
GENERAL REQUIREMENTS

SECTION 01010
SUMMARY OF WORK

PART 1) GENERAL

1.1 SECTION INCLUDES

- A) Contract Description.
- B) Work by Owner.
- C) Owner supplied Products.
- D) Contractor use of site.
- E) Future work.
- F) Work Sequence.
- G) Owner occupancy.
- H) Definitions.

1.2 CONTRACT DESCRIPTION

- A) Contract Type: Agreement - EJCDC.

1.3 WORK BY OWNER

- A) The Owner will award a contract installation of the Project indicated in the Bid Documents
- B) Work under this contract includes all work associated with the Project as indicated on the Contract Drawings.

1.4 CONTRACTOR USE OF SITE

- A) Access to Site: Contractor to have necessary access to site to complete the Work.
- B) Others Access to Site: Contractor to ensure that roads necessary for others ingress/egress to property is left open or alternate access provided. Ensure all construction on or near DOT maintained roads is coordinated with local DOT personnel and is in accordance with local DOT procedures.

- C) Utility Outages and Shutdown: Work that requires interference with other utilities to be coordinated with utility owner.

1.6 OWNER USE

- A) The Owner intends to begin operation of the system by the date indicated in the Bid and Contract Documents.

- B) Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.

-
- C) Schedule the Work to accommodate owner operation.

PART 2) PRODUCTS

Not Used.

PART 3) EXECUTION

Not Used.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Measurement and payment criteria applicable to the Work performed under a unit price payment method.
- B Defect assessment and non-payment for rejected work.

1.2 AUTHORITY

- A Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of this section governs.
- B Take all measurements and compute quantities. The Engineer will verify measurements and quantities.
- C Assist by providing necessary equipment, workers, and survey personnel as required.

1.3 UNIT QUANTITIES SPECIFIED

- A Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the Engineer determine payment.
- B If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.

1.4 MEASUREMENT OF QUANTITIES

- A Measurement Devices:
 - (1) Weigh Scales: Inspected, tested and certified by the applicable agency within the past year.
 - (2) Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
 - (3) Metering Devices: Inspected, tested and certified by the applicable agency within the past year.
- B Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be

measured by handbook or scale weight.

- C Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
 - D Measurement by Area: Measured by square dimension using mean length and width or radius.
 - E Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
-
- F Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

1.5 PAYMENT

- A Payment Includes: Full compensation for all required labor, Products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.
- B Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

1.6 DEFECT ASSESSMENT

- A Replace the Work, or portions of the Work, not conforming to specified requirements.
- B If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Engineer will direct one of the following remedies:
 - (1) The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of the Owner.
 - (2) The defective Work will be partially repaired to the instructions of the Engineer, and the unit sum/price will be adjusted to a new sum/price at the discretion of the Owner.
- C The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.
- D The authority of the Engineer and Owner to assess the defect and identify payment adjustment, is final.

1.7 NON-PAYMENT FOR REJECTED PRODUCTS

- A Payment will not be made for any of the following:
- (1) Products wasted or disposed of in a manner that is not acceptable.
 - (2) Products determined as unacceptable before or after placement.
 - (3) Products not completely unloaded from the transporting vehicle.
 - (4) Products placed beyond the lines and levels of the required Work.
 - (5) Products remaining on hand after completion of the Work.
 - (6) Loading, hauling, and disposing of rejected Products.

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Coordination and project conditions.
- B Field engineering.
- C Preconstruction meeting.
- D Site mobilization meeting.
- E Progress meetings.
- F Reinstallation meetings.
- G Equipment electrical characteristics and components.
- H Examination.
- I Preparation.
- J Cutting and Patching.
- K Alteration project procedures.

1.2 RELATED SECTIONS

- A Section 01300 - Submittals.
- B Section 01400 - Quality Control.

1.3 COORDINATION AND PROJECT CONDITIONS

- A Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements , with provisions for accommodating items installed later.

- B Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C Coordinate space requirements, supports, and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- E Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
- F After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.4 FIELD ENGINEERING

- A Employ a Land Surveyor registered in the State of the Work and acceptable to Engineer.
- B Contractor shall locate and protect survey control and reference points.
- C Control datum for survey is that shown on Drawings.
- D Verify set-backs and easements; confirm drawing dimensions and elevations.
- E Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.5 PRECONSTRUCTION MEETING

- A Engineer will schedule a meeting after Notice of Award.
- B Attendance Required: Engineer, and Contractor.
- C Agenda:
 - (1) Execution of Owner-Contractor Agreement.
 - (2) Submission of executed bonds and insurance certificates.
 - (3) Distribution of Contract Documents.
 - (4) Submission of list of Products, schedule of values, and progress schedule.
 - (5) Designation of personnel representing the parties in Contract and the Engineer.
 - (6) Procedures and processing of field decisions, submittals, substitutions,

applications for payments, proposal request, Change Orders, and Contract closeout procedures.

(7) Scheduling.

1.6 SITE MOBILIZATION MEETING

- A Engineer will schedule a meeting at the Project site prior to Contractor occupancy.
- B Attendance Required: Engineer, Contractor, Contractor's Superintendent, and major Subcontractors.
- C Agenda:
 - (1) Use of premises by Owner and Contractor.
 - (2) Owner's requirements.
 - (3) Construction facilities and controls provided by Owner.
 - (4) Temporary utilities provided by Owner.
 - (5) Survey and layout.
 - (6) Security and housekeeping procedures.
 - (7) Schedules.
 - (8) Application for payment procedures.
 - (9) Procedures for testing.
 - (10) Procedures for maintaining record documents.
 - (11) Requirements for start-up of equipment.
 - (12) Inspection and acceptance of equipment put into service during construction period.

1.7 PROGRESS MEETINGS

- A Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B Engineer will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C Attendance Required: Job superintendent, major Subcontractors and suppliers, Engineer, as appropriate to agenda topics for each meeting.
- D Agenda:
 - (1) Review minutes of previous meetings.
 - (2) Review of Work progress.
 - (3) Field observations, problems, and decisions.
 - (4) Identification of problems which impede planned progress.
 - (5) Review of submittals schedule and status of submittals.
 - (6) Review of off-site fabrication and delivery schedules.
 - (7) Maintenance of progress schedule.
 - (8) Corrective measures to regain projected schedules.

- (9) Planned progress during succeeding work period.
- (10) Coordination of projected progress.
- (11) Maintenance of quality and work standards.
- (12) Effect of proposed changes on progress schedule and coordination.
- (13) Other business relating to Work.

1.8 REINSTALLATION MEETING

- A When required in individual specification sections, convene a reinstallation meeting at the site prior to commencing work of the section.
- B Require attendance of parties directly affecting, or affected by, work of the specific section.
- C Notify Engineer four days in advance of meeting date.
- D Prepare agenda and preside at meeting:
 - (1) Review conditions of installation, preparation and installation procedures.
 - (2) Review coordination with related work.

PART 2 PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A Motors: Refer to Section 15170, NEMA MG1 Type. Specific motor type is specified in individual specification sections.
- B Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
- C Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

- A Employ skilled and experienced installer to perform cutting and patching.
- B Submit written request in advance of cutting or altering elements which affect:
 - (1) Structural integrity of element.
 - (2) Integrity of weather-exposed or moisture-resistant elements.
 - (3) Efficiency, maintenance, or safety of element.
 - (4) Visual qualities of sight exposed elements.
 - (5) Work of Owner or separate contractor.

- C Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
 - (1) Fit the several parts together, to integrate with other Work.
 - (2) Uncover Work to install or correct ill-timed Work.
 - (3) Remove and replace defective and non-conforming Work.
 - (4) Remove samples of installed Work for testing.
 - (5) Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D Execute work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- E Cut masonry and concrete materials using masonry saw or core drill.
- F Restore Work with new Products in accordance with requirements of Contract Documents.
- G Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
- J Identify hazardous substances or conditions exposed during the Work to the Engineer for decision or remedy.

3.2 ALTERATION PROJECT PROCEDURES

- A Materials: As specified in Product sections; match existing Products and work for patching and extending work.
- B Employ skilled and experienced installer to perform alteration work.
- C Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- D Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring Products and finishes to original or specified condition.
- E Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- F When finished surfaces are cut so that a smooth transition with new Work is not

possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Engineer for review.

- G Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- H Finish surfaces as specified in individual Product sections.

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Quality assurance.

1.2 RELATED SECTIONS

- A Document 00700 - General Conditions

1.3 QUALITY ASSURANCE

- A For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B Conform to reference standard by date of issue current on date of Contract Documents.
- C Obtain copies of standards when required by the Contract Documents.
- D Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E Should specified reference standards conflict with Contract Documents, request clarification from the Engineer before proceeding.
- F Neither the contractual relationship, duties, and responsibilities of the parties in Contract nor those of the Engineer shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1) GENERAL

4.1 SECTION INCLUDES

- A Submittal procedures.
- B Construction progress schedules.
- C Proposed Products list.
- D Product Data.
- E Shop Drawings.
- F Samples.
- G Design data.
- H Test reports.
- I Certificates.
- J Manufacturer's instructions.
- K Manufacturer's field reports.
- L Erection drawings.

4.2 RELATED SECTIONS

- A Section 01400 - Quality Control: Manufacturers' field services and reports.
- B Section 01700 - Contract Closeout: Contract warranties, bonds, manufacturers' certificates, and closeout submittals.

4.3 REFERENCES

- A AGC (Associated General Contractors of America) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

4.4 SUBMITTAL PROCEDURES

- A Transmit each submittal with Engineer accepted form.
- B Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E Schedule submittals to expedite the Project, and deliver to Engineer.
- F For each submittal for review, allow 15 days excluding delivery time to and from the contractor.
- G Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- H Provide space for Contractor and Engineer review stamps.
- I When revised for resubmission, identify all changes made since previous submission.
- J Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K Submittals not requested will not be recognized or processed.

4.5 CONSTRUCTION PROGRESS SCHEDULES

- A Submit initial schedule in duplicate within 15 days after date of Owner-Contractor Agreement.
- B Revise and resubmit as required.
- C Submit revised schedules with each Application for Payment, identifying changes since previous version.

- D Submit a horizontal bar chart with separate line for each major portion of Work or operation section of Work, identifying first work day of each week.
- E Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- F Indicate estimated percentage of completion for each item of Work at each submission.
- G Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

4.6 PROPOSED PRODUCTS LIST

- A Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

4.7 PRODUCT DATA

- A Product Data For Review:
 - (1) Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - (2) After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.
- B Product Data For Information:
 - (1) Submitted for the Engineer's knowledge as contract administrator or for the Owner.
- C Product Data For Project Close-out:
 - (1) Submitted for the Owner's benefit during and after project completion.
- D Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Engineer.
- E Mark each copy to identify applicable products, models, options, and other data.

Supplement manufacturers' standard data to provide information specific to this Project.

- F Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- G After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - CONTRACT CLOSEOUT.

4.8 SHOP DRAWINGS

- A Shop Drawings For Review:
 - (1) Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - (2) After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.
- B Shop Drawings For Information:
 - (1) Submitted for the Engineer's knowledge as contract administrator or for the Owner.
- C Shop Drawings For Project Close-out:
 - (1) Submitted for the Owner's benefit during and after project completion.
- D Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
 - (1) Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Engineer.

4.9 SAMPLES

- A Samples For Review:
 - (1) Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - (2) After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.
- B Samples For Information:

- (1) Submitted for the Engineer's knowledge as contract administrator or for the Owner.
- C Samples For Selection:
 - (1) Submitted to Engineer for aesthetic, color, or finish selection.
 - (2) Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Engineer selection.
 - (3) After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.
- D Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- E Include identification on each sample, with full Project information.
- F Submit the number of samples specified in individual specification sections; one of which will be retained by Engineer.
- G Reviewed samples which may be used in the Work are indicated in individual specification sections.
- H Samples will not be used for testing purposes unless specifically stated in the specification section.

4.10 DESIGN DATA

- A Submit for the Engineer's knowledge as contract administrator or for the Owner.
- B Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

4.11 TEST REPORTS

- A Submit for the Engineer's knowledge as contract administrator or for the Owner.
- B Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

4.12 CERTIFICATES

- A When specified in individual specification sections, submit certification by the

manufacturer, installation/application subcontractor, or the Contractor to Engineer, in quantities specified for Product Data.

- B Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

4.13 MANUFACTURER'S INSTRUCTIONS

- A When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to owner in quantities specified for Product Data.
- B Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C Refer to Section 01400 - Quality Control, Manufacturers' Field Services article.

4.14 MANUFACTURER'S FIELD REPORTS

- A Submit reports for the Engineer's benefit as contract administrator or for the Owner.
- B Submit report within 30 days of observation to Engineer for information.
- C Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

4.15 ERECTION DRAWINGS

- A Submit drawings for the Engineer's benefit as contract administrator.
- B Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- C Data indicating inappropriate or unacceptable Work may be subject to action by the Engineer or Owner.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Quality assurance - control of installation.
- B Tolerances
- C References and standards.
- D Mock-up.
- E Inspecting and testing laboratory services.
- F Manufacturers' field services.

1.2 RELATED SECTIONS

- A Section 01090 - Reference Standards.
- B Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.
- C Section 01410 - Testing Services.
- D Section 01600 - Material and Equipment: Requirements for material and product quality.
- E Section 01650 - Starting of Systems.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B Comply with manufacturers' instructions, including each step in sequence.
- C Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

- D Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
 - E Perform Work by persons qualified to produce required and specified quality.
 - F Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
 - G Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
-

1.4 TOLERANCES

- A Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C Adjust Products to appropriate dimensions; position before securing Products in place.

1.5 REFERENCES AND STANDARDS

- A For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
- C Obtain copies of standards where required by product specification sections.
- D Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 MOCK-UP

- A Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B Assemble and erect specified items with specified attachment and anchorage

devices, flashings, seals, and finishes.

- C Accepted mock-ups shall be a comparison standard for the remaining Work.
- D Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.7 TESTING SERVICES

- A Owner may appoint, employ, and pay for specified services of an independent firm to perform testing.
- B The independent firm will perform tests and other services specified in individual specification sections and as required by the Engineer.
- C Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Engineer or the Owner.
- D Reports will be submitted by the independent firm to the Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - (1) Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
 - (2) Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F Testing does not relieve Contractor to perform Work to contract requirements.
- G Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.

1.8 INSPECTION SERVICES

- A Owner may appoint, employ, and pay for specified services of an independent firm to perform inspection.
- B The independent firm will perform inspections and other services specified in

individual specification sections and as required by the Engineer.

- C Inspecting may occur on or off the project site. Perform off-site inspecting as required by the Engineer or the Owner.
- D Reports will be submitted by the independent firm to the Engineer and Contractor, in duplicate, indicating inspection observations and indicating compliance or non-compliance with Contract Documents.
- E Cooperate with independent firm; furnish safe access and assistance by incidental labor as requested.
 - (1) Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
- F Inspecting does not relieve Contractor to perform Work to contract requirements.

1.9 MANUFACTURERS' FIELD SERVICES

- A When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment and test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B Submit qualifications of observer to Engineer 30 days in advance of required observations.
- C Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D Refer to Section 01300 - SUBMITTALS, MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B Verify that existing substrate is capable of structural support or attachment of new

Work being applied or attached.

- C Examine and verify specific conditions described in individual specification sections.
- D Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

- A Clean substrate surfaces prior to applying next material or substance.
- B Seal cracks or openings of substrate prior to applying next material or substance.
- C Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Products.
- B Transportation and handling.
- C Storage and protection.
- D Product options.
- E Substitutions.

1.2 RELATED SECTIONS

- A Document 00105 - Instructions to Bidders: Product options and substitution procedures.
- B Section 01400 - Quality Control: Product quality monitoring.

1.3 PRODUCTS

- A Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- B Provide interchangeable components of the same manufacture for components being replaced.

1.4 TRANSPORTATION AND HANDLING

- A Transport and handle Products in accordance with manufacturer's instructions.
- B Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.
- C Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

- A Store and protect Products in accordance with manufacturers' instructions.
- B Store with seals and labels intact and legible.
- C Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.
- D For exterior storage of fabricated Products, place on sloped supports above ground.
- E Provide off-site storage and protection when site does not permit on-site storage or protection.
- F Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.
- G Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- H Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- I Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.6 PRODUCT OPTIONS

- A Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.7 SUBSTITUTIONS

- A Instructions to Bidders specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this section.
- B Substitutions may be considered when a Product becomes unavailable through no

fault of the Contractor.

- C Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D A request constitutes a representation that the Bidder:
 - (1) Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - (2) Will provide the same warranty for the Substitution as for the specified Product.
 - (3) Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - (4) Waives claims for additional costs or time extension which may subsequently become apparent.
 - (5) Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities.
- E Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F Substitution Submittal Procedure:
 - (1) Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - (2) Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
 - (3) The Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Starting systems.
- B Demonstration and instructions.
- C Testing, adjusting, and balancing.

1.2 RELATED SECTIONS

- A Section 01400 - Quality Control: Manufacturers field reports.
- B Section 01700 - Contract Closeout: System operation and maintenance data and extra materials.

1.3 STARTING SYSTEMS

- A Coordinate schedule for start-up of various equipment and systems.
- B Notify Engineer seven days prior to start-up of each item.
- C Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E Verify that wiring and support components for equipment are complete and tested.
- F Execute start-up under supervision of applicable manufacturer's representative [in accordance with manufacturers' instructions.
- G When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

- H Submit a written report in accordance with Section 01300 that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

- A Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.
- B For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- D Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time designated location.
- E Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

1.5 TESTING, ADJUSTING, AND BALANCING

- A Owner may appoint, employ, and pay for services of an independent firm to perform testing, adjusting, and balancing.
- B Reports will be submitted by the independent firm to the Engineer indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

PART 2 PRODUCTS

Not Used.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Closeout procedures.
- B Final cleaning.
- C Adjusting.
- D Project record documents.
- E Operation and maintenance data.
- F Spare parts and maintenance Products.
- G Warranties and bonds.
- H Maintenance service.

1.2 RELATED SECTIONS

- A Section 01650 - Starting of Systems: System start-up, testing, adjusting, and balancing.
- B Section 01700 - Contract Closeout

1.3 CLOSEOUT PROCEDURES

- A Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B Provide submittals to Engineer Owner that are required by governing or other authorities.
- C Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.4 FINAL CLEANING

- A Execute final cleaning prior to final project assessment.
 - B Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances and polish transparent and glossy surfaces.
 - C Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
 - D Clean filters of operating equipment.
-
- E Clean debris from roofs, gutters, downspouts, and drainage systems.
 - F Clean site; sweep paved areas, rake clean landscaped surfaces.
 - G Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.5 ADJUSTING

- A Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.6 PROJECT RECORD DOCUMENTS

- A Maintain on site one set of the following record documents; record actual revisions to the Work:
 - (1) Drawings.
 - (2) Specifications.
 - (3) Addenda.
 - (4) Change Orders and other modifications to the Contract.
 - (5) Reviewed Shop Drawings, Product Data, and Samples.
 - (6) Manufacturer's instruction for assembly, installation, and adjusting.
- B Ensure entries are complete and accurate, enabling future reference by Owner.
- C Store record documents separate from documents used for construction.
- D Record information concurrent with construction progress.
- E Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - (1) Manufacturer's name and product model and number.
 - (2) Product substitutions or alternates utilized.

- (3) Changes made by Addenda and modifications.
- F Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - (1) Measured depths of foundations in relation to finish floor datum.
 - (2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - (3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - (4) Field changes of dimension and detail.
 - (5) Details not on original Contract drawings.
- G Submit documents to Engineer with claim for final Application for Payment.

1.7 OPERATION AND MAINTENANCE DATA

- A Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic covers.
- B Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project , and subject matter of binder when multiple binders are required.
- C Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on pound white paper, in three parts as follows:
 - (1) Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - (2) Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - (a) Significant design criteria.
 - (b) List of equipment.
 - (c) Parts list for each component.
 - (d) Operating instructions.
 - (e) Maintenance instructions for equipment and systems.
 - (f) Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

- (3) Part 3: Project documents and certificates, including the following:
 - (a) Shop drawings and product data.
 - (b) Air and water balance reports.
 - (c) Certificates.
 - (d) Originals of warranties and bonds.

- E Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.
- F Submit two sets of revised final volumes, within 10 days after final inspection.

1.8 SPARE PARTS AND MAINTENANCE PRODUCTS

- A Provide spare parts, maintenance, and extra Products in quantities specified in individual specification sections.
- B Deliver to Engineer; obtain receipt prior to final payment.

1.9 WARRANTIES AND BONDS

- A Provide duplicate notarized copies.
- B Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- C Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
- D Submit prior to final Application for Payment.
- E For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.10 MAINTENANCE SERVICE

- A Furnish service and maintenance of components indicated in specification sections for one year from date of Substantial Completion.
- B Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C Include systematic examination, adjustment, and lubrication of components.

Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

- E Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 16000

ELECTRICAL

PART1: GENERAL

1.01 SCOPE OF WORK

- A. This section of the specifications includes the furnishing and installation of all labor, materials, tools, equipment, operations necessary for and reasonably incidental to proper execution and completion of all "Electrical" work, whether specifically mentioned or not, all as indicated, specified herein, and/or implied thereby to carry out the apparent intent thereof. All items not specifically mentioned in the specifications or noted on the drawings, but which obviously are required to make the working installation complete, shall be included automatically.
- B. Unless otherwise noted, the term "Contractor" in this specification section refers to the General Contractor for a single prime Contractor project.
- C. The Contractor shall furnish and install all conduit, wire, and cable complete and ready to operate in every respect, including connection of all equipment furnished by all contractors on this project.

1.02 QUALITY ASSURANCE

A. GENERAL

- 1. The drawings show the location and arrangement of fixtures, conduits, ducts, and equipment, together with details of connections of certain principal items. The layout shown shall be followed as closely as circumstances will permit, but the Contractor shall lay out his work so as to avoid conflict with other contractors and trades, and to avoid any unnecessary cutting or damage to walls, floors, and supporting structural members. He shall, therefore, carefully and accurately locate and install at the proper time all necessary sleeves, hangers and inserts that will be required for the completion of his work, and shall be solely responsible for the accurate and proper location of the above items.
- 2. The Contractor shall refer to architectural, civil, mechanical, structural and plumbing drawings and shall cooperate fully with

other contractors and trades while installing conduit, fixtures, and other equipment because of close space limits. In case of conflict the Engineer shall be notified before proceeding with installation. Refer to mechanical drawings for exact building dimensions and location of partition walls, doors and chases. Electrical drawings are not to be scaled for such dimensions.

3. The drawings and specifications complement each other and together are intended to give a complete description of the work. Any item of equipment or note of work to be done as shown on plans and not mentioned in the specifications, or mentioned in specifications and not shown on plans, shall be furnished the same as if mentioned or shown in both places. If conflicts exist, then the most stringent method shown or described should apply.
4. Any discrepancy, omission, or conflict found in plans or specifications shall be called to the immediate attention of the Engineer, prior to receipt of bids.
5. The drawings are not intended to show complete or accurate details. The figures and writing on drawings shall take precedence over scaling. It is the Contractor's responsibility to comply with the evident intent for centering and symmetric arrangement. The Contractor shall take all field measurements and be responsible therefore. Exact locations and relations are to be defined in the field and shall be satisfactory to the Engineer.

B. ALLOWANCE FOR ADDED WORK

Before proceeding with any work for which compensation may be claimed or the Owner may claim credit, a detailed estimate shall first be submitted and approved in writing. No claim for addition to the contract will be valid unless so ordered and approved by the Owner and Engineer.

C. INCIDENTAL CONSTRUCTION WORK

1. All blocking for openings, ducts and pipes in concrete floors, masonry walls, or partitions shall be provided by the Contractor. The Contractor shall do all cutting and fitting of his work and of other work that may be required to make the several parts come together properly and to fit his work to receive or be received by the work of other contractors as shown upon, or reasonably implied by the drawings and specifications. He shall properly complete and finish up his work after other contractors have finished as the Engineer may direct. All excavating required for the installation of the system shall be done by the Contractor and shall be unclassified, and backfill shall be accomplished as specified in the appropriate section of the specifications.
2. Chases are prohibited in masonry walls which are not to be plastered or paneled. Piping shall be set and ducts concealed in unplastered or

unpaneled masonry walls before walls are constructed in order that walls may be constructed around pipes or ducts. The Contractor shall furnish all sleeves in floors, beams and walls for each such penetration. Unless otherwise noted, the Contractor shall provide openings and lintels as new construction progresses.

D. INTERFERENCES

The Contractor shall cooperate with all contractors on the building and shall confer with all contractors installing mechanical work and equipment that may effect or come in contact with his work. He shall make necessary visits to site and examination of other trades to verify dimensions, installation conditions and conflicts and storage facilities.

E. TEMPORARY UTILITIES

All necessary utilities such as water and electricity shall be furnished by the contractor during construction, unless otherwise noted.

F. EXISTING FACILITIES

1. In existing facilities, disruption of operations must be kept to a minimum and coordinated with the Owner. Work in existing buildings must be cleaned up daily immediately after finishing that portion of the work and equipment left in order for the Owner to continue operations. When it is necessary to interrupt utility services in the fulfillment of this contract, such interruptions shall be kept to a minimum and coordinated with the Owner. Once work has begun it shall be pursued diligently until completed.
2. Every precaution shall be taken to prevent damage to existing underground lines and structures and public utilities. Damage to existing water and sewer lines, culverts, service connections, underground cables, and similar surface and sub-surface structures shall be at the expense of the Contractor.

G. ADAPTATION OF WORK TO EXISTING CONDITIONS

It is reasonably implied that the Contractor is to furnish all labor and materials to provide the Owner with a new and satisfactory system in existing facilities. The Contractor is to include necessary work for

adaptation of equipment to conditions that may be found to produce conflicts during construction. When any such conditions are encountered, the Contractor is to consult with the Engineer and then modify installation as directed to include any incidental materials

required.

H. PERMITS AND FEES

The Contractor shall secure all permits required for the completion of the contract. He shall obtain and deliver to the owner all certificates of inspection issued by the authorities having jurisdiction, with contractor paying cost of same.

I. WORKMANSHIP

Workmanship in the fabrication, preparation, and installation of materials and equipment shall conform to the best standards of practice of the trades involved. Work shall be performed by experienced and skilled mechanics under the supervision of a competent foreman. Substandard workmanship will be cause for rejection of work and replacement by Contractor.

J. TESTS

The right is reserved to conduct acceptance tests of all equipment, wiring, or any other work furnished under these specifications to determine the fulfillment of special requirements. Such tests shall be conducted in the presence of authorized representatives of the Contractor, Owner and Engineer, at such time as the Engineer may designate. The Contractor shall perform all tests and make adjustments of equipment and wiring as may be deemed necessary by the Engineer.

K. STANDARDS

All work performed and all equipment furnished by this Contractor shall be in accordance with applicable standards as published by ANSI, NFPA, and U.L.

1.03 REFERENCES

A. CODES AND ORDINANCES

1. All work performed shall be in accordance with the latest requirements of the most current edition of the National Electrical Code and all state and local codes, ordinances, rules and regulations.
2. If discrepancies occur between laws, codes, ordinances, rules and regulations, and the specifications or drawings, each discrepancy shall be called to the attention of the Engineer in writing before the bids are submitted. That work which is shown or specified in violation of these rules and regulations shall be done in compliance with the regulations, and no claim for additional cost required to make

implied systems complete will be accepted.

1.04 SUBMITTALS

A. SHOP DRAWINGS

1. Upon award of the contract, the Contractor shall submit to the Engineer for approval, a list of all proposed subcontractors and materials he proposes to utilize and seven (7) sets of shop drawings consisting of detailed drawings or manufacturer's cuts of all manufactured equipment he proposes to use on the job. The drawings or cuts shall show details of construction and arrangement of all pertinent data pertaining to equipment proposed to be furnished. The approval of the Engineer shall be obtained before equipment is ordered for delivery. Approval of the Engineer shall be for general fitness and design only. It will be the duty of the Contractor to verify quantities, dimensions, and details, and determine suitability of equipment for installation in space provided. Approval of shop drawings by the Engineer does not relieve the Contractor of the responsibility for coordination, dimensions, quantities or details.
2. The Contractor shall check and initial shop drawings making such notations and corrections as may be appropriate or necessary to comply with specifications before submission to the Engineer.

B. INSTRUMENTATION AND CONTROL EQUIPMENT DOCUMENTATION

Provide the following with the shop drawings:

1. Wiring diagrams showing point-to-point terminations for each item in each control loop.
2. Separate loop diagrams for each loop showing schematically each item in loop by tag number and sequence and description of operation. Verify in writing all loop descriptions showing additional items properly identified to satisfy complete functional system.
3. Panel layouts with panel wiring and/or piping diagrams with Bill of Materials indicating the manufacturer and catalog numbers of the components used in the wiring diagram.
4. Elementary, ladder type wiring diagrams for control wiring involving relays, control switches, motor starters, and pilot lights.

C. MAINTENANCE AND OPERATING INSTRUCTIONS

1. The Contractor shall furnish to the Engineer five (5) complete sets of applicable drawings, instructions and parts lists on all equipment

furnished, providing names and addresses of manufacturers or subcontractors and suppliers. Two (2) copies of manufacturer's warranties on all equipment so covered shall be provided to the Owner and one (1) copy to the Engineer.

2. Upon acceptance and approval of this project the one-year warranty period on all equipment and systems by this Contractor shall start, from that date.

D. RECORD DRAWINGS

This Contractor shall maintain a set of prints, showing exact location of all relocated equipment, concealed equipment, service accesses, hand holes, underground lines, and all other changes to the plans. This set of prints shall be kept current and turned over to the Engineer upon completion of the job. Dimensions shall be shown to locate all underground conduit and lines from permanent reference points.

1.05 DELIVERY, STORAGE AND HANDLING

All materials and equipment shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations. The Contractor shall be responsible for furnishing suitable shelter and protection for all materials and equipment stored on the job. Equipment shall be protected from damage from any source both during storage and after installation until completion of the job. No damaged equipment will be accepted.

1.06 SITE CONDITIONS

- A. Before submitting a bid, the Contractor shall visit the job site for the purpose of thoroughly examining the site and conditions under which the work must be performed. The submission of a bona fide bid will be construed to mean that the Contractor understands and is satisfied with conditions under which the contract must be fulfilled. No extra compensation will be allowed for situations arising from conditions, including charges and requirements for connection to utilities as shown for this project.

B. CLEAN UP

The Contractor shall be responsible for keeping work areas clean and free of trash and debris resulting from his operations. When work is conducted in occupied areas, clean up shall be accomplished daily and work areas left clean at end of the day's work. When all equipment and systems have been set and ready for use, they shall be thoroughly cleaned, removing all labels, plaster, rust and stains, and left in perfect working order.

C. CUTTING AND PATCHING

1. The Contractor, before installing any of his work shall see that it

does not interfere with clearances required for finished walls, partitions and equipment, as shown on mechanical and plumbing drawings and details. Any cutting or patching required by the failure of the Contractor to install sleeves, inserts and hangers at the proper time, or failure to accurately locate the above items, shall be done at his own expense.

2. Any cutting of walls or structures required for the installation of work under this section shall be done by the Contractor. Holes through walls for passage of conduits shall be properly and neatly sleeved and grouted. Sleeves through exterior walls shall be effectively sealed against passage of water. All disturbed areas shall be refinished and left in a finished and matching condition and must meet the approval of the Engineer.

D. CLEANING AND PAINTING

1. The Contractor shall at all times keep the Owner's premises, adjoining driveways and streets clean of rubbish caused by the Contractor's operations and at the completion of the work shall remove all the rubbish from and about the premises, all his tools, equipment, temporary work, surplus material and shall leave the work clean and ready for use.
2. The Contractor shall be required to perform touch-up painting on factory finished equipment installed under this contract where necessary to repair abraded or scarred areas and make a clean and neat installation at the direction of the Engineer. All metal exposed to weather shall be properly painted. Any equipment installed exposed to weather shall have all abraded areas cleaned, primed, and be painted one complete coat by the Contractor.

1.07 WARRANTY

The Contractor shall guarantee all materials, equipment, and workmanship in this contract against defects and failures of any nature for a period of one year from date on which the system is accepted. Apparatus furnished by the Contractor shall be guaranteed to be satisfactory when operated under rated conditions in accordance with manufacturer's instructions and to be of size, function, and capacity specified on drawings or in the specifications. Upon notice from the Engineer or Owner, he shall immediately check the system, make necessary repairs or adjustments as required due to faulty workmanship, materials, faults, operation, or equipment, without cost to the Owner, and instruct the Owner in proper operation, adjustment, and care of the systems.

PART 2:

PRODUCTS 2.01

MATERIALS

A. ELECTRICAL MATERIALS

1. Materials and workmanship on all work installed under this contract shall be new and of the best quality and shall conform to the best practice for such work and be installed in accordance with manufacturer's recommendations and instructions, including all hardware and accessories recommended or appropriate. Any work or materials not specifically mentioned in these plans and specifications, but required to make this job a complete and workable system shall be furnished and installed by the Contractor.
2. Certain items of manufactured materials and equipment are specified by manufacturer's or product name and model number. This is to establish a standard of design and quality, and is not intended to be as restrictive as to the use of materials and equipment of similar design and quality by other manufacturers, which may be used subject to the approval of the Engineer, unless otherwise specifically noted.
3. Substitutions will be considered only after contract award, and acceptance or rejection of the proposed substitutions shall be subject to approval of the Engineer. The Contractor shall submit, within ten (10) days after award of the contract, a list indicating the manufacturer of all equipment and materials which he proposes to use for approval. After that date, no substitution will be considered or approved, and all items shall be as specified. Substitution for equipment specified must be equal in every respect and the Contractor shall base his proposal on the quality of materials and equipment covered in these specifications and shown on the drawings. If required by the Engineer, the Contractor shall submit for inspection samples of both the specified and the proposed substitute items for comparison by the Engineer and test data from a recognized independent testing laboratory for both pieces of equipment.
4. Where substitutions alter the design or space requirements indicated on the plans, the Contractor shall include all items of cost for the revised design and construction, including the cost of any changes or modifications in structural or mechanical details and

electric service resulting from substitution of electrical equipment, and the cost of all allied trades involved.

5. All fabricated assemblies of electrically operated equipment furnished under this contract shall have Underwriter's Laboratories approval or U. L. Re-examination listing in every case where such approval has been established for the particular type of materials or devices in question.
6. All manufactured items of electrically operated equipment shall have Underwriter's Laboratories approval or U. L. Re-examination listing in every case where such approval has been established for the particular type of devices in question.

B. CONDUITS AND RACEWAYS

1. All wiring shall be installed in conduit. All conduit shall be heavy wall rigid galvanized steel except rigid PVC conduit conduit shall be installed for exterior work below grade, and shall always have marker tape placed above, 6" below finished grade. Rigid steel or PVC conduit shall be installed where routed in poured concrete, in exterior masonry walls, in concrete slabs or in wet locations. Minimum depth for buried raceway is 30" below finished grade. All stub-ups shall be rigid galvanized steel. No exposed PVC shall be permitted on this project.
2. Flexible PVC covered metal conduit shall be used for motor and transformer connections. Length shall be limited to 48".
3. All conduits used for service entrance feeders from supply point to first overcurrent device shall be bonded with suitable bonding locknuts and/or bonding insulating bushings, or by separate copper bonding conductor.

C. CONDUCTORS

1. General

The Contractor shall furnish and install all wire and cable necessary to complete the work herein outlined and as shown on drawings. All wiring in the entire system must be color-coded and all conductors shall have their size, voltage, manufacturer, and type clearly marked on the outer covering. All wire and cable shall be as herein specified or as shown on the drawings. Wire and cable shall be as manufactured by Okonite, Anaconda, Rome, General Cable, or approved equal.

2. Conductors

Conductors shall consist of annealed copper wire of size indicated on

drawings or as may be specified herein. No conductors smaller than #12 AWG copper shall be used, except as noted. All conductors up to and including #10 AWG shall be solid copper and all conductors of #8 AWG and larger shall be copper of size indicated on drawings or, as may be specified herein, Class B concentric stranded construction, unless specified otherwise herein or on drawings. Control wiring shall be stranded.

3. Wire Insulation

All wire and cable unless otherwise specified shall be single conductor type THW or THWN 600 volt insulation. Fixture dropwire to lighting fixtures shall be type AF. Where branch circuits are fed through fluorescent channels, type XHHW or type RHH wire may be used. Conductors, shall be color coded - black, red, orange, white, on 240/120 volt systems.

4. Installation

The Engineer reserves the right to inspect any and all joints in wiring. If the joint is already taped, the Contractor shall properly retape after inspection. Conductors shall be continuous without joints or splices in runs between outlet boxes. All splices shall be made at boxes only.

5. Splices and Terminations

Splices shall be made by use of mechanical connectors of the following manufacturers' types, T & B, "Sta-Kon", Burndy, "Crimpfit";

Minnesota Mining and Manufacturing Company, "Scotchlock" Ideal, "Wing-Nuts". Conductors size #8 AWG and larger shall be spliced and connected with suitable solderless, mechanical lugs and connectors. All splices, taps, and connections shall be insulated with Scotch electrical tape as made by Minnesota Mining & Manufacturing Company as applicable to installation.

2.02 EQUIPMENT

A. IDENTIFICATION

1. All equipment shall be identified and properly marked. All marking must meet the Engineer's approval. All markers shall be of appropriate size. Each switchgear unit, transformer, panel, contractor, starter, and other piece of electrical equipment shall be identified as to their service.
2. All disconnect switches, junction boxes, motor controllers, and other equipment requiring electrical power connection shall

be
marked with voltage present, as appropriate to designate 120, 208,
240, 277, or 480 volts and single or three phase, as applicable.

B. ELECTRICAL PANELBOARDS

1. The Contractor shall furnish and install all panelboards and distribution equipment as shown on the drawings. All panelboards will be complete with the size and number of single, double, and triple pole breakers as indicated on the drawings. All buss shall be copper.
2. All branch breakers shall be quick-make, quick-break thermal-magnetic trip, air circuit breakers, mechanically trip free with trip indication. All multiple breakers will be common trip and all breakers shall be of the bolted-in type.
3. Panelboard boxes shall have a minimum of 6-1/2" side and 5" end gutter. The front shall have adjustable indicating trim clamps, hinged doors, a directory holder for a plastic or glass covered directory that shall be neatly typed identifying each circuit as to space, function and area served. Panels shall be flush mounting unless otherwise noted. Branch loads are to be connected and numbered as in directory on plans.
4. The door shall have a cylinder tumbler-type, common keyed lock. On doors more than 43" high, a combination three-point catch and lock shall be provided. A neatly typed circuit directory shall be provided on the inside of the door or front as applicable, for all panels, switches, and controls, providing relative descriptive title for each load. Branch circuit-protective devices shall be of the number of poles, ampere rating and interrupting rating as listed on drawings and required by Code.
5. Distribution type panelboards shall be circuit breaker type, Square "D" "I" line, Westinghouse CDP or G.E. CCB. Panelboards on voltages below 240 shall be Square "D" NQOB, Westinghouse B10B, or G.E. NQB.

C. SWITCHES AND RECEPTACLES

1. Switches shall be two, three or four-way as specified on the drawings, mounted 4'-0" A.F.F.
2. Receptacles shall be Bryant 5252 or Leviton 5252, or P & S 5252, 15 amp, 125 volt, grounding type unless specifically noted on the drawings. Receptacles shall be grounded and bonded per N.E.C.,

D. CONTROL PANEL CONSTRUCTION

1. The panels shall be fabricated, assembled, pre-wired, and shall contain all required terminals, instruments, switches, pushbuttons, alarms, relays, lights, and power supplies. All cutouts shall be made and all instruments, to be supplied by the instrument manufacturer, shall be mounted and wired. Additional cutouts shall be made for all future instruments shown on the Drawings. These cutouts shall be furnished with suitable cover plates and painted to match the panel surface.
2. All wiring shall conform to the national Electrical Code and NEMA standards. All power wire shall be No. 16 AWG stranded copper, NEC type MTW. All signal wire shall be No. 18 AWG stranded, shielded copper. All wiring shall be installed in covered plastic wire ways. Wiring shall be installed so as to facilitate the removal of individual instruments without disturbing other operating instruments. All field wiring shall terminate on terminal blocks, with each terminal bearing the number of the wire as shown on wiring diagrams. Terminal blocks shall be Allen Bradley Type 1492 tubular screw type with pressure plate. Plastic wireways shall be "Panduit" manufactured by Panduit Corporation. Attach wireway with screws at 6" intervals. Wireway attached with adhesives is not permitted. All wire ends shall have markers with wire numbers as shown on the wiring diagrams required to be furnished by the Contractor.
3. Nameplates shall be furnished and installed with machine screws to panel. Nameplates shall be engraved laminated phenolic plastic 1/16" thick, white surface on black block. Edges of nameplate shall be chamfered 1/32" x 45 degrees approximately. Standard nameplate size is 1/2" x 3". Engraved letter size shall be 5/32" high, with one, two, or three lines of lettering, as required, centered on the nameplate. If nameplate legend needs more than 3", nameplate sizes can be increased as required.
4. The Contractor is responsible for approved panel layouts. Dimensioned panel layout drawings to scale shall be submitted with the shop drawings, and they shall be approved by the Engineer before fabrication is begun.
5. No manufacturer's nameplate is to be attached to the outside of the cabinet. Place the manufacturer's designation, for use in identifying the panel, inside the cabinet.
6. Wiremanship shall be first class. Unsightly wiring shall be cause for rejection of the panel.

7. Wire shall be AWG# 16 type MTW without nylon cover. The following colors shall be used:
 - a. 120vac line -black
 - b. 120vac neutral - white
 - c. ground - green
 - d. 120vaccontrol -red
 - e. DC control - blue
 - f. signal - yellow

8. All wires shall have wire markers on each end with same numbers as shown on the panel wiring diagrams. Submit panel layout and wiring diagrams for approval. Wiring diagrams shall be complete and shall include the following:
 - a. Front layout
 - b. Inside panel layout
 - c. Wiring diagrams with terminal and wire numbers
 - d. Bill of materials for all equipment used including manufacturer and Cat. Number.

E. MOTORS

1. The Contractor shall furnish power wiring and disconnect switches for all equipment furnished and shall install disconnect switches where shown or required. All contacts shall be inspected and cleaned, if required, in control panels, starters, and miscellaneous control devices and all necessary adjustments and wiring changes as may be required for proper adjustments shall be made.

2. Running tests shall be made on all equipment connected by the Contractor to check proper operation of equipment and verify installation of properly sized overcurrent relays. Such tests shall not be made; however, without the permission of a responsible party designated by the Owner. The Contractor shall connect and test all other equipment and shall provide cords and mating caps for receptacles where equipment is cord connected.

F. DISCONNECT SWITCHES

Interior switches shall be as called for on the drawings, heavy duty, in N.E.M.A. 1 enclosures complete with all fuses. Fuses will

be nonrenewable and where rated above 30 amperes will be of "fusetron" type. Switches to be exterior to be in NEMA 4X enclosures.

G. SUPPORTING

DEVICES

1. General

All electrical devices such as outlet boxes, poles, bases, switches, receptacles and fixtures, shall be located generally as shown on the drawings.

2. Outlet and Switch Boxes

- a. Outlet and switch boxes shall be cast metal with conduit hubs.
- b. All outlets shall be equipped with a stainless steel plate, type 302, Hubble series 93000, Bryant Series 93000, P & S Series 93000 or approved equal. All exterior mounted boxes shall have approved weather-proof plates and/or covers and all surface installed boxes shall have stamped steel device plates.

3. Outlet Locations

- a. All outlets for fixtures, receptacles, switches, intercoms, and telephones shall be installed in the location shown on the drawings. The Contractor shall study the general building plans in relation to the spaces surrounding each outlet in order that his work may fit the other work required by these specifications and plans as well as the work of other trades. When necessary, the Contractor shall relocate outlets so that when fixtures or other fittings are installed, they will be symmetrically located according to room layout and will not interfere with other work or equipment.
- b. Unless otherwise indicated on the prints, the top of outlet boxes shall be placed at the following distances from finished floors:
 - i. Lighting & Power Panelboards - top of cabinet 6'-6" above floor.

- ii. Safety switches and/or circuit breakers - handle not over 6-6" above floor.
 - iii. Wall switches - 4'-0" above floor.
 - iv. Receptacles and telephone - 1'-6" above floor except where noted; and centered 6" above counter top to bottom of plate.
 - v. Thermostats - 4'-0" above floor.
 - vi. Lighting Fixtures - as noted on drawings.
- c. When finished surfaces are brick, glazed tile, concrete masonry or similar material, outlet heights may be varied slightly on approval of Engineer to fit into masonry courses with a minimum of cutting.
 - d. The Contractor is cautioned to review mechanical, plumbing and heating plans to confirm location of equipment and to adjust the exact installed location of receptacles and devices accordingly to avoid interferences between electrical devices and equipment. Responsibility for locating in the field is the Contractor's and the Engineer should be contacted for clarification before installation.
 - e. Lighting outlets are to be centered or spaced symmetrically as evidently intended, unless they are dimensioned.

4. Structural Steel

The Contractor shall provide miscellaneous structural steel necessary to mount electrical equipment to walls, beams and joists. All structural steel furnished shall be standard shapes and sizes and shall be free from rust and/or scale. All interior steel shall be firmly and rigidly welded or bolted in place. All structural steel shall be structural quality conforming with ASTM A7-497. All exterior steel shall be painted by the Contractor as approved by the Engineer.

5. Tap and Pull Boxes

- 1. Boxes shall be of code gauge galvanized sheet steel but not less than 14-gauge metal. Holes for raceways shall be drilled on the job. Where necessary for boxes to be supported away from the ceiling or beams, strap iron or threaded rod shall be used for supports.
- 2. Boxes shall have covers fastened on with screws. Sizes of boxes shall be determined by N.E.C. requirements. In concealed wiring areas, boxes shall be installed flush with the finished surfaces and provided with oversized covers.

6. Secondary Systems

The Contractor shall furnish and install all conduit, junction boxes, outlet boxes, and plates for conduit systems for telephone, communications, and other miscellaneous systems as shown on plans. The Contractor shall coordinate installation of all telephone equipment such as hand sets, cables and terminal boards and shall conform to the requirements as to bonds, box size, conduit size, power and plates.

H. GROUNDING

1. All electrical systems and equipment connected under this contract shall be grounded in strict accordance with requirements set forth in the current edition of the National Electrical Code and local regulations. Provide a green TW insulated equipment grounding conductor in all conduits. It is intended that equipment grounding is not dependent on conduit terminations.

2. Metal raceways, metal enclosures or electrical devices, switchgear enclosures, transformer frames, medical equipment, and other equipment shall be completely grounded in an approved manner prescribed by the N.E.C. All necessary conduit, conductors, clamps and connectors for the grounding system shall be furnished, installed and connected by the Electrical Contractor. The ground connection shall be to a driven ground rod and a water main where it enters the building and the connection must be accessible. The water pipe connection shall consist of a ground fitting that bonds both conduit and conductor to the pipe.
3. Bonding shall be provided in accordance with the current edition of the National Electrical Code, and all service equipment shall be bonded up through and including the first over-current bonding conductor shall be utilized. All separately derived systems shall be grounded and bonded locally as described above and per the current edition of the National Electrical Code.

I. INTERIOR LIGHTING FIXTURES

1. The Contractor shall furnish and install all fixtures as called for on the drawings or as herein specified. All fixtures shall be new.
2. The catalog numbers of lighting fixtures and lamps described the basic lighting quality, foot candles and performance intended for this installation. Approved substitutes of fixtures by other manufacturers will be allowed subject to the Engineer's approval provided they meet the basic standards established by the fixture selected in terms of up-light, shielding, maintenance factors and wattage of lamps. The fixtures shall be complete in all respects including plaster rings where required, and plates and other appurtenances necessary for the complete installation.
3. Ballasts supplied with fluorescent fixtures shall be approved by Underwriters' Laboratories and shall be Type P, premium grade, properly applied to each installation.
4. The neutral conductor of lighting systems must be of the same size as the other conductors. On three wire systems the load shall be divided as evenly as possible on each "outside" or phase conductor. Neutral conductors shall be identified throughout.

J. LAMPS

The Contractor shall furnish and install all lamps required for all fixtures. All lamps shall be of size and type specified, G.E., Westinghouse, or Sylvania and shall be 130 volt, extended service incandescent lamps, white, inside

frosted, or as noted, of wattage indicated. Fluorescent lamps shall be cool white. All mercury vapor lamps shall be deluxe white or as noted. All H.I.D. lamps shall be phosphored or as noted and shall be of the self extinguishing type. All lamps shall be warranted by the Contractor for published rated life. Four weeks after acceptance of the system, the Contractor shall check all lighting fixtures and replace burnt out lamps and ballasts that have failed during this period of time.

K. DRY TYPE TRANSFORMERS

1. Dry-type transformers are to be air-cooled, 60 Hertz, two winding type, single or three phase as indicated. Voltage rating shall be 480-208/120 volts delta primary, wye secondary for three phase units, unless otherwise shown, KVA rating as indicated. Transformers for 30-KVA and above are to have four (4) 2-1/2% FCBN taps and two (2) FCAN, suitable for indoor service and arranged for floor or wall mounting as indicated. Insulation for 30-KVA and above shall be Class H with an average temperature rise not exceeding 150° C. based on 40° C. ambient at full load. Below 30-KVA, Class B, F or H insulation and two (2) 5% FCBN taps. U.L. listing mark is required. Three phase transformers shall have separate coil winding for each phase. So called "T" connected transformers are not acceptable.
2. Mount transformers on rubber-in-shear vibration dampeners or integral vibration dampeners. Rated sound level shall not be less than 5% below NEMA maximums. Make all external wiring connections to units with flexible steel Sealite conduit. Transformers 30-KVA and above are to be Westinghouse Type DT-3, General Electric Type QL, Sorgel, Heavy-Duty, Jefferson, Wide-Lite, or equal. Below 30-KVA Westinghouse Type EPT. General Electric Type M or equal single phase Westinghouse Type EP General Electric Type QM or equal.

L. 480V TRANSIENT VOLTAGE SURGE SUPPRESSOR

1. Furnish and install a surge suppressor at each service entrance to provide voltage transient protection.
2. Surge suppressor shall be suitable for use on a 277/480V grounded wye system, and shall have an impulse sparkover voltage of 1500 V on a voltage surge of either polarity having a rate-of-rise of 10,000 volts per microsecond.
3. Minimum life shall be 2000 current surges of 5,000 amperes on a 10 x 20 microsecond waveshape, and the subsequent power-follow current, per phase.

4. Surge suppressors shall be mounted near each main switchboard.
5. Surge arrester shall be similar to Joslyn Model 1414-08.

M. SIGNAL SURGE AND TRANSIENT PROTECTION

1. Furnish and install surge and transient voltage protection devices for all electronic equipment in the instrumentation and control system. All electronic equipment shall be protected from damage caused by common mode or transverse transients and surges occurring on the equipment power lines and signal cable.
2. Furnish and install grounding electrode for each item of electronic equipment. Where signal cable is shown run below grade, provide shielding along the entire length of cable, grounded as specified at least at each end, to prevent the induction of surges into the signal cable by lightning induced earth currents. For this project, shielding shall be rigid galvanized steel conduit in which all instrumentation cable is required to be run.
3. The installed transient and surge protection devices and grounding shall prevent drainage to the equipment caused by a power line voltage of 2500V peak with waveshape as required by IEEE Standard 472 "Guide for Surge Withstand Capacity". Signal line voltages of 1000V peak with a 10 x 560 micro seconds wave shape shall not damage the protected electronic equipment. Submit drawings, equipment lists, and wiring diagrams showing the proposed transient and surge protection devices and grounding.
4. Surge and transient protectors shall be two-stage type that will then rapidly clamp the residual voltage to a level that will not damage the protected equipment. Fast blow, 1/8 amp fuses on the field wiring side of the protectors shall be provided for signal lines.
5. Each instrument shall have power and signal line protectors inside the instrument or mounted within 1'-0" of the instrument.
6. All protectors shall be grounded to the grounding electrode specified for each item of electronic equipment.
 7. A group of instruments mounted in a control panel with a common signal line may be protected by one surge and transient protector. Provide power line protection for all instruments in a control panel at the point where 120VAC power is terminated in the control panel.

N. GROUNDING FOR TRANSIENT PROTECTION

1. Each instrument ground point and each surge and transient protector ground terminal shall be connected through an AWG #6 insulated conductor to the acceptable grounding electrode. This ground conductor shall either be run in no conduit, in non-metallic conduit, or in metal conduit provided both ends of the metal conduit are connected to the acceptable grounding electrode

O. CONTROL AND INSTRUMENTATION CABLE

1. Control cable shall be multiconductor AWG #12 copper with an overall outer covering suitable for direct burial. Control cable shall be equal to American Insulated Wire Corporation type BC.
2. Instrumentation Cable shall be shielded, twisted, AWG No. 18 pairs with an outer jacket suitable for direct burial or installation in underground conduits.
3. Instrumentation cable shall be provided by the contractor as indicated and specified for all items in the instrumentation system. Install this cable in rigid galvanized steel conduit run separately from the duct bank system. Do not install instrumentation cable in the duct bank conduits. Instrumentation cable shall not be run in conduit with conductors energized at any AC voltage.

2.03 HEATING, VENTILATION AND AIR CONDITIONING

1. Wall Mounted Propeller Exhaust Fans

- a. Provide wall mounted propeller exhaust fans and motors of capacities and sizes scheduled on drawings. Provide fans certified by AMCA test codes.
- b. Provide wall mounted propeller exhaust fans and motors of capacities and sizes scheduled on drawings. Provide fans certified by AMCA test codes.
- c. Provide propeller fans with direct or V-belt drive with a suitable low speed TEFC motor as scheduled.
- d. Provide with back draft damper having blades linked together.

- e. Provide each fan motor and drive isolated from fan enclosure by rubber-in-shear or spring type isolators standard with manufacturer.
 - f. Provide fan guard on each propeller fan.
2. Louver/Damper Assemblies
- a. Louver/Damper assemblies shall be fabricated of 0.071" thick extruded aluminum. A gird screen shall be provided with each assembly.
 - b. Louver/Dampers for inlet air shall be 4" thick vent products Ajust-o-Vent series model 2400 with electric motor operator.
 - c. Louver/Dampers for far exhaust air shall be 4" thick Vent Products Ajust-O-Vent series Model 2500 with gravity operated back draft damper.
3. Unit Heaters

Unit heaters shall be rated as indicated, and for 480V 3 phase. Heaters shall have all controls, contactors, and thermostat requiring only that power be brought to the unit. Unit heaters shall be mounted on a wall bracket furnished by the unit heater manufacturer. Unit heaters shall be Chromalox, or equal.

PART 3: EXECUTION

3.01 INSTALLATION

All materials and equipment shall be installed in accordance with the current edition of the National Electric Code.

3.02 QUALITY CONTROL AND FIELD TESTING

- A. The Contractor shall employ and pay for services of equipment manufacturer's field service representatives fully commissioned and authorized by manufacturer's factory to:
- 1. Inspect equipment covered by these specifications.
 - 2. Supervise adjustment, calibrations and installation checks and full commissioning.
 - 3. Conduct initial start up of equipment and perform basic operational checks. Verify system operation in accordance with Quality Standards of this specification.

4. Provide Owner with a written statement that manufacturer's equipment has been installed properly, commissioned, and calibrated and is ready for operation by the Owner. Secure manufacturer's certification that each control loop functions as required.
5. After receipt of written statement and approval by Owner, provide authorized factory training and maintenance service representatives for not less than two (2) days at job site to train Owner's personnel. Include training for operations.

B. SUPERVISION

The Contractor shall have in charge of the work at all times during construction a thoroughly competent foreman with extensive experience in the work to be performed under this contract. Anyone deemed not capable by the Engineer shall be replaced immediately upon request.

PART 4: MEASUREMENT AND PAYMENT

4.01 PAYMENT

No payment will be made for work completed under this Section of these Contract Documents. The Contractor shall merge anticipated costs into the lump sum Contract Bid.

END OF SECTION

DOCUMENT 02000
SPECIFICATIONS

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Removal of surface debris.
- B. Removal of paving, curbs, and structures
- C. Removal of trees, shrubs, and other plant life.
- D. Removal of underground storage tanks.
- E. Topsoil excavation.

1.2 RELATED SECTIONS

- A. Section 02211 - Rough Grading.
- B. Section 02229 - Rock Removal.

1.3 REGULATORY REQUIREMENTS

- A. Conform to Owner, County, Department of Transportation, local fire department, and any other applicable codes for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.
- B. Coordinate clearing Work with applicable utility companies.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Herbicide: as indicated on plans.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Identify a waste area for placing removed materials.

3.2 PROTECTION

- A. Locate, identify, and protect utilities that remain from damage.
- B. Protect trees, plant growth, and features designated to remain as final landscaping.
- C. Protect bench marks, and survey control points, and existing remaining structures from damage or displacement.

3.3 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs as indicated on plans. Remove stumps and root systems to an adequate depth. Remove surface rocks and other debris.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Apply herbicide to remaining stumps to inhibit growth.

3.4 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove demolished pavement and curb and other debris from site.
- C. Excavate and remove underground storage tanks, restraining straps, associated plumbing, and other debris.

3.5 TOPSOIL EXCAVATION

- A. Excavate topsoil from\marked areas in accordance with the plans without mixing with foreign materials.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on the plans to depth not exceeding 8 feet and protect from erosion.
- D. Remove topsoil not intended for reuse from site to an appropriate and permitted site.

END OF SECTION

SECTION 02205

SOIL MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Subsoil materials.
- B. Topsoil materials.

1.2 RELATED SECTIONS

- A. Section 02207 - Aggregate Materials.
- B. Section 02223 - Backfilling.
- C. Section 02225 - Trenching.
- D. Section 02275 - Riprap.
- E. Section 02936 - Seeding.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with all references, Owner requirements, and applicable state agency requirements.

1.4 REFERENCES

- A. ASTM D698 – Laboratory Compaction Characterizes of Soil Using Standard Effort
- B. ASTM D2487 - Classification of Soils for Engineering Purposes.
- C. ASTM D4318 – Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- D. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils
- E. ASTM D2974 – Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with State of North Carolina, Owner and the NCDOT. Maintain one copy of all approved permits on site during construction.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

- A. Subsoil Type S1: Conforming to North Carolina Department of Transportation requirements.

- B. Subsoil Type S2:
 - 1. Excavated and re-used material, imported borrows, or select or local borrow.
 - 2. Graded.
 - 3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 4. Relatively free of organic material.
 - 5. Group symbols GM, SW, SP, SM, SC, ML, CL. MH and CH may be satisfactory with engineers approval. OL, OH and PT are unsatisfactory.

2.2 TOPSOIL MATERIALS

- A. Topsoil Type S3: Conforming to North Carolina Department of Transportation requirements.
- B. Topsoil Type S4:
 - 1. Excavated and reused material.
 - 2. Graded.
 - 3. Free of roots, rocks larger than ½ inch, subsoil, debris, large weeds and foreign matter.
 - 4. Containing a minimum of 4 percent and a maximum of 25 percent organic matter.

C. Topsoil Type S5:

1. Imported borrow.
2. Friable loam.
3. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
4. Acidity range (pH) of 5.5 to 7.5.
5. Containing a minimum of 4 percent and a maximum of 25 percent organic matter.

2.3 SOURCE QUALITY CONTROL

- A. Testing and Analysis of Topsoil Material: Perform testing as referenced in Section 1.4 of 02205.
- B. If tests indicate materials do not meet specified requirements, change material and retest.

Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 SOIL REMOVAL

- A. Excavate subsoil and topsoil from areas designated.
- B. Remove lumped soil, boulders, and rock.
- C. Either stockpile or removal soil as required by design plans.
- D. Separate differing materials with dividers or stockpile apart to prevent mixing.
- E. Prevent intermixing of soil types or contamination.
- F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

- A. As specified on design plans either direct surface water away from stockpile site to prevent erosion or deterioration of materials or leave unused materials in a neat, compact stockpile.
- B. If a borrow area is indicated, leave area in a clean and neat condition. Grade site surface to prevent freestanding surface.

END OF SECTION

SECTION 02207
AGGREGATE MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aggregate materials.

1.2 RELATED SECTIONS

- A. Geotechnical Report (if provided); bore hole locations and findings of subsurface materials.
- B. Section 02205 - Soil Materials.
- C. Section 02225 - Trenching.
- D. Section 02275 - Riprap.
- E. Section 02667 - Site Water Lines.
- F. Section 02732 - Site Sanitary Sewerage Systems.

1.3 REFERENCES

- A. AASHTO - M147 - Materials for Aggregate and Soil-Aggregate.
- B. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.
- D. ASTM D2487 - Classification of Soils for Engineering Purposes.
- E. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with all references, Town requirements, and applicable state agency requirements.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate Type A1: Aggregate Base Course (ABC) conforming North Carolina Department of Transportation Standard.
- B. Coarse Aggregate Type A2 (Gravel): AASHTO M147, 35% or less passing the No. 200.
- C. Coarse Aggregate Type A3 (Gravel): Washed stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C136, ASTM D2487 Group Symbol GP.
- D. Aggregate Type A4 (Pea Gravel): Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136, ASTM D2487 Group Symbol GM.

2.2 FINE AGGREGATE MATERIALS

- A. Fine Aggregate Type A5: Conforming to North Carolina Department of Transportation standard.
- B. Fine Aggregate Type A6 (Sand): Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136, ASTM D2487 Group Symbol SP.

2.3 SOURCE QUALITY CONTROL

- A. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557.
- B. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557.
- C. If tests indicate materials do not meet specified requirements, change material or material source and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 STOCKPILING

- A. Stockpile materials on site at locations designated by Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.
- B. If a borrow area is indicated, leave area in a clean and neat condition. Grade site surface to prevent freestanding surface water.

END OF SECTION

SECTION 02211

ROUGH GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Removal of topsoil and subsoil.
- B. Cutting, grading, filling, rough contouring, and compacting the site for site structures, building pads, and other required grading.

1.2 RELATED SECTIONS

- A. Section 02110 - Site Clearing.
- B. Section 02205 - Soil Materials.
- C. Section 02207 - Aggregate Materials.
- D. Section 02229 - Rock Removal.
- E. Section 02222 - Excavating.
- F. Section 02223 - Backfilling.
- G. Section 02225 - Trenching.
- H. Section 02923 - Landscape Grading.

1.3 REFERENCES

- A. ASTM C136 - Method For Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- D. ASTM D2419 - Test Method For Sand Equivalent Value of Soils and Fine Aggregate.

- E. ASTM D2434 - Test Method For Permeability of Granular Soils (Constant Head).
- F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C136, ASTM D2419, ASTM D2434, and any other applicable local standards. Maintain one copy of all required permits on site.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Topsoil: Type S3, S4 or S5 as specified in Section 02205.
- B. Subsoil Fill: Type S1 or S2 as specified in Section 02205.
- C. Structural Fill: Type S1 or S2 as specified in Section 02205.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions conform to site plans.
- B. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain, from damage.
- D. Notify applicable utility company to remove and relocate utilities.

- E. Protect above and below grade utilities that remain.
- F. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- G. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.
- C. When excavating through roots, perform work by hand and cut roots with sharp axe.
- D. Remove subsoil from site or stockpile in area designated on site to depth not exceeding eight feet and protect from erosion. Remove from site, subsoil not being reused.
- E. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide firm bearing.
- F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 FILLING

- A. Install Work in accordance with applicable local standards.
- B. Fill areas to contours and elevations with unfrozen materials.
- C. Place fill material on continuous layers and compact.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Slope grade away from building minimum 1.5:100 unless noted otherwise.
- F. Make grade changes gradual. Blend slope into level areas.

G. Remove surplus fill materials from site.

3.5 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.6 FIELD QUALITY CONTROL

A. Testing: In accordance with ASTM D1557.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

i. Frequency of Tests: Perform tests as required by Owner and/or Engineer.

END OF SECTION

SECTION 02222

EXCAVATING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating for site structures.

1.2 RELATED SECTIONS

- A. Section 02110 - Site Clearing.
- B. Section 02223 - Backfilling.
- C. Section 02225 - Trenching.
- D. Section 02229 - Rock Removal.
- E. Section 02607: Manholes and Covers.
- F. Section 02667 - Site Water Lines.

1.3 FIELD MEASUREMENTS

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain from damage.
- C. Notify utility company to remove and relocate utilities.
- D. Protect plant life, lawns, rock outcroppings and other features remaining as a portion of final landscaping.

- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 EXCAVATING

- A. Excavate subsoil to accommodate building foundations, slabs-on-grade paving and site structures.
- B. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 02223 and 02225.
- C. Grade top perimeter of excavating to prevent surface water from draining into excavation.
- D. Hand trim excavation. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Larger material will be removed under Section 02229.
- F. Notify Owner of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- G. Correct areas over excavated in accordance with Section 02223.
- H. Stockpile excavated material in area designated on site in accordance with Section 02205.

3.3 FIELD QUALITY CONTROL

- A. Provide for visual inspection of bearing surfaces.

3.4 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building perimeter and site structure backfilling to subgrade elevations.
- B. Site filling and backfilling.
- C. Fill under slabs-on-grade and paving.
- D. Fill for over-excavation.
- E. Consolidation and compaction as scheduled.

1.2 RELATED SECTIONS.

- A. Section 02222 - Excavating.
- B. Section 02225 - Trenching.
- C. Section 02229 - Rock Removal.
- D. Section 02275 - Riprap.
- E. Section 2607: Manholes and Covers.
- F. Section 02667 - Site Water Lines.
- G. Section 02923 - Landscape Grading.

1.3 REFERENCES

- A. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Fill Type: As specified in Section 02205.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- B. Verify underground tanks and manholes are anchored to their own foundations to avoid flotation after backfilling.
- C. Verify structural ability of unsupported walls to support imposed loads by the fill.

3.2 PREPARATION

- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type A3 fill and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify and proof roll subgrade surface to identify soft spots. Fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Employ a placement method that does not disturb or damage other work.
- D. Place geotextile fabric over Type A2 fill prior to placing next lift of fill.
- E. Granular Fill Type A3: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- F. Soil Fill Type S2: Place and compact material in equal continuous layers not exceeding 12 inches compacted depth.

- G. Maintain optimum moisture content of backfill materials to attain required compaction density.
- H. Remove surplus backfill materials from site.
- I. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 0.5 inches from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1557.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Proof roll compacted fill surfaces under slabs-on-grade and paving.

3.6 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Reshape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

- A. All fill and compaction to comply with approved design plans.

END OF SECTION

SECTION 02225

TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating trenches for utilities from clean out outside building to municipal utilities.
- B. Compacted fill from top of utility bedding to subgrade elevations.
- C. Backfilling and compaction.

1.2 RELATED SECTIONS

- A. Section 02110 - Site Clearing.
- B. Section 02205 - Soil Materials.
- C. Section 02222 - Excavating.
- D. Section 02223 - Backfilling.
- E. Section 02229 - Rock Removal.
- F. Section 02275 - Riprap.
- G. Section 02667 - Site Water Lines.
- H. Section 02732 - Site Sanitary Sewerage Systems.
- I. Section 02923 - Landscape Grading.

1.3 REFERENCES

- A. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

1.4 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

1.5 FIELD MEASUREMENTS

- A. Verify that survey bench mark, control point, and intended elevations for the work are as shown on drawings.

1.6 COORDINATION

- A. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.
-

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Fill Type S2: As specified in Section 02205.

2.2 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable fabric in accordance with plans.
- B. Filter Fabric: Non-biodegradable fabric in accordance with plans.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- C. Protect bench marks, existing structures, paving, and curbs from excavating equipment and vehicular traffic.
- D. Maintain and protect above and below grade utilities that are to remain.
- E. Cut out soft areas of subgrade not capable of compaction in place. Backfill and compact to density equal to or greater than requirements for subsequent backfill material.

3.2 EXCAVATING

- A. Excavate subsoil required for municipal utilities.

- B. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. In trenches where water is present or where dewatering is required, the trench bottom shall be undercut and stabilized with No. 67 stone, having a minimum depth of 8 inches.
- E. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- F. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd, measured by volume. Larger material will be removed under Section 02229.
- G. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.3 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen fill materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Place geotextile fabric over Fill Type A2 prior to placing next lift of fill.
- D. Granular Fill Type A6: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- E. Soil Fill Type S2: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- F. Employ a placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, or any other existing structures.
- G. Maintain optimum moisture content of fill materials to attain required compaction density.
- H. Remove surplus fill materials from site.
- I. Leave fill material stockpile areas completely free of excess fill materials.

3.4 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 0.5 inches from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1557.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- C. Frequency of Tests: Compaction tests will be conducted as required by the Owner's Representative.

3.6 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 02229

ROCK REMOVAL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Removal of discovered rock during excavation.
- B. Explosives to assist rock removal.

1.2 RELATED SECTIONS

- A. Section 02225 - Trenching: Trenching and backfilling for utilities.
- B. Section 02275 - Riprap.

1.3 REFERENCES

- A. NFPA 495 - Code for Manufacture, Transportation, Storage, and Use of Explosive Materials.

1.4 DEFINITIONS

- A. Rock Excavation: Any material that cannot be excavated with a single tooth ripper drawn by a crawler tractor having a minimum flywheel power rated at not less than 310 horse power (Caterpillar D-8T or equivalent), occupying an original volume of at least one cubic yard or more, and requires blasting.
- B. Trench Excavation: Any Material which cannot be excavated with a Caterpillar 345C with flywheel power of 345 horse power or equivalent occupying an original volume of at least ½ cubic yard or more, and which requires blasting or other rock excavation methods.

1.5 SUBMITTALS FOR REVIEW

- A. Shop Drawings: Indicate the proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock removal method. Owner's Representative must approve prior to any blasting.

1.6 QUALITY ASSURANCE

- A. Seismic Survey Firm: Company specializing in seismic surveys with five years experience or approval by Owner's Representative.
- B. Explosives Firm: Company specializing in explosives for disintegration of rock, with five years documented experience or approval by Owner's Representative.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable safety codes for explosive disintegration of rock and to NFPA 495 for handling explosive materials.
- B. Blasting Procedures shall conform to all applicable local, state, and Federal laws and ordinances. The Contractor shall take all necessary precautions to protect life and property, including the use of an approved blasting mat where there exists the danger of throwing rock or overburden.
- C. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

1.8 PROJECT CONDITIONS

- A. The Contractor shall keep explosive materials that are needed on the job site in specially constructed boxes provided with locks. These boxes shall be painted red and plainly identified as to their contents. After working hours, the boxes containing explosive materials shall be removed from the job site. Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made.
- B. Conduct survey and document conditions of buildings near locations of rock removal, prior to blasting, and photograph existing conditions identifying existing irregularities.
- C. Advise owners of adjacent buildings or structures in writing, prior to executing seismographic survey. Explain planned blasting and seismic operations.
- D. Where blasting takes place within 500 feet of a utility, structure, or property which could be damaged by vibration, concussion, or falling rock, the Contractor shall be required to keep a blasting log containing the following information for each and every shot:
 - 1. Date of shot.

2. Time of shot.
 3. Foreman's name.
 4. Number and depth of holes.
 5. Approximate depth of overburden.
 6. Amount and type of explosive used in each hole.
 7. Type of caps used (instant or delay).
 8. The weather.
- E. Blasting log shall be made available to the Owner's Representative upon request and shall be kept in an orderly manner. Compliance by the Contractor with these specifications does in no way relieve him of legal liabilities relative to blasting operations.
- F. Obtain a seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.
- G. No blasting shall be allowed unless a galvanometer is employed to check cap circuits.
- H. The Owner reserves the right to require removal of rock by means other than blasting where any utility, residence, structure, etc. is either too close to, or so situated with respect to the blasting as to make blasting hazardous.

1.9 SCHEDULING

- A. Schedule Work to avoid disruption to occupied buildings nearby.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Explosives: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.
- B. Delay Device: Type recommended by explosives firm.
- C. Blast Mat Materials: Type recommended by explosives firm.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.

3.3 ROCK REMOVAL BY A MECHANICAL METHOD

- A. Excavate and remove rock by the mechanical method.
- B. Drill holes and utilize wedges or mechanical disintegration compound to fracture rock.
- C. Cut away rock at bottom of excavation to form level bearing.
- D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.
- E. Remove excavated materials from site or reuse for site landscaping.
- F. Correct unauthorized rock removal to directions of Owner's Representative.

3.4 ROCK REMOVAL BY EXPLOSIVE METHODS

- A. If rock is uncovered requiring the explosives method for rock disintegration, notify the Owner.
- B. Provide seismographic monitoring during progress of blasting operations.
- C. Drill blasting holes within 12 feet of finished slope.
- D. Disintegrate rock and remove from excavation.
- E. Remove rock at excavation bottom to form level bearing.
- F. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.
- G. Remove excavated material from site or reuse for site landscaping.

- H. Correct unauthorized rock removal to directions of Owner's Representative.

3.5 FIELD QUALITY CONTROL

- A. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

END OF SECTION

SECTION 02231

AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aggregate base course.

1.2 RELATED SECTIONS

- A. Section 02207 - Aggregate Materials.
- B. Section 02225 - Trenching.
- C. Section 02275 - Riprap.
- D. Section 02510 - Asphaltic Concrete Paving.
- E. Section 02520 - Portland Cement Concrete Paving.
- F. Section 02607 - Manholes and Covers.
- G. Section 02923 - Landscape Grading.

1.3 REFERENCES

- A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb. Rammer and an 18-in. Drop.
- B. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and an 18 inch Drop.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Coarse Aggregate Fill Type A1: As specified in Section 02207.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate has been inspected, gradients and elevations are correct,

and is dry.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

- A. Spread aggregate over prepared substrate to a total compacted thickness as indicated on design plans and in accordance with North Carolina Department of Transportation. Requirements.
- B. Place aggregate in maximum 6 inch layers and roller compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

- A. Flatness: Maximum variation of 1/2 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation From Design Elevation: Within 1/2 inch.

3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with AASHTO T180.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.6 SCHEDULES

A. Under Asphalt Pavement:

1. Compact placed aggregate materials to achieve compaction of 95 percent.

B. Under Concrete Pavement:

1. Compact placed aggregate materials to achieve compaction of 95 percent.

END OF SECTION

SECTION 02275

RIPRAP

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Riprap.

1.2 RELATED SECTIONS

- A. Section 02225 – Trenching.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Riprap: Sized in accordance with design plans.
- B. Geotextile fabric.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not place riprap over frozen or spongy subgrade surfaces.

3.2 PLACEMENT

- A. Place geotextile fabric over substrate, lap edges and ends.
- B. Place riprap at culvert pipe ends and other locations as indicated on design plans.
- C. Place riprap into position. Key into grade so that top of riprap is at same grade as surrounding ground.
- D. Install to indicated thickness.
- E. Place rock evenly and carefully to minimize voids (do not tear fabric) and place in one consistent operation to preclude disturbance or displacement of substrate.
- F. After placement, spray with water to moisten the bagged mix. Maintain moist for 24 hour.

END OF SECTION

SECTION 02510

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Asphaltic concrete paving, wearing binder or base course.
- B. Surface sealer.
- C. Aggregate base course.

1.2 RELATED SECTIONS

- A. Section 02231 - Aggregate Base Course.
- B. Section 02607 - Manholes and Covers.

1.3 REFERENCES

- A. ASTM D946 - Penetration-Graded Asphalt Cement for Use in Pavement Construction.
- B. TAI - (The Asphalt Institute) - MS-2 Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.

1.4 PERFORMANCE REQUIREMENTS

- A. Paving: Designed in accordance with Owner Requirements and/or North Carolina Department of Transportation.
- B. Patching: Designed in accordance with approved design plans. Patching in Owner streets or DOT roads must meet appropriate requirements.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Owner and/or North Carolina Department of Transportation standard.
- B. Mixing Plant: Conform to Owner and/or North Carolina Department of Transportation standard.
- C. Obtain materials from same source throughout.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F or surface is wet or frozen.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Asphalt Cement: ASTM D946. In accordance with North Carolina Department of Transportation standards.
- B. Aggregate for Base Course Mix: In accordance with Section 02207 Type A1.
- C. Aggregate for Binder Course Mix: In accordance with North Carolina Department of Transportation standards.
- D. Aggregate for Wearing Course Mix: In accordance with North Carolina Department of Transportation standards.
- E. Fine Aggregate: In accordance with Section 02207 Type A5.
- F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- G. Primer: In accordance with North Carolina Department of Transportation standards.
- H. Tack Coat: In accordance with North Carolina Department of Transportation standards.
- I. Seal Coat: In accordance with North Carolina Department of Transportation standards.

2.2 ASPHALT PAVING MIX

- A. Use dry material to avoid foaming. Mix uniformly.
- B. Base Course: 3.0 to 6.0 percent of asphalt cement by weight in mixture in accordance with North Carolina Department of Transportation

standards.

- C. Binder Course: 4.5 to 6.0 percent of asphalt cement by weight in mixture in accordance with North Carolina Department of Transportation standards.
- D. Wearing Course: 5.0 to 7.0 percent of asphalt cement by weight in mixture in accordance with North Carolina Department of Transportation standards.]

2.3 SOURCE QUALITY CONTROL AND TESTS

- A. Submit proposed mix design of each class of mix for review prior to beginning of work.
- B. Test samples in accordance with TAI MS-2.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify base conditions satisfactory.
- B. Verify that compacted granular base is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.

3.2 SUBBASE

- A. Section 02231 - Aggregate Base Course forms the base construction for work of this section.

3.3 PREPARATION - PRIMER

- A. Apply primer in accordance with North Carolina Department of Transportation standards

3.4 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with North Carolina Department of Transportation standards

3.5 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. Install Work in accordance with North Carolina Department of Transportation standards
- B. Place asphalt within 24 hours of applying primer or tack coat.
- C. Place asphalt to thickness shown on approved design plans.
- D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.6 SEAL COAT

- A. Apply seal coat to surface course in accordance with North Carolina Department of Transportation standards.

3.7 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch .
- C. Variation from True Elevation: Within 1/2 inch .

3.8 FIELD QUALITY CONTROL

- A. Take samples and perform tests in accordance with TAI MS-2.

3.9 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 02520

PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete sidewalks and driveways.
- B. Aggregate base course.

1.2 RELATED SECTIONS

- A. Section 02231 - Aggregate Base Course
- B. Section 02510 - Asphaltic Concrete Paving.
- C. Section 02607 - Manholes and Covers.
- D. Section 02923 - Landscape Grading.

1.3 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- C. ASTM C33 - Concrete Aggregates.
- D. ASTM C94 - Ready Mix Concrete.
- E. ASTM C150 - Portland Cement
- F. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- G. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.

- B. Obtain cementitious materials from same source throughout.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet or frozen.

PART 2 PRODUCTS

2.1 FORM MATERIALS

- A. Form Materials: Conform to ACI 301.

2.2 REINFORCEMENT

2.3 CONCRETE MATERIALS

- A. Cement: ASTM C150 Portland type, white color.
- B. Fine and Coarse Mix Aggregates: ASTM C33.
- C. Water: Potable, not detrimental to concrete.

2.4 ACCESSORIES

- A. Curing Compound: ASTM C309.
- B. Liquid Surface Sealer.
- C. Surface Retarder.
- D. Joint Sealers.

2.5 CONCRETE MIX - BY PERFORMANCE CRITERIA

- A. Mix and deliver concrete in accordance with ASTM C94, Alternative No. 2.
- B. Select proportions for normal weight concrete in accordance with ACI 301 Method 1.
- C. Provide concrete to the specifications given on the approved design plans.
- D. Use accelerating admixtures in cold weather only when approved by Owner. Use of admixtures will not relax cold weather placement requirements.

- E. Use calcium chloride only when approved by Owner.
- F. Use set retarding admixtures during hot weather only when approved by Owner.

2.6 SOURCE QUALITY CONTROL AND TESTS

- A. Submit proposed mix design to Owner for review prior to commencement of work.
- B. Tests on cement and aggregates will be performed to ensure conformance with specified requirements.
- C. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify compacted stabilized soil is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.2 SUBBASE

- A. Section 02231 - Aggregate Base Course forms the base construction for work of this Section.

3.3 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole or catch basin (if applicable) frames with oil to prevent bond with concrete pavement.
- C. Notify Owner minimum 24 hours prior to commencement of concreting operations.

3.4 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.5 REINFORCEMENT

- A. Place reinforcement as indicated.
- B. Interrupt reinforcement at expansion joints.
- C. Place reinforcement to achieve pavement and curb alignment as detailed.

3.6 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.

3.7 JOINTS

- A. Place expansion joints at 20 foot intervals. Align curb, gutter, and sidewalk joints.
- B. Place joint filler between paving components and building or other appurtenances.
- C. Provide sawn joints at 3 foot intervals, between sidewalks and curbs, and between curbs and pavement.
- D. Provide keyed joints as indicated.

3.8 EXPOSED AGGREGATE

- A. Wash exposed aggregate surface with clean water and scrub with stiff bristle brush to match sample panel.

3.9 FINISHING

- A. Finish as stated on design plans or to match existing surfaces.

3.10 JOINT SEALING

- A. Separate pavement from vertical surfaces with 1/4 inch thick joint filler.
- B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- C. Extend joint filler from bottom of pavement to within 1/4 inch of finished

surface.

3.11 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/2 inch in 10 ft.
- B. Maximum Variation From True Position: 1/2 inch.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian or vehicular traffic over pavement for 3 days minimum after finishing.

END OF SECTION

SECTION 02923
LANDSCAPE GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Final grade topsoil for finish landscaping.

1.2 RELATED SECTIONS

- A. Section 02205 - Soil Materials.
- B. Section 02211 - Rough Grading.
- C. Section 02223 - Backfilling.
- D. Section 02225 - Trenching.
- E. Section 02936 - Seeding.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Topsoil: Fill Type S3, S4 or S5 as specified in Section 02205.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify building and trench backfilling have been inspected.
- B. Verify substrate base has been contoured and compacted.

3.2 SUBSTRATE PREPARATION

- A. Eliminate uneven areas and low spots.
- B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove subsoil contaminated with petroleum products.
- C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.3 PLACING TOPSOIL

- A. Place topsoil in areas where seeding is required. Place topsoil during dry weather.
- B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
- C. Remove roots, weeds, rocks, and foreign material while spreading.

- D. Manually spread topsoil close to plant life, buildings, and other structures to prevent damage.
- E. Lightly compact placed topsoil.
- F. Remove surplus subsoil and topsoil from site.
- G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 TOLERANCES

- A. Top of Topsoil: Plus or minus 12 inch.

3.5 PROTECTION

- A. Protect landscaping and other features remaining as final work.
- B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

END OF SECTION

SECTION 02936

SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Seeding, Hydroseeding, mulching and fertilizer.
- D. Maintenance.

1.2 RELATED SECTIONS

- A. Section 02205 - Soil Materials: Topsoil material.
- B. Section 02223 - Backfilling: Rough grading of site.
- C. Section 02225 - Trenching: Rough grading over cut.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Grassed Areas:
 - 1. Basis of Measurement: By the acre.
 - 2. Basis of Payment: Includes preparation of topsoil, and seeding, and maintenance until full growth achieved.

1.4 REFERENCES

- A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.5 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quack grass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambs quarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.6 MAINTENANCE DATA

- A. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.7 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.8 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilized in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 COORDINATION

- A. Coordinate with installation of underground sprinkler system piping and watering heads.

1.11 MAINTENANCE SERVICE

- A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition cuttings.

PART 2 PRODUCTS

2.1 SEED REQUIREMENTS

- A. Tall Fescue: 200 lbs/acre.
- B. Kentucky Blue Grass: 20 lbs/acre.
- C. Rye: 40 lbs/acre.

2.2 SOIL MATERIALS

- A. Topsoil: Excavated from site and free of weeds.

2.3 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable. Use 400 lbs/acre.
- B. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil. Use 1200 lbs/acre.
- C. Lime: Use 4000 lbs/acre.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.2 PREPARATION OF SUBSOIL

- A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.
- C. Scarify subsoil to a depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

- A. Spread topsoil to a minimum depth of 8 inches over area to be seeded. Rake until smooth.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

- E. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.4 FERTILIZING

- A. Apply fertilizer at a rate of 4000 lbs/acre.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.5 SEEDING

- A. Apply seed, at the rates identified in Part 2.2 of this section, in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- D. Roll seeded area with roller not exceeding 112 lbs.
- E. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
- F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.6 HYDROSEEDING

- A. Apply seeded slurry with a hydraulic seeder at a rate to be approved by Engineer evenly in two intersecting directions.
- B. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
- C. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.7 SEED PROTECTION

- A. Identify seeded areas with stakes and string around area periphery. Set string height to 6 inches.
- B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- D. Secure outside edges and overlaps at 36 inch intervals with stakes.
- E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.8 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out.
- E. Roll surface to remove minor depressions or irregularities.
- F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- G. Immediately reseed areas which show bare spots.
- H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

