SPECIFICATIONS

PROJECT:

501 DANFORTH STREET
PORTLAND, MAINE

OWNER:

PROPSYS, INC.
SUITE 2400
55 LISBON STREET
LEWISTON, ME 04240

ARCHITECT:

ARCHETYPE, P.A.
48 UNION WHARF
PORTLAND, MAINE 04101

27 APRIL 2010

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April 27, 2010

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General Conditions of the Contract for Construction

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document has been approved and endorsed by The Associated General Contractors of America.

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AIA DOCUMENT A201-1997
GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The American Institute of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

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ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of Addenda relating to bidding requirements).

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor, (3) between the Owner and Architect or (4) between any persons or entities other than the Owner and Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

1.1.7 THE PROJECT MANUAL

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are

complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.2.3 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 CAPITALIZATION

1.3.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document or (3) the titles of other documents published by the American Institute of Architects.

1.4 INTERPRETATION

1.4.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.5 EXECUTION OF CONTRACT DOCUMENTS

1.5.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

1.5.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

1.6 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

1.6.1 The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect's consultants, and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in

the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' copyrights or other reserved rights.

ARTICLE 2 OWNER

2.1 GENERAL

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Subparagraph 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 The Owner shall, at the written request of the Contractor, prior to commencement of the Work and thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Furnishing of such evidence shall be a condition precedent to commencement or continuation of the Work. After such evidence has been furnished, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

2.2.2 Except for permits and fees, including those required under Subparagraph 3.7.1, which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

2.2.4 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in

accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period give the Contractor a second written notice to correct such deficiencies within a three-day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

3.1 GENERAL

3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

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

3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Since the Contract Documents are complementary, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Subparagraph 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect as a request for information in such form as the Architect may require.

3.2.2 Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents. The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any nonconformity discovered by or made known to the Contractor shall be reported promptly to the Architect.

3.2.3 If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.6 and 4.3.7. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents unless the Contractor recognized such error, inconsistency, omission or difference and knowingly failed to report it to the Architect.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage.

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

3.4 LABOR AND MATERIALS

3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.4.2 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order.

3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract

Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

3.6 TAXES

3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

3.7 PERMITS, FEES AND NOTICES

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received or negotiations concluded.

3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work.

3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

3.8 ALLOWANCES

3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

3.8.2 Unless otherwise provided in the Contract Documents:

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances;

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Clause 3.8.2.1 and (2) changes in Contractor's costs under Clause 3.8.2.2.

3.8.3 Materials and equipment under an allowance shall be selected by the Owner in sufficient time to avoid delay in the Work.

3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

3.10.2 The Contractor shall prepare and keep current, for the Architect's approval, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Architect reasonable time to review submittals.

3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.

3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by

the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.

3.12.6 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice the Architect's approval of a resubmission shall not apply to such revisions.

3.12.10 The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Subparagraph 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

3.15 CLEANING UP

3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16 ACCESS TO WORK

3.16.1 The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

3.18 INDEMNIFICATION

3.18.1 To the fullest extent permitted by law and to the extent claims, damages, losses or expenses are not covered by Project Management Protective Liability insurance purchased by the Contractor in accordance with Paragraph 11.3, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be

construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Subparagraph 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

4.1.3 If the employment of the Architect is terminated, the Owner shall employ a new Architect against whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the former Architect.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents, and will be an Owner's representative (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Paragraph 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

4.2.2 The Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Subparagraph 3.3.1.

4.2.3 The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

4.2.4 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

4.2.6 The Architect will have authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Subparagraphs 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

4.2.7 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.

4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, will receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor.

The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and initial decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

4.3 CLAIMS AND DISPUTES

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 Time Limits on Claims. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be initiated by written notice to the Architect and the other party.

4.3.3 Continuing Contract Performance. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

4.3.4 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Paragraph 4.4.

4.3.5 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.6.

4.3.6 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be filed in accordance with this Paragraph 4.3.

4.3.7 CLAIMS FOR ADDITIONAL TIME

4.3.7.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

4.3.7.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

4.3.9 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

4.3.10 Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Subparagraph 4.3.10 shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

4.4.1 Decision of Architect. Claims, including those alleging an error or omission by the Architect but excluding those arising under Paragraphs 10.3 through 10.5, shall be referred initially to the Architect for decision. An initial decision by the Architect shall be required as a

condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered by the Architect. The Architect will not decide disputes between the Contractor and persons or entities other than the Owner.

4.4.2 The Architect will review Claims and within ten days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Architect is unable to resolve the Claim if the Architect lacks sufficient information to evaluate the merits of the Claim or if the Architect concludes that, in the Architect's sole discretion, it would be inappropriate for the Architect to resolve the Claim.

4.4.3 In evaluating Claims, the Architect may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Architect in rendering a decision. The Architect may request the Owner to authorize retention of such persons at the Owner's expense.

4.4.4 If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either provide a response on the requested supporting data, advise the Architect when the response or supporting data will be furnished or advise the Architect that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Architect will either reject or approve the Claim in whole or in part.

4.4.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefor and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be final and binding on the parties but subject to mediation and arbitration.

4.4.6 When a written decision of the Architect states that (1) the decision is final but subject to mediation and arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

4.4.7 Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.4.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines prior to resolution of the Claim by the Architect, by mediation or by arbitration.

4.5 MEDIATION

4.5.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5 shall, after initial decision by the Architect or 30 days after submission of the Claim to the Architect, be

subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

4.5.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

4.5.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

4.6 ARBITRATION

4.6.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5, shall, after decision by the Architect or 30 days after submission of the Claim to the Architect, be subject to arbitration. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 4.5.

4.6.2 Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect. The demand for arbitration shall be filed in writing with the other party to the Contract and with the American Arbitration Association, and a copy shall be filed with the Architect.

4.6.3 A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.4.6 and 4.6.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.6.4 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract shall include, by consolidation or joinder or in any other manner, the Architect, the Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a Claim not described therein or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

4.6.5 Claims and Timely Assertion of Claims. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

4.6.6 Judgment on Final Award. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

ARTICLE 5 SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

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

5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitute.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the

Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Paragraph 4.3.

6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the

Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Subparagraph 10.2.5.

6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Subparagraph 3.14.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

7.1 GENERAL

7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

7.2 CHANGE ORDERS

7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:

.1 change in the Work;

.2 the amount of the adjustment, if any, in the Contract Sum; and

.3 the extent of the adjustment, if any, in the Contract Time.

7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Subparagraph 7.3.3.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 unit prices stated in the Contract Documents or subsequently agreed upon;

.3 cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 as provided in Subparagraph 7.3.6.

7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.6 shall be limited to the following:

.1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 additional costs of supervision and field office personnel directly attributable to the change.

7.3.7. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

7.3.8 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect will make an interim determination for purposes of monthly certification for payment for those costs. That determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a claim in accordance with Article 4.

7.3.9 When the Owner and Contractor agree with the determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

8.1.2 The date of commencement of the Work is the date established in the Agreement.

8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Paragraph 9.8.

8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.2 PROGRESS AND COMPLETION

8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by the Contract Documents or a notice to proceed given

by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of morgages, mechanic's liens and other security interests.

8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending mediation and arbitration, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.

8.3.3 This Paragraph 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for operations completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for in the Contract Documents.

9.3.1.1 As provided in Subparagraph 7.3.8, such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

9.3.1.2 Such applications may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1.

9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Subparagraph 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Subparagraph 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's

opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.2, because of:

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or another contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.6 PROGRESS PAYMENTS

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

9.6.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

9.6.4 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

9.6.5 Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

9.7 FAILURE OF PAYMENT

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by arbitration, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Clause 11.4.1.5 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and

have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that

portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

.1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents; or

.3 terms of special warranties required by the Contract Documents.

9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

10.3 HAZARDOUS MATERIALS

10.3.1 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

10.3.2 The Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. The Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up, which adjustments shall be accomplished as provided in Article 7.

10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Subparagraph 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) and provided that such damage, loss or expense is not due to the sole negligence of a party seeking indemnity.

10.4 The Owner shall not be responsible under Paragraph 10.3 for materials and substances brought to the site by the Contractor unless such materials or substances were required by the Contract Documents.

10.5 If, without negligence on the part of the Contractor, the Contractor is held liable for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

10.6 EMERGENCIES

10.6.1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or

extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 claims for damages insured by usual personal injury liability coverage;

.5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 claims for bodily injury or property damage arising out of completed operations; and

.8 claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

11.3.1 Optionally, the Owner may require the Contractor to purchase and maintain Project Management Protective Liability insurance from the Contractor's usual sources as primary coverage for the Owner's, Contractor's and Architect's vicarious liability for construction operations under the Contract. Unless otherwise required by the Contract Documents, the Owner

shall reimburse the Contractor by increasing the Contract Sum to pay the cost of purchasing and maintaining such optional insurance coverage, and the Contractor shall not be responsible for purchasing any other liability insurance on behalf of the Owner. The minimum limits of liability purchased with such coverage shall be equal to the aggregate of the limits required for Contractor's Liability Insurance under Clauses 11.1.1.2 through 11.1.1.5.

11.3.2 To the extent damages are covered by Project Management Protective Liability insurance, the Owner, Contractor and Architect waive all rights against each other for damages, except such rights as they may have to the proceeds of such insurance. The policy shall provide for such waivers of subrogation by endorsement or otherwise.

11.3.3 The Owner shall not require the Contractor to include the Owner, Architect or other persons or entities as additional insureds on the Contractor's Liability Insurance coverage under Paragraph 11.1.

11.4 PROPERTY INSURANCE

11.4.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.4 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

11.4.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

11.4.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

11.4.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

11.4.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

11.4.1.5 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial

occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.4.2 Boiler and Machinery Insurance. The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

11.4.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

11.4.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

11.4.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Subparagraph 11.4.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.4.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Paragraph 11.4. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

11.4.7 Waivers of Subrogation. The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Paragraph 11.4 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

11.4.8 A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.4.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

11.4.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.6. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

11.4.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved as provided in Paragraphs 4.5 and 4.6. The Owner as fiduciary shall, in the case of arbitration, make settlement with insurers in accordance with directions of the arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.5 PERFORMANCE BOND AND PAYMENT BOND

11.5.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

11.5.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered which the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2 CORRECTION OF WORK

12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

12.2.1.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 In addition to the Contractor's obligations under Paragraph 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Paragraph 2.4.

12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work.

12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Paragraph 12.2.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.5 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

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

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Subparagraph 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.2.2 The Owner may, without consent of the Contractor, assign the Contract to an institutional lender providing construction financing for the Project. In such event, the lender shall assume the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

13.3 WRITTEN NOTICE

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Subparagraph 13.5.3, shall be at the Owner's expense.

13.5.3 If such procedures for testing, inspection or approval under Subparagraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 INTEREST

13.6.1 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor:

.1 Before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;

.2 Between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and

.3 After Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 issuance of an order of a court or other public authority having jurisdiction which requires all Work to be stopped;

.2 an act of government, such as a declaration of national emergency which requires all Work to be stopped;

14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Subparagraph 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

.3 because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Subparagraph 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 the Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Subparagraph 2.2.1.

14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

14.1.3 If one of the reasons described in Subparagraph 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages.

14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.3.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

.1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 accept assignment of subcontracts pursuant to Paragraph 5.4; and

.3 finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

14.2.3 When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

AIA® Document A312™ – 1984

Payment Bond

CONTRACTOR *(Name, Legal Status and Address)*:

SURETY *(Name, Legal Status and Principal Place of Business)*:

OWNER *(Name, Legal Status and Address)*:

CONSTRUCTION CONTRACT
Date:
Amount: $
Description *(Name and Location)*:

BOND
Date *(Not earlier than Construction Contract Date)*:
Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL	**SURETY**
Company: *(Corporate Seal)*	Company: *(Corporate Seal)*
Signature:	Signature:
Name and Title:	Name and Title:

(Any additional signatures appear on the last page)

(FOR INFORMATION ONLY - Name, Address and Telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE *(Architect, Engineer or other party)*:

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contract, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and the Surety, jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 With respect to the Owner, this obligation shall be null and void if the Contractor:
§ 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and

§ 2.2 Defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity whose claim, demand, lien or suit is for the payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Section 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default.

§ 3 With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.

§ 4 The Surety shall have no obligation to Claimants under this Bond until:
§ 4.1 Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Section 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

§ 4.2 Claimants who do not have a direct contract with the Contractor:

.1 Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

.2 Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and

.3 Not having been paid within the above 30 days, have sent a written notice to the Surety (at the address described in Section 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.

§ 5 If a notice required by Section 4 is given by the Owner to the Contractor or to the Surety, that is sufficient compliance.

§ 6 When the Claimant has satisfied the conditions of Section 4, the Surety shall promptly and at the Surety's expense take the following actions:
§ 6.1 Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

§ 6.2 Pay or arrange for payment of any undisputed amounts.

§ 7 The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 8 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any Construction Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 9 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Section 4.1 or Section 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the Owner or the Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 15 DEFINITIONS

§ 15.1 Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 15.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

§ 15.3 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

§ 16 MODIFICATIONS TO THIS BOND ARE AS FOLLOWS:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

AIA® Document A312™ – 1984

Performance Bond

CONTRACTOR *(Name, Legal Status and Address)*:

SURETY *(Name, Legal Status and Principal Place of Business)*:

OWNER *(Name, Legal Status and Address)*:

CONSTRUCTION CONTRACT
Date:
Amount: $
Description *(Name and Location)*:

BOND
Date *(Not earlier than Construction Contract Date)*:
Amount: $
Modifications to this Bond: ☐ None ☐ See Section 13

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page)

(FOR INFORMATION ONLY - Name, Address and Telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE *(Architect, Engineer or other party)*:

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contract, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Section 3.1.

§ 3 If there is no Owner Default, the Surety's obligation under this Bond shall arise after:
§ 3.1 The Owner has notified the Contractor and the Surety at its address described in Section 10 below that the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; and

§ 3.2 The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Section 3.1; and

§ 3.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Construction Contract or to a contractor selected to perform the Construction Contract in accordance with the terms of the contract with the Owner.

§ 4 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
§ 4.1 Arrange for the Contractor, with consent of the Owner, to perform and complete the Construction Contract; or

§ 4.2 Undertake to perform and complete the Construction Contract itself, through its agents or through independent contractors; or

§ 4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and the contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or

§ 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or

.2 Deny liability in whole or in part and notify the Owner citing reasons therefor.

§ 5 If the Surety does not proceed as provided in Section 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 4.4, and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 6 After the Owner has terminated the Contractor's right to complete the Construction Contract, and if the Surety elects to act under Section 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Construction Contract, the Surety is obligated without duplication for:

§ 6.1 The responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

§ 6.2 Additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 4; and

§ 6.3 Liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 7 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators or successors.

§ 8 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 9 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 10 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page.

§ 11 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 12 DEFINITIONS

§ 12.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 12.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

§ 12.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.

§ 12.4 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

§ 13 MODIFICATIONS TO THIS BOND ARE AS FOLLOWS:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

AIA® Document A701™ – 1997

Instructions to Bidders

for the following PROJECT:
(Name and location or address):

THE OWNER:
(Name and address):

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

THE ARCHITECT:
(Name and address):

TABLE OF ARTICLES

1 DEFINITIONS

2 BIDDER'S REPRESENTATIONS

3 BIDDING DOCUMENTS

4 BIDDING PROCEDURES

5 CONSIDERATION OF BIDS

6 POST-BID INFORMATION

7 PERFORMANCE BOND AND PAYMENT BOND

~~8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR~~

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.3 SUBSTITUTIONS

§ 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect' s decision of approvaor disapproval of a proposed substitution shall be final.

§ 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

§ 3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder' s refusal to accept award ofless than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent' s authority to bind the Bidder.

§ 4.2 BID SECURITY

§ 4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2.

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

§ 4.3 SUBMISSION OF BIDS

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder' s name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner' s judgment, is in the Owner' s own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor' s Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner' s obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 SUBMITTALS

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

- **.1** a designation of the Work to be performed with the Bidder' s own forces;
- **.2** names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- **.3** names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder' s option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder' s usual sources.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder' s usual sources, changes in cost will be adjusted as provided in the Contract Documents.

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

SECTION 00700

SUPPLEMENTARY CONDITION
OF THE CONTRACT FOR CONSTRUCTION

1. GENERAL

1.1 CHANGE ORDERS

A. Delete Subparagraph 7.2.2 and substitute the following:

7.2.2 The General Contractor will be allowed the following Profit and Overhead on Change Orders: OH&P General Contractor = 10% on own work, 5% on Subcontractors and Sub-subcontractors.

1.2 INSURANCE

A. Refer to General Conditions, Article 11, Insurance and Bonds for general provisions concerning insurance.

B. Amend, General Conditions, Article 11, as follows:

1. Add to Sub-sub-paragraph 11.1.1.7 the following: Liability insurance shall include all major divisions of coverage, and be on a comprehensive basis including:

a. Premises operations (including XCU as applicable).
b. Independent contractors' protective.
c. Products and completed operations.
d. Personal injury liability with employment exclusion deleted.
e. Contractual, including specified provisions for Contractor's obligation under Paragraph 4.18.
f. Owned, non-owned, and hired motor vehicles.
g. Broad form property damage, including completed operations.
h. Umbrella excess liability.

2. Sub-paragraph 11.1.2, add Sub-sub-paragraph 11.1.2.1 as follows: "11.1.2.1: Insurance required by Sub-paragraph 11.1.1 shall be written for not less than following, or greater if required by law:

a. Statutory Workman's Compensation and Employer's Liability.
b. Comprehensive General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations' Broad Form Property Damage):
   i. Bodily Injury:
   $1,000,000 each person
   $3,000,000 annual aggregate

ii. Property Damage
$1,000,000 each occurrence
$3,000,000 annual aggregate

iii. Products and Completed Operations shall be maintained for two years after final payment.

iv. Property Damage Liability Insurance shall provide X, C, and U coverage (explosion, collapse, underground utilities) as applicable.

c. Contractual Liability:
i. Property Injury:
$1,000,000 each occurrence

ii. Property Damage:
$1,000,000 each occurrence
$3,000,000 annual aggregate

d. Personal Injury, with Employment Exclusion deleted:
$1,000,000 annual aggregate

e. Comprehensive Automobile Liability:
i. Bodily Injury:
$1,000,000 each occurrence
$3,000,000 annual aggregate

ii. Property Damage:
$1,000,000 each occurrence

f. Umbrella Excess Liability
i. $1,000,000 over primary insurance
$ 3,000 retention for self-insured hazards, each occurrence

END OF SECTION

SECTION 00800

INVITATION TO BID

Proposal for the construction for a warehouse, Portland, Maine will be available to the General Contractor on April 28, 2010. Proposals should be addressed to:

PropSys, Inc.
Suite 2400
55 Lisbon Street
Lewiston, ME 04240

The project consists of a 6,000 sq. ft. Warehouse Building.

Qualified bids will be rejected.

Proposals will be received at the office of the Architect by 4:00 pm on May 12, 2010. Bids will be received by the Architect . There will not be a public opening. General Contractor will be contacted within three (3) working days.

Archetype, P.A
48 Union Wharf
Portland, ME 04101
(207) 772-6022
Fax (207) 772-4056

Contract Bid Documents may be viewed at the office of the Architect, Archetype, P.A. or at Xpress Copy, Portland, ME. One set of documents will be given to General Contractor, additional sets may be ordered from Xpress Copy, Portland, ME (207) 775-2444.

The Owner reserves the right to accept or reject any or all bids. Owner will select contractor on the basis of cost, timing and interview post bid.

END OF SECTION

SECTION 00900

BID FORM

BIDDERS PROPOSAL

DATE: _____

TO: PropSys, Inc.
Suite 2400
55 Lisbon Street
Lewiston, ME 04240

In response to your invitation for bids, and subject to all the consideration thereof, the undersigned

_____

_____

_____

A corporation organized and existing under the laws of the state of _____

a partnership consisting of _____

or an individual trading as _____

of the city or town of _____

state of _____: Hereby proposes to furnish all labor and

materials and to perform all work required for the construction of 501 Danforth Warehouse, Portland, ME.

In strict accordance with the specifications, plans and the articles of contract, therein and dated

_____ for the consideration of _____

_____Dollars.

Included in the above figure are the following cost associated with plumbing, heating and electric.

Heating $_____

Plumbing $_____

Electric $_____

Construction Start Date: On or about _____.

Construction completion date to be _____, after which liquidated damages will be incorporated at a cost of $400 per calendar day.

The undersigned bidder agrees to execute the contract for the amount of the total of this bid within ten (10) calendar days from the date when the written notice to commence construction (Notice To Proceed) is delivered to him at the address given on this proposal.

Bidder acknowledges receipt of the following Addendums to the Drawings and Specifications, which have been incorporated into the bid figure.

Addendum No._____ Dated _____

Addendum No._____ Dated _____

Addendum No._____ Dated _____

Addendum No._____ Dated _____

Bidder acknowledges the following Allowances: (These are included in Base Bid)

Contractor

By: _____

Title: _____

Business Address: _____

_____

_____

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

1. GENERAL

1.1 REFERENCES

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

B. Divisions 2 through 16.

1.2 DESCRIPTION OF WORK

A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition. This section does not apply to new work that has been installed as part of the Work.

B. Structural Work: Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.

C. Operational/Safety Limitations: Do not cut-and-patch operational elements and safety components in a manner resulting in decreased performance, shortened useful life, or increased maintenance.

D. Visual/Quality Limitations: Do not cut-and-patch work exposed to view (exterior and interior) in a manner resulting in noticeable reduction of aesthetic qualities and similar qualities, as judged by the Architect/Engineer.

E. Limitation on Approvals: The Architect/Engineer's approval to proceed with cutting and patching does not waive right to later require removal/replacement of work found to be cut-and-patched in an unsatisfactory manner, as judged by the Architect/Engineer.

F. Materials marked to be removed and reused shall be repaired as necessary to maintain their existing condition. When repair is not sufficient, existing materials shall be disposed of and new materials installed to match existing materials.

G. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

H. Unless otherwise specified, requirements of this Section apply to Mechanical and Electrical work. Refer to Divisions 15 and 16 for additional requirements and limitations on cutting and patching of mechanical and electrical work.

1.3 QUALITY ASSURANCE

A. Refer to Section 01631, Products and Substitutions, for general provisions covering product selection, substitutions, material storage and installation.

B. Refer to Section 01400, Quality Control Services, for provisions for testing and inspections.

C. Refer to specific Specification Section covering subject in question for quality assurance requirements.

1.4 SUBMITTALS

A. Issue submittals in accordance with Section 01300, Submittals.

B. Refer to specific Specification Section covering subject in question for submittal requirements.

2. PRODUCTS

2.1 GENERAL

A. Use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

B. Fire-stopping:

1. Seal openings in fire-rated walls and floors to make a tight fit with penetrating items, using appropriate non-combustible filler material. to provide a rating equivalent to wall/floor assemble.

2. Acceptable filler materials include:
   a. Concrete
   b. Cementitious proprietary product: Zonolite Firestop ZF-1
   c. Blanket-type mineral-fiber or ceramic-fiber insulation (glass-fiber insulation is not acceptable)
   d. Fire-resistant sealant: Domtar Fire-Halt, Dow Corning Fire Stop, Hilti CS 240 Firestop, or Nelson CLK or CMP

e. Fire-resistant silicone foam: Dow Corning RTV Foam Penetration Seal System, Hilti CB 120 Adhesive Filling and Sealing Foam, Tremco Fyre-Sil
f. Flexible intumescent strip wrapped around pipe penetrations: Dow Corning Fire Stop Intumescent Wrap, Hilti CS 24720 Intumescent Wrap, Nelson RSW, Tremco TREMstop WS
g. Intumescent fibrous material enclosed in a polyethylene envelope: Nelson PLW, Tremco TREMstop PS
h. Pliable intumescent putty: Nelson FSP Flameseal, Tremco TREMstop WBM
i. Water-based intumescent fire-protective coating for electrical cables: Nelson CTG

3. Neatly patch and seal exposed-to-view openings, using sealants, tooled mortar joints, escutcheons, or flanged collars, as appropriate.

3. EXECUTION

3.1 INSPECTION

A. Before cutting, examine surfaces to be cut and patched and conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

3.2 TEMPORARY SUPPORT

A. To prevent failure provide temporary support of work to be cut.

3.3 PROTECTION

A. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.4 PERFORMANCE

A. Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect/Engineer, proceed with cutting and patching at the earliest feasible time and complete work without delay.

B. Cutting:
1. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Provide dust barriers to prevent dust from entering existing building beyond immediate work area. Where possible, review proposed procedures with the original installer; comply with original installer's recommendations.

2. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.

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

4. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in walls or partitions to be removed. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.

C. Patching:

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

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

3. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.

4. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove existing floor and wall coverings and replace with new materials.

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

6. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.5 MAINTENANCE OF TRAFFIC, ACCESS, AND UTILITIES

A. Throughout progress of work, do not interfere with use of or means of access and egress for tenants. Do not interfere with adjoining tenants in same building. Do not close or otherwise obstruct sidewalks, streets or means of egress without obtaining permission to do so.

B. Maintain accessibility from street at all times to any fire hydrants within construction area. Ensure that utilities serving adjacent buildings remain in service.

END OF SECTION

SECTION 01300

SUBMITTALS, MEETINGS AND RECORD DOCUMENTS

1. GENERAL

1.1 PRE-CONSTRUCTION MEETING

A. Architect will schedule a pre-construction meeting within 10 days of issuance of Notice to Proceed, to be attended by the owner, Maine State Housing Authority, Construction Lenders Representative, all project managers, Contractor's field superintendent, and representatives of major sub-contractors. At this time, Contractor shall make specified pre-construction submittals including following:

1. Typed list of sub-contractors with addresses and telephone numbers.
2. Certificates of insurance.
3. Approved construction schedule. See General Conditions, Paragraph 3.10.
4. Schedule of values.
5. Building permit and similar start-up authorization or certificates.

B. Pre-construction meeting agenda will include following:

1. Processing application for payment.
2. Processing and distribution of submittals.
3. Maintenance of record documents.
4. Procedure for field changes, change estimates, change orders, etc.
5. Site and building security.
6. Location and maintenance of temporary storage areas, field offices, vehicular parking and access, waste disposal, etc.
7. Safety and first-aid procedures.
8. Date and time for regular bi-weekly coordination and progress meeting (to be coordinated with monthly application for payment).

1.2 CONSTRUCTION SCHEDULE

A. Refer to General Conditions, Paragraph 3.10, for general provisions concerning construction progress schedule. Schedule shall show activities, itemized according to specification Section, and be organized in bar-chart or graph form so as to show both projected and actual progress of work.

B. Arrange schedule to indicate required sequencing of units, and to show time allowances for submittals, inspections, and similar time margins.

C. Show critical submittal dates related to each time bar, or prepare a separate coordinated listing of critical submittal dates.

D. Show phases of work within each time bar for major elements which involve purchase lead-time, fabrication, seasonal treatment, mockups, testing, or similar phases as well as installation.

E. Submit updated schedule monthly, together with application for payment.

1.3 SCHEDULE OF VALUES

A. Refer to General Conditions, Paragraph 9.2 for general provisions concerning schedule of values.

B. For these submittals, use AIA Document G702/703, Application and Certificate for Payment.

C. Use specifications Sections as listed in Table of Contents as basis for format for listing costs.

D. Itemize separately general cost items, such as bonds and allowances.

E. Itemize change orders separately as they are approved.

1.4 MEETINGS AND REPORTING

A. Contractor shall conduct general progress and coordination meetings at least once each month, attended by a representative of each primary entity engaged for performance of work. Record discussions and decisions, and distribute copies to those attending and others affected, including Architect/Engineer.

B. Date and time of at least one regular monthly progress and coordination meeting shall be determined at the pre-construction meeting. Timing of this monthly meeting shall be coordinated with payment requests.

1.5 APPLICATION FOR PAYMENT

A. Refer to General Conditions, Paragraph 9.3, for general provisions concerning applications for payment.

B. Use AIA Form G702/703, fully completed and executed.

C. Submit a minimum of five copies of all except two copies of waiver and required documentation.

1.6 SHOP DRAWINGS, PROJECT DATA, SAMPLES

A. Refer to General Conditions, Product Data and Samples, paragraph 3.12, for general provisions covering this type of submittal.

B. Coordinate the preparation and processing of work-related submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities that require sequential activity. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the necessity of reviewing a related submittal.

C. Architect/Engineer Review:

1. Allow ten working days for the Architect/Engineer's initial processing of each submittal. Allow one week for reprocessing each submittal. No extension of time will be authorized because of failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

2. The Architect/Engineer will stamp each submittal to be returned with a uniform, self-explanatory action stamp, appropriately marked and executed to indicate the status of the submittal.

D. Mark each submittal with a permanent label for identification. Provide project name, date, name of Architect/Engineer, name of Contractor, number and title of appropriate specification section and similar definitive information. Provide a space on the label for Contractors and Architect/Engineer's review markings.

E. Package each submittal appropriately for transmittal and handling. Send each submittal from the Contractor to the Architect/Engineer and other destinations using AIA Transmittal Form G810.

F. Provide additional copies of submittals required by governing authorities that are in addition to copies specified for submittal to the Architect/Engineer.

G. Where it is necessary to provide intermediate submittals between the initial and final submittals, provide and process intermediate submittals in the same manner as for initial submittals.

H. Submit as follows:

1. Shop drawings (original drawings prepared by Contractor or sub-contractor illustrating fabrication, layout, erection details, etc.): six prints, or one reproducible transparency and one opaque print, to Architect.

2. Manufacturers' specifications, installation instructions, charts, schedules, catalogs, brochures, etc.: number of copies required by Contractor for distribution, plus one copy for Architect's retention.

3. Samples: one sample to Architect only, unless otherwise specified.

4. In submitting shop drawings and product data to Architect, use separate transmittals for material in different specification Sections, with applicable specification Section clearly numbered.

I. Architect will review submittals within ten working days, measured from date of receipt by Architect until date of mailing. Contractor shall promptly make corrections and resubmit when so directed. Where submittal is marked "Approved as Noted" or similar, assume that all items are approved other than those to which specific exception is taken. Do not delay fabrication, assembly and delivery pending receipt of entirely "Approved" submittal.

J. Distribute approved submittals to job site and record document files, and to suppliers and sub-contractors as required. Samples not designated by Contractor for incorporation into Work shall be kept on file until job completion. Any sample not reclaimed within 30 days after job completion will be considered unclaimed, and will be disposed of as directed by Architect.

1.7 PROJECT RECORD DOCUMENTS

A. Keep on file at job site one complete set of up-to-date Contract Documents, including drawings and specifications, addenda, shop drawings and product data, testing data, change orders, field orders, and other modifications. Documents shall be neatly and securely stored in files or on racks, clearly indexed by trade activity or specification Section, and shall not be used for construction purposes.

B. Legibly mark significant field changes such as following, using colored pencils or felt-tipped pens:

1. Drawings: locations of concealed utilities, field changes of dimension and detail, changes resulting from change order or field order, and details not on original drawings.

2. Specifications: manufacturer and model number of equipment actually installed.

3. Shop drawings and manufacturers' literature: changes made after Architect's review.

C. At completion of Work, deliver completed record documents to Architect. Final payment for Project will not be made until Architect reviews and approves these documents.

1.8 SUBSTANTIAL COMPLETION

A. Refer to General Conditions, Article 9, Substantial Completion, for general provision concerning substantial Completion.

B. Following issuance by Architect/Engineer of Certificate of Substantial Completion, Contractor may submit special payment request, provided the following have been completed:

1. Obtain permits, certificates of inspection and other approval and releases by governing authorities, required for Owner's occupancy and use of project.
2. Submit warranties and similar documentation.
3. Submit maintenance manuals and provide instruction of Owner's operational/maintenance personnel.
4. Complete final cleaning of the work.
5. Submit record documents.
6. Submit listing of work to be completed before final acceptance.

C. Following completion of the following requirements, final payment request may be submitted:

1. Complete work listed as incomplete at time of substantial completion, or otherwise assure Owner of subsequent completion of individual incomplete items.
2. Settle liens and other claims, or assure Owner of subsequent settlement.
3. Submit proof of payment on fees, taxes and similar obligations.
4. Transfer operational, access, security and similar provisions to Owner; and remove temporary facilities, tools and similar items.
5. Completion of requirements specified in "Project Closeout" section.
6. Obtain consent of surety for final payment.

END OF SECTION

SECTION 01400

QUALITY CONTROL SERVICES

1. GENERAL

1.1 DESCRIPTION

A. Quality control services include inspections and tests performed by independent agencies and governing authorities, as well as by the Contractor.

B. Inspection and testing services are intended to determine compliance of the work with requirements specified.

C. Specific quality control requirements are specified in individual specification sections.

1.2 RESPONSIBILITIES

A. Except where indicated as being the Owner's responsibility, quality control services are the Contractor's responsibility, including those specified to be performed by an independent agency and not by the Contractor.

B. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

C. The Owner will engage and pay for services of an independent agency to perform the inspections and tests that are specified as Owner's responsibilities.

D. Where results of inspections or tests do not indicate compliance with contract document, retests are the Contractor's responsibility.

E. The Contractor shall cooperate with independent agencies performing inspections or tests. Provide auxiliary services as are reasonable. Auxiliary services include:

1. Provide access to the work.
2. Assist taking samples.
3. Deliver samples to test laboratory.

1.3 COORDINATION

A. The Contractor and independent test agencies shall coordinate the sequence of their activities. Avoid removing and replacing work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections and tests.

1.4 QUALIFICATIONS FOR SERVICE AGENCIES

A. Engage inspection and test service agencies which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories.

B. Each agency shall be employed with the approval of the Architect/Engineer.

1.5 SUBMITTALS

A. Notify the Architect/Engineer of the testing schedule.

B. Submit a certified written report of each inspection test or similar service, in duplicate to the Architect/Engineer. Submit additional copies of each report to governing authority, when the authority so directs.

1.6 REPORT DATA

A. Written inspection or test reports shall include:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples, tests or inspections.
3. Names of individuals present.
4. Complete inspection or test data.
5. Test results.
6. Interpretations.
7. Recommendations.

B. Reports shall be provided to the Architect/Engineer in a timely manner.

1.7 REPAIR AND PROTECTION

A. Upon completion of inspection or testing repair damaged work and restore substrates and finishes. Comply with requirements for "Cutting and Patching".

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES

1. GENERAL

1.1 DESCRIPTION OF REQUIREMENTS: Provide temporary services and facilities ready for use when first needed to avoid delay in the work. Maintain, expand and modify as needed. Do not remove until no longer needed, or replaced by authorized use of permanent facilities.

1.2 USE CHARGES: Usage charges for temporary services or facilities are not chargeable to the Owner or Architect/Engineer.

1.3 REGULATIONS: Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities.

1.4 STANDARDS: Comply with the requirements of NFPA Code 241, "Building Construction and Demolition Operations", the ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and the NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services".

1.5 INSPECTIONS: Inspect and test each service before placing temporary utilities in use. Arrange for inspections and tests by governing authorities, and obtain certifications and permits for use.

1.6 SUBMITTALS: Submit copies of reports and permits required or necessary for installation and operation, including reports of tests, inspections and meter readings performed on temporary utilities, and permits and easements necessary for installation, use and operation.

1.7 MATERIALS AND EQUIPMENT

A. Provide materials and equipment that are suitable for the intended use.

B. Provide new materials and equipment for temporary services and facilities; if acceptable to the Architect/Engineer, used materials and equipment that are undamaged may be used.

1.8 INSTALLATION

A. Use qualified tradesmen for installation.

B. Locate temporary services and facilities where they will serve the project adequately and result in minimum interference with the work.

1.9 TEMPORARY UTILITY INSTALLATION

A. Engage, or make arrangements if necessary with, the local utility company to make connections to existing service.

B. Arrange with the companies and existing users for an acceptable time when service can be interrupted to make connections.

C. Establish a service implementation and termination schedule. As early as possible change to use of permanent service, to enable removal of the temporary utility and eliminate possible interference with completion of the work.

D. Provide adequate capacity at each stage of construction. Prior to availability at the site, provide, trucked-in services for start up of construction operations.

E. Obtain and pay for easements required to bring temporary utilities to the site, where the Owner's easement cannot be utilized for that purpose.

1.10 ELECTRIC POWER SERVICE

A. Provide weathertight, grounded temporary electrical service-entrance and distribution system, with ground-fault circuit interrupters and ground-fault interrupter features of proper types, sizes, electrical ratings and characteristics to fulfill project requirements.

B. Comply with applicable requirements of NEMA, NECA and UL standards and governing regulations.

C. Install temporary lighting of adequate illumination levels to perform the work specified.

D. Comply with NEC pertaining to installation of temporary wiring service and grounding. Provide meters, transformers, and overcurrent protective devices at main distribution panel for power and light circuitry. Provide disconnects for equipment circuits.

1.11 POWER DISTRIBUTION SYSTEM

A. Provide circuits of proper sizes, characteristics, and ratings for each use indicated.

B. Install wiring overhead, and risers vertically where least exposed to damage.

C. Provide rigid steel conduit to protect wiring on grade, floors, decks or other areas exposed to possible damage.

D. Provide 20 amp, 4-gang receptacle outlets, equipped with ground-fault circuit interrupters, reset button and pilot light, spaced that a 100 foot extension cord can reach

each area of work. Use only grounded extension cords; use "hard- service" cords where exposed to abrasion and traffic.

E. Provide warning signs at power outlets that are other than 110/120 volt. Provide outlets of proper NEMA configuration to prevent insertion of 110/120 volt plugs into higher voltage outlets.

1.12 TEMPORARY LIGHTING

A. Provide general service incandescent lamps of wattage required for adequate illumination.

B. Protect lamps with guard cages or tempered glass enclosures, where exposed to breakage.

C. Provide exterior type fixtures where exposed to weather or moisture.

D. Provide one 200-watt incandescent lamp per 1000 square feet of floor area for general construction lighting, one 100-watt incandescent lamp every 50 feet in corridors, and one lamp per story, located to illuminate each landing and flight in stairways.

E. Install temporary lighting to fulfill security and protection requirements, without having to operate the entire temporary lighting system.

1.13 TEMPORARY TELEPHONES

A. Provide project manager's and supervisor's cell phone number to architect.

1.14 TEMPORARY HEAT

A. Provide temporary heat where needed for performance of work, for curing or drying of recently installed work or for protection of work in place from adverse effects of low temperatures or high humidity.

B. Provide UL or FM tested and labeled heating units known to be safe and without adverse effect upon work in place or being installed. Coordinate with ventilation requirements to produce the ambient condition.

C. Maintain a minimum temperature of 45 deg. F (7 deg. C) in permanently enclosed portions of the building and areas where finished work has been installed.

D. Except where use of the permanent heating system is available and authorized, provide properly vented self-contained LP gas or fuel oil heaters with individual space thermostatic control for temporary heat. Do not use open burning or salamander type heating units.

1.15 FIELD OFFICES

A. Provide (1) lockable field office.

B. Provide (1) lockable, weathertight storage trailer.

1.16 SANITARY FACILITIES

A. Sanitary facilities include temporary toilets.

B. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities.

C. Supply toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility. Provide covered waste containers for used material.

D. Install single occupant self-contained toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with glass fiber reinforced polyester shell. Use of pit-type privies will not be permitted.

E. Provide separate toilet facilities for male and female construction personnel.

F Provide drinking water fountains where and when piped potable water, approved by local authorities, is reasonably accessible from permanent or temporary lines. Otherwise, provide containerized tap-dispenser bottled-water type drinking water units.

1.17 FIRST AID SUPPLIES: Comply with governing regulations and recognized recommendations within the construction industry.

1.18 DEWATERING FACILITIES AND DRAINS

A. For temporary drainage and dewatering facilities and operations not directly associated with performance of work included under other sections, comply with dewatering requirements of applicable Division-2 sections. Where feasible, utilize the same facilities.

B. Maintain the site, excavations and construction free of water.

C. Dispose of rainwater in a lawful manner which will not result in flooding and project or adjoining property, nor endanger either permanent work or temporary facilities.

1.19 TEMPORARY ENCLOSURE

A. Provide temporary enclosure of materials, equipment, work in progress and completed portions of the Work to provide protection from exposure, foul weather, other construction operations, and similar activities.

B. Provide enclosures where temporary heat is needed and the permanent building enclosure is not completed, and there is no other provision for containment of heat. Coordinate with ventilating and material drying or curing requirements to avoid dangerous conditions.

C. Provide temporary enclosures by installing waterproof, fire- resistant, UL labeled tarpaulins with a flame-spread rating of 15 or less, using a minimum of wood framing. Use translucent nylon reinforced laminated polyethylene tarpaulins to admit the maximum amount of daylight. Individual openings of 25 square feet or less may be closed with plywood or similar materials.

D. Close openings through the floor or roof decks and other horizontal surfaces with substantial load-bearing wood-framed or similar construction.

1.20 COLLECTION AND DISPOSAL OF WASTES

A. Establish a system for daily collection and disposal of waste materials. Do not hold collected materials longer than 7 days.

B. Handle waste materials that are hazardous, dangerous, or unsanitary separately from other waste by containerizing.

C. Burying or burning of waste materials on the site or washing waste material down sewers will not be permitted.

D. Refer to MSHA Green Building Standards Section 11 R1 for additional requirements including a written construction materials recycling / waste management plan.

1.21 MISCELLANEOUS SERVICES AND FACILITIES

A. Design, construct, and maintain miscellaneous services and facilities as needed to accommodate performance of the work, including temporary stairs, ramps, ladders, staging, shoring, scaffolding, temporary partitions, waste chutes and similar items.

1.22 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Provide a neat and uniform appearance in security and protection facilities acceptable to the Architect/Engineer and the Owner.

B. Maintain site in a safe, lawful and publicly acceptable manner.

C. Take necessary measures to prevent erosion.

D. Except for utilization of permanent fire protection facilities, as soon as available, do not change over to use of permanent facilities until substantial completion.

1.23 TEMPORARY FIRE PROTECTION

A. Until fire protection needs may be fulfilled by permanent facilities, install and maintain temporary fire protection of the types needed to protect against losses.

B. Comply with recommendations of NFPA Standard 10.

C. Locate fire extinguishers where most effective; provide not less than one on each floor at or near each stairwell.

D. Provide type "A" fire extinguishers for temporary offices and spaces where there is minimal danger of electrical or flammable liquid fires, and type "ABC" dry chemical extinguishers elsewhere.

E. Store combustible materials in containers in fire-safe locations.

F. Review fire prevention and protection needs with local fire department officials and establish procedures to be followed in the event of fire. Instruct personnel in procedures and post warnings and information.

G. Maintain unobstructed access to fire extinguishers, temporary fire protection facilities, stairways and other access routes.

H. Prohibit smoking in hazardous areas.

I. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of ignition.

J. At temporary water outlets provide hoses of sufficient length to reach construction areas. Hang hoses with a warning sign, indicating that hoses are for fire protection purposes and are not to be removed.

K. At the earliest feasible date complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel at the site on how to use facilities which may not be self-explanatory.

1.24 BARRICADES, WARNING SIGNS AND LIGHTS

A. Comply with recognized standards and code requirements for erection of substantial, barricades where needed to prevent accidents.

B. Paint with appropriate colors and warning signs to inform personnel at the site and the public, of the hazard being protected against.

C. Provide lighting where needed, including flashing red lights where appropriate.

1.25 SECURITY ENCLOSURE AND LOCKUP: Where materials and equipment must be temporarily stored, and are of substantial value or attractive for possible theft, provide a secure lockup.

1.26 ENVIRONMENTAL PROTECTION

A. Conduct construction activities, and by methods that comply with environmental regulations, minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result from the performance of work at the site.

B. Avoid the use of tools and equipment which produce harmful noise.

C. Restrict the use of noise making tools and equipment to hours of use that will minimize complaints.

1.27 OPERATION, TERMINATION AND REMOVAL

A. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse. Do not permit temporary installations to be abused or endangered.

B. Operate and maintain temporary services and facilities in good operating condition and in a safe and efficient manner until removal is authorized. Do not overload services or facilities. Protect from damage by freezing temperatures and similar elements.

C. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

D. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24- hour basis where required to achieve indicated results and avoid the possibility of damage to the Work or to temporary facilities.

E. Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation.

F. Remove each temporary service and facility promptly when need has ended, or when replaced by use of a permanent facility, but no later than substantial completion. Complete, or, if necessary, restore permanent work delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces and replace work which cannot be repaired.

G. At substantial completion, clean and renovate permanent services and facilities that have been used to provide temporary services and facilities during the construction period.

1.28 PROJECT IDENTIFICATION AND TEMPORARY SIGNS

A. Prepare a 4'x8' project identification sign as per Architect's requirements. Use 3/4" exterior plywood, and exterior grade acrylic latex-base enamel. Install at location indicated by Architect.

B. Support on suitable posts or framing of treated wood or steel. Maintain in a manner which will properly inform the public and persons seeking entrance to the project.

C. Do not permit installation of unauthorized signs that are visible outside the site.

END OF SECTION

SECTION 01631

PRODUCTS AND SUBSTITUTIONS

1. GENERAL

1.1 PROCEDURAL REQUIREMENTS

A. Source Limitations:

1. To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work. Where it is not possible to do so, match separate procurements as closely as possible.

2. To the extent that the product selection process is under the Contractor's control, provide products that are compatible with previously selected products.

3. Where standard products are available that comply with specified requirements, provide those standard products that have been used successfully before in similar applications, and that are recommended by the manufacturers for the applications indicated.

1.2 PRODUCT SELECTION LIMITATIONS

A. Product Selections: Comply with the following requirements in the selection of products, materials and equipment:

1. Single Product Name: Where only a single product or manufacturer is named provide the product, or approved equal, unless it is incompatible with existing work, or does not comply with specified requirements or governing regulations.

2. "Or Approved Equal" Provisions": Where products or manufacturers are specified by name provide either the product named, or comply with the requirements for gaining approval of "substitutions" for the use of an unnamed product.

4. Compliance with Standards: Where the specifications require only compliance with an imposed standard, code or regulation, the Contractor has the option of selecting any product that complies with specified requirements provided no product names are indicated.

5. Performance Requirements: Where the specifications require compliance with indicated performance requirements, the Contractor has the option of selecting any product that complies with the specific performance requirements, provided no product names are indicated.

6. Visual Requirements: Where the specifications indicate that a product is to be selected from the manufacturer's standard options, without naming the manufacturer, the Architect/Engineer has the option of making the selection, after the Contractor has determined or selected the manufacturer.

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

1.3 SUBSTITUTIONS

A. Conditions: The Contractor's requests for substitutions will be considered when they are reasonable, timely, fully documented, and when they qualify under one or more of the following circumstances.

1. The proposed substitution is related to an "or approved equal" or similar provision in the contract documents.

2. The required product cannot be supplied in time for compliance with Contract Time requirements.

3. The required product is not acceptable to governing authorities.

4. The required product cannot be properly coordinated with other materials in the work, or cannot be warranted or insured as specified.

5. The proposed substitution will offer a substantial advantage to the Owner after deducting offsetting disadvantages including delays, additional compensation to the Architect/Engineer for redesign, evaluation and other necessary services, and similar considerations.

B. Submittals: Include the following information, as appropriate, in each request for substitution:

1. Provide complete product documentation, including product data and samples, where appropriate.

2. Provide detailed performance comparisons and evaluation, including testing laboratory reports where applicable.

3. Provide coordination information indicating the effect of the substitution on other work and the time schedule.

4. Provide cost information for the proposed change order.

5. Provide the Contractor's general certification of the recommended substitution.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Receive, store and handle products, materials and equipment in a manner which will prevent loss, deterioration and damage.

B. Schedule deliveries so as to minimize long-term storage at the project site.

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

1. GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Provisions of this section apply to the procedural requirements for the actual closeout of the Work, not to administrative matters such as final payment or the change over of insurance.

B. Closeout requirements relate to both substantial and final completion of the Work; they also apply to individual portions of completed work as well as the total Work.

C. Specific requirements contained in other sections have precedence over the general requirements contained in this section.

1.2 PROCEDURES AT SUBSTANTIAL COMPLETION

A. Prerequisites: Comply with General Conditions and complete the following before requesting Architect's/Engineer's inspection of the Work, or a designated portion of the Work, for certification of substantial completion.

1. Submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates and similar required documentation for specific units of work, enabling owner's unrestricted occupancy and use.

2. Submit record documentation, maintenance manuals, tools, spare parts, keys and similar operational items.

3. Complete instruction of Owner's operating personnel, and start-up of systems.

4. Complete final cleaning, and remove temporary facilities and tools.

B. Inspection Procedures:

1. Upon receipt of Contractor's request, Architect/Engineer will either proceed with inspection or advise Contractor of prerequisites not fulfilled.

2. Following initial inspection, Architect/Engineer will either prepare certificate of substantial completion, or advise Contractor of work which must be performed prior to issuance of the certificate of substantial completion.

3. The Architect/Engineer will repeat the inspection when requested and assure that the Work has been substantially completed.

4. Results of the completed inspection will form the initial "punch-list" for final acceptance.

1.3 PROCEDURES AT FINAL ACCEPTANCE

A. Reinspection Procedure:

1. The Architect/Engineer will reinspect the Work upon receipt of the Contractor's notice that, except for those items whose completion has been delayed due to circumstances that are acceptable to the Architect/Engineer, the Work has been completed, including punch-list items from earlier inspections.

2. Upon completion of reinspection, the Architect/Engineer will either recommend final acceptance and final payment, or will advise the Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, this procedure will be repeated.

1.4 RECORD DOCUMENTATION

A. Record Drawings:

1. Maintain a complete set of either blue- or black-line prints of the contract drawings and shop drawing for record mark-up purposes throughout the Contract Time.

2. Mark-up these drawings during the course of the work to show both changes and the actual installation for all trades, in sufficient detail to form a complete record for the Owner's purposes. Give particular attention to work which will be concealed and difficult to measure and record at a later date, and work which may require servicing or replacement during the life of the project.

3. Require the entities marking prints to sign and date each mark-up.

4. Bind prints into manageable sets, with durable paper covers, appropriately labeled.

B. Maintenance Manuals:

1. Provide 3-ring vinyl-covered binders containing required maintenance manuals, properly identified and indexed.

2. Include operating and maintenance instructions extended to cover emergencies, spare parts, warranties, inspection procedures, diagrams, safety, security, and similar appropriate data for each system or equipment item.

1.5 GENERAL CLOSEOUT REQUIREMENTS

A. Operator Instructions: Require each Installer of systems requiring continued operation and maintenance by owner's operating personnel, to provide on-location instruction to Owner's personnel, sufficient to ensure safe, secure, efficient, non-failing utilization and operation of systems. Provide instructions for the following categories of work:

1. Mechanical/electrical/electronic systems (not limited to work of Divisions 15 and 16).
2. Live plant materials and lawns.
3. Roofing, flashing, joint sealers.
4. Floor finishes.

B. Final Cleaning: At the time of project close out, clean or reclean the Work to the condition expected from a normal, commercial building cleaning and maintenance program. Complete the following cleaning operations before requesting the Architect/Engineer's inspection for certification of substantial completions.

1. Remove non-permanent protection and labels.
2. Polish glass.
3. Clean exposed finishes.
4. Touch-up minor finish damage.
5. Clean or replace mechanical systems filters.
6. Remove debris.
7. Broom-clean unoccupied spaces.
8. Sanitize plumbing and food service facilities.
9. Clean light fixtures and replace burned-out lamps.
10 Sweep and wash paved areas.
11. Police yards and grounds

END OF SECTION

SECTION 02000

SITE PERMIT REQUIREMENTS

PART 1 - GENERAL

A. Construction of this project must meet the terms and conditions of a The City of Portland Site Plan Permit, Historic Commision Review and Building permit.

B. Copies of the Site Plan Permit Application and Correspondence During Review of the Permit may be inspected during normal working hours at the office of:

DeLuca-Hoffman Associates Inc.
Consulting Engineers
778 Main Street Suite 8
South Portland, Maine 04106
(207) 775-1121

C. Any Contractor who desires to view the Permit Application and Associated Correspondence must contact DeLuca-Hoffman Associates Inc. 48 hours prior to inspecting the information.

D. Certain conditions of the permits will be the responsibility of the Contractor. The specific condition for which the Contractor is responsible are expected to include:

1. Local Permits:

The Contractor will be required to secure a street opening permit from the City of Portland Public Services Department for any activities within the public right of way. The contract drawings can be used by the contractor for securing this permit.

The Contractor is responsible for securing any permits not secured by the Owner pursuant to Condition 2 of the approvals.

PART 2 - PERMITS

A. Copies of the Local Permit is attached.

END OF SECTION

City of Portland Site Plan Approval

SECTION 02001

CIVIL ENGINEERING REQUESTS FOR INFORMATION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for handling and processing "Requests for Information (RFI).

2. "Request for Information" form is attached at the end of this Section.

3. Request/limit of use for AutoCAD files.

1.2 DEFINITION

A. Requests for Information: A formal process used during the construction phase to facilitate communication between the contractor, the Owner's representative, the Architect, and the Civil Engineer with regard to requests for additional information and clarification of the intent of the Contract Documents (Drawings and Specifications).

B. Do not use "Request for Information" form during bidding. Direct questions during bidding phase as indicated in the bid documents.

1.3 PROCEDURE

A. Conditions Requiring Clarification and the Contract Documents:

1. Contractor shall submit a "Request for Information" to the Owner and request review by the Civil Engineer.

2. Submit "Request for Information" from the Contractor's office or field office only. "Requests for Information" submitted directly from subcontractors or suppliers will not be accepted.

3. Generate "Requests for Information" by one source per project and number accordingly.

4. Submit one "Request for Information" per form.

B. Engineer will review RFI from the Contractor with reasonable promptness and the Contractor will be notified in writing of decisions made.

1. The Engineering Consultant's written response to the RFI shall not be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Sum or Contract Time.

C. Contractor shall maintain a log of "Requests for Information" sent to, and responses from Engineer "Requests for Information" log shall be sent, by Fax, every Friday to the Engineer.

D. All "Requests for Information" regarding scheduling, costing, and Owner provided equipment coordination shall be directed to the Architect.

1.4 REQUEST FOR INFORMATION FORM

A. Submit "Requests for Information" on the attached "Request for Information" form, or format accordingly on letterhead. Engineer will not respond to requests for information unless this form or format is utilized.

Where submittal form or format does not provide space needed for complete information, additional sheets may be attached.

1.5 REQUEST FOR ELECTRONIC MEDIA

A. Contractors may request AutoCAD disks for use in determining earthwork quantities. Contractors may obtain these disks by submitting the enclosed form to the Engineer. This form restricts the use of this data.

END OF SECTION

DeLUCA HOFFMAN ASSOCIATES, INC.
CONSULTING ENGINEERS

778 MAIN STREET
SUITE 8
SOUTH PORTLAND, MAINE 04106
TEL. 207 775 1121
FAX 207 879 0896

- SITE PLANNING AND DESIGN
- ROADWAY DESIGN
- ENVIRONMENTAL ENGINEERING
- PERMITTING
- AIRPORT ENGINEERING
- CONSTRUCTION ADMINISTRATION
- LANDSCAPE ARCHITECTURE

ELECTRONIC MEDIA TRANSFER

Recipient: _____

Date: _____

Firm/Location: _____ **Fax:** _____

Sender: _____

Re: _____

Via: ☐ E-mail Address: _____

☐ Floppy Disk ☐ Zip Disk ☐ CD-R ☐ Data Cartridge Tape

☐ Other _____

☐ Individual ☐ Zipped File Name(s): _____

_____

File(s) Sent By: _____

Remarks: _____

_____

Copies To: _____

Receipt and/or use of these files in whole or in part constitutes Recipient's agreement to the following:

a) This information is for use on the _____ project only. Reuse of the data without forwarding a print copy to, and without authorization and/or adaptation by DeLuca-Hoffman Associates, Inc. will be at the sole risk of the user and without liability or legal exposure to DeLuca-Hoffman Associates, Inc., its dependent consultants and professional associates. DeLuca-Hoffman Associates, Inc. does not represent that the data is suitable for reuse on the specific project or any other projects. Furthermore, the user shall indemnify and hold harmless DeLuca-Hoffman Associates, Inc., its independent consultants and professional associates from any and all claims, damages, losses and expenses, and including attorney's fees, through appeal, arising out of or resulting there from.

b) Copies that can be relied upon of data transferred between the Engineer and the Client are limited to printed copies (also known as hard copies). Files delivered in electronic format are only for the convenience of the receiving party. Any conclusion or information derived from such files shall be at the user's sole risk.

c) Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic data agrees that it will perform acceptance tests upon receipt, after which the receiving party shall be deemed to have accepted the data. Any errors detected upon receipt shall be corrected by the delivering party. DeLuca-Hoffman Associates, Inc. makes no representations to the Recipient or others as to the long-term usability or readability of electronic media or of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the creating party.

_____ _____

Authorized Representative Date

REQUEST FOR INFORMATION FROM THE ENGINEER

RFI NO. _____

DATE: _____ PROJECT: _____
(City, State)

TO: _____

FROM: _____ DRAWING NO. _____
(General Contractor)

_____ DETAIL NO. _____
(Project Superintendent)

_____ SPECS SECTION NO. _____
(Job Site Fax Number)

RFI Type:

( ) Demolition
( ) Site Preparation
( ) Earthwork
( ) Rock
( ) Erosion Control
( ) Storm Sewer
( ) Utilities
( ) Paving
( ) Landscape/ Irrigation
( ) Site Lighting
( ) Slope Stabilization Retaining Walls
( ) Traffic Related
( ) Other

Information Requested: _____

Requested By: _____

Reply: _____

_____ _____
Response By: Date:

File Distribution:

REQUEST FOR INFORMATION FROM THE ENGINEER

RFI NO. _____

DATE: _____ PROJECT: _____

(City, State)

TO: _____

FROM: _____ DRAWING NO. _____

(General Contractor)

_____ DETAIL NO. _____

(Project Superintendent)

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( ) Utilities
( ) Paving
( ) Landscape/ Irrigation
( ) Site Lighting
( ) Slope Stabilization Retaining Walls
( ) Traffic Related
( ) Other

Information Requested: _____

Requested By: _____

Reply: _____

_____ _____

Response By: Date:

File Distribution:

SECTION 02009

LAYOUT OF WORK

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The Owner has retained Owen Haskell Inc., licensed land surveyors, to establish a project benchmark and to establish the site property boundary on the Maine State Coordinate Grid. For the purposes of this specification, this shall be the limit of Owner provided survey control to the contractor.

B. The Contractor shall employ a licensed land surveyor in the State of Maine to lay out the work from the established reference points and bench marks, base lines, and the coordinate system indicated on the drawings, and shall be responsible for all measurements in connection with the layout. AutoCAD 2004 or newer files will be furnished to the Contractor upon written request. The licensed land surveyor shall certify in writing that the layout was performed under his/her direct supervision and is correct and meets the requirements of the contract documents. A copy of the certificate shall be furnished to the Architect and owner.

The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Owner. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Owner until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Owner may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

C. The layout shall establish the locations of silt fence and areas of existing site features to be protected for review and approval of the Owner prior to clearing.

D. Establish and plainly mark center lines for the site work and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each structure, roadways, utilities, and parking lots, are in accordance with lines and elevations shown on contract drawings.

E. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of work.

1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the Owner before any work is placed.

2. A detailed check of all coordinates, resultant pipe lengths, backslopes, and appurtenant locations shall be made by the registered land surveyor or civil engineer and provided to the Owner prior to starting utility lines.

F. During progress of work, the Contractor shall have line grades and plumbness of all major work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of contract drawings. Furnish such certification to the Owner before any major items are placed. In addition, Contractor shall furnish to the Owner certificates from a registered land surveyor or registered civil engineer that the following work is complete in every respect as required by contract drawings.

1. Elevations of all pavement areas and building pads.

2. Lines and elevations of sewers, storm drains, utility systems.

3. Lines of elevations of all swales and drainage areas.

4. Lines of elevations of parking area.

5. Horizontal and alignment of all access drives.

6. Record conditions of the stormwater management system.

After binder pavement is placed, the Contractor shall have the binder surface surveyed to verify that grades have been established within Specification Section 02511. A profile of each drive with elevations at 25 foot stations and location of spot grades shown on the grading and drainage plan including all frames and covers shall be obtained by the surveyor, recorded on the plans, and provided to the Owner and Engineer for review. Any areas not meeting the design requirements shall be corrected by the Contractor by removal of binder pavement and replacement at no cost to the Owner. The Contractor shall be responsible to complete paving in a manner that results in the unobstructed access for the owner's vehicles, including but not limited to, custom motorcoach(s) and equipment extending from the street into and out of the site.

G. Record Drawings:

1. The Contractor shall record the following information for buried utilities including the location of all appurtenances and controls including control or shutoff valves, manholes, head holes, inlets, and all changes in pipe direction.

2. All information shall be identified on a CAD reproducible drawing by a number or letter with a schedule of locations by coordinates tied to the Maine State Coordinate Grid.

H. The location of catch basins and manholes shall be accurately located by a registered land surveyor. Catch basins and manholes shall be located from the layout data and established on the contract drawings.

I. Whenever approved changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing bearing the registered land surveyor or registered civil engineer seal, and forward these drawings upon completion of work to the Owner and Architect.

J. Changes in location, additions and appurtenant items such as, but not limited to, manholes, inlets, pipe lines and conduits shall be shown in same manner as on contract drawings (by coordinates or dimensions from buildings); however, if no such locations are shown on contract drawings, changes in locations of items shall be shown by a sufficient number of right-angled dimensions from the nearest building.

K. Contractor is responsible for all costs associated with layout of work, and any costs associated with correcting non-conforming work or with restoring the landscape to its original condition.

L. The coordinates or data shown on the civil drawings for the building shall be for orientation only. Use the architectural and structural drawings for exact building dimensions and layout data for the building.

M. The survey data obtained for this section shall be incorporated into the project record drawings and profiles.

END OF SECTION

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition and removal of designated site structures, fencing, or other ancillary features from the site.

B. Demolition and removal of existing pavements, sidewalks, utilities, storm drains, signage or landscaping.

C. Disconnecting and capping or removal of identified utilities which are not proposed to be used as part of this project.

D. Filling voids in subgrade created as a result of removals or demolition.

1.2 RELATED SECTIONS

A. Section 02100 - Site Preparation.

B. Section 02200 – Earthwork.

C. The work shall comply with the erosion control plan appended to the end of Section 02270.

D. Section 02227 - Aggregate Materials: Backfill materials.

E. Construction drawings.

F. Vacant.

G. Vacant.

1.3 PROJECT RECORD DOCUMENTS

A. Accurately survey record actual locations of capped utilities, and subsurface obstructions.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable local code for demolition of structures, safety of adjacent structures, dust control and runoff control.

B. Vacant.

C. Obtain required permits and licenses from authorities. Pay associated fees including disposal charges.

Permits, fees, and licenses shall be secured and paid for by the General Contractor. It is the General Contractor's responsibility and obligation as part of the contract to pay for all charges for containers, transport, tipping fees, and disposal of all solid waste generated during the construction of the project. These fees shall be paid for by the General Contractor and included as part of the base bid. The Owner will not reimburse the General Contractor for these fees separately. The General Contractor shall provide the Owner with appropriate "bills of lading" demonstrating proper disposal of all waste.

D. Notify affected utility companies before starting work and comply with their requirements.

E. Do not close or obstruct roadways or sidewalks without permits.

F. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

G. Vacant.

1.5 JOB CONDITIONS

A. An existing wood retaining wall will be demolished.

B. Owner assumes no responsibility for condition of items to be demolished.

C. Removed items of salvageable value to Contractor may be removed from the site with the Owner's permission except where noted on the Drawings to be salvaged or

reused. Storage or sale of removed items on site will be permitted but shall not interfere with any other work in the contract documents.

D. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable.

E. Explosives shall not be brought to site or used without written consent of authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to persons or for damage to property due to blasting operations. The performance of any required blasting shall comply with governing regulations.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

Aggregate materials specified in Section 02227.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide, erect, and maintain temporary barriers and security devices at locations indicated.

B. Protect existing landscaping materials, appurtenances and structures which are not to be demolished. Repair damage caused by demolition operations at no cost to Owner.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

D. Mark location of utilities. Protect and maintain in safe and operable condition the utilities to remain. Prevent interruption of existing utility service occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities.

3.2 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures or pavements.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify authority having jurisdiction. Do not resume operations until directed.

C. Conduct operations with minimum interference to public or private access. Maintain access and egress at all times.

D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.

E. Sprinkle work with water to minimize dust. Provide hoses and water connections for this purpose.

F. Comply with governing regulations pertaining to environmental protection.

G. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

3.3 DEMOLITION

A. Proceed in the demolition and remove materials from site using methods as required to complete work within limitations of governing regulations.

B. Demolish concrete and masonry in small sections. Break up concrete slabs-on-grade that are two or more feet below finished grade. Remove slabs within 2 feet of finished grade.

3.4 FILLING VOIDS

A. Completely fill below grade areas and voids resulting from demolition using approved granular fill materials as specified in the Geotechnical Report, free from debris, trash, frozen materials, roots and other organic matter.

B. Ensure that areas to be filled are free of standing water, frost, frozen, or unsuitable material, trash and debris prior to fill placement.

C. Place fill materials in horizontal layers not exceeding 8" in loose depth and compact each layer at optimum moisture content of fill material to proposed density, unless subsequent excavation for new work is required.

D. Grade surface to match adjacent grades and to provide flow of surface drainage after fill placement and compaction.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from site debris, rubbish, and other materials resulting from demolition operations. All demolished or removed items shall be disposed of in accordance with the applicable State, Local and Federal regulations.

B. Stumps and grubbings may be stockpiled and removed from site in accordance with Local and State regulations.

C. Transport materials removed with appropriate vehicles and dispose off-site to areas which are approved for disposal by governing authorities and appropriate property owners.

D. VACANT

E. The permits issued for this project prohibit the placement of any material in wetlands not specifically shown on the Contract Documents.

F. Areas of any existing on-site solid waste shall be disposed of in accordance with applicable State, Local and Federal regulations. The Contractor shall review the site conditions to determine the quantity and composition of waste.

3.6 UTILITY SERVICES

A. Demolish and remove outside utility lines as follows:

1. Any utility which is to be abandoned and located within 36 inches of the final finish grade.

2. Any storm drain which is to be abandoned.

3. Any overhead utility which is discontinued.

4. Other abandoned lines which would interfere with performance of this contract.

B. Plug and seal any abandoned utility lines not scheduled for removal as follows:

1. All pipelines shall be plugged at any appurtenant opening or point of breakage which occurs during construction of the work.

2. The portion of the appurtenant utility structures which is more than 36 inches below grade shall be dewatered, all entry lines shall be sealed, and the void shall be filled with clean stone gravel or sand and compacted.

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Clearing site of debris, grass, trees and other plant life in preparation for site or building excavation work.

B. Protection of existing structures, trees or vegetation indicated on the contract documents to remain. Unless otherwise shown, the grading limit shown on the drawings is the work limit. The Owner reserves the right to adjust the layout or clearing limit to protect major trees.

C. Stripping topsoil from areas that are to be incorporated into the limits of the project and where so indicated on the construction drawings.

1.2 RELATED SECTIONS

A. Section 02000 - Site Permit Requirements

B. Section 02050 – Demolition

D. Section 02200 – Earthwork

C. Section 02270 - Slope Protection and Erosion Control

E. Construction Drawings

F. Geotechnical Report

G. An erosion/sedimentation control program has been prepared for this project. The program is appended to Section 02270, Slope Protection and Erosion Control, of these specifications. Scheduling constraints, stabilization of disturbed areas, and the other requirements of this program shall be strictly adhered to. Any and all penalties which are imposed on the Owner for the failure to comply with these provisions shall be paid by the Contractor.

H. A subsurface geotechnical investigation of the site was undertaken as a part of this project. A copy of the geotechnical investigation is being provided as part of the bid documents. This document was obtained only for the Owner's use in design, and interpretation of the data for purposes of construction is the responsibility of the Contractor. The report is being made available for information purposes, but is not a warranty of subsurface conditions. Bidders shall visit the site and acquaint themselves with existing conditions. Refer to the General Conditions, as amended for limitations to the use of the geotechnical data.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion control systems as shown on the plans or as described in the erosion control report appended to Section 02270, and as required by the Permits to protect adjacent properties and water resources from erosion and sedimentation.

B. Site work on this project will disturb less than one (1) acre, therefore a Maine Construction General Permit as administered by the MEDEP is not reqired.

C. Vacant

D. The Contractors responsibilities for compliance with this plan are outlined in the Erosion/Sediment Control Plan and notes for this project.

1.4 JOB CONDITIONS

A. Conditions existing at time of inspection for bidding purposes will be maintained by the Owner in so far as practical.

B. Variations to conditions or discrepancy in actual conditions as they apply to site preparation operations are to be brought to the attention of the Owner prior to the commencement of any site work.

PART 2 – PRODUCTS

A. Off-site materials shall be transported to the project site using well-maintained and operating vehicles. Once onsite, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify that existing plant life and clearing limits are clearly tagged, identified and marked in such a manner as to insure their safety throughout construction operations. Mark the clearing limits for review by the Owner.

3.2 PROTECTION

A. Locate and identify existing utilities that are to remain and protect them from damage.

B. Protect trees, plant growth and features designated to remain as final landscape.

C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain access and egress at all times and clean or sweep any roadways daily or as required by the governing authority. At such times as deemed necessary by the Owner, dust control shall be provided with sprinkling systems or equipment provided by the Contractor.

D. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same.

E. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of the Uniform Traffic Control Devices" and the state highway department requirements. The Contractor shall be responsible for preparing, submitting and receiving approval of a traffic control plan, if required, from the Maine Department of Transportation and the City of Portland for all work within the public right-of-way.

3.3 CLEARING – GENERAL

A. The Contractor shall identify by means of flagging or other suitable measures the proposed work clearing limits for approval by the Owner prior to clearing activity. Clear areas required for access to site and execution of work.

B. Unless otherwise indicated on the drawings or modified by the Owner, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations are to be filled to subgrade

elevation to avoid water ponding. Satisfactory fill material shall be placed in horizontal layers not exceeding 8" loose depth, and thoroughly compacted per fill requirements of this section and Section 02200.

C. Stumps and grubbings must be removed from the site.

3.4 TOPSOIL EXCAVATION – GENERAL

A. Strip topsoil from areas that are to be filled, excavated, landscaped or re-graded to such a depth that it prevents intermingling with underlaying subsoil or questionable materials. It is very important to avoid intermixing topsoil with underlying material.

B. Cut heavy growths of grass from areas before stripping and remove with the rest of the cleared vegetative material.

C. Topsoil shall consist of organic surficial soil found in depths of not less than 6". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 1" in diameter, weeds, roots, and other objectionable material. It shall not be reused on the site unless augmented as necessary to meet the minimum organic content of the specification for topsoil.

D. Stockpile topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Stockpiles shall be stabilized in accordance with the Erosion and Sedimentation Control Report, appended to Specification Section 02270. Dispose of unsuitable topsoil as specified for waste material, unless otherwise specified by Owner. Excess topsoil shall be removed from the site by the Contractor.

3.5 SITE PREPARATION: BUILDING PAD ZONES, PARKING AREAS AND PAVED DRIVES

Soil subgrade surfaces for foundations, slabs, and pavements are generally anticipated to be located in existing in-situ fill soils.

The following guidelines are recommended to protect subgrade soils beneath footings, slabs, and parking areas.

- Make final excavations into natural bearing soils by hand or using smooth-bladed equipment to limit disturbance (particularly important in the glaciomarine clay soils).

- Prevent water from accumulating on soil surfaces to reduce the possibility of soil disturbance. All filling and concreting of slabs and footings should be performed in-the-dry. Subgrades that become disturbed due to water infiltration should be

re-excavated and stabilized. Subgrade stabilization methods could include placement of crushed stone and filter fabric with approval of a geotechnical engineer.

- Exposed subgrades should be examined in the field by a geotechnical engineer to verify strength and bearing capacity. Excavation may be necessary to remove weak, disturbed or otherwise unacceptable soils. Additional excavation, where necessary, will be completed at no additional expense to the owner. Disturbance due to water and adverse weather could be reduced by maintaining footing excavations at least 12 in. above the final bearing level until immediately before placing footing reinforcement and concrete. Alternatively, it may be desirable to protect the exposed soil subgrade areas, as soon as possible after acceptance by a geotechnical engineer, by placing a 2 to 3-in. thick lean concrete mud-mat.

- Limit equipment traffic across the exposed soil bearing surfaces.

- Do not permit temporary drainage trenches or other dewatering facilities to extend below the bearing level near footings.

Footings

All excavation work shall be conducted in a manner that minimizes disturbance to the natural soils when excavating for footing bearing surfaces. After final excavation to the natural bearing soils, the exposed subgrade should be observed in the field by a geotechnical engineer to confirm the assumed foundation bearing conditions. It may be necessary to over-excavate and replace locally weak, disturbed or otherwise unacceptable foundation bearing soils.

Soil bearing surfaces below completed foundations and slabs must be protected against freezing, before and after foundation construction. If construction is performed during freezing weather, footings should be backfilled to a sufficient depth (up to 4.5 ft.) as soon as possible after they are constructed. Alternatively, insulating blankets or other means may be used for protection against freezing.

Slabs

All topsoil, existing in-situ fill material, debris and organic matter should be removed from beneath the interior and exterior slabs and should be replaced with compacted granular fill. We recommend that fill subgrade surfaces be inspected by a geotechnical engineer prior to placement of fill.

Pavement Areas

All topsoil, debris and organic matter should be removed within the limits of access roads and parking areas. If existing man-placed fill is present at subgrade level, these surfaces shall be proofrolled with a minimum of four passes of a self-propelled vibratory roller or heavy hand-guided vibratory compactor, until firm. Any soft areas revealed by proofrolling should be removed and replaced by compacted granular fill or base course material.

Filling and Backing

Compacted granular fill (CGF) shall be used to raise site grades below the slabs and beneath the site roadway and parking areas. All topsoil, debris and organic matter should be removed as previously stated prior to placement of CGF.

A. Placement of compacted fills should not be conducted when air temperatures are low enough (approximately 30 degrees F., or below) to cause freezing of the moisture in the fill during or before placement. Fill materials should not be placed on snow, ice or uncompacted frozen soil. Compacted fill should not be placed on frozen soil. No fill should be allowed to freeze prior to compaction. At the end of each day's operations, the last lift of fill, after compaction, should be rolled by a smooth-wheeled roller to eliminate ridges of uncompacted soil.

3.6 PROTECTION OF PREPARED AREAS

A. Prepared areas of the site shall be protected with erosion control measures. Positive surface drainage away from prepared subgrade areas shall be maintained throughout the period of construction.

END OF SECTION

SECTION 02180

SUBSURFACE INVESTIGATIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

Related documents: Drawings and General Provisions of Contract, including General and Supplementary Conditions apply to work of this Section.

1.2 DESCRIPTION OF WORK

Contractor shall review the geotechnical report and supplement prepared for the project by Sebabo Technics, Inc. These reports are appended to the project manual specifications. During the Bidding Process, the Contractor may conduct his own subsurface investigations after requesting and receiving prior approval from the Owner. The request for approval shall be accompanied by a plan indicating the location and type of investigations to be undertaken by the Contractor. The Contractor is encouraged to verify Owner's subsurface investigations and shall notify the Owner in writing prior to the bid date of any discrepancies.

PART 2 - PRODUCTS

2.1 REPORT

A. Subsurface conditions have been investigated by test pits, borings and probes. Locations of the test pits are shown on the contract drawings. Logs of the explorations are appended to these specifications.

B. A report of subsoil conditions has been prepared by Sebago Technics, Inc. that is based on subsurface explorations. Said subsurface investigations are not warranted to show the actual subsurface conditions except at the location of said test pits or investigations, and at these points are subject to inaccuracies inherent in methods used and to variations in the classification and interpretation of soil layers.

Subsurface information is included only as an aid to the Bidder and it is the obligation of the Bidder to draw his own conclusions of subsurface conditions from his own investigations prior to submitting his proposal. The Contractor agrees, in signing his Contract, that he will make no claims against the Owner or Architect, if in carrying out

the work he finds that the actual conditions encountered in performing the work do not conform to conditions presented, discussed, or anticipated prior to the commencement of work, the Contractor shall notify the Owner immediately of such differences in the conditions.

PART 3 - EXECUTION

3.1 REPORT REVIEW

A copy of the subsurface investigation report is appended to the project manual and shall be considered part of the Contract Documents.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Protection, modification and/or installation of utilities as sitework progresses paying particular attention to grade changes and any necessary staging of work.

B. Cutting, filling and grading to required lines, dimensions, contours and proposed elevations for proposed improvements.

C. Scarifying, compaction, drying and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.

D. Sequencing the construction is required to protect the subgrades, the work and to comply with the Erosion/Sediment Control Plan for this project.

E. VACANT

F. The footing zone shall be defined to be the area below footings and below imaginary lines that extend 2 feet laterally beyond the footing outer bottom edges and projecting outward and down away from the footing at an imaginary 1:1 slope.

G. Dewatering, trench protection, shielding, attendant safety measures, and protection of the work throughout construction required by the contract.

1.2 RELATED REQUIREMENTS

A. Section 02050 - Demolition

B. Section 02100 - Site Preparation

C. Section 02221 – Excavation, Backfilling and Compacting for Structures

D. Section 02222 – Excavation, Backfilling and Compacting for Utilities

E. Section 02227 – Aggregate Materials

F. Section 02229 – Rock Removal

G. Section 02270 – Slope Protection and Erosion Control

H. Geotechnical Report for boring locations and findings of subsurface materials and conditions.

I. Contract Drawings

J. A copy of the Erosion and Sedimentation Control Report is appended to Specification Section 02270 and shall be considered part of the Contract Document.

1.3 REFERENCE STANDARDS

American Society for Testing and Materials (ASTM), Latest Edition:

D422 Method for Particle Size Analysis of Soils

D1556 Test for Density of soil in Place by the Sand Cone Method

D1557 Test for Moisture-Density Relations of Soils using 10-lb (4.5 kg) Rammer and 18-inch (457 mm) Drop (**Modified Proctor)**

D1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

D2167 Test for Density of Soil in Place by the Rubber Balloon Method

D2216 Laboratory Determination of Moisture content of Soil

D2487 Classification of Soils for Engineering Purposes

D2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D4318 Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils

American Association of State Highway and Transportation Officials (AASHTO), Latest Edition:

T88 Mechanical Analysis of Soils

1.4 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion control systems as shown on the plans as directed by the Engineer or to comply with environmental permits to protect adjacent properties and water resources for erosion and sediment damages.

1.5 QUALITY ASSURANCE

A. Independent Testing Laboratory: Refer to General Conditions for Clarification if the testing firm to perform construction testing is to be selected and paid by Contractor or by the Owner. Site testing requirements shall be based on the following:

1. Building Subgrade Areas, including 10'-0" Outside Exterior Building Lines: In cut areas, not less than one compaction test for every 2,000 square feet. In fill areas, same rate of testing for each lift of fill (measured loose). This area shall include all footing zones.

2. Areas of Construction exclusive of building subgrade: In cut areas not less than one compaction test for every 5,000 square feet. In fill areas, same rate of testing for each lift of fill (measured loose).

3. Compaction testing shall not be performed on undisturbed, naturally deposited clay subgrades. The Geotechnical Engineer shall examine exposed clay subgrades if encountered to verify suitable strength and bearing capacity.

B. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to the Owner.

C. The following tests shall be performed on each type of on-site or imported soil material used as compacted fill as part of construction testing requirements:

1. Moisture and Density Relationship: ASTM D 1557

2. Mechanical Analysis: AASHTO T-88

3. Plasticity Index: ASTM D 4318

D. Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements:

651. Sand-Cone Method: ASTM D 1556

2. Balloon Method: ASTM D 2167

3. Nuclear Method: ASTM D 2922 (Method B- Direct Transmission)

E. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. Owner, the project Site Engineer, Architect, Geotechnical Engineer of Record, and Contractor shall be provided with copies of reports within 96 hours of time test was performed. In the event that any test performance fails to meet these Specifications, the Owner and the Contractor shall be notified immediately by Testing Laboratory.

F. Unless stipulated otherwise, the following compaction requirements shall be required for this project and placed in accordance with the following maximum lift (layer) thicknesses.

1. Building Pad Fill Outside of Footing Zone and Lower than 12" Below the Finish Floor Slab.	Granular Fill	12	95
2. Building Pad for Slab	Granular Fill	12	95
3. Building Entryway and Contiguous Sidewalk	Granular Fill	12	95
4. Foundation and Retaining Wall	Granular Fill	12	95
5. Pavement Subbase Course	Aggregate Subbase	8	95
6. Pavement Base Course	Aggregate Base	6	95
7. Road Embankment Fill and Parking Area Subgrade Fill	Common Borrow, Granular Borrow, or Structural Fill	12 12	90 95
9. Foundation and Retaining Wall Backfill * Within 6 Feet of Wall Face	Granular Fill or Select Fill with Drainage Stone in Modular Block Voids	9	93 (Unless governed by other criteria) Hand-operated compaction

* Beyond 6 Feet of Wall Face	Granular Borrow or Common Borrow	12	equipment required. 93 (Unless governed by other criteria)
10. Access Path Walkway	Asphalt or Stone Dust	10	95
11. Turf	Loam w/Organic Admixture	N/A	N/A
12. Underdrain and Flexible Pipe Bedding	Crushed Stone	100%	100 ASTM C-29 not D1557

The fill material types listed above shall conform with the specifications presented in Section 02227.

The following fill material types correspond to the specifications presented in Section 02227 and are permitted for use as follows:

Granular Fill	- Engineered Fill Beneath Buildings - Fill within the footing zone - Road Embankment Layers - Pavement Subgrade (below subbase) - Foundation and Retaining Wall Backfill Within 6 Feet of Outside Face and Above Perimeter Foundation Drains
Subbase Aggregate	- Backfill within 10 Feet of Backface of 1.5H:1V Riprap Slopes Pavement Subbase Course Layer - Also May be Used for all Applications where Granular Fill is - Required. -
Aggregate Base	- Pavement Base Course Layer, Also May be Used for all Applications Where Subbase, Select, Common or Granular Borrow is Required.
Common Borrow	- General Sitework Outside of Building Pad and not within 2 feet below Pavement Subgrade Surface
Drainage Stone	- Filling Voids in Modular Block Walls - Backfill Around Foundation Drains - Bedding Around Storm Drain Pipe, Sewers and Water Mains Soft Ground Working Mat -

Granular Borrow	- Road Embankment Fill and Parking Area Subgrade Fill Foundation and Retaining Wall Backfill Beyond 6 Feet of - Outside Wall Face -

All costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to the Owner. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that is deemed necessary. Contractor shall provide free access to site for testing activities.

1.6 SUBMITTALS

A. Submit a sample and gradation test results of each type of off-site fill materials that is to be used at the site in an air tight, 10 lb container for the testing laboratory.

B. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the Owner and engineer.

C. For use of fabrics or geogrids, an Owner approved design shall be submitted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Excavated and re-used materials for subsoil fill as specified herein.

B. Aggregate fill as specified in Section 02227.

C. Imported subsoil material approved by the owner and specified herein or in Section 02227.

D. Topsoil fill as specified in Section 02900 with proper organic admixtures.

E. Acceptable stabilization fabrics and Geogrids for some (but not all) uses.

1. Mirafi 500X or 600X

2. Phillips 66 Supac 6WS

3. Dupont Typar 3401 and 3601

4. Trevira S1114 and S1120

5. Tensar SS-1 and SS-2

6. Exxon GTF-200 or 350

7. Geogrids specifically shown on the Contract Drawings for some (but not all) uses

F. Acceptable filter/drainage fabrics for some (but not all) uses:

1. Mirafi 140NS

2. Phillips 66 Supac 4NP

3. Dupont Typar 3341

4. Fabric Types Specifically Shown on the Contract Drawings

G. When the Contract Drawings show a specific fabric or geogrid type, that material shall be used unless otherwise approved by the Engineer and Owner in writing.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Locate and identify existing utilities that are to remain and protect them from damage.

C. Notify utility companies to remove and/or relocate any utilities that are in conflict with the proposed improvements.

D. Protect plant life, lawns, fences, existing structures, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

E. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same.

F. Remove from site material encountered in grading operations that, in opinion of Owner or Owner's representative, is unsuitable or undesirable for backfilling, subgrade or foundation purposes. Dispose of in a manner satisfactory to Owner and in accordance with the applicable State, Local, and Federal Regulations.

G. Prepare the site as specified in Section 02100.

H. Prior to placing fill in low areas, such as previously existing streams, ponds, or wetlands, perform following procedures:

1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain same results. Direct runoff to approved erosion control measures.

2. After drainage of low area is complete, remove muck, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying low areas dry and undisturbed.

3. If proposed for fill, all muck, mud, and other materials removed from above low areas shall be dried on-site by spreading in thin layers for observation by the Owner's representative. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under or within 10'-0" of perimeter of building pad or paving subgrade. If, after observation by the Owner's representative, material is found to be unsuitable, all unsuitable material shall be removed from site.

3.2 EXCAVATION FOR FILLING AND GRADING

A. Classification of Excavation: Contractor by submitting bid acknowledges that he has investigated site to determine type, quantity, quality, and character of excavation work to be performed. All excavation shall be considered unclassified excavation except that defined as rock. Refer to Section 02900.

B. Perform excavation using capable, well-maintained equipment and methods acceptable to Owner and governing agencies.

C. When performing grading operations during periods of wet weather, provide adequate drainage and ground water management to control moisture of soils. Protect exposed clay soils from runoff, erosion or elevated moisture content.

D. Comply with the erosion control plan and special provisions shown on the Contract Drawings.

E. Shore, brace, and drain excavations as necessary to maintain safe, secure, and free of water at all times.

F. Excavated material containing rock or stone exceeding 6" in size limitations is unacceptable as fill within the proposed building and paving area.

G. Protect excavated materials from moisture and condition as required for placement in parking lot subgrades, embankments, and general site fills. (Material excavated from the site shall not be used in the building pad zones.)

H. Excavation shall consist of the removal of all materials encountered in grading the project and disposal where necessary.

I. Excavation shall be accomplished in a manner which complies with the erosion control measures for this site, meets all OSHA and related requirements, and maintains positive drainage of the subgrade throughout construction.

3.3 FILLING AND SUBGRADE PREPARATION

A. BUILDING SUBGRADE AREAS: **VACANT**

B. AREA OF CONSTRUCTION EXCLUSIVE OF THE BUILDING SUBGRADE:

1. Unless specifically stated otherwise on the Drawings, areas exposed by excavation or stripping and on which the subgrade preparations are to be performed shall be completed with a smooth-blade excavator. These areas shall then be proofrolled in areas of granular subgrade soil and examined in areas of clay subgrade to compact the subgrade and/or detect any areas of weak subgrade prior to placement of any fill. Proofrolling shall be accomplished by making a minimum of two (2) complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions under the supervision and direction of a field geotechnical engineer. Areas of failure shall be excavated, replaced with select fill and recompacted as stated above. Proofrolling shall not be performed on naturally deposited clay subgrades. See Sections 02222 and 02223 for additional specifications on subgrade preparation for utilities and pavement and general site grading.

2. Unless specifically stated otherwise on the Drawings, fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed the lift thickness specified in Section 1.05 of this specification and compacted to a minimum density specified in Section 1.05 of this specification.

3. The following table stipulates maximum allowable values for plasticity index (PI) and liquid limit (LL) of suitable fill material in the specified areas; unless specifically stated otherwise on the Drawings:

Location*	PI	LL
Area below upper three feet, exclusive of building area	20	50
Upper three feet, exclusive of building area	15	40

*References to depth are to proposed subgrade elevations.

4. Material imported to the site shall meet the material specifications of Section 02227 of these specifications and Section 1.05 of this specification.

3.4 PLACEMENT OF EMBANKMENT FILLS

Place embankments and fills in the lift thickness specified in Section 1.05 and compact to meet the density specified in Section 1.05. The embankments and fills shall be placed using the materials specified, incorporate the drainage and all special placement measures stipulated by the Erosion Control Plan, the Contract Documents, and Permits required by the drawings using appropriate compaction equipment. In building fill zones, the compaction equipment should include a vibratory drum compactor with a minimum static weight of 10,000 pounds and a minimum dynamic force of 20,000 lbs. In areas close to retaining walls and buried manholes or appurtenances, the use of hand-held vibratory equipment is anticipated. In parking lot embankments and other site fills, the use of steel drum rollers and/or sheepsfoot-type rollers to compact native borrow material from the site is anticipated.

The selection of compaction equipment, their use, and operation to achieve the specified compaction is the sole responsibility of the Contractor.

The embankments shall be protected from inclement weather including:

3.4.1 Rolling any exposed embankments and parking lot fills constructed of on-site material with a smooth drum roller at the end of each workday.

3.4.2 Covering all exposed embankments of parking lot fills with a compacted sand layer prior to any significant rainfall.

3.4.3 Maintaining positive drainage from the embankments and parking lot subgrades throughout construction.

3.4.4 Providing drainage chutes and windrowing the top edge of embankments to avoid concentrated runoff from traveling down embankment sideslopes.

3.4.5 Staging and phasing the work to meet the requirements of the erosion control plan and specific sequences shown on the drawings.

3.4.6 Compliance with the project geotechnical report.

3.5 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

D. Grading of paving areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Tolerance of + 0.10 feet will be permitted. Contractor to provide engineering and field staking necessary for verification of lines, grades, and elevations.

E. Maintain subgrade for area to be paved. Make adjustments that may be required in accordance with Specifications at no additional expense to Owner.

The Contractor shall protect all soils, compacted gravel, sand, and drainage material under poured slabs and in areas where slabs will be poured within the building from surface runoff excessive moisture. All expenses associated with protective measures, temporary heating, and recompaction shall be at the expense of the Contractor.

3.6 RIPRAP

A. Place riprap in all areas where indicated on the Drawings. The stone for riprap shall be washed and consist of field stone or rough unhewn quarry stone as nearly uniform, in section as is practical. Exposed stones shall be angular. Rounded boulders or cobbles will not be permitted.

The stones shall be dense, resistant to the action of air and water, and suitable in all aspects for the purpose intended. The riprap shall be composed of a well-graded mixture down to the one-inch size particle such that 50 percent of the mixture by weight shall be larger than the D50 size specified on the drawings.

A well-graded mixture is defined as a mixture composed primarily of the larger stone size but with a sufficient mixture of other sizes to fill the progressively smaller voids between the stones. The diameter of the largest stone size in such a mixture shall be 1.5 times the D50 size. When subjected to the magnesium sulfate soundness test (ASTM C-88), the percent weight loss shall be less than 15%. When tested according to ASTM C-131, the crushed stone shall have a maximum loss of 45% at 5,000 revolution.

B. Slopes and other areas to be protected shall be dressed to the line and grade shown on the plans prior to the placing of riprap. Contractor shall then undercut the areas to receive riprap to an elevation equal to the final elevation less the specified thickness of riprap as shown on the drawings.

C. Filter fabric and bedding material shall be installed prior to the placement of the riprap if so indicated on the drawings. The bedding material shall be in accordance with Section 02227 and shall be 6" in depth. Filter fabric shall be as specified herein and as detailed on the plans.

D. Stones shall be placed so that the greater portion of their weight is carried by the earth and not by the adjacent stones. These stones shall be placed uniformly with close joints. The upright areas of the stone shall make an angle of approximately 90 degree with the embankment slope. The courses shall be placed from the bottom of the embankment upward, the larger stones being placed in the lower courses. Open joints shall be filled with spalls. Stones shall be embedded in the embankment as necessary to present a uniform top surface such that the variation between tops of adjacent stones shall not exceed 3".

3.7 FINISH GRADING

A. Grade all areas where finish grade elevations or contours are indicated on Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free of rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below established finished subgrade elevation, and all ground surfaces shall vary uniformly between indicated elevations. Finish ditches shall be graded to allow for proper drainage without ponding and in manner that will minimize erosion potential. For topsoil application, refer to Section 02900 (LANDSCAPING, SEEDING, AND SODDING).

B. Correct all settlement and eroded areas within one year after date of completion at no additional expense to owner. Bring grades to proper elevation. Replant or replace any grass, shrubs, bushes, or other vegetation disturbed by construction using corrective measures. Refer to Section 02270 for slope protection and erosion control.

C. Refer to Section 02245 for soil stabilization and geotextile fabric materials.

3.8 ROCK EXCAVATION

See Section 02229 - Rock Removal

END OF SECTION

SECTION 02221

EXCAVATION, BACKFILLING AND COMPACTING FOR STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavate to line, grade and configuration as shown in the plans and specifications for proposed building, structures or retaining walls.

B. Fill to line, grade and configuration as shown in the plans and specifications for proposed structures.

C. Compacting for materials in an acceptable manner as stated herein.

D. VACANT

1.2 RELATED REQUIREMENTS

A. Section 02100 – Site Preparation

B. Section 02200 - Earthwork

C. Section 02227 - Aggregate Material

D. Section 02229 - Rock Removal

E. Section 02505 - Paving Base Course

F. Section 02511 - Asphaltic Concrete Paving

G. Geotechnical Report for boring locations and findings of subsurface materials and conditions.

H. Construction Drawings

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

D422 Method for Particle and Size Analysis of Soils

D1556 Test for Density of soil in Place by the Sand Cone Method

D1557 Test for Moisture-Density Relations of Soils using 10-lb (4.5 kg) Rammer and 18-inch (457 mm) Drop (**Modified Proctor)**

D1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

D2167 Test for Density of Soil in Place by the Rubber Balloon Method

D2216 Laboratory Determination of Moisture content of Soil

D2487 Classification of Soils for Engineering Purposes

D2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D4318 Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils

C25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.

T88 Mechanical Analysis of Soils

1.4 QUALITY ASSURANCE

A. Independent testing laboratory approved by the Owner shall be retained to perform construction testing on filling operations and subgrade analysis as specified in Section 02200 and as stated herein. Refer to the general contract conditions for clarification on the cost for this independent laboratory.

1.5 SUBMITTALS

A. Shop drawings or details pertaining to excavating and filling for structures are not required unless otherwise shown on the drawings or specifications or if contrary procedures to the project documents are proposed.

B. Submit a sample of each type of off-site fill material that is to be used in backfilling in an air-tight, 10 lb. container and submit a gradation and certification of the aggregate material that is to be used to the testing laboratory for review.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill material from on-site as specified in Section 02200 and approved by the owner or owner's representative.

B. Fill material from off-site as specified in Section 02200 and approved by the owner or owner's representative.

C. Aggregate material as specified in Section 02227.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify all lines, elevations and grades necessary to construct building subgrades as shown in the plans and specifications. The Contractor's attention is directed specifically to Section 02200.

B. Carefully protect bench marks, property corners, monuments or other reference points.

C. Locate and identify all site utilities that have previously been installed and may be in danger of damage by grading operations.

D. Locate and identify all existing utilities that are to remain and protect them from damage.

E. Over excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas are to be stabilized by using acceptable backfill materials placed and compacted as specified, filter fabrics and/or aggregate materials.

3.2 EXCAVATION FOR FILLING AND GRADING

A. Excavate structural areas to line and grade as shown in the plans and specifications being careful not to over excavate beyond the elevations needed for structural subgrades. Refer to Sections 02000 and 02200.

B. Engage all suitable material into the project fill areas as specified in Section 02200.

C. Unsuitable excavated material is to be disposed of in a manner and location that is acceptable to the owner and local governing agencies and is in accordance with State, local and federal regulations. Prior to any off-site disposal of spoil material, the Contractor shall at a minimum notify the Owner of the proposed haul route, disposal location and quantity of materials.

D. Perform excavation using capable, well maintained equipment and methods acceptable to the owner and the project document requirements.

3.3 FILLING AND SUBGRADE PREPARATION

A. Structural subgrade zones shall be as defined in Section 02100 of these specifications.

B. The structural subgrade pad for the building shall be prepared in strict accordance with paragraphs 3.3 E and 3.3F below and the building pad preparation notes provided on the drawings. Rock larger than six inches (6") shall not be part of building subgrade fill.

C. Stumps and the major portions of root systems (including all roots larger than 1 inch in diameter) and other deleterious material shall be removed in all building or structual areas as defined in Section 02200. Topsoil, organic soils, and other unsuitable materials shall be stripped in all building areas to expose native soils or bedrock.

D. Construction dewatering shall begin as early as is practicable during site grading work to keep on-site soils as well drained as possible. Effective dewatering and surface runoff control shall be accomplished with a network of drains, swales, sumps, and DIRTBAGS®. Dewatering trenches or other dewatering facilities shall not extend below the bearing level for footings.

E. Dry subgrades exposed in fill areas after grubbing and stripping that consist of granular soil shall be proofrolled with at least two passes of a minimum 10,000 pound static weight roller until firm. Subgrade surfaces shall be covered with at least a 12" layer of compacted granular fill as early as practicable. The fill will provide a working mat to protect the subgrade from disturbance. Soft areas identified during proofrolling or under subsequent traffic prior to subsequent filling activities shall be excavated and replaced with compacted granular fill.

F. Where excavations encounter wet or naturally deposited clay soils, the work shall proceed carefully in a manner that avoids subgrade disturbance including: using smooth edged cutting buckets when making excavations within one foot of the final subgrade elevation, and placement of the compacted granular fill (floor slab areas) as soon as practicable to protect the subgrade from disturbance. Naturally deposited clays shall not be proofrolled; the Geotechnical Engineer shall examine exposed clay subgrades to verify strength and bearing capacity prior to placement of fill material. In fill areas, the initial lift of fill on wet, natural subgrades should consist of 12 inches of Granular Fill or Crushed Stone. Fill materials and/or subgrade materials that become contaminated with fines during construction shall be replaced with the appropriate clean materials immediately prior to placing overlying Subbase Course, Base Course, or engineered fill material.

G. Fill materials used in preparation of building subgrade shall be compacted granular fill meeting the gradation requirements of Section 02227. Fill should be placed in uniform lifts not exceeding 9 inches in uncompacted thickness and be compacted with large, self-propelled compaction equipment. In confined areas, the structural fill should be placed in uniform lifts not exceeding 6 inches in uncompacted thickness and compacted with hand operated compaction equipment. Compacted granular fill should be compacted to at least 95 percent of maximum dry density determined by ASTM D1557.

Only fill specified in Section 02220 and Section 02227 should be used as fill below the structural zones.

K. To aid in maintaining stable cut and fill slope conditions, surface water runoff shall be diverted away from the top of slopes. Likewise, surface runoff shall be diverted away from footing excavations and floor slab excavations.

L. Any fill materials that become wet or disturbed before the overlying lift of fill can be placed (e.g. due to a rainstorm during the work day, overnight, or over a weekend) shall be proofrolled, recompacted and/or excavated and replaced with drier fill.

3.4 COMPACTION

A. Maintain optimum moisture content of fill materials to attain required compaction density.

B. All material shall be tested in accordance with Section 02200.

C. An Independent Testing Laboratory shall be retained to perform testing on site. Refer to the General Contract provisions for the method of selection and payment for independent testing services.

D. Compaction tests will be as specified in Section 02200 together with the following for building subgrade areas including 10'-0" outside exterior building lines:

In cut areas, not less than one compaction test for every 2,000 square feet unless directed otherwise by Geotechnical Engineer. In fill areas, same rate of testing for each 12" lift (measured loose).

E. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to the Owner.

3.5 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density of depth necessary and replace in a manner that will comply with compaction requirements by use of materials equal to or better than best subgrade materials on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable and true to grade and cross-section.

3.6 FINISH GRADING

A. Finish grading shall be in accordance with Section 02200 and as more specifically stated herein.

B. Grading of building areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Tolerance of up to 0.05 feet, will be permitted. Contractor to provide engineering and field staking necessary for verification of lines, and elevations.

3.7 ROCK EXCAVATION

See Section 02229 - Rock Removal.

END OF SECTION

SECTION 02222

EXCAVATION, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavating trenches for the installation of utilities.

B. Backfilling trench with bedding materials as specified and indicated and finishing filling trench with suitable material to proposed subgrade.

C. Compacting backfill materials in an acceptable manner.

D. Within 5' of the building and under the building the Division 2 Contractor is responsible for excavation and backfill of the pipes and coordination with the work of other trades.

1.2 RELATED REQUIREMENTS

A. Section 02200 – Earthwork

B. Section 02227 - Aggregate Materials

C. Section 02229 - Rock Removal

D. Section 02605 - Sewer and Catch Basin Structures

E. Section 02660 - Water Distribution Systems

F. Section 02720 - Storm Sewer Systems

G. Section 02730 - Sanitary Sewer Systems

H. Geotechnical Report for boring locations and findings of subsurface materials and conditions

I. Construction Drawings

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

D422 Method for Particle Size Analysis of Soils

D1556 Test for Density of soil in Place by the Sand Cone Method

D1557 Test for Moisture-Density Relations of Soils using 10-lb (4.5 kg) Rammer and 18-inch (457 mm) Drop **(Modified Proctor)**

D1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

D2216 Laboratory Determination of Moisture content of Soil

D2487 Classification of Soils for Engineering Purposes

D2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D4318 Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils

C25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.

T88 Mechanical Analysis of Soils

1.4 QUALITY ASSURANCE

A. Independent testing laboratory approved by the Owner shall be retained to perform construction testing on backfilling operations as specified in Section 02200 and as stated herein. It shall be the responsibility of the Contractor to accurately establish locations for all utilities. Refer to the general contract conditions for clarification on the cost for this independent laboratory.

1.5 SUBMITTALS

A. Shop drawings or details pertaining to the work of this section are not required unless use of materials, methods or procedures contrary to Drawings or these specifications are proposed. Do not perform work until required shop drawings have been accepted by Owner.

B. The Contractor shall contact all utility companies and determine if additional easements will be required to complete the project. Contractor shall provide written confirmation of the status of all easements to the Owner's at the time of the preconstruction conference.

C. Submit a sample of each type of off-site fill material that is to be used in backfilling in an air-tight container of a size appropriate for the material for the testing laboratory or submit a gradation and certification of the aggregate material that is to be used to the testing laboratory for review.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of all subsurface utilities, structures and obstructions encountered.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate Material as specified in Section 02227.

B. Acceptive Stabilization Fabrics and Geogrids for some (but not all) uses.

1. Mirafi 500x or 600x
2. Phillips 66 Supac 6WS
3. Dupont Typar 3401 and 3601
4. Trevira S1114 and S1120
5. Tensar SS-1 and SS-2
6. Exxon GTF-200 or 350

7. Geogrids specifically shown on the Contract Drawings for some (but not all) uses.

C. Filter/Drainage Fabrics

1. Mirafi 140 NS

2. Phillips 66 Supac 4NP

3. Dupont Typar 3341

4. Fabric Types

D. When the Contract Drawings show a specific fabric or geogrid type, that material shall be used unless otherwise approved by the Engineer and Owner in writing.

PART 3 - EXECUTION

3.1 SUMMARY

A. Set all lines, elevations, and grades for utility and drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

B. Maintain in operating condition existing utilities, active utilities, and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.

C. Verify location, size, elevation, and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Contractor shall comply with local codes and regulations.

D. Over excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas are to be stabilized by using acceptable backfill material placed and compacted as specified, filter fabrics and/or additional bedding material.

E. Install dewatering systems that will be required to construct the proposed utilities in a manner that is described herein. Use proper sedimentation facilities to avoid turbid discharges.

3.2 EXCAVATION

A. The local utility companies shall be contacted before excavation shall begin. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding.

B. All trench excavation side walls greater than 5 feet in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

C. Perform excavation as indicated for specified depths. During excavation, stockpile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins, with a minimum setback of any surcharging materials or equipment of 2 feet from the top edge of trench.

D. Remove excavated materials not required or not suitable for backfill or embankments and waste as specified. Any structures discovered during excavation(s) shall be disposed of as specified.

E. Utilities placed in embankment areas shall be placed by the induced trench method wherein the embankment is formed first and the utility is trenched into the embankment. In such situations, the embankment shall have been formed to a height at least 24" above the crown of the pipe.

F. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

G. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.

H. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been

graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

I. Trench width requirements below the top of the pipe shall not be less than 12" nor more than 18" wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

J. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances unless otherwise shown on the Drawings:

1. Water Mains: 66" to top of pipe barrel or 6" below the frost line (established by the local building official), whichever is deeper except where insulation is shown on the drawings.

2. Sanitary Sewer: Depths, elevations, and grades as indicated on Drawings.

3. Storm Sewer: Depths, elevations, and grades as shown on Drawings.

4. Electrical Conduits: 29" minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or the local utility company requirements, whichever is deeper.

5. TV Conduits: 29" minimum to top of conduit or as required by the local utility company, whichever is deeper.

6. Telephone Conduits: 29" minimum to top of conduit, or as required by the local utility company, whichever is deeper.

7. Propane or Natrual Gas Mains and Service: 24" minimum to top of pipe, or as required by the local utility company, whichever is deeper.

8. Fire Alarm Conduit: 29" minimum to top of conduit, or as required by the local Fire Department, whichever is deeper.

K. Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen is required. Sheeting may be removed after sufficient backfilling to protect against damaging or injurious caving.

3.3 PIPE BEDDING

A. Accurately cut trenches for pipe or conduit that is installed to designated elevations and grades to line and grade from 6" below bottom of pipe and to width as specified. Place 6" of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel. After pipe installation, place select backfill and compact in maximum 6" layers measured loose to the top of the trench.

B. Place geotextile fabrics as specified on the plans and specifications.

3.4 BACKFILLING

A. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact, as specified, to properly correct condition in an acceptable manner.

B. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in 8" maximum loose lifts.

C. Backfill trenches to the contours and elevations shown on the plans with unfrozen materials.

D. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

3.5 COMPACTION

A. Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

B. Maintain optimum moisture content of fill materials to attain required in-place density.

C. An independent testing laboratory shall perform field density tests at intervals not exceeding 200'-0" of trench for the first and every other eight-inch (8") lift of compacted trench backfill and furnish copies of test results as specified. Compact to minimum density of 95% of maximum dry density as determined by ASTM D 1557.

D. All materials used for backfilling shall be tested in accordance with Section 02200.

3.6 ROCK EXCAVATION

See Section 02229 - Rock Removal

END OF SECTION

SECTION 02223

EXCAVATION, BACKFILLING, AND COMPACTING
FOR PAVEMENT AND GENERAL SITE GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduct site preparation in accordance with Section 02100.

B. Excavate to line, grade and configuration as shown in the plans and specifications for proposed pavements.

C. Fill to line, grade and configuration as shown in the plans and specifications for proposed pavements.

D. Compacting fill materials in acceptable manner as stated herein.

1.2 RELATED REQUIREMENTS

A. Section 02200 – Earthwork

B. Section 02227 - Aggregate Material

C. Section 02229 - Rock Removal

D. Section 02505 - Paving Base Course

E. Section 02511 - Asphaltic Concrete Paving

F. Section 02525 - Curbs and Sidewalks

G. Geotechnical Report for boring locations and findings of subsurface materials and conditions

H. Construction Drawings

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition:

D422 Method for Particle and Size Analysis of Soils

D1556 Test for Density of soil in Place by the Sand Cone Method

D1557 Test for Moisture-Density Relations of Soils using 10-lb (4.5 kg) Rammer and 18-inch (457 mm) Drop (**Modified Proctor)**

D1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

D2167 Test for Density of Soil in Place by the Rubber Balloon Method

D2216 Laboratory Determination of Moisture content of Soil

D2487 Classification of Soils for Engineering Purposes

D2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D4318 Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils

C25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime

C110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method

C618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

C977 Quicklime and Hydrated Lime for Soil Stabilization

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.

T88 Mechanical Analysis of Soils

1.4 QUALITY ASSURANCE

A. Independent Testing Laboratory selected and paid by Contractor and approved by the Owner shall be retained to perform construction testing on filling operations and subgrade analysis as specified in Section 02200 and as stated herein.

1.5 SUBMITTALS

A. Shop drawings or details pertaining to excavating and filling for pavement are not required unless otherwise shown on the drawings or specifications or if contrary procedures to the project documents are proposed.

B. Submit a sample of each type of off-site fill material that is to be used in backfilling in an air-tight, 10 lb. container for the testing laboratory or submit a gradation and certification of the aggregate material that is to be used to the testing laboratory for review.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill material from on-site as specified in Section 02200 and approved by the owner or owner's representative.

B. Fill material from off-site as specified in Section 02200 and approved by the owner or owner's representative.

C. Aggregate material as specified in Section 02227.

D. Acceptable stabilization fabrics and Geogrids for some (but not all) uses.

1. Mirafi 500x or 600x
2. Phillips 66 Supac 6WS
3. Dupont Typar 3401 and 3601
4. Trevira S1114 and S1120
5. Tensar SS-1 and SS-2

6. Exxon GTF-200 or 350

7. Geogrids specifically shown on the Contract Drawings

E. Filter/Drainage Fabrics for some (but not all) uses.

1. Mirafi 140NS

2. Phillips 66 Supac 4NP

3. Dupont Typar 3341

4. Fabric Types

F. When the Contract Drawings show a specific fabric or geogrid type, that material shall be used unless otherwise approved by the Engineer and Owner in writing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify all lines, elevations and grades necessary to construct pavements, curb and gutter, bases, walkways and roadways as shown in the plans and specifications.

B. Carefully protect benchmarks, property corners, monuments or other reference points.

C. Locate and identify all site utilities that have previously been installed and may be in danger of damage by grading operations.

D. Locate and identify all existing utilities that are to remain and protect them from damage.

E. Over excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas are to be stabilized by using acceptable backfill materials placed and compacted as specified, filter fabrics and/or additional aggregate material.

3.2 EXCAVATION

A. Excavate roadway and pavement areas to line and grade as shown in the plans and specifications.

B. Engage all suitable materials into the project fill areas as specified in Section 02200.

C. Unsuitable excavated material is to be disposed of in a manner and location that is acceptable to the owner and the local governing agencies.

D. Perform excavation using capable, well maintained equipment and methods acceptable to the owner and the project document requirements.

3.3 FILLING

A. Stumps shall be removed in all parking lot areas and hardscape areas where the stumps are located within 4 feet of final grade. Topsoil, organic soils, and other unsuitable materials shall be stripped in all pavement areas to expose native soils of bedrock.

B. Construction dewatering shall begin as early as is practicable during site grading work to keep onsite soils as well drained as possible. Effective dewatering and surface runoff control shall be accomplished with a network of drains, swales, and sumps.

C. Dry subgrades in fill areas after grubbing and stripping that consist of granular soil shall be proofrolled with at least four passes of a minimum of 10,000 pound static weight roller and covered with a 12" layer of compacted Granular Fill, except as noted above, as early as practicable. The fill will provide a working mat to protect the subgrade from disturbance. Soft areas identified during proofrolling or under subsequent traffic prior to subsequent filling activities shall be excavated and replaced with compacted Granular Fill.

D. Where excavations encounter wet or naturally deposited clay soils, the work shall proceed carefully in a manner that avoids subgrade disturbance including: using smooth-edged cutting buckets when making excavations within one foot of the final subgrade elevation, and placement of the Subbase Course (pavement areas) as soon as practicable to protect the subgrade from disturbance. Naturally deposited clays shall not be proofrolled; the Geotechnical Engineer shall examine exposed clay subgrades to verify strength and bearing capacity prior to placement of fill material. In fill areas, the initial lift of fill on wet, natural subgrades should consist of 12 inches of Granular Fill or Crushed Stone.

Fill materials and/or subgrade materials that become contaminated with fines during construction shall be replaced with the appropriate clean materials immediately prior to placing overlying Subbase course, Base course, or engineered fill material.

E. To aid in maintaining stable cut and fill slope conditions, surface water runoff shall be diverted away from the top of slopes. Likewise, surface runoff shall be diverted away from footing excavations and floor slab excavations.

F. Any fill materials that become wet or disturbed before the overlying lift of fill can be placed (e.g., due to a rainstorm during the work day, overnight, or over a weekend) shall be proofrolled, recompacted and/or excavated and replaced with drier fill.

G. All fills consisting of on-site natural stiff olive-brown marine clays shall be placed at moisture contents no wetter than 3 or 4 percent of optimum in accordance with the criteria summarized below and Note 1. The maximum dry density of each fill material used should be determined in accordance with ASTM D-1557 (Modified Proctor):

1. Pavement base	Base Course Fill	6	95
2. Pavement subbase	Subbase Course Fill	8	95
3. General pavement subgrade fills	Engineered Fill Section or Granular Fill	8	92
4. General site fills	Engineered Fill Section, Granular Fill, or Common Borrow Fill	12	92

(1) Use of Onsite clay borrow shall not be allowed

3.4 COMPACTION

A Maintain optimum moisture content of fill materials to attain required compaction density.

B. All material shall be tested in accordance with Section 02200.

C. An Independent Testing Laboratory selected and paid by the Contractor and approved by the Owner shall be retained to perform testing on-site.

D. Compaction test will be as specified in Section 02200 together with the following for paving areas:

1. In cut areas not less than one compaction test for every 20,000 square feet unless directed otherwise by Geotechnical Engineer.

2. In fill areas, same rate of testing for each 12" lift (measured loose).

E. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to owner.

3.5 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to be disturbed or to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, true to grade and cross section.

3.6 FINISH GRADING

A. Finish grading shall be in accordance with Section 02200 and as more specifically stated herein.

B. Grading of paving areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Tolerances of 0.10 feet, more or less, will be permitted, provided drainage regime is maintained. Contractor to provide engineering and field staking necessary for verification of lines, grades, and elevations.

C. All other areas shall be graded to achieve drainage. Tolerances shall be 0.16 foot, provided drainage flow rates are maintained.

3.7 ROCK EXCAVATION

See Section 02229 - Rock Removal.

END OF SECTION

SECTION 02227

AGGREGATE MATERIAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aggregate Materials

1.2 RELATED SECTIONS

A. Section 02050 - Demolition

B. Section 02100 - Site Preparation

C. Section 02200 - Earthwork

D. Section 02221 - Excavation, Backfilling and Compacting for Structures

E. Section 02222 - Excavation, Backfilling and Compacting for Utilities

F. Section 02223 - Excavation, Backfilling and Compacting for Pavement

G Section 02270 - Slope Protection and Erosion Control

H. Construction Drawings

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM): latest edition ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Course Aggregates. ANSI/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.

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

ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

ASTM D2487 - Classification of Soils for Engineering Purposes.

ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

ASTM D4318 - Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition. AASHTO T180 - Moisture-Density Relations of Soils Using A 10 lb (4.54 Kg) Rammer and an 18 inch (457 mm) Drop.

AASHTO M147 - Materials for Aggregate and Soil Aggregate.

1.4 QUALITY ASSURANCE

A. Test and analysis of aggregate material will be preformed in accordance with standard ASTM and AASHTO procedures listed herein.

1.5 SUBMITTALS

A. Submit in air tight containers a 10 pound sample of each aggregate or mixture that is to be incorporated into the project to the testing laboratory designated by the Owner.

B. Submit the names of each material supplier and specific type and source of each material. Any changes in source throughout the job require approval of the Owner or Engineer.

C. Submit materials certificate to on-site Independent Testing Laboratory which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All construction and materials shall meet or exceed the requirements of this section and any state highway department specification section referred to or noted on the

drawings which pertain to paving base course design, materials, preparation, and/or execution. All materials shall be as indicated on Drawings and shall comply with applicable state highway specification regarding source, quality, gradation, liquid, limit, plasticity index, and mix proportioning.

B. The following tables serve as a guide for the gradation of the various aggregate materials. Local availability and variances with each States requirements may change the gradations and parameters of these materials. The Contractor shall indicate when submitting material test results what the various applications will be.

	Percentage By Weight Passing A Square Mesh Sieve												
	Inch Sizes								**Numbered Sieves**				
Material Description	**6**	**3**	**2**	**1**	**3/4**	**1/2**	**3/8**	**1/4**	**No 4**	**No 10**	**No 40**	**No. 100**	**No. 200**
Aggregate Base**	--	--	100	--	--	45-70	--	30-55	--	--	0-20	--	0-5
Granular Borrow*	--	--	--	--	--	--	--	--	--	--	0-70	--	0-20
Common Borrow	--	PER MDOT 703.18											
Select Backfill for pipes	--	--	--	--	--	--	85-100	--	--	--	0-5	--	--
Riprap Bedding Material & Structural Fill	--	100	--	--	--	--	--	25-70	--	--	0-30	--	0-7
Pipe Bedding / Crushed Stone/ Drainage Stone	--	--	--	100	90-100	--		25-90			0-30	--	0-5
Subbase Course Gravel***	--	100	--	--	--	--	--	25-70	--	--	0-30	---	0-5
Granular Fill (1)	100	100						30-80			10-50		0-8

* The maximum stone size shall be limited to 3 inches within two feet of walls, piers, footings and floor slabs; and 6 inch maximum stone size elsewhere.

** Aggregate base course shall not contain particles of rock which will not pass the 2 inch square mesh sieve.

*** Aggregate subbase course shall not contain particles of rock which are larger than 4 inches.

(1) Cobbles or boulders having a size exceeding 2/3 of the loose lift thickness should be removed prior to compaction.

PART 3 - EXECUTION

3.1 STOCKPILING

A. Stockpile on-site at locations indicated by the owner in such a manner that there will be no standing water or mixing with other materials.

3.2 BORROW SITES

A. Upon completion of borrow operations, clean up borrow areas as indicated on the plans and in neat and reasonable manner to the satisfaction of the property Owner or the Engineer.

3.3 TRANSPORTATION

A. Off-site materials shall be transported to the project using well maintained and operating vehicles. Once on the job site, all transporting vehicles shall stay on designated haul roads and shall at no time endanger any of the improvements by rutting, overloading or pumping the haul road.

END OF SECTION

SECTION 02229

ROCK REMOVAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of identified and discovered rock during excavation.

B. Use of Explosives to assist rock removal.

C. Incorporating removed rock into fills and embankments.

1.2 RELATED SECTIONS

A. Section 02200 – Earthwork

B. Section 02221 – Excavation, Backfilling and Compacting for Structures

C. Section 02222 - Excavation, Backfilling and Compacting for Utilities

D Section 02223 – Excavation, Backfilling and Compaction for Pavement

E. Geotechnical Report for boring locations and findings of subsurface materials and conditions

F. Construction Drawings

1.3 REFERENCE STANDARDS

NFPA 495 - Code for Explosive Materials

1.4 ENVIRONMENTAL REQUIREMENTS

A. Determine all environmental effects associated with proposed work and safeguard those concerns as regulated by law and all others by reasonable and practiced methods.

1.5 JOB CONDITIONS

A. Rock is not anticipated on the project site. If rock is encountered, the removal will be accomplished by change order.

1.6 QUALIFICATIONS

A. Contractor to remove rock by blasting shall submit records of documented experience to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Explosives, delay device and blast mat materials shall be the type recommended by the explosive firm that will comply with the requirements of this section.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify site conditions and note subsurface conditions affecting work of this section. The Contractor shall follow all procedures required by the City of Portland at no additional expense to the owner.

B. Identify required lines, levels, and elevations that will determine the extent of the proposed removals.

C. Conduct a pre-blast survey in accordance with the following requirements.

1. The Contractor shall conduct a Pre-Blast Survey of all structures within the Blasting Area and provide the Owner, and the City of Portland a written report of the Pre-Blast Survey and Blasting Plan. The Pre-blast Survey shall be filed, reviewed, and approved by the Owner and the City of Portland. This survey should include:

- All structures within a minimum distance of 500 feet from any blasting activity. The area extending beyond the 500 feet minimum shall be determined by the Contractor. This distance shall be confirmed after consultation of the General Contractor, Site Contractor, Blasting Contractor and Insurance Companies.

- A blasting plan which addresses:

  - Airblast limits
  - Ground vibrations
  - Maximum peak particle velocity

- The blasting plan shall meet criteria established in Chapter 3 (Control of Adverse Effects) in the Blasting Guidance Manual of the United States Dept. of the Interior.

- Provisions and measures to monitor and assure compliance with the blasting plan.

2. The Contractor shall provide the Engineer with a Blasting Log for the work. The Blasting Log shall contain the following information:

   - Location
   - Time and Date
   - Number of Holes
   - Amount and type of explosive used per hole
   - The names of persons, companies, corporations, or public utilities contacted, owning, leasing, or occupying property or structures in proximity to the site of the work of the Contractor's intention to use explosives.

3. Drilling equipment will be equipped with suitable dust control apparatus which must be kept in repair and used during all drilling operations.

   A copy of the City of Portland approvals of the pre-blast survey and blasting plan obtained by the Contractor shall be submitted to the Owner prior to blasting.

3.2 ROCK EXCAVATION

A. Rock Excavation - definition - Igneous, metamorphic or sedimentary rock that cannot be removed by rippers or other mechanical methods and, therefore, requires drilling and blasting. Cut rock to form level bearing at bottom of trench. In the utility trenches, excavate to 6" below invert elevation of pipe. This excludes pavement, concrete, and boulders less than 3 cubic yards.

Reuse excavated materials on-site in accordance with Section 02200, if applicable.

B. Comply with all laws, rules, and regulations of Federal, State and local authorities and insurer which govern storage, use, manufacture, sale, handling, transportation, licensing, or other disposition of explosives. Take special precautions for proper use of explosives to prevent harm to human life and damage to surface structures, all utility lines, or other subsurface structures.

Do not conduct blasting operations until persons in vicinity have had ample notice and have reached positions of safety.

All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., of the "Construction Safety Rules and Regulations," ***as adopted by the State Board of Construction Safety, Augusta, Maine, and Maine Department of Transportation*** "Standard Specifications" Section 107.12, Use of Explosives. Blasting through the over burden will not be allowed.

C. Contractor shall save harmless owner, architect, and owner's representative from any claim growing out of use of such explosives. Removal of materials of any nature by blasting shall be done in such manner and such time as to avoid damage affecting integrity of design and to avoid damage to any new or existing structure included in or adjacent to work. It shall be the contractor's responsibility to determine method of operation to ensure desired results and integrity of completed work.

D. Perform rock excavation in a manner that will produce material of such size as to permit it being placed in embankments in accordance with Section 02200. Remove rock to limits as indicated. Remove loose or shattered rock, overhanging ledges and boulders which might dislodge.

E. When during the process of excavation, rock is encountered, such material shall be uncovered and exposed. Remove as much weathered rock as possible with conventional excavating equipment. Notify the Architect before proceeding with any excavating, blasting or removal of materials which might be claimed as rock. The Contractor shall not proceed with the removal of the material claimed as rock until the material has been classified by the Architect.

Failure to uncover such material or notify the Architect to take cross sections prior to any excavation shall forfeit the Contractor's claim for ledge removal.

The Contractor shall employ and pay for an approved registered civil engineer or land surveyor acceptable to the Architect to take cross sections of rock before removal of same and to provide computations of cross sections within the limit lines of the excavation. No material claimed as rock shall be excavated, blasted or removed until the following procedures have been performed:

Contractor shall quantify rock excavation and provide Architect with sections and profiles for review.

Architect shall provide to the Contractor a letter of authorization to proceed with the excavation of material claimed as rock. The letter shall indicate the agreed upon quantity of rock and the price for the entire process of excavation, hauling and disposal.

Blasting operations shall be accomplished in compliance with the "Blasting" clause of the Supplemental General Conditions. Rock shall be trimmed so that none protrudes within 6 inches of all utilities when said utilities are installed to correct line and grade.

F. Definition of Rock Removal Classifications

Rock excavation shall be classified as either open or trench. Trench rock shall be excavation classified as rock where the pay width is 5'-0" or less. Trench rock includes certain rock removal for footings. All other excavation classified as rock shall be considered open rock. Rock shall be classified as open rock in the upper zones above trenches when applicable.

G. No additional payment will be made for ledge encountered during the course of work.

H. VACANT.

I. Rock excavation for structures shall be measured by cross sectioning the ledge surface. The depth shall be between the sectioned surface and the bottom of the concrete or gravel base, if called for. The horizontal limits shall be twelve (12) inches beyond the concrete lines unless otherwise noted on the Contract Drawings. All overblast not specifically required by the Contract or over-excavation shall be at the Contractor's expense. Any sections over-excavated shall be brought to grade with materials which comply with the geotechnical report.

J. Rock excavation for roadways or pond areas shall be measured and computed using the average end area method.

K. Provisions for Blasting

Blasting shall be performed only after approval has been given by the Owner for such operations and must comply with the following provisions:

1. *The Contractor or any subcontractor shall use sufficient stemming, matting or natural protective cover to prevent flyrock from leaving property owned or under control of the owner or operator or from entering protected natural resources or natural buffer strips. Crushed rock or other suitable material must*

be used for stemming when available; native gravel, drill cuttings or other material may be used for stemming only if no other suitable material is available.

2. *The maximum allowable airblast at any inhabited building not owned or controlled by the developer may not exceed 129 decibels peak when measured by an instrument having a flat response (+ or – 3 decibels) over the range of 5 to 200 hertz.*

3. *The maximum allowable airblast at an uninhabited building not owned or controlled by the developer may not exceed 140 decibels peak when measured by an instrument having a flat response (+ or – 3 decibels) over the range of 5 to 200 hertz.*

4. *Monitoring of airblast levels is required in all cases for which a preblast survey is required by paragraph F. The Contractor may file a request with the Owner to waive the monitoring requirement if the Contractor or subcontractor secures the permission of affected property owners to increase allowable airblast levels on their property and the Owner determines that no protected natural resource will be adversely affected by the increased airblast levels.*

5. *If a blast is to be initiated by detonating cord, the detonating cord must be covered by crushed rock or other suitable cover to reduce noise and concussion effects.*

6. *A preblast survey is required and must extend a minimum radius of 2,000 feet from the blast site. The preblast survey must document any preexisting damage to structures and buildings and any other physical features within the survey radius that could reasonably be affected by blasting. Assessment of features such as pipes, cables, transmission lines and wells and other water supply systems must be limited to surface conditions and other readily available data, such as well yield and water quality. The preblast survey must be conducted prior to the initiation of blasting at the operation. The Contractor or subcontractor shall retain a copy of all preblast surveys for at least one year from the date of the last blast on the development site.*

   (a) *The Contractor or the subcontractor is not required to conduct a preblast survey on properties for which the owner or operator documents the rejection of an offer by registered letter, return receipt requested, to conduct a preblast survey. Any person owning a building within a preblast survey radius may voluntarily waive the right to a survey.*

7. *Blasting may not occur in the period between sundown and sunrise the following day or in the period 7:00 p.m. and 7:00 a.m., whichever is greater. Routine production blasting is not allowed in the daytime on Sunday. Detonation of misfires may occur outside of these times but must be reported to the department within 5 business days of the misfire detonation. Blasting may not occur more frequently than 4 times per day. Underground production blasting may be exempted from these requirements provided that a waiver is granted by the department.*

8. *Sound from blasting may not exceed the following limits at any protected location:*

Number of Blasts Per Day	*Sound Level Limit*
1	*129 dbl*
2	*126 dbl*
3	*124 dbl*
4	*123 dbl*

9. *The maximum peak particle velocity at inhabitable structures not owned or controlled by the developer may not exceed the levels established in Table 1 in paragraph J and the graph published by the United States Department of the Interior in "Bureau of Mines Report of Investigations 8507," Appendix B, Figure B-1.*

10. *Table 1 of this paragraph or the graph published by the United States Department of the Interior in "Bureau of Mines Report of Investigations 8507", Appendix B. Figure B-1 must be used to evaluate ground vibration effects for those blasts for which a preblast survey is required.*

    (a) Either Table 1 of this paragraph or graph published by the United States Department of the Interior in "Bureau of Mines report of Investigations 8507", Appendix B, Figure B-1 may be used to evaluate ground vibration when blasting is to be monitored by seismic instrumentation.

    (b) Blasting measured in accordance with Table 1 of this paragraph must be conducted so that the peak particle velocity of any one of the 3 mutually perpendicular components of motion does not exceed the ground vibration limits at the distances specified in Table 1 of this paragraph.

    (c) Seismic instruments that monitor blasting in accordance with Table 1 of this paragraph must have the instrument's transducer firmly coupled to the ground.

(d) An owner or operator using Table 1 of this paragraph must use the scaled-distance equation, $W=(D/D_s)^2$, to determine the allowable charge weight of explosives to be detonated in any 8 millisecond or greater delay period without seismic monitoring, where W is equal to the maximum weight of explosives, in pounds, and D and Ds are defined as in Table 1 of this paragraph.

(e) Blasting monitored in accordance with the graph published by the United States Department of the Interior in "Bureau of Mines Report of Investigations 8507", Appendix B, Figure B-1 must be conducted so that the continuously variable particle velocity criteria are not exceeded.

11. A record of each blast, including seismographic data, must be kept for at least one year from the date of the last blast, must be available for inspection at the development or at the offices of the owner or operator if the development has been closed, completed or abandoned before the one-year limit has passed and must contain at a minimum the following data:

(a) Name of blasting company or blasting contractor;

(b) Location, date and time of blast;

(c) Name, signature and social security number of blaster;

(d) Type of material blasted;

(e) Number and spacing of holes and depth of burden or stemming;

(f) Diameter and depth of holes;

(g) Type of explosives used;

(h) Total amount of explosives used;

(i) Maximum amount of explosives used per delay period of 8 milliseconds or greater;

(j) Maximum number of holes per delay period of 8 milliseconds or greater;

(k) Method of firing and type of circuit;

(l) Direction and distance in feet to the nearest dwelling, public building, school, church or commercial or institutional building neither owned nor controller by the developer;

(m) Weather conditions, including such factors as wind direction and cloud cover;

(n) Height or length of stemming;

(o) Amount of mats or other protection used;

(p) Type of detonators used and delay periods used;

(q) The exact location of each seismograph and the distance of each seismograph from the blast;

(r) Seismographic readings;

(s) Name and signature of the person operating each seismograph; and

(t) Names of the person and the firm analyzing the seismographic data.

12. All field seismographs must record the full analog wave form of each of the 3 mutually perpendicular components of motion in terms of particle velocity. All seismographs must be capable of sensor check and must be calibrated according to the manufacturer's recommendations.

END OF SECTION

SECTION 02230

SUBBASE AND BASE GRAVEL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Granular Base and Subbase (also referred to as base and subbase aggregates or base and subbase gravels).

1.2 RELATED REQUIREMENTS

A. Section 02100 - Site Preparation

B. Section 02200 - Earthwork

C. Section 02227 - Aggregate Materials

D. Section 02511 - Asphaltic Concrete Paving

E. Section 02525 - Curbs and Sidewalks

F. Geotechnical Report

1.3 REFERENCES

A. ANSI/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.

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

C. ASTM D2167 - Test for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

D. ASTM D1556 - Test Method for Density of Soil in-place by the Sand-Cone Method.

E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) Method B (Direct Transmission).

F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Submit materials certificate to on-site independent testing laboratory which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein. Materials shall comply with the gradations specified in Section 02227, Aggregate Material.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 CONSTRUCTION

A. Perform base and subbase course construction in a manner that will drain surface properly at all times and at same time prevent runoff from adjacent areas from draining onto base course or subbase construction.

B. Compact base material to not less than 95% of maximum density as determined by ASTM D-1557 unless otherwise indicated on the Drawings.

C. Granular Subbase: Construct to thickness indicated on Drawings; apply in lifts or layers not exceeding 8", measured loose.

D. Granular Base: Construct to thickness indicated on Drawings. Apply in lifts or layers not exceeding 6" measured loose.

E. All work of this section shall conform to the requirements of Sections 304 of the Maine Department of Transportation Specification, latest revision, for furnishing, placing, and surface tolerance of aggregate base and subbase courses.

3.3 FIELD QUALITY CONTROL

A. An Independent Testing Laboratory, retained by the Owner, shall perform construction testing of in-place base courses for compliance with requirements for gradation and density. The Contractor shall retain an independent surveyor to verify paving base course tolerances (by rod and level readings on no more than fifty-foot centers) to +0.05' of design elevation that allow for paving thickness as shown in the Drawings. Contractor shall provide instruments and a suitable benchmark and perform all survey. The Contractor may, at his option, retain his own test laboratory for quality control, production schedules, or for any other reason at no cost to the Owner.

B. The following tests shall be performed on each type of material used as base and subbase course material:

1. Moisture and Density Relationship: ASTM D 1557

2. Mechanical Analysis: AASHTO T-88

3. Plasticity Index: ASTM D-4318-84

4. Base and subbase material thickness: Perform one test for each 20,000 square feet in-place base material area.

5. Base and subbase material compaction: Perform one test in each lift for each 20,000 square feet in-place base material area.

6. Test each source of base material for compliance with applicable state highway specifications.

C. Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements:

1. Sand-Cone Method:ASTM D1556

2. Balloon Method: ASTM D2167

3. Nuclear Method: ASTM D2922, Method B (Direct Transmission).

D. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner and Contractor shall be provided with copies of reports within 96 hours of time test was performed. In event that any test performed fails to meet these Specifications, the Owner and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves right to

employ a separate testing laboratory and to direct any testing that is deemed by them to be necessary. Contractor shall provide free access to site for testing activities.

E. Any base or subbase courses which become contaminated due to weather, erosion, or other activities, whether or not such contamination is under the control of the Contractor shall be removed and replaced. Said removal and replacement shall be incidental to the work and no additional payment will be made to the Contractor.

END OF SECTION

SECTION 02240

DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes construction dewatering.

1.2 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations, to permit construction to proceed on stable subgrades and to restrict the flow of surface water into the excavation.

1.3 SUBMITTALS

A. Shop Drawings for Information: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of headers and discharge lines; and means of discharge and disposal of water, piles, slurry walls, or other formal dewatering systems.

1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction.

B. Comply with all OSHA and other safety regulations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

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

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.

2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, DIRTBAGS and other flow-control devices as required by authorities having jurisdiction and to avoid the transport of sediment laden runoff.

F. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION

SECTION 02242

CONCRETE MODULAR RETAINING WALL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work includes designing furnishing and installing modular block retaining wall units, geogrid reinforcement if required by the manufacturer, wall fill and backfill to the lines and grades designated on the construction drawings and as specified herein.

B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit fill and backfill to the lines and grades designated on the construction drawings.

C. Furnishing and installing all appurtenant materials required for construction of the geogrid reinforced soil retaining wall as shown on the construction drawings.

1.2 RELATED SECTIONS

A. SECTION 02200 – EARTHWORK (Includes Riprap)

B. SECTION 02720 – STORM SEWER SYSTEMS

1.3 REFERENCE STANDARDS

A. The following most current publications form part of the specification to the extent indicated by references thereto and shall be followed for all construction testing:

ASTM C90 – 85 Hollow Load Bearing Masonry Units
ASTM C140 – 75 Sampling and Testing Concrete Masonry Units
ASTM C145 – 85 Solid Load Bearing Concrete Masonry Units

1.4 DELIVERY, STORAGE AND HANDLING

A. Contractor shall check the materials upon delivery to assure that proper material has been received.

B. Geogrids shall be stored above –20 Degrees F.

C. Contractor shall prevent excessive mud, wet cement, epoxy, and like materials which may affix themselves, from coming in contact with the materials.

D. Contractor shall protect the material from damage. Damaged material shall not be incorporated into the retaining wall structure.

E. Rolled geogrid material may be laid flat or stood on end for storage.

1.5 SUBMITTALS

A. Samples of all products used in the work of this section. Available colors and texture shall be provided to the Owner for selection.

B. Latest edition of manufacturer's specifications for proposed materials, method of installation and list of material proposed for use.

C. The design of all walls shall be stamped by a qualified vendor representative or registered professional engineer. All walls shall be designed for highway surcharge. The design shall be presented as a submittal for review by the owner and shall include the following items:

1. Assumed naturally-deposited soil and backfill physical and strength properties.

2. Local stability calculations, including calculated safety factors against sliding and overturning failure.

1.6 QUALITY ASSURANCE

A. Soil testing and inspection services for quality control testing during earthwork operation will be supplied by the independent test laboratory retained by the Contractor and approved by the Owner. Refer to general contract provisions for clarification on who pays for the independent test site.

B. Qualifications – The Owner's approval of the system and the supplier will be based upon the following considerations:

1. The geogrid reinforcement if required, drainage details, and erosion control system for the system have each been reviewed and approved for use.

2. The supplier has a large enough operation and the necessary experience to supply and support the construction on a timely basis.

3. Past experience in the design and construction of at least 10 projects of a similar magnitude of the proposed system shall be documented.

C. The design shall be signed by a qualified professional or registered Professional Engineer who shall demonstrate a minimum Errors and Omissions insurance coverage of $1,000,000 by furnishing the owner with a current certificate of insurance.

D. Pre-Construction Conference – Prior to the installation of the wall material, the Contractor shall arrange a meeting at the site with the material supplier and, where applicable, the geogrid installer. The Owner shall be notified at least 3 days in advance of the time of the meeting. The representative of the wall supplier shall be available on an "as-needed" basis during construction.

PART 2 - PRODUCTS

2.1 CONCRETE UNITS

A. Masonry units shall be Retaining Wall Units designed to create a modular block wall.

B. Concrete retaining wall units shall have a minimum net 28-day compressive strength of 3,000 psi. The concrete shall have a maximum moisture absorption of 6 to 8 lbs/ft.$^{3.}$

C. Exterior dimensions may vary in accordance with ASTM C90-85. Standard and Compac units shall have a minimum of 1 square foot face area each. Mini units shall have a minimum ½ square foot face area each.

D. Units shall have angled sides capable of concave and convex alignment curves with a minimum radius of 10 feet. NOTE: Where applicable, for straight walls use non-angled straight side cap units.

E. Units shall be interlocked with non-corrosive fiberglass pins.

F. Units shall be interlocked as to provide a 4.4 degree setback per each course of wall height.

2.2 GEOGRID

A. Geogrid to be used as soil reinforcement shall be TENSAR UX1100 or approved equal.

2.3 FIBERGLASS CONNECTING PINS

A. Connecting pins shall be ½ inch diameter thermoset isopthalic polyester resin/pultruded fiberglass reinforcement rods.

B. Pins shall have a minimum flexural strength of 128,000 psi and short beam shear of 6400 psi.

2.4 BASE LEVELING PAD MATERIALS

A. Material shall consist of compacted granular fill, ¾" crushed stone, and underdrains as shown on the construction drawings. The compacted leveling pad shall be a minimum 12 inches thick for each layer (compacted granular fill and crushed stone).

2.5 UNIT FILL

A. Fill for units and within the geogrid behind the units shall be compacted granular fill.

2.6 BACKFILL

A. Material shall be compacted granular fill as approved by the Engineer.

B. Where additional fill is required, Contractor shall submit sample and specifications to the Engineer to determine if acceptable.

C. Backfill zone shall extend to encapsulate all Geogrids.

2.7 FILTER FABRIC

A. Filter fabric shall be installed as shown on the plans and shall meet the requirements of Section 02200 of these Specifications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Contractor shall excavate to the lines and grades shown on the construction drawings. Over excavation shall not be paid for and replacement with compacted fill and/or wall system components will be required at contractor expense. Contractor shall be careful not to disturb embankment materials beyond lines shown.

3.2 FOUNDATION SOIL PREPARATION

A. Foundation soil shall be excavated as required for footing dimensions shown on the construction drawings or as directed by the Engineer.

B. Foundation soil shall be examined by the Engineer to assure that the actual foundation soil strength meets or exceeds assumed design strength. Soils not meeting required strength shall be removed and replaced with acceptable material.

C. Over-excavated areas shall be filled with approved compacted granular fill backfill material.

D. Foundation shall be proofrolled prior to fill and geogrid placement.

3.3 BASE LEVELING PAD

A. Leveling pad materials shall be placed as shown on the construction drawings, upon undisturbed in-situ soil.

B. Material shall be compacted so as to provide a level hard surface on which to place the first course of units. Compaction shall be to 95% of modified proctor.

C. Leveling pad shall be prepared to insure complete contact of retaining wall unit with base.

D. Leveling pad materials shall be to the depths and widths shown.

3.4 UNIT INSTALLATION

A. First course of concrete wall units shall be placed on the base leveling pad. The units shall be checked for level and alignment. The first course is the most important to ensure accurate and acceptable results.

B. Ensure that units are in full contact with base.

C. Units are placed side by side for full length of wall alignment. Alignment may be done by means of a string line or offset from base line.

D. Install fiberglass connecting pins and fill all voids at units with unit fill material. Tamp fill.

E. Sweep all excess material from top of units and install next course. Ensure each course is completely unit filled backfilled and compacted prior to proceeding to next course.

F. Lay up each course insuring that pins protrude into adjoining courses above a minimum of one inch. Two pins are required per unit. Pull each unit forward, away from the embankment, against pins in the previous course and backfill as the course is completed. Repeat procedure to the extent of wall height.

G. The top two courses of wall units below the cap shall also have an adhesive or epoxy to provide a permanent bond of the upper blocks.

H. As appropriate where the wall changes elevation, units can be stepped with grade or turned into the embankment with a convex return end. Provide appropriate buried units on compacted leveling pad in area of convex return end.

3.5 CAP INSTALLATION

A. Place Modular Block Cap units over projecting pins from units below. Pull forward to set back position. Back fill and compact to finished grade.

B. As required, provide permanent mechanical connection to wall units with construction adhesive or epoxy. Apply adhesive or epoxy bottom surface of cap units and install on units below.

3.6 GEOGRID INSTALLATION

A. The geogrid soil reinforcement shall be laid horizontally on compacted backfill. Connect to the concrete wall units by hooding geogrid over fiberglass pins. Pull taut, and anchor before backfill is placed on the geogrid.

B. Slack in the geogrid at the wall unit connections shall be removed.

C. Geogrid shall be laid at the proper elevation and orientation as shown on the construction drawings or as directed by the Engineer.

D. Correct orientation (roll direction) of the geogrid shall be verified by the contractor.

E. To pretension geogrid, pull pinned geogrid taut to eliminate loose folds. Stake or secure back edge of geogrid prior to and during backfill and compaction.

F. Follow manufacturer's guideline relative to overlap requirement of uniaxial and biaxial geogrids.

3.7 FILL PLACEMENT

A. Backfill material shall be placed in 8 inch lifts and compacted to 95% of Modified Proctor.

B. Backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack or loss of pretension of the geogrid.

C. Only hand-operated compaction equipment shall be allowed within 3 feet of the back surface of the Modular Block units.

D. Backfill shall be placed from the wall rearward into the embankment to ensure that the geogrid remains taut.

E. Tracked construction equipment shall not be operated directly on the geogrid. A minimum backfill thickness of 6 inches is required prior to operation of tracked vehicles over geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

F. Rubber-tired equipment may pass over the geogrid reinforcement at slow speeds, less than 10 MPH. Sudden braking and sharp turning shall be avoided.

G. Fill placed one foot behind the geogrid units shall be wrapped in filter fabric as shown on the plans. A 6" overlap of the filter fabric shall be provided at the top of each layer of stone backfill.

H. The fill placement shall be coordinated with the installation of handrails, fences, or guiderails.

END OF SECTION

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Temporary and permanent erosion control systems.

B. Slope Protection Systems.

1.2 RELATED SECTIONS

A. Section 02000 – Local Permit

B. Section 02100 - Site Preparation

C. Section 02200 - Earthwork

D. Construction Requirements

1.3 ENVIRONMENTAL REQUIREMENTS

A. The Contractor shall protect adjacent properties and water resources from erosion and sediment damage throughout the life of the contract in accordance with the Erosion and Sediment Control plan, details and notes prepared for this project.

B. The general contractor will be required to designate, by name, a Registered Professional Engineer or equivalent person responsible for implementation of all erosion control measures. Specific responsibilities will include:

1. Assuring and certifying the contractor's construction sequence is in conformance with the specified schedule. In addition, a weekly certification stating compliance, any deviations, and corrective measures shall be filed with the owner by this person. A copy of the certification form is contained the Erosion and Sedimentation Control Report which is appended to this Specification Section.

2. Inspection of the project work site on a weekly basis, with the installation of added erosion control measures in areas which appear vulnerable to erosion.

3. Inspection of all erosion control measures and drainage inlets after any significant rainfall. Accumulated silt/sediment should be removed when the depth of sediment reaches 50 percent of the barrier height. Accumulated silt/sediment should be removed from behind silt fencing when the depth of the sediment reaches 6 inches. A significant rainfall shall be defined as over ½ inch of precipitation in any consecutive 24-hour period.

4. Inspect areas for catch of grass. A minimum catch of 90 percent is required prior to removal of erosion control measures.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Quick growing grasses for temporary seeding.

B. Hay or straw bales.

C. Fencing for siltation control as specified on the plans.

D. Erosion Control blankets with wood excelsior constrained in a photodegradable ***net*** or natural fibers sewn together with cotton thread.

E. Bale stakes shall be a minimum of 4 feet in length and 1" in width.

F. Temporary mulches such as loose hay, straw, netting, wood cellulose or agricultural siltage.

G. Fence stakes shall be metal stakes a minimum of 8 feet in length.

H. Stone check dams shall be spaced according to the Erosion Control Detail Plan.

I. Stone Sediment Barriers or SiltSacks™, or approved equal for inlet protection.

J. A stabilized construction entrance shall be constructed temporarily.

K. Riprap for slopes, culvert, storm drain inlet, and outlet aprons.

L. VACANT

M. VACANT

N. VACANT

O. Wood mulch.

P. Calcium chloride and water for dust control.

Q. DIRTBAGS as outlined on the contract drawings.

R. Erosion Control Netting/Matting: Neutral Fiber Biodegradable netting: COIR or Jute.

S. Filter Fabric shall be constructed of post consumer plastic geotextile.

PART 3 - EXECUTION

3.1 PREPARATION

A. Review site erosion control plan attached to this section of the specifications.

B. Deficiencies or changes in the erosion control plan as it is applied to current conditions will be brought to the attention of the Engineer for remedial action.

3.2 EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Provide catalog cuts and information concerning the erosion control products which will be used for construction for review by the Owner.

B. Provide information concerning the installation of the erosion sedimentation control including anchorage trench provisions and anchorage devices and spacing for review by the Owner.

C. Place erosion control systems in accordance with the erosion control plan and in accordance with approved installation procedures.

D. This contract limits the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations. The Owner has the authority to direct the Contractor to provide immediate permanent or temporary pollution control measures. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical.

E. The temporary erosion control systems installed by the Contractor shall be maintained as directed by the Engineer to control siltation at all times during the life of the Contract. The Contractor must respond to any maintenance or additional work ordered by the Engineer within a 48 hour period.

F. Any additional material work required beyond the extent of the erosion control plan shall be paid for by the Owner except where such measures are required to correct deficiencies caused by the failure of the Contractor to construct the work in accordance with the erosion sediment control plan.

G. Slopes that erode easily shall be temporarily seeded as the work progresses with a cereal grain of wheat, rye or oats.

END OF SECTION

SECTION 02271

DIRTBAG® SPECIFICATIONS FOR CONTROL OF SEDIMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work shall consist of furnishing, placing and removing the DIRTBAG® pumped sediment control device for erosion-sediment control. The DIRTBAG® pumped-silt control system is marketed by:

ACF Environmental, Inc.
2831 Cardwell Drive
Richmond, Virginia 23234
Phone: 800-448-3636
Fax: 804-743-7779

PART 2 - MATERIALS

2.1 DIRTBAG®

A. The DIRTBAG® shall be a non-woven bag which is sewn with a double needle matching using a high strength thread.

B. The DIRTBAG® seams shall have an average wide width strength per ASTM D-4884 as follows.

DIRTBAG® Style	Test Method	Test Result
DIRTBAG® 53	ASTM D-4884	60 LB/IN
DIRTBAG® 55	ASTM D-4884	100 LB/IN

C. Each standard DIRTBAG® shall be supplied with fill spout large enough to accommodate a 4" discharge hose and straps to secure the hose and prevent pumped water from escaping without being filtered.

D. The geotextile fabric shall be non-woven fabric with the following properties:

Properties	**Test Method**	**Units**	**Non-Woven**	
			53	**55**
Weight	ASTM D-3776	Oz/yd	8	10
Grab Tensile	ASTM D-4632	Lbs.	203	250
Puncture	ASTM D-4833	Lbs.	130	165
Flow Rate	ASTM D-4491	$Gal/Min/Ft^2$	80	70
Permittivity	ASTM D-4491	$Sec.^1$	1.5	1.3
Mullen Burst	ASTM D-3786	$Lbs.^{in2}$	400	550
UV Resistant	ASTM D-4355	%	70	70
AOS % Retained	ASTM D-4751	%	100	100

All properties are minimum average roll value except the weight of the fabric which is given for information only.

PART 3 – CONSTRUCTION SEQUENCE

3.1 Install DIRTBAG® on a prepared crushed stone pad overlying Mirafi 600X as shown on the contract drawings. Strap the neck of the DIRTBAG® tightly to the discharge hose.

3.2 The DIRTBAG® is full when it no longer can efficiently filter sediment or pass water at a reasonable rate. Flow rates will vary depending on the size of the DIRTBAG®, the type and amount of sediment discharged into the DIRTBAG®, the type of ground, rock or other substance under the bag and the degree of the slope on which the bag lies. Under most circumstances, the vendor claims DIRTBAGS® will accommodate flow rates of 1,500 gallons per minute. Use of excessive flow rates or overfilling DIRTBAG® with sediment will cause ruptures of the bags or failure of the hose attachment straps.

3.3 Dispose of DIRTBAG® in accordance with Local, State, and Federal regulations. If allowed, the DIRTBAG® may be cut open and the contents seeded after removing visible fabric. DIRTBAG® is strong enough to be lifted with added straps if it must be hauled away (extra option). Off-site disposal may be facilitated by placing the DIRTBAG® in the back of the dump truck or flatbed prior to use and allowing the water to drain from the bag in place, thereby dismissing the need to lift the DIRTBAG®.

END OF SECTION

SECTION 02511

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide all material and labor for the placement of surface course and binder course on roads, access drives, parking lots, sidewalks, and walkways. Reference Appendix A for Superpavement requirements which, if used, replaces this and MDOT Section 401 in their entirety.

1.2 REFERENCES

A. December 2002 MDOT Standard Specifications, including relevant updates, except as modified herein.

B. April 1997 MDOT Standard Details, Highways & Bridges.

C. MS-2 - Mix design methods for asphalt concrete and other hot mix types - The Asphalt Institute (AI).

D. MS-3 - Asphalt Plant Manual - The Asphalt Institute (AI).

E. Hot Mix Asphalt Paving Handbook - US Army Corp of Engineers, UN-13 (CE MP-ET).

F. MS-19 - Basic Asphalt Emulsion Manual - The Asphaltic Institute (AI).

G. ASTM D946 - Penetration - Graded Asphalt Cement for use in Pavement Construction.

H. AASHTO M-226/ASTM D3381 Asphalt Cement

I. AASHTO M-140/ASTM D997 or AASHTO M-208/ASTM D-2397 Tack Coat

J. AASHTO M-117/ASTM D242 Mineral Filler

K. AASHTO T-245/ASTM D1559 Marshall Mix Design

L. Approved and released for construction plans.

1.3 RELATED SECTIONS

A. Section 02223 - Excavation, Backfilling and Compacting for Pavement

B. Section 02230 – Subbase and Base Gravel

C. Section 02525 - Curbs and Side Walks

E. Section 02584 - Pavement Markings

1.4 SUBMITTALS

A. Design Mix: Before any asphaltic concrete paving is constructed, the Contractor shall submit the proposed actual design mix to the Owner for review and/or approval. Design mix submittal shall follow the format as indicated in the Asphalt Institute Manual MS-2, Marshall Stability Method; and shall include the type/name of the mix, gradation analysis, asphalt cement grade used, Marshall Stability (lbs), flow, effective asphalt content (percent), and direct references to the applicable highway department specifications sections for each material. Design shall be for a mixture listed in the most recent edition of roadway specifications of the state in which the project is to be constructed. In no case shall a mix design over three years old be submitted.

B. Material Certificates: Submit materials certificate to an independent testing laboratory retained by the Owner. The certificates shall be signed by the material producer and contractor, certifying that materials comply with, or exceed, the requirements herein.

C. Field density test results, minimum 1 per 200 tons of bituminous pavement placed including sta/offset of test.

D. Plant inspection reports to verify pavement batch plant and paving equipment meets or exceeds MDOT Specification 401. The inspections shall be conducted by an independent testing firm retained by the Owner.

1.5 JOB CONDITIONS

A. Weather Limitations:

1. Apply tack coats when ambient temperature is above 40 degrees F, and when temperature has been above 35 degrees F for 12 hours immediately prior to application.

2. Construct asphaltic concrete paving when atmospheric temperature is above 40 degrees F base, 50 degrees F surface.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide asphaltic concrete mixture as recommended by local or state paving authorities to suit project conditions. Use locally available materials and gradations which meet State Department of Transportation specifications and exhibit satisfactory record on previous installations.

B. Asphalt Cement: Comply with AASHTO M-226/ASTM D 3381; Table 2 AC-10, AC-20, or AC-30, AR-80, viscosity grade, depending on local mean annual air temperature. (See following chart):

Temperature Condition	Asphalt Grades
Cold, mean annual air temperature < 7° C (45° F)	AC-10 85/100 pen.
Warm, mean annual air temperature between 7° C (45° F) and 24° C (75° F)	AC-20 60/70 pen.
Hot, mean annual air temperature > 24° C (57° F)	AC-30

Final acceptance of the proper grade of A.C. shall be made by the Owner's Engineer.

C. Tack Coat: Emulsified asphalt; AASHTO M-140/ASTM D 997 or M 208/ASTM D 2397, SS-1h, CSS-1, or CSS-1h, diluted with one part water to one part emulsified asphalt.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M-17/ASTM D242, if recommended by applicable state highway standards.

E. Asphalt-Aggregate Mixture: Unless otherwise noted on the Drawings, the Design Mix shall have a minimum stability based on a 50-blow Marshall complying with ASTM D 1559 of 1000 lbs. with a flow between 8 and 16. The Design Mix shall be within sieve analysis and bitumen ranges below:

SIEVE ANALYSIS OF MIX

Square Sieve	Total Percent Passing	Percent Tolerance
3/4"	100	
1/2"	80-100%	5%
3/8"	65-93%	4%
#8	40-55%	4%
#50	12-27%	2%
#200	0-10%	0%

Percent bitumen by weight of total mix: 5.0 - 8.5.
Air voids: 3-6%
Percent aggregate voids filled with asphalt cement: 70-82%
Allowable variance of percent bitumen by weight of total mix=0.4

2.2 EQUIPMENT

Maintain all batch plant and paving equipment in satisfactory operating condition and correct breakdowns in a manner that will not delay or be detrimental to progress of paving operations.

PART 3 – EXECUTION

3.1 PREPARATION

A. Remove loose material from compacted base material surface immediately before applying prime coat.

B. Proof roll prepared base material surface to check for areas requiring additional compaction and areas requiring removal and recompaction.

C. Do not begin paving work until deficient base material areas have been corrected and are ready to receive paving.

3.2 APPLICATIONS

A. Tack Coat:

1. Apply to contact surfaces of previously constructed asphaltic concrete base courses or Portland cement concrete and surfaces abutting or projecting into

asphalt concrete and surfaces abutting or projecting into asphalt concrete pavement.

2. Apply tack coat to asphaltic concrete base course or sand asphalt base course. Apply emulsified asphalt tack coat on the surface of all such bases where asphaltic concrete paving will be constructed.

3. Apply emulsified asphalt tack coat in accordance with APWA Section 2204 and applicable state highway specifications.

4. Apply at minimum rate of 0.05 gallon per square yard of surface.

5. Allow to dry until at proper condition to receive paving.

3.3 ASPHALTIC CONCRETE PLACEMENT

A. Place asphalt concrete mixture on completed compacted subgrade surface, spread, and strike off. Spread mixture at following minimum temperatures:

1. When ambient temperature is between 40 degrees F and 50 degrees F: 285 degrees F.

2. When ambient temperature is between 50 degrees F and 60 degrees F: 280 degrees F.

3. When ambient temperature is higher than 60 degrees F: 275 degrees F.

B. Whenever possible, all pavement shall be spread by a finishing machine. Inaccessible or irregular areas, pavement may be placed by hand methods. The hot mixture shall be spread uniformly to the required depth with hot shovels and rakes. After spreading, the hot mixture shall be carefully smoothed to remove all segregated coarse aggregate and rake marks. Rakes and lutes used for hand spreading shall be of the type designed for use on asphalt mixtures. Loads shall not be dumped faster than they can be properly spread. Workers shall not stand on the loose mixture while spreading.

C. Paving Machine Placement: Apply successive lifts of asphaltic concrete in transverse directions with the surface course placed in the direction of surface-water flow. Place in typical strips not less than 10'-0" wide.

D. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have

same texture, density, and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

3.4 WEATHER AND SEASONAL LIMITATIONS

A. For weather limitations the State of Maine will be considered to be divided into two paving zones:

(a) Zone 1: All area north of US Route 2 from Gilead to Brewer and north of Route 9 from Brewer to Calais.

(b) Zone 2: All area south of Zone 1 including the US Route 2 and Route 9 boundaries.

B. Bituminous plant mix for use other than traveled way wearing course may be placed in either zone between the dates of April 15th and November 15th, provided that the air temperature as determined by an approved thermometer placed in the shade at the paving location is 35 degrees F or higher and the area to be paved is not frozen. Plant mix to be placed as traveled way wearing course may be placed in Zone 1 between the dates of May 1st and the Saturday following October 1st and in Zone 2 between the dates of April 15th and the Saturday following October 15th provided the air temperature determined above is 50 degrees F or higher.

C. Any hot bituminous base or binder course that is to be subject to traffic during the winter months shall have its gradation densified or asphalt content (percent of mix) adjusted through a change in the job mix formula as submitted by the Contractor and approved by the Owner.

3.5 ROLLING AND COMPACTION

A. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. Mixture shall be compacted to a minimum, of 92% theoretical maximum density. The number, weight, and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in a workable condition.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 FIELD QUALITY CONTROL

A. An Independent Testing Laboratory, shall be retained to perform construction testing of in-place asphaltic concrete courses for compliance with requirements for thickness, density, composition and surface smoothness. Asphaltic surface and asphaltic base/binder courses shall be randomly cored at a minimum rate of one core for every 20,000 square feet of paving. In no event shall less than three cores in light duty areas and three cores in heavy duty areas shall be obtained. Coring holes shall be immediately filled with full-depth asphalt or with concrete. Asphaltic Concrete pavement samples shall be tested for conformance with the mix design. Refer to the general contract conditions for clarification on the cost for the independent laboratory.

B. Grade Control: Establish and maintain required lines and elevations.

C. Thickness: In-place compacted thickness shall not be less than thickness specified on the drawings. Areas of deficient paving thickness shall receive a tack coat and a minimum 1" overlay; or shall be removed and replaced to the proper thickness, at the discretion of the Owner's; until specified thickness of the course is met or exceeded at no additional expense to the Owner.

D. Surface Smoothness: Testing shall be performed on the finished surface of each asphalt concrete course for smoothness, using 10'-0" straightedge applied parallel with, and at right angles to centerline of paved area. The results of these tests shall

be made available to the owner upon request. Surfaces will not be acceptable if exceeding following tolerances for smoothness:

Base Course Surface: 1/4"
Wearing Course Surface: 3/16"

E. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner.

F. Compaction: Field density tests for in-place materials shall be performed by examination of field cores in accordance with one of the following standards:

1. Bulk specific gravity of paraffin-coated specimens: ASTM D-1188.

2. Bulk specific gravity using saturated surface-dry specimens: ASTM D-2726.

Rate of testing shall be one core per 20,000 square feet of pavement, with a minimum of 3 cores from heavy-duty areas and 3 cores from standard-duty areas. Cores shall be cut from areas representative of the project.

Areas of insufficient compaction shall be delineated, removed, and replaced in compliance with the specifications at no expense to the Owner.

G. Pavement Plant Inspection: The paving plant shall be inspected a minimum of one week prior to pavement placement to verify the plant meets the requirements outlined in Section 401. Random inspection and sampling during pavement placement shall be conducted and documented by a testing firm hired and paid for by the Owner.

H. After the binder pavement is placed, the Contractor shall retain an independent surveyor to profile the centerline of the access drive at a minimum of 25-foot stations plus survey the elevations at the locations of any pavement spot grades shown on the drawing and all catch basin inlets. This survey information shall be plotted on the drawing access drive profile and a grading plan. The Contractor shall supply this information in triplicate to the Engineer with copies to the Owner, Architect and Construction Manager. A narrative identifying any areas which do not meet the specification tolerances of subsection E of this specification with an outline of corrective measures shall accompany the submission. The Owner shall have four working days upon certified receipt of these data to issue a letter authorizing surface pavement to be placed.

END OF SECTION

APPENDIX A

SECTION 401

HOT MIX ASPHALT PAVEMENT

Section 401 of MDOT Standard Specifications and the preceding Asphaltic Concrete section are deleted in their entirety and replaced by the following:

401.01 Description. The Contractor shall furnish and place one or more courses of Superpave Hot Mix Asphalt Pavement (SHMA) on an approved base in accordance with the Contract documents and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established. The Owner will accept this Work under Quality Assurance (QA) provisions, in accordance with these specifications and the requirements of Section 106.

For the purposes of this Section, the Owner shall be defined as the developer or their assigned agent in charge of construction supervision and inspection.

MATERIALS

401.02 Composition of Mixtures. The Contractor shall compose the Hot Mix Asphalt Pavement with aggregate, Performance Graded Asphalt Binder (PGAB), and mineral filler if required. SHMA shall be designed and tested according to AASHTO TP-4. The Contractor shall size, uniformly grade, and combine the aggregate fractions in proportions that provide a mixture meeting the grading requirements of the Job Mix Formula (JMF). The Contractor may use a maximum of 20 percent reclaimed asphalt pavement in any base, binder or shim course, and in any wearing course placed on shoulders (excluding Urban areas).

The Contractor shall submit a JMF for approval. A JMF shall be submitted for testing to a laboratory selected by the Owner for each mixture to be supplied at least 15 calendar days prior to production. The JMF shall establish a single percentage of aggregate passing each required sieve size within the limits shown in Table 1, and shall not cross the restricted zone. The general composition limits given in Table 1 indicate the control points of mixtures permissible under this specification. The JMF shall state the source, gradation, and percentage to be used of each portion of the aggregate, and mineral filler if required. It shall also state the proposed PGAB content, the name and location of the refiner and the supplier for the source of PGAB submitted for approval, and the type of PGAB modification if applicable.

In addition, the Contractor shall provide the following information in the proposed JMF.

Superpave Stockpile Gradation Summary
Superpave Design Aggregate Structure Consensus Property Summary
Superpave Design Aggregate Structure Trial Blend Gradation Plots
Superpave Trial Blend Results (summary)
PGAB Specific Gravity and temperature/viscosity charts and Recommended mixing and compaction temperatures from supplier
Material Safety Data Sheets (MSDS) for PGAB

Table 1: COMPOSITION OF MIXTURES – CONTROL POINTS

	GRADING			
	TYPE 25 mm	TYPE 19 mm	TYPE 12.5 mm	TYPE 9.5 mm
SIEVE SIZE	PERCENT BY WEIGHT PASSING – COMBINED AGGREGATE			
37.5 mm	100			
25 mm	90-100	100		
19 mm	-90	90-100	100	
12.5 mm	-	-90	90-100	100
9.5 mm	-	-	-90	90-100
4.75 mm	-	-	-	-90
2.36 mm	15-41	23-49	28-58	32-67
1.18 mm	-	-	-	-
0.60 mm	-	-	-	-
0.30 mm	-	-	-	-
0.075 mm	1-7	2-8	2-10	2-10

	RESTRICTED ZONES			
	TYPE 25 mm	TYPE 19 mm	TYPE 12.5 mm	TYPE 9.5 mm
SIEVE SIZE	PERCENT BY WEIGHT PASSING – COMBINED AGGREGATE			
37.5 mm	-	-	-	-
25 mm	-	-	-	-
19 mm	-	-	-	-
12.5 mm	-	-	-	-
9.5 mm	-	-	-	-
4.75 mm	39.5	-	-	-
2.36 mm	26.8-30.8	34.6	39.1	47.2
1.18 mm	18.1-24.1	22.3-28.3	25.6-31.6	31.6-37.6
0.60 mm	13.6-17.6	16.7-20.7	19.1-23.1	23.5-27.5
0.30 mm	11.4	13.7	15.5	18.7
0.075 mm	-	-	-	-

At the time of JMF submittal, the Contractor shall identify and make available the stockpiles of all proposed aggregates at the plant site. The Owner shall obtain samples for laboratory testing. The Contractor shall also make available to the Owner the PGAB proposed for use in the mix in sufficient quantity to test the properties of the asphalt and to produce samples for testing of the mixture. Prior to the start of paving, the Contractor and the Owner shall split a production sample for evaluation. The Contractor shall test its split of the sample and determine if the results meet the requirements of the MDOT's written policy for mix design verification (Available at the Central Lab in Bangor). If the results are found to be acceptable, the Contractor will forward their results to the Owner's laboratory, which will test the Owner's split of the sample. The results of the two split samples will be compared and shared between the Owner and the Contractor. If the Owner finds the mixture acceptable, an approved JMF will be forwarded to the Contractor and paving may commence.

The Contractor shall submit a new JMF for approval each time a change in aggregate source, a significant change in proportions, or a change in PGAB is proposed. The same approval process shall be followed.

TABLE 2 – SUPERPAVE Volumetric Design Criteria

Estimated Traffic, million 80 kN ESALs	%G @$N_{initial}$	Voids in the Mineral Aggregate (VMA)					Voids Filled With Binder (VFB)		Fines to Effective Binder Ratio ($P_{0.075}/P_{be}$)	
		9.5 mm	12.5 mm	19.0 mm	25.0 mm	37.5 mm				
		Minimum					Min.	Max.	Min.	Max.
<0.3	<91.5	15.0%	14.0%	13.0%	12.0%	11.0%	70	80	0.6	1.2
0.3 to <1.0	<90.5						65	78		
1.0 to <3.0	<89.5						65	78		
3.0 to <10	<89						65	75*		
10 to <30							65	75*		
30 to <100							65	75*		
≥100							65	75*		

*For 9.5 mm nominal maximum aggregate size mixtures, the maximum VFB is 76.

As design criteria, Voids @ N_{des} shall be 4.0%, Voids @ N_{max} shall be ≥ 2.0%

401.03 Aggregates. Fine aggregate, that material passing the 2.36 mm sieve, shall not exceed an absorption of 3.0 percent by weight as determined by AASHTO T84. The composite blend, minus any reclaimed asphalt pavement used, shall have a minimum degradation value of 30 as determined by the Washington State Degradation Test of 1967, or a Micro-Deval value of under 18 as determined by the AASHTO Provisional Standard available from the Owner's Central Lab in Bangor. If the Contractor elects to use the Micro-Deval, it shall be indicated in the proposed JMF.

Aggregates shall also meet the following consensus properties. The Owner reserves the right to sample and test the composite aggregate for any of the following properties at any time.

TABLE 3 – SUPERPAVE Aggregate Consensus Properties Criteria

Estimated Traffic, Million 80 kN ESALs	ASTM D 5821 Coarse Aggregate Angularity (Minimum)		AASHTO TP33 Method A Uncompacted Void Content of Fine Aggregate (Minimum)		ASTM D 4791 (8.4) Flat and Elongated Particles (Maximum)	AASHTO T176 Clay Content/ Sand Equivalent (Minimum)
	Depth from Surface					
	<100mm	>100mm	<100mm	>100mm		
<0.3	60/60	60/60	-	-	-	45
0.3 to <1.0	65/60	60/60	40	-	-	45
1.0 to <3.0	75/60	60/60	40	40	10	45
3.0 to <10	85/80	60/60	45	40	10	45
10 to <30	95/90	80/75	45	40	10	45
30 to <100	100/100	95/90	45	45	10	50
≥ 100	100/100	100/100	45	45	10	50

ASTM D 5821 – "85/80" denotes that 85% of the coarse aggregate has one fractured face and 80% has two fractured faces.

AASHTO TP33 – Criteria are presented as percent air voids in loosely compacted fine aggregate, (U).

ASTM 4791 – Criteria are presented as maximum percent by weight of flat and elongated particles. (5:1 ratio).

401.04 – Vacant

401.05 Temperature Requirements. After the JMF is established, the temperatures of the mixture shall conform to the following tolerances:

In the truck at the mixing plant	± 10º C*
At the Paver	± 10º C*

* If noted in the Quality Control Plan, these may be increased or decreased due to extraordinary considerations, but temperature shall in no case vary by more than 15º C.

The JMF and the mix subsequently produced shall meet the requirements of Tables 2 and 3.

401.06 Performance Graded Asphalt Binder. PGAB shall be as specified in Special Provision 403. The PGAB shall meet the applicable requirements of AASHTO Provisional Standard MP1 – Standard Specifications for PGAB, in accordance with Section 702. The Contractor shall provide the Owner with an approved copy of the Quality Control Plan for PGAB in accordance with AASHTO PP-26.

CONSTRUCTION REQUIREMENTS

401.07 Weather and Seasonal Limitations. The State is divided into 2 paving zones as follows:

(a) Zone 1. Areas north of U.S. Route 2 from Gilead to Bangor and north of Route 9 from Bangor to Calais.

(b) Zone 2. Areas south of Zone 1 including the U.S. Route 2 and Route 9 boundaries.

The Contractor may place Hot Mix Asphalt Pavement for use other than a traveled way wearing course in either Zone between the dates of April 15th and November 15th, provided that the air temperature as determined by an approved thermometer (placed in the shade at the paving location) is 2º C or higher and the area to be paved is not frozen. The Contractor may place Hot Mix Asphalt Pavement as traveled way wearing course in Zone 1 between the dates of May 1st and the Saturday following October 1st and in Zone 2 between the dates of April 15th and the Saturday following October 15th, provided the air temperature determined as above is 10º C or higher. For the purposes of this Subsection, the traveled way includes truck lanes, ramps, approach roads and auxiliary lanes.

Hot Mix Asphalt Pavement used for curb, driveways, sidewalks, islands, or other incidentals is not subject to seasonal limitations, except that conditions shall be satisfactory for proper handling and finishing of the mixture. Unless otherwise specified, the Contractor shall

not place Hot Mix Asphalt Pavement on a wet or frozen surface, and the air temperature shall be 2º C or higher.

401.08 Hot Mix Asphalt Plant.

401.081 General Requirements. Mixing plants shall conform to AASHTO M 156. The mixing plant shall include an efficient dust collecting system to prevent loss of fine material. The material collected may be returned to the mixture at a uniform rate and/or be discarded.

(a) Truck Scales. When the bituminous mixture is to be weighted on scaled meeting the requirements of Section 109 – Measurement and Payment, the scales shall be inspected and sealed by the State Sealer as often as the Owner deems necessary to verify their accuracy.

(b) Performance Graded Asphalt Binder. The Contractor shall provide a valve for sampling the bituminous material, located in a circulating feed line connecting the storage tank with the mixing plant or in a line of the storage circulation system. The valve shall be in a readily accessible location offering protection from damage. The Contractor shall maintain this valve in a workable condition and provide a drainage receptacle.

401.083 Automation of Batching. Batch plants shall be automated for weighing, recycling and the monitoring system. In the case of a malfunction of the printing system, the requirements of Subsection 109.013(c) will apply.

The batch plant shall accurately proportion the various materials in the proper order by weight. The entire batching and mixing cycle shall be continuous and shall not require any manual operations. The batch plant shall use auxiliary interlock circuits to trigger an audible alarm whenever an error exceeding the acceptable tolerance occurs. Along with the alarm, the printer shall print an asterisk on the delivery slip in the same row containing the out-of-tolerance weight. The automatic proportioning system shall be capable of consistently delivering material within the full range of batch sizes.

Tolerances are based on the total batch weight of the Hot Mix Asphalt Pavement. The batch plant shall be able to automatically or manually adjust for all desired batch sizes. The first or last bin drawn shall be the sand bin. Allowable tolerances are as follows:

Each aggregate component	± 2.5 percent from the cumulative target, each bin
Last Bin Drawn	± 1.5 percent
Mineral Filler	± 0.5 percent
Performance Graded Asphalt Binder	± .25 percent, -.15 percent
Zero Return (aggr.)	± 0.5 percent
Zero Return (bit. Material)	± 0.1 percent

All plants shall be equipped with an approved digital recording device. The delivery slip load ticket shall contain information required under 1 through 4 of Section 109.01(f), and sections (a) and (b) of 109.012.

401.085 Drum Plant Recordation of Proportions. The plant shall utilize an approved recordation system. In the case of a malfunction of this recordation system, the Contractor may continue production for up to two working days while the system is repaired, after which time production shall cease until repairs are completed. The recorder shall simultaneously record the accumulated weights of the dry aggregates, the mineral filler (if added separately) and the Performance Graded Asphalt Binder, all at 5 minute intervals during production and on demand, unless the Owner approves otherwise. The printed record shall include the actual Performance Graded Asphalt Binder content quantity as a percentage of the total mixture weight. The maximum resolution shall be 90 kg of dry aggregate, 9 kg of mineral filler, 9 kg of Performance Graded Asphalt Binder, and 0.1 percent for Performance Graded Asphalt Binder content. The printout shall indicate the amount of moisture programmed into the moisture compensation by total weight. All printed records shall show the day, month, year, and the time to the nearest minute when the printout was generated. The Contractor shall provide the Owner with a clear and legible copy of the recordings at the end of each day.

401.09 Hauling Equipment. Trucks for hauling Hot Mix Asphalt Pavement shall have tight, clean, smooth metal dump bodies which have been thinly coated with a small amount of lime solution or an approved soap solution or detergent to prevent the mixture from adhering to the bodies.

All truck dump bodies shall have a cover of canvas or other water repellent material capable of heat retention which completely covers the mixture. The cover shall be securely fastened on the loaded truck except when unloading.

All truck bodies shall have an opening on both sides which will accommodate a thermometer stem. The opening shall be located near the midpoint of the body, at least 300 mm above the bed.

401.10 Pavers. Pavers shall be self-contained, self-propelled units with an activated screen (heated if necessary) capable of placing courses of Hot Mix Asphalt Pavement in lane widths on the main line, or shoulder width for shoulders and similar construction.

The Contractor shall place Hot Mix Asphalt Pavement on the main line with a paver using an automatic grade and slope controlled screed, unless otherwise authorized by the Owner. The controls shall automatically adjust the screed and increase or decrease the layer thickness to compensate for irregularities in the preceding course. The controls shall maintain the proper transverse slope and be readily adjustable so that transitions and superelevated curves can be properly paved. The controls shall operate from a fixed or moving reference such as a grade wire or ski type device (floating beam) with a minimum length of 9 M, except that a 12 M ski shall be used on Expressway projects.

The Contractor shall operate the paver at speeds which produce a uniform mat. The paver shall have a receiving hopper with sufficient capacity for a uniform spreading operation and a distribution system to place the mixture uniformly, without segregation in front of the screed. The screed assembly shall produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screeds shall have auger extensions and tunnel extenders as necessary.

The Contractor shall have the paver at the project site sufficiently before the start of paving operations to be inspected and approved by the Owner. The Contractor shall repair or replace any paver found worn or defective, either before or during placement, to the satisfaction of the Owner.

401.11 Rollers. Rollers shall be static steel, pneumatic tire, or approved vibrator type. Rollers shall be in good mechanical condition, capable of starting and stopping smoothly, and be free from backlash when reversing direction. Rollers shall be equipped and operated in such a way as to prevent the picking up of hot mixed material by the roller surface. Use of rollers which result in crushing of the aggregate or displacement of the mixture will not be permitted. Any Hot Mix Asphalt Pavement that becomes loose, broken, contaminated, shows an excess or deficiency of Performance Graded Asphalt Binder, or is in any other way defective shall be removed and replaced at no additional cost with fresh Hot Mix Asphalt Pavement which shall be immediately compacted to conform with the adjacent area.

The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor's option, provided specification densities are attained and with the following requirements:

1) At least one roller shall be pneumatic-tired on bridges and variable depth courses as well as the first lift of pavement over gravel or a reclaimed pavement or other irregular surface.
2) Compaction with a vibratory or steel wheel roller shall precede pneumatic-tired rolling, unless otherwise authorized by the Owner.
3) Vibratory rollers shall not be operated in the vibratory mode when checking or cracking of the mat occurs, or on bridge decks.
4) Any method which results in cracking or checking of the mat will be discontinued, and corrective action taken.

The maximum operating speed for a steel wheel roller shall not exceed the manufacturer's recommendations.

401.111 Surface Tolerances. The Owner will check surface tolerance with a 4.9 m straightedge or string line placed parallel to the centerline of pavement and with a 3 m straightedge or string line placed transverse to the centerline of pavement. The Contractor shall correct variations exceeding 6 mm by removing defective work and replacing it with new

material as directed by the Owner. The Contractor shall furnish a 3 m straightedge for the Owner's use.

401.12 Conditioning of Existing Surface. The Contractor shall thoroughly clean the surface upon which Hot Mix Asphalt Pavement is to be placed of all objectionable material. When the surface of the existing base or pavement is irregular, the Contractor shall bring it to uniform grade and cross section.

401.13 Hot Mix Asphalt Material Documentation. The Contractor and the Owner shall agree on the amount of Hot Mix Asphalt Pavement that has been placed each day.

401.14 Preparation of Aggregates. The Contractor shall dry and heat the aggregates for the mixture to the required temperature. The Contractor shall properly adjust flames to avoid physical damage to the aggregate and to avoid depositing soot on the aggregate.

401.15 Mixing. The Contractor shall combine the dried aggregate in the mixer in the amount of each fraction of aggregate required to meet the JMF. The Contractor shall measure the amount of PGAB and introduce it into the mixer in the amount specified by the JMF.

The Contractor shall produce the mixture at the temperature established by the JMF.

The Contractor shall dry the aggregate sufficiently so that the mixture will not flush, foam excessively, or displace excessively under the action of the rollers. The Contractor shall introduce the aggregate into the mixer at a temperature of not more than 14º C above the temperature at which the viscosity of the bituminous material being used is 0.150 Pas.

The Contractor shall store and introduce into the mixer the Performance Graded Asphalt Binder at a uniformly maintained temperature at which the viscosity of the material is between 0.150 Pas and 0.300 Pas. The aggregate shall be completely and uniformly coated with a thorough distribution of the PGAB. The Contractor shall determine the wet mixing time for each plant and for each type of aggregate used.

401.16 Spreading and Finishing. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the Contractor shall spread, rake, and lute the mixture with hand tools to provide the required compacted thickness.

On the roads opened to two way traffic, the Contractor shall place each course over the full width of the traveled way section being paved that day, unless otherwise approved by the Owner.

401.17 Compaction. Immediately after the Hot Mix Asphalt Pavement has been spread, struck off, and any surface irregularities adjusted, the Contractor shall thoroughly and uniformly compact the mixture by rolling.

The Contractor shall roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving. The Contractor shall prevent adhesion of the mixture to the rollers or vibrating compactors without the use of oil.

The Contractor shall immediately correct any displacement occurring as a result of the reversing of the direction of a roller or from other causes to the satisfaction of the Owner. Any operation other than placement of variable depth shim course that results in breakdown of the aggregate shall be discontinued.

Along forms, curbs, headers, walls, and other places not accessible to the roller, the Contractor shall thoroughly compact the mixture with mechanical vibrating compactors. The Contractor shall only use hand tamping in areas inaccessible to all other compaction equipment. On depressed areas, the Contractor may use a trench roller or cleated compression strips under a roller to transmit compression to the depressed area.

401.18 Joints. The Contractor shall construct wearing course transverse joints in such a manner that minimum tolerances shown in section 401.111 are met when measured with a straightedge.

The paver shall always maintain a uniform head of material during the joint construction. The bituminous mix shall be free of segregation and meet temperature requirements. Transverse joints of the wearing course shall be straight and neatly trimmed. The Contractor may form a vertical face exposing the full depth of the course by inserting a header, by breaking the bond with the underlying course, or by cutting back with hand tools. The Owner may allow feathered or "lap" joints on lower courses or when matching existing low type pavements.

The Contractor shall apply a coating of emulsified asphalt immediately prior to paving all joints, except those formed by pavers operating in echelon. The Contractor shall use an approved spray apparatus designed for covering a narrow surface. The Owner may approve application by a brush for small surfaces, or in the event of a malfunction of the spray apparatus, but for a period of not more than one working day.

Where pavement under this Contract joins an existing pavement of when the Owner directs, the Contractor shall cut the existing pavement along a smooth line, producing a neat, even, vertical joint. The Owner will not permit broken or raveled edges. The cost of all work necessary for the preparation of joints is incidental to related Contract items.

401.19 Quality Control Method A & B.

The Contractor shall operate in accordance with the approved Quality Control Plan (QCP) to assure a product meeting the Contract requirements. The QCP shall meet the

requirements of 106.031 and these Special Provisions. The Contractor shall not begin paving operations until the QCP is approved in writing by the Owner.

Prior to placing any mix, the Owner and the Contractor shall hold a Pre-paving conference to discuss the paving schedule, source of mix, type and amount of equipment to be used, sequence of paving pattern, rate of mix supply, and traffic control. All field and plant supervisors including the responsible onsite paving supervisor shall attend this meeting.

The QCP shall address all elements which affect the quality of the Plant Mix Pavement including, but not limited to, the following:

(a) JMF(s)
(b) Hot asphalt mix plant details
(c) Stockpile Management (to include provisions for a minimum 2 day stockpile)
(d) Make & type of paver(s)
(e) Make & type of rollers including weight, weight per inch of steel wheels, and average contact pressure for pneumatic tired rollers
(f) Name of QCP Administrator, and certification number
(g) Name of Process Control Technician(s), and certification number(s)
(h) Name of Quality Control Technician(s), and certification number(s)
(i) Mixing & transportation including process for ensuring that truck bodies are clean and free of debris or contamination that could adversely affect the finished pavement.
(j) Frequency of and tests for Quality Control pavement.

(k) Laydown operations including longitudinal joint construction, procedures for avoiding paving in inclement weather, tacking of all joints, methods to ensure that segregation is minimized, procedures to determine the maximum rolling and paving speeds based on best engineering practices as well as past experience in achieving the best possible rideability of the pavement.
(l) Examples of Quality Control Forms
(m) Process for compacting paved shoulders and traveled way for method B projects
(n) Silo management and details (can show storage for use on project of up to 36 hours)

(o) Provisions for varying mix temperature due to extraordinary conditions.
(p) Name and responsibilities of the Responsible onsite Paving Supervisor

The QCP shall include the following technicians together with these minimum requirements:

(a) QCP Administrator – A qualified individual shall administer the QCP. The QCP Administrator must be a full-time employee of or a consultant engaged by the Contractor or paving subcontractor. The QCP Administrator shall have full authority to institute any and all actions necessary for the successful operation

of the QCP. The QCP Administrator (or its designee in the QCP Administrator's absence) shall be available to communicate with the Owner at all times. The QCP Administrator shall be certified as a Plant Technician or Paving Technician certified by the New England Transportation Technician Certification Program.

(b) Process Control Technician(s) (PCT) shall utilize test results and other quality control practices to assure the quality of aggregates and other mix components and control proportioning to meet the JMF(s). The PCT shall periodically inspect all equipment used in mixing to assure it is operating properly and that mixing conforms to the mix design(s) and other Contract requirements. The QCP shall detail how these duties and responsibilities are to be accomplished and documented and whether more than one PCT is required. The Plan shall include the criteria to be utilized by the PCT to correct or reject unsatisfactory materials. The PCT shall be certified as a Plant Technician by the New England Transportation Certification Program.

(c) Quality Control Technician(s) (QCT) shall perform and utilize quality control tests at the job site to assure that delivered materials meet the requirements of the JMF(s). The QCT shall inspect all equipment utilized in transporting, laydown, and compacting to assure it is operating properly and that all laydown and compaction conform to the Contract requirements. The QCP shall detail how these duties and responsibilities are to be accomplished and documented, and whether more than one QCT is required. The QCP shall include the criteria utilized by the QCT to correct or reject unsatisfactory materials. The QCT shall be certified as a Paving Technician by the New England Transportation Technician Certification Program.

The QCP shall detail the coordination of the activities of the Plan Administrator, the PCT and the QCT. The project Superintendent shall be named in the QCP, and his responsibilities for successful implementation of the QCP shall be outlined.

The Contractor shall sample, test, and evaluate Hot Mix Asphalt Pavement in accordance with the following minimum frequencies:

Table 4: MINIMUM QUALITY CONTROL FREQUENCIES

Test or Action	Frequency	Test Method
Temperature of mix	6 per day at street and plant	-
Temperature of Mat	4 per day	-
% TMD (Surface)	1 per 150 Mg	ASTM D-2950*
% TMD (Base)	1 per 600 Mg	AASHTO T-166
Fines/Effective Binder	1 per 1200 Mg	AASHTO TP-4
Gradation	1 per 600 Mg	AASHTO T-30
PGAB content	1 per 600 Mg	AASHTO T-164, T-287 or TP 53
Voids at N_{design}	1 per 600 Mg	AASHTO TP-4
Voids in Mineral Aggregate at N_{design}	1 per 600 Mg	AASHTO TP-4
Rice Specific Gravity	1 per 600 Mg	AASHTO T-209
Coarse Aggregate Angularity	1 per 6000 Mg	ASTM D 5821
Flat and Elongated Particles	1 per 6000 Mg	ASTM D-4791
Fine Aggregate Angularity	1 per 6000 Mg	AASHTO TP33

* May be modified according to the MDOT's policy on file at the Central Lab in Bangor.

The Contractor may utilize innovative equipment or techniques not addressed by the Contract documents to produce or monitor the production of the mix, subject to approval by the Owner.

The Contractor shall record all Hot Mix Asphalt Pavement plant test results in writing, signed by the appropriate technician and present them to the Owner by 10:00 AM on the next working day, except when otherwise noted in the QCP due to local restrictions. The Contractor shall make density test results, including randomly sampled densities, available to, and summaries of each day's results shall be recorded and signed by the QCT and presented to the Owner by 10:00 AM the next working day.

The Contractor shall have a testing lab at the plant site, equipped with all testing equipment necessary to complete the tests in Table 4. The Contractor shall locate an approved SHRP Gyratory Compactor at the plant testing lab or within 30 minutes of the plant site.

The Contractor shall fill all holes in the pavement resulting from cutting cores by the Contractor or the Owner with an acceptable mixture no later than the following working day. Before filling, the Contractor shall carefully clean the holes and apply a coating of emulsified asphalt. On surface courses, cores shall not be cut except for calibration of the Nuclear Density Gauge, or as directed by QA testing by the Owner. On a daily basis, the Contractor shall perform nuclear density testing across the mat being placed, at 300 mm intervals. If the values

vary by more than 2.0% from the mean, the Contractor shall make adjustments until the inconsistencies are remedied.

The Contractor shall monitor plant production using control charts as specified in Section 106. If plotted test results indicate a production problem, the Contractor shall notify the Owner and take corrective action acceptable to the Owner. The Contractor shall keep control charts up to date and available for review by the Owner at any time.

The Contractor may construct a pavement test strip on a given project at the option of the Contractor for each individual JMF. Prior to test strip placement the Contractor shall deliver a written notice to the Owner notifying that a test strip will be scheduled. Prior to placement of the test strip, a passing verification test is required.

The test strip shall not exceed 800 M. The quantity of Hot Mix Asphalt produced for the test strip shall not exceed 700 MG, 4 hours production, or 4% of the total quantity for the project, as determined by the Owner.

The test strip is intended to allow the Contractor to establish rolling patterns to achieve optimum density for the mat being laid. The Owner will not test the first third of the mat, allowing the plant to "balance itself". The Owner will calibrate thin lift densometers against cut cores. For surface mixes, the Owner will select 3 test sites and take 4 shots at each site. For base and binder mixes, 3 cores shall be run for density verification. The Contractor shall not commence full production until the calibrations are complete and the test strip has attained its minimum values for percent voids and percent TMD.

Should the test strip fail to meet an average density of 89% or greater (minimum of 3 tests, maximum of 7 including re-tests) or should the volumetrics, based on QC results, be outside of the 3-6% range, the Owner will reject the test strip. The Contractor shall remove and replace rejected test strips at their expense. The test strip shall be considered part of the project pavement and no separate payment will be made.

The Contractor shall cease paving operations whenever one of the following occurs on a lot in progress:

(1) The Pay Factor (which will be used for QA purposes only) for VMA, Voids @ N_d, Percent PGAB, composite gradation, VFB, fines to effective binder or density using all available tests is less than 0.90.

(2) The Coarse Aggregate Angularity or Fine Aggregate Angularity value falls below the requirements of Table 3 for the design traffic level.

(3) The first 2 control tests for the lot fall outside the upper or lower limits.

(4) The Flat and Elongated Particles value exceeds 10 percent by ASTM D-4791.

(5) There is any visible damage to the aggregate due to over-densification other than on variable depth shim courses.

(6) The Contractor fails to follow the approved QCP.

Paving operations shall not resume until the Contractor and the Owner determine that material meeting the Contract requirements will be produced. The Owner will consider corrective action acceptable if the Pay Factor for the failing property increases. If the Owner determines that the resumption of production involves a significant change to the production process, the current lot will be terminated and a new lot will begin.

401.20 Quality Assurance.

Method A

This method utilizes Quality Level Analysis and Pay Factor specifications. However, the pay factor shall be utilized to evaluate pavement performance only. Payment for all material and labor to place the payment shall be included in the Lump Sum contract. No separate payment will be made.

For asphalt pavement designated for acceptance under Quality Assurance (QA) provisions, the Owner will sample once per sublot on a statistically random basis, test, and evaluate in accordance with the following Acceptance Criteria:

Table 5: ACCEPTANCE CRITERIA

PROPERTIES	POINT OF SAMPLING	LOT SIZE	SUBLOT SIZE	TEST METHOD
Gradation	Paver Hopper	JMF*	1200 Mg	AASHTO T-30
PGAB Content	Paver Hopper	JMF*	1200 Mg	AASHTO TP-53
% TMD (Surface)	Mat behind all Rollers	JMF*	300 Mg	ASTM-2950/ AASHTO T-166
% TMD (Base or Binder)	Mat behind all Rollers	JMF*	600 Mg	AASHTO T-166
Air Voids at N_d	Paver Hopper	JMF*	1200 Mg	AASHTO TP-4
Voids in Mineral Aggregate at N_d	Paver Hopper	JMF*	1200 Mg	AASHTO TP-4
Fines to Effective Binder	Paver Hopper	JMF*	1200 Mg	AASHTO TP-4
Voids Filled with Binder	Paver Hopper	JMF*	1200 Mg	AASHTO TP-4

* Not to exceed 6,000 Mg, unless an unplanned overrun less than 2400 MG, or agreed to at the Pre-Construction Conference.

On the first day of production the Owner will take 3 random samples which will be used to calculate the quality level of the in-place material in the event the lot is terminated prematurely. Only 1 of the 3 will be for tested, the other 2 will be held onsite until at least 3 random samples have been taken, at which time the other 2 will be discarded.

(a) Lot Size. For purposes of evaluating all acceptance test properties, a lot shall consist of the total quantity represented by each item listed under the lot size heading in the table above. Each lot will be divided into at least 3 sublots, 5 where possible.

(b) Sublot size. The quantity represented by each sample will constitute a sublot. The size of each sublot shall be as listed under the sublot size heading in the table above. If there is insufficient quantity in a lot to make up at least three sublots, then the lot quantity will be divided into three equal sublots.

If there is less than one half of a sublot remaining at the end, then it shall be combined with the previous sublot. If there is more than one half sublot remaining at the end, then it shall constitute the last sublot and shall be represented by test results.

(c) Rejection by Contractor. The Contractor may, prior to sampling, elect to remove any defective material and replace it with new material at no expense to the Owner. The Owner will sample, test, and evaluate any such new material for acceptance. The Owner will review any test results for density below 90%, and areas found to be deficient shall be isolated and 3 random tests taken. If the resultant Pay Factor falls at or below 0.75, the Contractor shall remove and replace the material for the full lane width for a length of no less than 50 Meters at no expense to the Owner.

(d) Acceptance Testing. The Owner will obtain samples of Hot Mix Asphalt Pavement in conformance with AASHTO T168 – Sampling Bituminous Paving Mixtures. The Owner will take the sample randomly within each sublot. Target values shall be as specified in the JMF. The Owner will use the following Table for calculating Pay Factors for gradation, PGAB content, air voids at N_d, VMA, Fines to Effective Binder and VFB.

Table 6: GRADATION, VOLUMETRIC AND ASPHALT CEMENT ACCEPTANCE LIMITS

Property	USL and LSL
Passing 4.75 mm and larger sieves	Target ± 7 percent
Passing 2.36 mm to 1.18 mm sieves	Target ± 4 percent
Passing 0.60 mm	Target ± 3 percent
Passing 0.30 mm to .075 mm sieve	Target ± 2 percent
PGAB Content	Target ± 0.4 percent
Air Voids	Target ± 1.5 percent
Fines to Effective Binder	0.6% to 1.4%

Voids in the Mineral Aggregate	JMF Target -/+ 1.5% but not more than 0.5% below the table 2 Min. Value
Voids Filled with Binder	Target +/- 5%

Prior to paving, the Contractor shall determine whether testing of the surface for density QA will be done with cores or the Nuclear Density Gauge. If the Owner tests with the Nuclear Method, then the following table shall apply:

Table 7a: Density Acceptance Limits

	TARGET	LSL	USL
% of Maximum Theoretical Density	94.5	92.0	97.0

The Owner will designate a control section of pavement approximately 150 m long at the start of the paving operations. Within the control section at least three locations will be tested at the same offset at approximately a 2 M spacing to calibrate the nuclear density gauge. After placement of pavement, the Contractor shall cool the pavement to be tested by using ice and promptly cut the necessary calibration cores. After cooling to 20° C, the Contractor shall remove the cores using a core removing tool to assure minimum damage to the core. The Owner will adjust the nuclear density gauge to reflect the average of the cores. The Owner reserves the right to designate a new control section at any time. When nuclear testing is performed at locations outside normal paving and traffic control areas, the Contractor shall furnish a flagger and other necessary safety devices to protect personnel and equipment.

For base of binder courses, or for surface course when the nuclear density gauge is not available and the Owner so directs, the Contractor shall cut cores within 24 hours of placement of the pavement, or by the end of the next working day.

If the Owner tests with the Core Method then the following Table shall apply:

Table 7b: Density Acceptance Limits

	TARGET	LSL	USL
% of Maximum Theoretical Density	95.0	92.5	97.5

The Owner will measure pavement density on the compacted wearing surface using core samples tested according to AASHTO T-166. The Owner will randomly determine core locations. The Contractor shall cut cores at no additional cost to the Owner within 24 hours of placement of the pavement, and immediately give them to the Owner. At the time of sampling, the Contractor and the Owner shall mutually determine if a core is damaged. If it is determined that the core(s) is damaged, the Contractor shall cut new core(s) adjacent to the initial sample. In the Owner's presence, the Contractor may saw-cut the bottom of the core

onsite without disturbing the layer being tested to remove lower layers of Hot Mix Asphalt Pavement, gravel, or RAP. No recuts are allowed at a test location after the core has been tested.

The minimum acceptable density for shoulders shall be 90.0% unless waived by the Owner due to local conditions that make densification to this point detrimental to the finished pavement.

Method B

Method B utilizes Product Verification testing to determine the quality of the material incorporated into the project. The Hot Mix Asphalt Pavement (other than that placed outside the traveled way and shoulders) shall meet the material properties in Tables 1 through 3. Aggregates and Mix shall meet the Consensus and Volumetric properties in Table 8 and Section 401.03, Aggregates, utilizing the testing methods and sampling procedures in Table 5.

For the traveled way density will be tested with 3 random cores, and statistically evaluated for Pay Factors with a USL of 98.0% and an LSL of 92.0%. If the resultant Pay Factor is 0.75 or below, the Contractor shall remove and replace the material with mix meeting the specifications at no additional cost to the Owner.

Only the Owner shall be allowed to dispute whether the test results reflect the true quality of the mix.

Unless otherwise noted, the Owner will verify density by inspection to ensure that the proper compaction procedures are complied with. The Owner may test for density to ensure that the Contractor's method attains acceptable results. At any time, the Owner may take samples from the source of production to determine the properties shown in Table 8, Section 401.03, Aggregates, or will verify these properties with test results from another project done during the same time period.

Table 8: GRADATION, VOLUMETRIC AND PGAB CONTENT VERIFICATION LIMITS (METHOD B)

	USL and LSL		
	Mainline	Shoulder	Drives & Sidewalks
Percent Passing 4.75 mm and larger sieves	Target ± 7	Target ± 7	Target ± 7
Percent Passing 2.36 mm to 1.18 mm sieves	Target ± 5	Target ± 5	Target ± 5
Percent Passing 0.60 mm	Target ± 4	Target ± 4	Target ± 4
Percent Passing 0.30 mm to 0.75 mm sieve	Target ± 3	Target ± 3	Target ± 3
PGAB Content	Target ± 0.5	Target ± 0.5	Target ± 0.5
Air Voids	4.0% ± 2.0	4.0% ± 2.0	Not Applicable

Fines to Effective Binder	0.6% to 1.6%	0.6% to 1.6%	Not Applicable
Voids in the Mineral Aggregate	JMF Target ± 1.5%*	JMF Target ± 1.5%*	Not Applicable
Voids Filled with Binder	Target ± 5%	Target ± 5%	Not Applicable

* But not more than 0.5% below the Table 2 Min. Value

For PGAB Content, Gradation, and Volumetric properties on items covered under Method B, the Owner may take 3 or more random samples from the material delivered to the project. The Owner may elect to test one or more of these samples to evaluate the quality of the mix. If there is concern about the quality, the Owner will test 3 or more random samples to determine a Pay Factor for each property using Table 8 USLs and LSLs. The Owner may reject material with a 0.75 pay factor or less. If the PF is less than 1.00 but greater than 0.75, price adjustments may be made accordingly. If the PF is 1.00 or greater the Owner will pay the full contract price.

401.21 Method of Measurement and Payment. All material, equipment and labor required to produce, place and test the asphalt pavement shall be included in the Lump Sum contract except testing by the independent testing laboratory hired by the Owner. No quantity measurement will be made for any pavement placed under this contract.

401.22 Basis of Payment. Payment for all paving activity shall be included in the Project Lump Sum contract price.

This Work shall include all labor, equipment, materials, and incidentals necessary to meet all related Contract requirements, including design of the JMF, implementation of the QCP, obtaining core samples, filling core holes, applying emulsified asphalt to joints, and providing testing facilities and equipment. Cleaning objectionable material from the pavement and furnishing and applying bituminous material to joints and contact surfaces is incidental.

No separate payment will be made for any pavement work under this Contract.

401.222 Pay Factor (PF) (Method A Only). The Owner will use density, Performance Graded Asphalt Binder content, voids @ N_d, VMA, VFB, F/B^e, and the screen sizes listed below (Table 9) for the type of material represented in the JMF. The Owner will evaluate materials using the following price adjustment factors under Subsection 106.033 for QA purposes only and no additional payment will be based on these calculations.

Table 9: Table of Gradation Composite "f" Factors
(Method A)

Constituent		"f" Factor				
		25 mm	19 mm	12.5 mm	9.5 mm Surface	9.5 mm Other
Gradation	25 mm	4	-	-	-	-
	19 mm		4	-	-	-
	12.5 mm			4	-	-
	9.50 mm				4	4
	2.36 mm	6	6	6	6	6
	1.18 mm					
	0.60 mm	2	2	2	2	2
	0.30 mm	2	2	2	2	2
	0.075 mm	6	6	6	6	6

For each lot of material, the Owner will determine a price adjustment as follows:

Gradation. The Owner will determine a composite pay factor (PF) using applicable price adjustment factors "f" from Table 9 and acceptance limits from Table 6. The Owner will not make price adjustments for gradations, but will monitor them as a shutdown criteria.

VFB and Fines to Effective Binder. The Owner will determine a pay factor (PF) using acceptance limits from Table 6. The Owner will not make price adjustments for VFB or Fines to Effective Binder, but will monitor them as a shutdown criteria.

Density. For mixes having a density requirement, the Owner will determine a Pay Factor using acceptance limits from Table 7a or 7b.

PGAB Content, VMA and Air Voids. For mixes having a Volumetric requirement, the Owner will determine a Pay Factor using acceptance limits from Table 6.

If any single Pay Factor for PGAB Content, VMA, Air Voids or Density falls below 0.75, the Owner will reject the material.

401.223 Process for Dispute Resolution (Method A Only).

The Owner will take a split for each QA test random sample, including mix samples for PGAB content, volumetrics and gradation, and label and store them to allow at least 2 working days for the Contractor to notify the Owner in writing of any disputes. At the time of sampling, the Contractor may also take a split sample of the material.

(a) PGAB content. To contest PGAB content within a sublot the Contractor must run its split of the original sample. If the Contractor tests its split and the results are equal to or greater than the allowable tolerances in Table 10, and notifies the Owner in writing within 2 working days of receiving the QA test results, the Owner will retest for PGAB content by the ignition method. If the re-test result is within the allowable tolerance shown in Table 10, the original test result will be used. If the re-test is equal to or greater than the allowable tolerances from Table 10 the new value will be used to calculate PGAB Content, VMA, VFB and Fines to Effective Binder.

(b) Density. To contest a nuclear density reading within a sublot, 1) the Contractor's nuclear gauge must have been calibrated using the same cores as the QA test gauge, and 2) the QC test must have been taken at the same location, and 3) the difference must have been greater than the tolerance allowed inn Table 10. If the difference is greater, the Contractor may request a new reading be taken by the QA Technician within 10 meters at the same offset from centerline. If this result is within Table 10 tolerance, the Owner will use the initial QA test. If the resulting density reading differs more than allowed in Table 10, the Owner will use the second reading. If the difference is less than the tolerance allowed in Table 10, the Owner will use the original reading.

If the Contractor and the Owner believe that the mat being tested may be 5 mm less than the designated thickness or thinner, the Contractor may cut a core in the same location as the original test. If the core is found to be 5 mm or more thinner than the designated thickness, then the Owner will test the core. If the density results exceed the tolerances allowed in Table 10, then the Owner will substitute the core value for the nuclear value. Re-testing may only take place after the area is opened to traffic if approved by the Owner. On any pavement thickness found to be less than 30 mm, the Owner will determine density using the core.

Where the Owner tests for density by the core method, no disputes will be allowed unless based on evidence that the results are inaccurate, as reasonably determined by the Owner.

(c) Volumetric. If the Contractor believes that the Owner's test results vary significantly from the Contractor's results, the Contractor may dispute the Owner's results by testing their split of the original sample. If the Contractor's results vary from the Owner's results by more than the tolerance in Table 10, and the Owner is notified in writing within at least 2 working days of the Contractor receiving QA test results, the Owner will re-test the remaining split of the original sample. If the Owner's re-test is within the allowable tolerance shown in Table 10, the original test shall stand. If the re-test is outside the allowable tolerances from Table 10 but is within the Table 10 tolerance of the Contractor's test, the Owner will use the second value.

When the Contractor has initiated 3 disputes that have not been overturned, further disputes resulting in no change will be paid for by the Contractor at the rates established by the Owner.

Table 10. Dispute Resolution Variance Limits

PGAB Content	± 0.3%*
Density	± 1.0%
Voids @ N_d	± 0.8%
VMA	± 0.8%

* 0.4% will be used if the Contractor uses any method other than TP53.

END OF SECTION 02511-APPENDIX A

SECTION 02516

UNIT PAVERS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS:

A. The Conditions of the Contract and all Sections of Division 1 are hereby made a part of this Section.

1.2 WORK INCLUDED:

A. Provide paving units and ADA-compliant detectable warning pavers where shown and as detailed on the drawings.

1.3 RELATED WORK:

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 02200 – Earthwork.
2. Section 02511 – Asphaltic Concrete Paving
3. Section 02525 – Curbs and Sidewalks

B. Unit Prices: Refer to Section 01220 to determine the extent, if any, work of this Section will be affected by any Unit Prices.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 – Concrete Aggregates
2. C67 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
3. C144 – Aggregate for Masonry Mortar
4. C936 – Standard Specification for Solid Interlocking Concrete Pavers.
5. C979 – Specification for Pigments for Integrally Colored Concrete.

B. Interlocking Concrete Pavement Institute (ICPI).

1. Interlocking Concrete Pavement Manual

1.5 QUALITY ASSURANCE, SUBMITTALS:

A. Comply with requirements of Division 1- General Requirements.

B. Paver installation to be performed by a professional firm with a proven history of successful projects of similar scope.

C. Submittals: Provide submittals as follows:

1. Product Data:
   a. Paving Brick, each type.
   b. Polyethylene edge restraint.

2. Samples:
   a. Unit or units representative of full color image, size, shape and texture of pavers.
   b. Polyethylene edge restraint.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect pavers before and during construction from physical damage and contamination from soil and other materials that may cause staining.

1.7 JOB CONDITIONS

A. Cold Weather Protection:

1. Frozen Materials: Do not use frozen materials or materials mixed or coated with ice or frost.
2. Frozen Work: Do not install when subgrade, base, or setting bed is frozen. Remove and replace work damaged by frost or freezing.

PART 2 - PRODUCTS

2.1 UNIT PAVERS

A. Heavy vehicular prest paving bricks as manufactured by Hanover Architectural Products, or approved equal (1-800-426-4242).

B. Pavers shall have minimum average compressive strength of 8500 psi.

1. Water absorption shall be less than 5%.

2. No weight loss or visual signs of deterioration after 50 cycles of freeze-thaw, or three-day application of rock salt (wet).

3. Allowable tolerance shall be plus or minus 1/16 in. in any direction.

1. Color selections correspond to manufacturers' designations.
2. Refer to Enlarged Site Layout Plans for coursing and pattern direction.

B. Detectable Warning Pavers as manufactured by Pavestone, (www.pavestone.com), Whitacre-Greer (www.wgpaver.com or 1-800-947-2837), or approved equal.

1. Dry-press solid (uncored) hard-burned, frost-free pavers with chamfered edge.
2. Complies with ADA requirements, 5,000 psi min. compressive strength, 8% maximum absorption.
3. Size: 2 ¼" x 4" x 8".
4. Color: Colonial Red.

C. The pavers shall be free of cracks or other imperfections when viewed from a distance of 20 feet (6 meters). The exposed parts of the brick shall be free of chips exceeding 5/16" from the edge and ½" from a corner. All pavers that do not meet these criteria shall be replaced with acceptable units.

2.2 EDGE RESTRAINT

A. Provide injection molded polyethylene edge restraint as manufactured by Snap Edge Corporation or approved equal. Use approved edge restraints where a structure, pavement, or curbing does not abut pavers.

B. Edge restraint spikes shall be 12" x 3/8" diameter galvanized steel.

2.3 SETTING BED AND JOINT SAND

A. Concrete sand conforming to ASTM C33 for bedding sand; ASTM C144 for joint sand. Bedding sand may be used for joints, but may require extra sweeping compound and compaction.

B. Sand to be sharp, washed and free of foreign material.

2.4 BITIMINOUS SETTING BED

A. Refer to Section 02525 – Curbs and Sidewalks

PART 3 - EXECUTION

3.1 GENERAL

A. Place bituminous setting bed sand and leveling layer and edge restraints, where necessary.

B. Set pavers in configurations/patterns as shown on drawings.

C. Compact and sand sweep joints to provide tight, interlocking surface. Repeat as necessary to completely fill joints after settlement.

D. Units with excessive chips, cracks, voids, discoloration, or other defects which may affect finished work, will not be used and will be rejected.

3.2 INSTALLATION OF UNIT PAVERS

A. Base:

1. Contractor shall inspect and verify that aggregate base and bituminous binder course or concrete frost slab for all work covered in this Section have been placed and compacted in the amounts specified in the Drawings and Specifications (See Section 02200 - Earthwork and Section 02511 – Asphaltic Concrete Paving).
2. Commencement of work by the Contractor signifies acceptance of base conditions. Any deviations or abnormalities in base preparation are to be reported to the Architect immediately.

B. Edge Restraint:

1. Place edge restraint to exact lines as shown on drawings.
2. Straight runs to be true to the line, and curves to be smooth and true to form.
3. Install edge as per manufacturer's specifications. Top edge should not be visible from surface.
4. Notify Landscape Architect after edge installation and before setting of pavers.

C. Sand Setting Bed:

1. Place and screed sand to grades and lines as required. Thickness after paver installation to be no less than 1" and no greater than 1 1/2".
2. Do not use water-saturated or frozen sand.
3. Do not use sand to compensate for improperly installed or compacted base or for making up any unevenness or irregularity in the base course surface as this will show through to the finished surface of the pavers over time.
4. Do not walk on or otherwise disturb screeded setting bed surface prior to paver installation.

D. Pavers:

1. Set pavers hand tight using specified colors, shapes and textures in patterns and configurations shown.
2. Trim and cut pavers as required using a motor driven masonry saw with a blade designed specifically for the cutting of paving units. Keep cuts to a minimum. Small pieces less than 2" in any dimension, or pieced together to create a larger "whole" will not be accepted.
3. A typical spacing of 1/16" is to be maintained between pavers; maximum joint width 1/8".
4. Gaps between pavers and adjoining objects of greater than 3/8" shall be filled with sand.
5. After pavers are set, vibrate into place with a plate vibrator capable of 3,000 to 5,000 pounds centrifugal compaction force and operating at a frequency of 80 to 90 hertz. Two passes in opposing directions (at right angles) minimum to be made with vibrator.
6. Sweep joints with dry sand, and vibrate (lightly water when sand/cement used). Repeat process to fill joints. Damp sand may be spread over paver surface and allowed to dry before filling joints.
7. Do not compact closer than 3' to an unrestrained paver edge.
8. All work must be compacted up to 3' from stopping point by the end of each workday. Cover and protect setting bed and uncompacted pavers until resumption of work.

E. Expansion and Control Joints:

1. Provide for sealant-filled joints at building foundation and against concrete slabs or foundations.
2. Provide compressible form filler as backing for sealant-filled joints as necessary.
3. Install joint filler before setting pavers.
4. Make top of joint filler flush with top of pavers.

F. Tolerances:

1. Do not exceed 1/16-inch (1.6 mm) unit–to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and ¼ inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface paving.
2. Surface elevation of pavers are to be 1/8" to 1/4" above adjoining curbs, inlets, walks, etc. (and may be 1/8" to 1/4" above final grades in general) to allow for characteristic minor settling.

3.3 REPAIR, PROTECTION, CLEANUP

A. Replace units that are chipped, broken, stained, or in any other way do not conform to or may adversely affect the adjoining work.

B. Work area to be left in a neat and orderly manner upon completion of work, free from debris and swept clean.

C. Finished work is not to be used for storage of materials, unapproved vehicle movement or other operations which may damage, stain or otherwise mar the paver surface.

3.4 INSPECTION AND ACCEPTANCE

A. When paver installation is complete, the Landscape Architect will, upon request, inspect work to determine acceptability.

B. Work that does not comply with requirements will be removed and replaced as specified and as shown on drawings, at no additional cost to Owner.

C. Owner will, upon completion and request, inspect replaced areas to determine acceptability.

END OF SECTION

SECTION 02525

CURB AND SIDEWALKS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete and Bituminous Sidewalks

B. Granite Curb

C. Bituminous Curb

1.2 RELATED SECTIONS

A. Section 02100 - Site Preparation

B. Section 02227 - Aggregate Materials

C. Section 02505 - Paving Base and Subbase Course

D. Section 02516 – Unit Pavers

E. Section 02584 - Pavement Markings

F. Section 03300 - Cast-in-place Concrete

G. State Highway Department Standard Specifications

H. City of Portland Technical Design Requirements Manual

I. Construction Documents.

1.3 SECTION EXCLUDES STRUCTURAL SLABS AT ENTRANCES

A. Structural slabs are entryway areas consisting of a slab supported by a foundation contiguous with the building foundation.

1.4 REFERENCES

A. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete

B. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural construction.

C. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

D. ASTM C33 - Concrete Aggregates.

E. ASTM C94 - Ready Mix Concrete.

F. ASTM C150 - Portland Cement

G. ASTM C260 - Air-Entraining Admixtures for Concrete.

H. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

I. ASTM C494 - Chemical Admixtures for Concrete.

J. FA TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.5 PERFORMANCE REQUIREMENTS

A. Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with nonstaining type coating that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM 185. Furnish in flat sheets, not rolls, unless otherwise acceptable to Owner.

C. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

D. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.

E. Joint Sealers: Non-priming, pourable, self-leveling polyurethane. Acceptable sealants are Sonneborn "Sonolastic Paving Joint Sealant", Sonneborn "Sonomeric CT 1 Sealant", Sonneborn "Sonomeric CT 2 Sealant", Mameco "Vulken 45", or Woodmont Products "Chem-Caulk".

F. Granite Curb: Type "1" vertical curb, shall the requirements of MDOT Specification 609 and the City of Portland Technical requirements. Type 1 granite headstones and transitions shall be used at all catch basin inlets along gutter lines. Granite at all ADA ramps shall be Type 1 with no reveal. Type 5 curb is not permitted for tip downs or to directly abut Type 1 curb in any area. The Contractor shall submit samples of granite for owner approval of color and quality prior to ordering and delivery.

G. Bituminous Curb shall be used where required on the Contract Drawings and shall be installed in accordance with Section 609 of the MDOT specifications. Fiberglass resin shall be used in all curb and coatings pursuant to MDOT specifications shall be provided.

H. Aggregates subbase gravels and base gravels (if appropriate) for sidewalks shall meet the requirements of Section 02227 of these specifications.

I. Asphaltic concrete pavement for sidewalks shall meet the requirements of Section 02511 of these specifications.

J. Catalog cuts and information on the curb supplier shall be submitted to the Owner for approval prior to ordering the material.

2.2 MIX DESIGN AND TESTING

A. Concrete mix design and testing shall comply with requirements of applicable Section 03300 or the City of Portland technical requirements for concrete sidewalks, which ever is more stringent.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:

1. Compressive Strength: 4,000 psi, minimum at 28 days, unless otherwise indicated on the Drawings.

2. Slump Range: 3"-5" for normal concrete at time of placement.

3. Air Entrainment: 4% to 6%

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare subgrade to receive sidewalk subbase gravel in accordance with Section 02223.

B. Place and compact subbase and base gravel in accordance with Section 02200, 02223, 02227 of these specifications.

C. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after the unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.

D. Surface Preparation: Remove loose material from compacted base material surface immediately before placing concrete.

3.2 INSTALLATION (CONCRETE SIDEWALKS)

A. Form Construction

1. Set forms to required grades and lines, rigidly braced and secured.

2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.

3. Check completed formwork for grade and alignment to following tolerances:

   Top of forms not more than 1/8" in 10'-0".
   Vertical face on longitudinal axis, not more than 1/4" in 10'-0".

4. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Locate, place and support reinforcement per Division 3 specifications.

C. Concrete Placement

1. Comply with requirements of Section 03300.

2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structure until they are at the required finish elevation and alignment.

3. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels and joint devices.

4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hours, place construction joint.

D. Joint Construction

1. Contraction Joints: If joints are specified, the curb or gutter shall be constructed in uniform sections of the length specified on the plans. The joints between sections shall be formed either by steel templates 1/8 inch in thickness, or a length equal to the width of the gutter or curb, and with a depth which will penetrate at least 2 inches below the surface of the curb and gutter; or with 3/4 inch thick preformed expansion joint filler cut to the exact cross section of the curb or gutter; or by sawing to a depth of at least 2 inches while the concrete is between 4 to 24 hours old. If steel templates are used,

they shall be left in place until the concrete has set sufficiently to hold its shape, but shall be removed while the forms are still in place.

2. Longitudinal Construction Joints: Concrete curb, concrete gutter, combination concrete curb and gutter, where specified on the plans, shall be tied to concrete pavement with 1/2 inch round, reinforcement bars of the length and spacing shown on the plans.

3. Transverse Expansion Joints: Transverse expansion joint in curb, curb and gutter, gutter or sidewalk shall have the filler cut to the exact cross section of the curb, curb and gutter, gutter or sidewalk. The joints shall be similar to the type of expansion joint used in the adjacent pavement.

E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If not joint sealer, place top of joint filler flush with finished concrete surface. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler section together.

F. Joint Sealants: Exterior pavement joint sealants shall be installed per manufacturer's recommendations.

3.3 COLD WEATHER PLACING

A. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions or low temperatures, in compliance with ACI 306 and as specified herein. All expenses associated with the protective measures, temporary heating, etc. shall be at the expense of the Contractor.

When air temperature has fallen to or is expected to fall below 40° F (4° C) uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50° F (10° C) and not more than 80° F (27° C) at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete or frozen subgrade or subgrade containing frozen materials.

Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical agents, unless otherwise accepted in mix design.

3.4 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

B. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius. Eliminate tool marks on concrete surface. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Inclined Slab Surfaces: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to line of traffic.

2. Paving: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to line of traffic.

C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed.

D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in the "water-curing" section of ACI 308-81.

3.5 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.6 GRANITE CURB

A. Granite curbing will be installed and backfilled in accordance with provisions of Paragraph 3.06. All granite curb used to form a radius and any granite curb of any type with stone length of less than 36" if allowed by the City of Portland, shall be set

in a dry mortar bedding. Generally the City of Portland does not allow granite curb lengths less than 4' to be used.

B. Protection of granite curb shall be in accordance with Paragraph 3.06 C above.

3.7 BITUMINOUS CURB

A. Bituminous curb shall be installed on the bituminous pavement base course prior to placement of final bituminous pavement wearing course. The curb shall be backfilled with approved materials. This material shall be placed in layers not exceeding 8 inches in depth, loose measure and thoroughly tamped.

B. Protection of bituminous curb with coatings shall be in accordance with MDOT Standard Highway specifications.

3.8 HOT BITUMINOUS CONCRETE

A. Bituminous concrete pavement for sidewalks shall be placed in two lifts to provide the total thickness specified on the drawings.

B. Compaction shall be by a paver roller having a minimum total weight of 2,000 lb. with a minimum of 65 lbs. per inch of drive roll or by satisfactory vibratory equipment.

C. Placement and quality control shall comply with Section 02511 of these specifications.

3.9 CAST-IN-PLACE SLIPFORM CONCRETE CURB

A. Cast-in-place concrete curb shall be placed with an approved slipform machine that will produce a finished product according to the design specified in the plans and will meet the same standards set for cast-in-place curbing. For cold weather slipforming, the outside temperature must be at least 36^0F (2.2^0) and rising. The curb shall be placed on a firm, uniform bearing surface, shall conform to the section profile specified in the plans and shall match the appropriate grade. Proper curing shall be insured through the use of a curing compound spray that meets ASTM specifications. Expansion joints will be provided at the ends of curve radii or wherever the curb meets rigid structures such as building foundations or fire hydrants. Contraction joints will be placed at 10-foot (3 m) intervals using sawing methods, which cut 1-3" into the concrete. Joints shall be constructed perpendicular to the subgrade and match other joints in roadways, sidewalks or other structures when applicable.

B Backfilling: Same as Section MDOT 609.05 (b).

C. Protection: Slipform curbing must be adequately protected after placement. The concrete shall be allowed to cure for at least 72 hours. During cold weather conditions, when temperatures drop below the required 36^0F (2.2^0) after placement, curbing shall be protected by concrete blankets or a combination of plastic sheeting and straw. After any placement of slipform curbing, regardless of weather conditions, the placed curbing shall be adequately protected by traffic control devices and flagging as necessary.

END OF SECTION

SECTION 02584

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS:

A. Section 02200 Earthwork

B. Section 02505 Paving Base Course

C. Section 02511 Asphaltic Concrete Paving

D. Construction Drawings

E. VACANT

1.2 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The paint shall be a non-bleeding, quick-drying, alkyd petroleum base paint suitable for traffic-bearing surfaces and shall meet FS TTP-85E and mixed in accordance with manufacturer's instructions before application.

B. Vacant

PART 3 - EXECUTION

3.1 SITE MEETING

A. A site meeting including the General Contractor, Pavement Marking Subcontractor, and the Owner shall be conducted prior to conducting the work. Marking locations, colors, and dates of application shall be confirmed at this meeting.

3.2 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

B. Where existing pavement markings are indicated on the drawings to be removed or would interfere with the adhesion of new paint, a motorized device shall be used to remove the markings. The equipment employed shall not damage the existing paving or create a surface hazardous to vehicle or pedestrian traffic. In all areas within public rights-of-way, the method of marking removal shall be approved by governing authority.

3.3 APPLICATION

A. Apply two (2) applications of paint at manufacturer's recommended rate without the addition of thinner, with a maximum of 125 square feet per gallon. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use a straightedge to ensure a uniform, clean, and straight stripe. A minimum of 48 hours shall elapse between the applications.

B. The following items are to be painted with the colors noted below:

1. Pedestrian Crosswalks: White
2. Guardposts: Safety Yellow per Engineer's direction.
3. Lane Striping where separating traffic in opposite directions: Yellow
4. Lane Striping where separating traffic in same direction: White
5. Handicap Symbols: White symbol with 4' square non-skid blue background or per Local Code and conforming to ADA requirements.
6. Parking Stall Striping: Yellow or white (distinguished compact/non-compact spaces).
7. Stop Bars: Provide painted stop bars where shown on the plan
8. Directional Arrows: White

END OF SECTION

SECTION 02605

WATER, SEWER, STORM AND CATCH BASIN STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Monolithic concrete manholes with masonry transition to lid frame, covers, anchorage and accessories.

B. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage and accessories.

C. Masonry manholes sections with masonry transition to lid frame, covers, anchorage and accessories.

D. Catch basin structures.

E. VACANT

F. VACANT

G. VACANT

H. VACANT.

I. Electrical transformer pads. N.I.C.

J. Electrical handholes and manholes. N.I.C.

K. Precast bases for lighting. N.I.C.

1.2 RELATED REQUIREMENTS

A. Section 02222 - Excavation, Backfilling, and Compacting for Utilities

B. Vacant

C. Section 02720 - Storm Sewer Systems

D. Section 02730 - Sanitary Sewer System

E. Section 03300 - Cast-In-Place Concrete

F. Local Governing Authority and Code Requirements

G. Construction Drawings

H. The public utility for sewers is the City of Portland. All materials, installation, and workmanship will comply with the requirements specified in this section, and the requirements of the City of Portland and the City of Portland Public Services Department. Where a more stringent standard exists, the more stringent standard shall apply.

1.3 REFERENCES

A. ANSI/ASTM C55 - Concrete Building Brick.

B. ASTM A48 - Gray Iron Castings

C. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

D. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

E. ASTM D1248 - Precast Polyethylene Manholes.

F. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.4 SUBMITTALS

A. Shop Drawings: For all precast structures indicate manhole locations, rim elevation, piping, sizes and elevations of proposed penetrations. Submit a prefabrication drawing for each appurtenance showing this data.

B. Product Data: Provide manhole covers, component construction, features, configuration and dimensions.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE ITEMS

A. Precast Manhole and Catch Basin Sections: Manhole and catch basin super-structures shall be precast reinforced concrete of the dimensions indicated on the Plans conforming to ASTM Specification C478. Sections shall be installed with a flexible plastic gasket equal to or better than "Ram-Nek" as manufactured by K. T. Snyder Co., Houston, Texas, or sections may be fabricated to accept Tylox "O" rubber gaskets as manufactured by Hamilton Kent Manufacturing Co., Kent, Ohio. The casting and the outside of the brick work required to bring the rim to grade shall be plastered with at least 3/8" mortar, thoroughly troweled to leave a smooth waterproof exterior surface.

Manhole steps shall be forged aluminum safety type, alloy 6061, temper T6, or reinforced polypropylene plastic. Steps shall be cast or anchored into walls of precast sections to form a ladder with a distance of 12 inches between steps.

The Contractor shall furnish the name of the manufacturer to the Engineer prior to commencing work.

B. Precast Manhole and Catch Basin Bases: Manhole and catch basin bases shall be precast reinforced concrete of the dimensions indicated on the Plans conforming to ASTM Specification C478. Bases shall be placed on a well-compacted layer of crushed stone.

Jointing system for pipe entering or leaving manholes shall be a flexible manhole sleeve cast in the base. A stainless steel pipe clamp shall be used to fix the pipe into the sleeve. All materials shall meet or exceed rubber quality standards of ASTM C-443 and C-361.

For manhole bases, a minimum of 4 inches shall be allowed between pipe invert and inside bottom of base for construction of brick inverts.

Where precast bases are used for drop manholes, a 6-inch concrete slab is to be placed under the base section large enough to receive the concrete encased drop pipes. Provide suitable ties between manhole sections and drop pipe encasements.

Prior to ordering precast manhole bases, all angles between incoming pipes are to be field checked to incorporate possible line changes required in the field layout.

C. Vacant.

D. Vacant.

E. Precast Tanks, Vaults and Appurtenances: Precast tanks, vaults, and appurtenances shall be constructed of precast reinforced concrete with inside dimensions conforming to those indicated on the contract drawings and conforming to ASTM C478. The tank may be a monolithic section or constructed with tongue and grooves with approved watertight sealants such as butyl sealant. All penetrations through the tank shall use either cast in place wall sleeves with Link Seals or a flexible boot secured in the casting such as Kon N Seal. Any clamps or metallic connections shall be stainless steel.

The tanks, vaults, and appurtenances shall include shop drawings and submittals with supporting computations which demonstrate the tank can support an H20 loading, an equivalent external fluid pressure of 105-lb./cubic ft. (with the tank empty), and an internal fluid pressure of 65-lb./cubic ft. The pressures shall be assumed to apply from the base of the structure to the finish grade surface.

Tanks which require attachment to an anti-flotation slab shall use stainless steel angles and anchors sized to resist the uplift force.

The tanks shall be coated with a waterproof seal on the interior and exterior. Sections shall be fabricated to receive a watertight seal.

F. Precast Light Pole Bases: N.I.C.

2.2 CASTINGS

A. The Contractor shall furnish all cast iron frames, grates, and covers conforming to the details shown on the Drawings, or as hereinbefore specified.

B. Castings shall be at least Class 25 conforming to the ASTM Standard Specifications for Gray Iron Castings, Designation A-48-64 except for the 12" NDS risers and 12" inlets.

C. Before being shipped from the foundry, castings shall be given two coats of coal-tar-pitch varnish, applied in a satisfactory manner so as to make a smooth coating, tough, tenacious and not brittle or brittle with any tendency to scale off.

D. Sanitary sewer covers shall have the name "Sewer" cast therein. Storm drain covers shall have the name "Storm" cast therein.

E. The manhole castings for roadway or traffic areas shall be the equal of the Portland standard non-perforated manhole frame and cover M 24 x 8-S weighing

approximately 425 pounds as manufactured by the Etheridge Foundry Company, or Catalog No. LK610 as manufactured by the E.L. LeBaron Foundry Company.

F. Catch basins castings shall have frames conforming to S 24" x 8 square by Etheridge with a 24" square type "M" bicycle safe grate or catalog LK 124 (LeBaron), unless otherwise noted on the drawings.

2.3 MORTAR

A. Mortar used to adjust rims and covers for manholes shall consist of the following materials and proportions by volume: 1 part of Portland cement; 1/4 part lime hydrate; and 3 parts sand.

B. For precast reinforced concrete manholes, mortar for invert construction shall consist of the following materials and proportions by volume: 1 part Portland cement and 2 parts sand. Quantity of water in mixture shall be sufficient to produce a stiff, workable mortar, but in no case shall exceed 5-1/2 gallons of water per sack of cement.

2.4 BRICK

A. Brick for manholes and catch basins shall meet Standard Specifications for Sewer Brick, AASHTO Designation M-91-42, Grade SA, Size No. 1 wire cut. Any brick rejected by the Engineer as unsuitable shall be immediately removed from the work.

2.5 VENTS

A. Vents, when required by the Contract Drawings, shall be constructed of galvanized piping of the diameter indicated on the plans with a minimum size of 4" with threaded joints. The top of the vent shall have a minimum of 12 square inches of screened opening to permit air passage, and a cap to prevent extraneous material from entering the vent. The cap shall not interfere with the air passage. Vents shall be connected to appurtenances using a cast in wall pipe.

2.6 SITE CONCRETE

Site concrete shall meet the requirements set forth below:

A. Aggregate: The aggregate shall conform to the Standard Specifications for Concrete Aggregates, ASTM Designation C-33, as revised.

(a) Sand shall be a medium sand with a fineness modules of 2.60 - 2.90.

(b) Coarse aggregate shall not exceed 1-1/2 inches for mass concrete.

B. Cement: All cement shall be a Portland Cement conforming to the requirements of Standard Specifications of the American Society for Testing Materials, Designation C-150, as revised, Type II. An air entraining agent, approved by the Engineer, shall be used.

C. Proportioning Concrete:

Maximum Size Coarse Aggregate (Inches)	Air Content Percent by Volume
1-1/2, 2, or 2-1/2	5 +/- 1
3/4 or 1	6 +/- 1

The strength of the concrete shall be fixed in terms of water-cement ratio in accordance with trial batches of the materials to be used. All concrete placed under this Specification shall be mixed in the ratio not to exceed six (6) U.S. gallons of water per sack of cement, including surface water carried by the aggregate in each case. The Contractor shall determine the approximate amount of surface water contained in the aggregate, and make proper allowance. Concrete shall have a minimum 28-day strength of 3750 psi. The Contractor shall submit the proposed mix proportions to the Engineer for approval ten (10) days prior to placing concrete. Copies of recent test results for the proposed mix design shall also be submitted.

2.7 REINFORCEMENT

A. The Contractor shall submit detailed shop drawings for concrete reinforcement in accordance with ACI 318 and ACI 315. The steel shall be deformed Grade 60 bars which conform to ASTM 615, ASTM 616, or ASTM 617. Supports, spaces, and chairs shall permit the steel to be supported in accordance with ACI 318.

2.8 INSULATION

A. Insulation, when required by the Drawings, shall be Styrofoam SM or TG as manufactured by the Dow Chemical Company or equal. Profiles are generally the location where insulation required for the pipelines and appurtenances are shown.

Material submitted shall have a K factor of .20 @ 75 degrees by ASTM C518-70, 2-lb. density by ASTM C303-56, compressive strength of 30-lb. by ASTM D1621-64 and a

water absorption of less than .05% by ASTM C272-53 and meet Federal Specification HH1524B Type II, Class B.

The Contractor shall coat the insulation material in accordance with the manufacturer's instructions.

2.9 TREATMENT OF INTERIOR SURFACES

A. All interior surface of cast in place concrete structures shall have a liquid hardener applied. The application shall consist of two coats of VANDEX or approved equal installed in accordance with manufacturer's instructions including requirements for surface preparation. Catalog cuts of the hardener shall be submitted to the Engineer for approval. All interiors of contrite items shall be treated with a waterproof coating (18 mil. Film thickness).

2.10 TREATMENT OF EXPOSED SURFACES

A. All exposed exterior concrete surfaces shall have a "rub finish". Structures and appurtenances shall have an applied coating of Tnemec Series 104 H5 Epoxy applied in 2 coats or approved equal to achieve a minimum dry film thickness of 18 mils.

PART 3 - EXECUTION

3.1 MANHOLES

A. General: All appurtenant structures shall be set level on compacted material as specified in Section 2 of these Specifications and as shown on the Plans.

B. Manhole Channels: Channels shall be constructed in all sanitary sewer and storm drain manholes in accordance with the details shown on the Plans by a mason whose qualifications meet the approval of the Engineer or a preformed manhole channel: "FIBERLINER" or equal. The sides shall be raised by brick masonry construction from the spring line perpendicular to the height of the crown of the pipe. Where changes in directions are made at manholes, the invert shall be shaped with as great a radius as possible, and to the complete satisfaction of the Engineer. Brick shall be carefully laid to present a smooth surface as indicated on the Plans and to the satisfaction of the Engineer.

C. Pipe Connections:

1. Stubs in Manholes: Stubs placed as specified and indicated on the Drawings shall be short pieces cut from the bell ends of appropriate pipe and shall have compatible watertight stoppers. Stubs shall be set accurately to the required line and elevation and encased in the structure masonry as indicated on the Drawings:

2. Wall Sleeves and Castings: Wall sleeves and castings as specified and indicated on the Drawings shall be accurately cast to the required location and elevations as indicated on the Drawings.

D. Steps: Manhole and appurtenant steps shall be cast in the wall and installed in a straight vertical alignment.

3.2 ALTERATIONS TO EXISTING MANHOLES AND CATCH BASINS

A. Existing manholes and catch basins to be altered shall be reconstructed as indicated on the Plans or as directed by the Engineer. Adjusting to grade or connecting to an existing pipe stub is not considered an alteration.

B. Alterations covered include, but are not limited to, adjustments to manhole invert channel caused by new pipe connections or removal of existing pipe connections, and removal and plugging of existing catch basin lead and replacing with a new lead connection conforming to the appropriate section of the Specifications contained herein.

3.3 ADJUSTING EXISTING MANHOLES AND CATCH BASINS

A. Existing manholes and catch basins to be adjusted to grade shall be reconstructed to the required grade. The existing frames, grates, and covers shall be re-used unless otherwise directed.

B. The existing structure shall be dismantled to a sufficient depth to allow reconstruction conforming to the standard details.

C. Adjustment will take place just prior to placing of surface pavement for adjustments of the frame and cover. Adjustments which require dismantling and reconstruction of the super structure shall be accomplished at the time of subgrade preparation. Pavement which is removed for this adjustment shall be cut square, tack coated, and capped with 2" of bituminous concrete. No separate payment will be made for furnishing the bituminous cap.

D. Each structure that is adjusted shall be cleaned of accumulated silt, debris, or foreign matter prior to final acceptance of the work.

3.4 ABANDONING EXISTING CATCH BASINS AND MANHOLES

A. Existing catch basins and manholes designated to be abandoned shall be removed to a depth of one (1) foot below the subgrade line, unless otherwise indicated on the Plans below the proposed building or directed by the Engineer. The existing pipes shall be plugged with concrete and brick masonry and the catch basins and manholes shall be filled with heavy gravel satisfactorily compacted in 9 inch lifts. Prior to backfilling, the sump shall be pumped and cleaned of all water and foreign material. When an existing catch basin or manhole is below the proposed building, it shall be removed.

3.5 MANHOLE ADAPTERS

A. When altering an existing manhole or where a pre manufactured manhole adapter cannot be installed in precast manhole sections, the Contractor shall use a Fernco, or equal, concrete manhole adapter. The adapter shall be designed to provide a positive, watertight seal between the manhole and pipe and shall be mortared in place with Five Star grout or approved equal non-shrink grout.

3.6 PRECAST TANKS, VAULTS, AND APPURTENANCES

A. These precast items shall be set in a dry excavation, proofrolled, and prepared with one of the following bedding materials:

- Compacted ¾" crushed stone (8" min.),
- Compacted MDOT 703.06 Type D gravel.

B. If the subgrade is weak and/or unstable, a layer of Mirafi 600X shall be installed between the prepared subgrade and the bedding.

C. The anti-flotation slabs shall be carefully laid out and aligned, and set on the bedding with reinforcement and forms set on a dry excavation site. Concrete shall be poured and protected from inclement weather during the cure period.

D. Tanks shall be set on the anti-flotation slab. Where necessary for plumbness and level, the tank shall be shimmed with a strong slurry grout installed to fill the void space.

E. Multiple section tanks shall be set in place using approved sealants. Double rows shall be required when joint mastics are used. An approved adhesive primer shall be installed prior to installing the mastics and setting the concrete.

F. The tank shall be anchored to the anti-flotation slab with approved stainless steel masonry anchors. All anchors shall be inspected by the contractor to assure the anchor is secure and will provide the required resistance.

G. After anchorage, the tank excavation shall remain dewatered and backfilled. The backfill shall be brought up uniformly around the tank and compacted in place. Pipe connections shall occur after the tank has been backfilled to the level of the bottom of the pipe bedding.

H. Any voids created by removal of sheeting, bracing or shielding shall be filled and recompacted.

PART 4 - TESTING

4.1 GENERAL

All sanitary manholes, and other appurtenant structures shall be tested as to water tightness. If the initial test fails a retest shall be required. The Contractor has the option of either of the following methods:

A. Water Test: The inlet and outlet of the structure shall be plugged by watertight plugs furnished by the Contractor, and the manhole shall be filled with water. The water shall remain for sufficient time for the absorption into the concrete pipe to have been substantially completed. The amount of water loss from the manhole shall then be determined. The rate shall not exceed five (5) gallons per hour. Obvious leaks shall be repaired by the Contractor by excavating outside the structure, if required, at no cost to the Owner.

B. Vacuum: The manholes shall be vacuum tested by a method and apparatus subject to the prior approval of the Engineer. Vacuum testing shall be performed in the following manner:

The manhole shall be fully assembled, including all pipe connections into the structure. The manhole shall be in its final location and shall not have been backfilled prior to the performance of the test.

All lift holes shall be plugged with a non-shrinking mortar, as approved by the Engineer.

The seal between the manhole sections shall be in accordance with ASTM C923.

The Contractor shall plug the pipe openings, taking care to securely brace the plugs and the pipe.

With the vacuum tester set in place:

- Inflate the compression band to effect a seal between the vacuum base and the structure.

- Connect the vacuum pump to the outlet port with the valve open.

- Draw a vacuum to 10" of Hg. and close the valve.

- The test shall pass if the vacuum remains at 10" Hg. or drops to 9" Hg. in a time greater than one minute. If the manhole fails the initial test, the Contractor shall locate the leak and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material.

Any appurtenant structure which shows obvious infiltration, whether tested or not, shall be sealed to eliminate said infiltration.

END OF SECTION

SECTION 02660

WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, services, equipment, and other necessary items required for accompanying the construction of the water systems. This shall include, but not be limited to the following: pipe and fittings for site water line including domestic water line and fire water line, valves and fire hydrants, set lines, elevations, and grades for water distribution systems work and control system for duration of work including careful maintenance of benchmarks, property corners, monuments, or other reference points.

1.2 RELATED SECTIONS

A. Section 02222 - Excavation, Backfilling and Compacting for Utilities.

B. Section 02227 - Aggregate Materials.

C. Local Governing Authority and Code Requirements.

D. All Necessary Construction Permits.

E. The public utility for water is the Portland Water District. All materials, installation, and workmanship will comply with the requirements specified in this section, the requirements of the Public Utilities Commission and the Portland Water District. Where a more stringent standard exists, the more stringent standard shall apply.

F. Section 02605 – Water, Sewer, Storm, and Catch Basin Structure.

1.3 REFERENCE

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

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

C. ANSI/ASTM D2466 - Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.

D. ANSI/AWS A5.8 - Brazing Filler Metal.

E. ANSI/AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe Fittings for Water.

F. ANSI/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquid.

G. ANSI/AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

H. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

I. ANSI/AWWA C500 - Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.

J. ANSI/AWWA C502 - Dry Barrel Fire Hydrants.

K. ANSI/AWWA C504 - Rubber Seated Butterfly Valves.

L. ANSI/AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in through 24 in NPS.

M. ANSI/AWWA C509 - Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.

N. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.

O. ANSI/AWWA C606 - Grooved and Shouldered Type Joints.

P. ANSI/AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.

Q. ASTM B88 - Seamless Copper Water Tube.

R. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.

S. ASTM D2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).

T. ASTM D2855 - Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.

U. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

V. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

W. ASTM D3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

Z. ASTM D3035 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

AA. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, ½ inch through 3 inch, for water.

BB. UL 246 - Hydrants for Fire - Protection Service.

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, hydrants, valves and accessories including ASTM designations, AWWA certifications and UL labels as required.

B. Manufacturer's Certificate: Certify that products meet or exceed state or local requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of piping mains, valves, connections, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with utility company and/or municipality requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

PART 2 - PRODUCTS

2.1 PIPE GENERAL SPECIFICATIONS

2.1.1 PVC Water Pipe

A. For all water main installations that are less than 4" I.D., the District will require use of 2" I.D. PVC plastic water pipe meeting the following. The District will also require the use of C-900 PVC pressure pipe for all water mains that will be on the public side of the supply meter and that will become the responsibility of the District.

B. Pipe Specifications (2"):

1. Diameter:

   a. The I.D. shall be a minimum of 2".
   b. The O.D. shall be a maximum of 2.38".
   c. The minimum wall thickness shall be 0.113".

2. Pressure Rating:

   a. The minimum working pressure rating shall be 200 PSI (SDR-21).
   b. The pipe shall conform to standard ASTM 2241.

3. Pipe Length:

   a. The pipe shall be provided in 20' lengths.
      * Shorter lengths may be allowed and/or field cut following manufacturer's recommended procedures.

4. Gaskets:

   a. The gasket or O-Ring material shall be rubber meeting ASTM F 477 and of the "permanent use" type.

C. Fittings:

1. Standard AWWA C900 fittings are not available in the 2" I.D. and therefore "steel pipe" class fittings, or Certa-Lok Yelomine couplings and fittings meeting ASTM D 3139 shall be used.

2. The normal nomenclature for "steel fittings" is Schedule 40 or Schedule 80, with the respective pressure ratings of 280 PSI and 400 PSI. Both of these fitting classes are acceptable for use.

D. Service Connections:

1. All service connections shall be made with tapping saddles* per Portland Water District specifications or by use of tees meeting the above-noted fitting specification.

E. Installation:

1. Follow manufacturer's instructions.

2. An eight gauge bare copper wire shall be fastened to the buried PVC pipe to facilitate electronic pipe locating. The wire shall be fastened at two locations per length and not at any joint.

F. The District requires 200 PSI (SDR-14) PVC pipe for other sizes such as 4", 6", 8" and 12". Pipe shall conform to AWWA C-900.

G. Approved Manufacturer/Type

1. J-M Manufacturing – Blue Brute
2. Certainteed – Yelomine
3. Victaulic – Aquamine
4. IPEX – Blue Brute

2.1.2 Ductile Iron Pipe

A. Ductile iron pipe shall meet requirements of AWWA Standard C-151 (latest revision) and be cement lined and seal coated to meet AWWA Standard C-104 (latest revision).

B. Joints shall meet requirements of AWWA C-111 (latest revision).

C. Interior seal coated, bituminous paint oil cut, emulsion not acceptable, thickness minimum of 2 mils dry film thickness.

D. Exterior bituminous coated with minimum of 2 mils dry film thickness.

E. Class 52 wall thickness, 4-inch diameter through 12-inch diameter inclusive.

F. Ductile Iron Pipe with diameters 16 inches and larger shall be approved by PWD.

G. State nominal laying length and mark shorter lengths near bell.

H. Mechanical joint pipe to be furnished with gland, gaskets and Cor-Ten bolts and nuts.

I. Approved Manufacturers:

1. American Cast Iron Pipe
2. Griffin Pipe
3. U.S. Pipe
4. Clow Pipe
5. McWain Pipe (Not Atlantic States)

C. Ductile Iron Fittings: Fittings shall be manufactured by Tyler or Griffin and material shall be ASTM A536-72 mini grade 70-50-05, in accordance with AWWA C110. Fittings shall be cement lined (AWWA C104-74). Interior seal coated (AWWA C104-74) and exterior bituminous coated. Mechanical joint with accessories furnished; D.I. glands, gaskets, Cor-Ten T-bolts and nuts; Class 350 pressure rating in accordance with AWWA C110. Thickness shall be equal to ductile iron pipe Class 53 in accordance with AWWA C151. All plain end fittings shall be beveled-edged (60^{O}) to fit slip-joint fitting and shall be long body design.

D. Retainer Glands: Glands shall be heavy duty ductile iron body as manufactured be Romac or Ebba Iron and shall have a minimum working pressure rating as follows:

1) 4" - 350 psi (pounds per square inch)
6" - 350 psi
8" - 250 psi
12" - 200 psi

Set screws shall be:

1) cupped style ends;
2) composed of Cor-Ten Steel or Ductile Iron

The number of set screws shall be equal to or greater than the number of inches of nominal diameter of the gland (i.e. 4" - 4 set screws; 6" - 6 set screws, etc.).

Gland shall meet AWWA specifications.

E. Bolts and Nuts: General description of properties required.

1. Stainless Steel: Type 316 - contains the addition of molybdenum to the nickel-chromium steels.

Specific Chemical Composition:

a)	Carbon	-	0.08% max.
b)	Manganese	-	2.00% max.
c)	Silicone	-	1.00% max.
d)	Phosphorus	-	0.04% max.
e)	Sulphur	-	0.03% max.
f)	Chromium	-	16-18.00%
g)	Nickel	-	10-14.00%
h)	Molybdenum	-	2-3.00%
i)	SAE No.	-	30316
j)	ASM No.	-	5361A, 5524A, 5573, 5648B, 5690D

2. Cor-Ten Steel: Trade name for cold formed

T-head bolts containing alloying elements such as copper, nickel, and chrome.

Specific Chemical Composition:

a)	Carbon	-	0.2% max.
b)	Manganese	-	1.25% max.
c)	Sulphur	-	0.05% max.
d)	Nickel	-	0.25% min.
e)	Copper	-	0.20% min.
f)	Combined (Ni,Cu,Cr)	-	1.25% min.

F. Resilient Sealed Gate Valve: Valve shall meet all provisions of ANSI/AWWA C509-87 specification as latest revised; shall have a smooth unobstructed water way which shall be a minimum of the nominal diameter of the valve. Valve ends to be specified and shall be furnished with Cor-Ten (or equal) bolts and nuts. Valves shall be manufactured by Mueller, Clow or Eddy and shall open right.

G. Valve Boxes: The valve box bottom section shall be slide-type with bell-type base. The valve box top section shall be slide-type. It shall have a top flange, but shall not have a "bead" or bottom flange. The valve box cover shall be a 2" drop-type cover to fit the 7-1/4" opening of the top section. The valve box extension shall be slide-type with a minimum 3" belled bottom. Material shall be cast iron or ductile free from

defects. Interior and exterior of all components shall be bituminous coated with a minimum of 4 mils dry film thickness.

H. Service Box and Rod:

1. Service Box Specification:

Shall be 1.0" (in.) I.D. black iron or steel pipe with top having N.P.I. threads for 1.0" screw-on cover.

Shall be Erie style with 5-6' (ft.) slide-type riser.

2. Service Box Cover Specifications:

Shall be Quincy type (heavy duty) cover that screws on (1.1 above).

Shall be tapped with a 1" rope thread with a solid brass plug with pentagon operating head.

3. Service Box Foot Piece Specifications

The standard foot piece shall be heavy duty (Ford style or equal) cast iron design.

The large, heavy-duty foot piece shall have an arch that will fit over 2" ball-valve curb-stops.

4. Service Rod Specifications

Shall be 24"-30" in length and have a self-aligning design.

Shall be of circular dimension and constructed of:

a) 5/8" dia. min. cold rolled steel with an epoxy coating (minimum 4 mil D.F.T.), or,

b) 1/2" dia. min. #304 stainless steel.

Shall have a yoke design that is an integral part of the rod.

The curb-stop attachment point shall be a brass cotter pin.

The rod "wrench-flat" shall have a minimum thickness of 1/4" tapered to 1/16" and width of 5/8" or 1/2".

I. Tapping sleeves shall be as approved by the local water company. Options include the following:

Tapping sleeve shall be mechanical joint with recessed outlet flange for tapping valve; conform to AWWA C207, Class D, with rated maximum working pressure of 200 psi. The side rubber gaskets shall be rectangular in cross-section and fit into grooved channels in the casting. These gaskets shall extend the entire length of the sleeve and shall not require cutting or trimming to match MJ end gaskets. Tapping sleeve shall be AB-CD pattern to permit use of plain rubber and duck-tipped gaskets for various O.D. piping sizes.

Mechanical joint with accessories furnished; glands, gaskets, and Cor-Ten T-bolts and nuts or equal. All flange bolts shall be 316 stainless steel or silicone bronze. Interior and exterior to be bituminous coated with a minimum of 4 mils dry film thickness. The sleeve shall be provided with a 3/4" F.I.P.T. test port and brass plug.

The tapping sleeve shall be Romac Industries Inc., 304 Stainless Steel Tapping Sleeves with ductile iron flange. Flange bolts shall be stainless steel or silicon bronze. The sleeve shall be rated for a maximum, working pressure of 200 psi. The interior and exterior shall be bituminous coated with a minimum of 4 millimeters dry film thickness. The sleeve shall be provided with a 3/4" F.I.P.T. test port and plug.

J. Corporation Stop:

1. 3/4" - 1" shall be a ball valve design with a brass ball that is Teflon (or equal) coated. 1-1/2" - 2" shall be ball-corp design with an on-off identification mark on the operating nut.

2. The valve shall be supported by 2 seats for water tight shut-off in either direction.

3. The valve shall have a full port opening.

4. The body of the corporation-stop shall be of heavy duty design.

K. Specifications for Services:

1. Material

Copper Tubing: ASTM B88, Type K, Seamless, Annealed, 2 Inch Diameter Maximum.

2. Fittings

Brass Compression Manufactured by Ford, Mueller or McDonald.

L. Curb Stops

1. For sizes 3/4" - 2", the valve shall be a brass ball that is Teflon (or equal) coated.

2. The ball shall be supported by seats which are water tight in either direction.

3. The valve shall have a full-port opening.

4. The valve shall open with ¼ turn (90^{o}) with a check or stop.

5. The valve shall not have a drain.

6. The valve stem shall have 2 "O" rings and a bronze ring lock which holds the stem solidly in the valve body.

7. The valve body shall be a heavy duty design.

M. Hydrant: Hydrant shall be Mueller Centurion or Eddy F-2641 all with stainless steel nuts and bolts below grade. The hydrant shall have an epoxy coated base, and open left. The nozzles shall have National Standard Threads. Operating nut shall be 1-15/16".

All material used in the production of fire hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502.

N. Joint Restraint: Place thrust blocking consisting of 2,500 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 lbs./sq. ft. when water main pressure is 100 psi.

MINIMUM THRUST BLOCKING BEARING AREAS

Pipe Diameter	Tees Sq. Ft.	90 Deg. Bend Sq. Ft.	45 Deg. Bend Sq. Ft.	22 Deg. Bend Sq. Ft.
4"	1.0	1.0	1.0	1.0
6"	1.5	2.0	1.0	1.0
8"	2.5	3.5	1.8	1.0
10"	4.0	5.5	2.8	1.5

12"	6.0	8.0	4.0	2.0
14"	8.0	11.0	5.5	3.0
16"	10.0	14.2	7.0	4.0

O. Rigid Insulation: Installation, when required by the Drawings, shall be Styrofoam SM or TG as manufactured by the Dow Chemical Company or equal.

Materials submitted shall have a K factor of .20 @ 75 degrees by ASTM C518-70, 2-lb. density by ASTM C303-56, compressive strength of 30-lb. by ASTM D1621-64 and a water absorption of less than .05 meet Federal Specifications HH1524B Type II, Class B.

P. Temporary Water Service: Provide temporary water service as necessary during the site work and building construction. Use materials as approved by the Portland Water District

Q. Meter Pit: Provide meter pit with fire line meter and valves as shown on the drawings.

PART 3 - EXECUTION

3.1 WATER DISTRIBUTION SYSTEM

A. Building Service Lines: Install water service lines to point of connection within approximately five feet outside of buildings to which such service is to be connected and make connections thereto. If building services have not been installed provide temporary caps. Connections of service lines to distribution mains shall be constructed in accordance with the following requirements.

1. 2 Inch and Larger: Connect by rigid connections and provide gate valve below frost line.

B. Regrading: Raise or lower existing valve and curb stop boxes and fire hydrants to finish grade in areas being graded.

C. Pipe Laying, General

1. Install to same tolerances as specified for storm drain (Section 02720).

2. Do not lay pipe on unstable material, in wet trench, or, when trench or weather conditions are unsuitable.

3. Support pipe laid in fill area at each joint, by brick or concrete piers carried down to solid undisturbed earth.

4. Do not lay pipe in same trench with other pipes or utilities.

5. Hold pipe securely in place while joint is being made.

6. At least one foot shall separate water lines vertically from other pipes or underground structures.

7. Where water pipes cross sanitary sewers or are laid parallel and adjacent to them, bottom of water pipe shall be separated by not less than one foot above top of sewer and ten feet horizontally.

8. Do not work over, walk on, pipes in trenches until covered by layers of earth well tamped in place to a depth of 12 inches over pipe.

9. Full length of each section of pipe shall rest solidly upon pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipes on wood blocking.

10. Install water lines to avoid storm and sanitary sewer lines.

11. Clean interior or pipe thoroughly of all foreign matter before installation. Keep pipes clean during laying operations by means of plugs or other methods. When work is not in progress, securely close open ends of pipe and fittings to prevent water, earth, or other substances from entering.

12. Tees, plugs, caps, bends and hydrants on pipe installed underground shall be anchored. Pipe clamps and tie rods, or concrete thrust blocks may be used. Type of pipe and soil conditions determine methods. Anchor water mains as specified in NFPA No. 24.

13. Close pipe openings with caps or plugs during installation. Tightly cover and protect equipment against dirt, water and chemical, or mechanical injury. At completion of all work thoroughly clean exposed materials and equipment.

D. Laying Ductile Iron Pipe

1. Installing Pipe: Lay pipe in accordance with AWWA C600.

2. Joints:

   a. Mechanical: AWWA C111. Provide sufficient quantities of bolts, nuts, glands and gaskets for each socket opening on pipe and fittings.

   b. Push-On: Apply thin film of lubricant to gasket and place in proper position in contour of bell. Insert beveled end of joining pipe and make contact with gasket. Force beveled end of pipe to bottom of bell without displacing gasket. Do not caulk. Only lubricant furnished by manufacturer of pipe shall be used.

   c. Flanges: AWWA C115. Install only in concrete pits. Must be watertight and set not less than six inches from walls to floor.

E. Setting of Valves:

1. Install gate valves as indicated on the Drawings and support on concrete pads with valve stem vertical and plumb. Install valve boxes in a manner that will not transmit loads, stress, or shock to valve body.

2. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.

3. Clean valves and curb stops interior before installation.

F. Setting of Fire Hydrants

1. Install fire hydrant assemblies as indicated on Drawings in vertical and plumb position with steamer nozzle pointed toward building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly braced on side opposite inlet pipe against undisturbed soil or concrete blocking. Place minimum of 6 cu. ft. of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Exercise care when backfilling and compacting so proper vertical position will not be altered.

2. Clean interior of hydrants of all foreign matter before installation.

3. Set center of each hydrant not less than two (2) feet nor more than six (6) feet back of edge of road or face of curb. Set barrel flange not more than two (2) inches above finished grade and eighteen (18) inches between center of steamer nozzle and finished grade.

G. Pipe Sleeves: Install where water lines pass through retaining and foundation walls. Properly secure in place, with approximately 1/4-inch space between pipe and enclosing sleeve, before concrete is poured. Caulk annular opening between pipe and sleeves, and seal with asphaltic compound consisting of bituminous materials mixed with mineral matter. Install piping so that no joint occurs within a sleeve. Split sleeves may be installed where existing lines pass through new construction.

H. Meter: The Contractor will obtain the meter from the Portland Water District and install the domestic water meter for the installation and will pay all usage charges connected with water supply until the installation is accepted by the Owner.

3.2 DISINFECTION

A. Disinfect distribution system with chlorine before acceptance for domestic operation in accordance with the following procedures:

1. The only acceptable method of disinfection shall be the continuous Feed Method of chlorine.

2. The rates of introduction of the chlorine and water shall be so proportioned so that the chlorine concentration in the water is maintained at a minimum of 50 mg/l available chlorine.

3. During the application of the chlorine, valves shall be operated in such a manner that the treatment dosage shall not flow back into the line supplying the water. The operation of the valves shall be done under Water Department supervision.

4. The chlorinated water shall be retained in the main for at least 24 hours. At the end of the 24 hour period, the treated water shall contain no less than 25 mg/l available chlorine.

5. At the end of the retention period, the chlorinated water shall be flushed from the main until the chlorine in the water leaving the main is no higher than the normal residual in the system, or less than 1 mg/1.

6. All bacteriological tests shall be collected in sample bottles and shall be tested at a State certified laboratory. All costs for disinfection of the main as well as bacteriological costs shall be borne by the Contractor.

3.3 TESTING OF WATER DISTRIBUTION SYSTEM

A. Test water distribution system pipe sizes installed below grade and outside building in accordance with following procedures:

1. Before pressure testing the water main, air shall be completely expelled from the pipe. If permanent air valves are not located at all high points, corporation stops shall be installed at all high points so that the air can be expelled as the pipe is being filled. After completion of the test, the corporation stops shall either be removed or left in place at the discretion of the Water District.

2. If fire hydrants are installed on the new water main, the test shall be conducted against a closed hydrant valve.

3. The test pressure shall be 1.5 times the static pressure at the lowest point of elevation of the line and shall not be less than 150 p.s.i.

4. The test shall not exceed the pipe or thrust restraint design pressures, nor exceed twice the rated pressure of the valves or hydrants and shall not exceed the rated pressure of the valves, if resilient - sealed butterfly valves are used.

5. Water, only, shall be used to bring the main to the required test pressure. The type of pump shall be approved by the Portland Water District

6. The test shall be of at least two hours in duration. A leakage test shall be conducted immediately after the pressure test.

7. After the pressure test period, water shall be pumped into the main to bring the pressure back up to the initial test pressure. No pipe installation shall be accepted if the leakage is greater than that listed in Table 1 attached to this Section.

   If any pipe installation shows a leakage greater than that specified in Table 1, the contractor at his own expense shall locate and repair the leak until it is within the specified allowance.

   The pressure and leakage tests shall be conducted under Portland Water District's supervision.

END OF SECTION

SECTION 02720

STORM SEWER SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Site storm sewerage drainage piping, fittings, and accessories, and bedding.

B. Connection or providing stubs of building storm water drainage system.

C. Catch basins, paved area drainage, site surface drainage, and stormwater detention facilities.

D. Installation of perimeter underdrains around the building foundation with connectors to the storm drainage systems.

1.2 RELATED SECTIONS

A. Section 02222 - Excavation, Backfilling and Compacting for Utilities.

B. Section 02270 - Slope Protection and Erosion Control

C. Section 02605 - Sewer and Catch Basin Structures.

D. Section 02730 - Sanitary Sewer Systems.

E. Vacant.

F. Section 03300 - Cast-in-Place Concrete: Concrete type for catch basin, cleanout or appurtenant structures.

G. Local governing authority and code requirements.

H. All necessary construction permits.

I. Construction drawings.

1.3 REFERENCES

A. AASHTO M294 and M252 - Corrugated Polyethylene pipe smooth interior.

B. AASHTO M36 - Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.

C. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

D. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

E. ANSI/ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.

F. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

G. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

H. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

I. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations Soils and Soil-Aggregate Mixtures Using 10-lb (4.54 Kg) Rammer and 18-in. (457 mm) Drop

J. ANSI/ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

K. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

L. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 DEFINITIONS

A. Bedding: Fill placed under, beside and directly beside pipe to midpoint of pipe, prior to subsequent backfill operations.

B. Special Backfill: Fill placed above bedding beside and over pipe prior to other backfill operations.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipes and mains, connections, catch basins, cleanouts and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 COORDINATION

A. Coordinate the work with termination of storm connections outside building and trenching.

B. Coordinate the installation of the footing drains with the General Contractor and the foundation subcontractor.

C. The exact location of roof drain leaders shall be determined from the Architectural Plans or as shown on the drawings. The number and location of the roof drains may be different than shown in the site drawings. Verify roof drain lead locations with the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS AND ACCESSORIES

Provide any one of the following materials subject to any restrictions noted in this subsection or on plans. The contractor shall provide catalog cuts to the Owner and indicate the proposed materials to be used prior to ordering materials. The approval of the Owner must be obtained prior to ordering materials.

A. Reinforced Concrete Pipe: Comply with requirements of ASTM C 76, Class IV unless another class type is indicated on Drawings, installed with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with AASHTO M-198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.

B. Polyvinyl Chloride (PVC) Pipe: Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant. PVC shall not be used for any drainage pipe which will be permanently exposed to sunlight.

C. Corrugated Polyethylene Pipe (CPP), Smooth Interior: Shall conform with AASHTO Designations M294 and M252. Pipe must be installed in accordance with manufacturer's installation guidelines for culvert and other heavy duty drainage applications. Acceptable manufacturers: Advanced Drainage Systems, Inc. (ADS) N-12 and HANCOR, INC. (HiQ smooth interior). CPP pipe shall not be used for any drainage pipe which will be permanently exposed to sunlight. Piping below the water table, subject to surcharge, or which could affect a pond level, shall be watertight. All other piping shall be silt tight.

D. Polyvinyl Chloride (PVC) Large Diameter Closed Profile Gravity Sewer Pipe, UNL-B-9: Pipe and fittings shall be installed in accordance with pipe manufacturer's installation guidelines. Acceptable manufacturer: CARLON (Vylon HC). PVC pipe shall not be used for any drainage pipe which will be permanently exposed to sunlight.

E. Storm drain inlets, outlets, and culverts to include:

- Rip rapped aprons.
- Concrete flared inlets/outlets for pipes 24" or larger in diameter.
- Bar racks for pipes 24" diameter or larger.
- HDPE flares for pipe smaller than 24" in diameter. High density polyethylene flares with added carbon black for exposure to sunlight.

F. Manholes and Catch Basins Structures

2.2 UNDERDRAIN SYSTEM

A. Polyvinyl Chloride (PVC) Pipe: The perforated underdrain pipe with ring-tite joints and fittings shall comply with the requirements of ASTM F 758. Holes shall be 120 degrees double row, 1/4 inch diameter at 3 1/4 inch spacing. Underdrain pipe with a filter fabric sleeve shall not be acceptable. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM F 75B classification.

B. Filter fabric: Filter fabric shall be used around all underdrains as specified in Section 02222.

2.3 INLETS AND CATCH BASINS

A. Lid and frame per details shown on plans.

B. Catch basin and inlet structures shall be in accordance with Section 02605.

C. The location of catch basins shall be accurately located by a registered land surveyor. Catch basins shall be located as follows:

1. Edge of frame 6" off face of curb where shown near sloped granite or bituminous concrete curblines.

2. The center of aisle of parking modules when shown on plans.

3. In other cases, verify with Engineer.

2.4 ENGINEERED SURFACE DRAINAGE PRODUCTS

A. General: PVC surface drainage inlets shall include the drain basin type as indicated on the contract drawing and referenced within the contract specifications. The ductile iron grates (12" and 15") frames are cast iron) for each of these fittings are to be considered as integral part of the surface drainage inlet and shall be furnished by the same manufacturer. The surface drainage inlets shall be as manufactured by Nyloplast a division of Advanced Drainage Systems, Inc., or prior approved equivalent.

B. Materials: The drain basins required for this contract shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The pipe bell spigot shall be joined to the main body of the drain basin or catch basin. The pipe stock used to manufacture the main body and pipe stubs of the surface drainage inlets shall meet the mechanical property requirements for fabricated fittings as described by ASTM A536 grade 70-50 for ductile iron ASTM A-48-83 class 30B for 12" and 15" cast iron frames. Grates shall be provided painted black.

C. Installation: The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 1 or 2 material as defined in ASTM D2321. The surface drainage inlets shall be bedded and back-filled uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade so as to maintain a one piece, leak proof structure. No brick, stone or concrete block will be used to set the grate to the final grade height. For H-25 Load rated installations, an 8" to 10" thick concrete ring will be poured under the grate and frame as recommended by details provided from the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on civil engineering drawings.

3.2 INSTALLATION - STORM DRAINS

A. The pipe shall be accurately laid to the line and grades to the satisfaction of the Engineer. The line and grade may be adjusted by the Engineer from that shown on the Drawings to meet field conditions and no extra compensation shall be claimed therefore.

The Owner or his representative reserves the right to check the elevations and alignment on any pipe for conformance with proposed line and grade. Installed grades shall be within the tolerance of plus or minus 0.02 feet from theoretical computed grades. Alignment shall be within a tolerance of plus or minus 0.04 feet. Pipe grade shall be defined as the invert elevation of the pipe. Pipe not meeting the grade tolerance or of poor alignment shall be adjusted by the Contractor.

B. No pipe laying will be allowed to begin at any point other than a manhole or other appurtenance without the expressed consent of the Engineer. The interior of each length of pipe will be swabbed and wiped clean before laying the next length. No length of pipe shall be laid until the previous length has had sufficient fine material placed and tamped about it to secure it firmly in place to prevent any disturbance. Bell ends shall be laid uphill. Whenever the work is stopped temporarily, or for any reason whatsoever, the end of the pipe shall be carefully protected against dirt, water, or other extraneous material. Bedding shall be as shown on the Plans.

C. The pipe shall be cut as necessary for appurtenances. In general, the pipe material shall be cut by using a saw or milling process, approved by the pipe manufacturer and not by using any impact device, such as a hammer and chisel, to break the pipe. The pipe shall be cut, not broken. The cut end of the pipe shall be square to the axis of the pipe and any rough edges ground smooth.

D. Clean interior of all pipe thoroughly before installation. When work is not in progress, open ends of pipe shall be closed securely, in a manner approved by the Engineer, to prevent entrance of trench water, dirt, or other substances.

E. All joints shall be made in a dry trench in accordance with the manufacturer's recommendations.

F. A minimum of two (2) pipe lengths or pipe stubs shall be used between any two (2) appurtenances.

G. When connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions which least interfere with operation of existing pipeline service. Provide facilities for dewatering and for disposal of water removed from dewatering lines and excavations without damage to adjacent properties.

3.3 INSTALLATION-UNDERDRAIN SYSTEM

A. Pipe Laying: Underdrain system pipe laying shall comply with the requirements of pipe laying described above under "Installation - Storm Drains."

B. The underdrain pipe shall be installed with holes facing up unless otherwise noted on the plans.

C. Filter fabric shall be used around all underdrains. The filter fabric shall completely encapsulate the piping and a bedding and backfill of 3/4 inch crushed stone. The use of fabric sleeves for underdrains without stone shall not be permitted.

D. The work of this section includes the installation of the building underdrains and outfall.

END OF SECTION

SECTION 02730

SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, services, equipment, and other necessary items required for accompanying the construction of the sanitary systems. This shall include, but not be limited to, the following:

1. Sanitary sewer drainage piping, Fitting and Accessories, Cleanouts, and Bedding.

B. Set lines, elevations, and grades for sanitary sewer system work and control system for duration of work, including careful maintenance of benchmarks, property corners, monuments, or other reference points.

C. Provide sanitary sewer systems for wastewater only. Do not connect foundation drains, roof leaders, or other "illicit forms".

1.2 RELATED SECTIONS

A. Section 02222 - Excavation, Backfilling, and Compacting for Utilities.

B. Section 02605 - Sewer and Catch Basin Structures.

C. Construction Drawings.

D. Local governing authority and code requirements.

E. All necessary construction permits.

F. The public utility for the sewer is the City of Portland Public Services Department. All materials, installation, and workmanship will comply with the requirements specified in this section, the requirements of the City of Portland Public Services Department. Where a more stringent standard exists, the more stringent standard shall apply.

1.3 REFERENCE

A. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

B. ANSI/ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.

C. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

D. ANSI/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.

E. ANSI/ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

F. ASTM A746 - Ductile Iron Gravity Sewer Pipe.

G. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

H. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

I. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

J. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.5 SUBMITTALS

A. Product Data: Provide catalog materials indicating pipe, pipe accessories, and fittings.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

C. Manufacturer's Certificate: Certify that products meet or exceed ASTM designations.

1.6 COORDINATION

A. Coordinate the work with termination of the sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

PART 2 - PRODUCTS

2.1 SEWER PIPE MATERIALS

A. Polyvinyl Chloride Sanitary Sewer:

1. Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.

2. Pipe joints shall be integrally molded bell ends per ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

3. Corrugated Polyvinyl Chloride sewer pipe and fittings shall comply with ASTM F 949. Pipe must be marked with manufacturers name, pipe size, cell classification and ASTM F 949. Pipe must be marked with manufacturer's name, pipe size, cell classification and ASTM F 949 Classification. Pipe must be installed per the manufacturer's installation requirements. Acceptable manufacturer: CONTECH, INC. "A-2000" PVC sewer pipe or Owner-approved equivalent.

B. Ductile Iron Sanitary Sewer: Pipe and fittings shall comply with requirements of ductile iron pipe described under "Section 02660, Water Distribution Systems."

C. Polyvinyl Chloride Pressure Sewer:

1. Pipe and fittings shall comply with ASTM D 2241, rated SDR 18 or ASTM D1784 and shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 2241 or D1784 classification.

2. Joints shall be integral gasketed joints formed on a continuous pipe length, utilizing elastomeric seal such as "Ring Tite" as manufactured by Johns Manville Company.

D. Manholes (Refer to Section 02605).

2.2 CLEANOUTS

A. Lid and Frame: Heavy duty cast iron construction, manufactured by Mueller.

B. Shaft Construction: Cast iron shaft of internal diameter as specified on plans with 2,500 psi concrete collar for cleanouts located in paved areas.

C. Base Pad: Cast-in-place concrete, 2,500 psi leveled top surface to receive cast iron shaft sections, sleeved to receive sanitary sewer pipe sections.

2.3 PIPE AND VALVING ASSOCIATED WITH STRUCTURES

A. All pipe and valving shall be cast/ductile iron with 125 lb ANSI standard flanges.

B. All pipe to be cement lined.

C. Air and vacuum valve shall be Crispir Model A141.

D. Paint any piping inside special appurtenances with epoxy paint in accordance with 10 state standards and/or TR-16 manual "Guides for the Design of Wastewater Treatment Works."

PART 3 - EXECUTION

3.1 INSTALLATION - GRAVITY AND PRESSURE SEWERS

A. Pipe Laying: Gravity and pressure sewer pipe laying shall comply with the requirements of pipe laying described under "Storm Sewer System" Section 02720.

B. All service leads shall have a temporary cap placed to permit testing as outlined in Part 4 of this specification.

C. All service leads shall have cleanouts installed in accordance with Part 1 of the State Plumbing Code.

PART 4 - FIELD QUALITY CONTROL

4.1 TESTING OF SANITARY SEWER SYSTEM (GRAVITY MAIN)

A. Testing of a section of sewer between manholes shall be performed using the below stated equipment according to stated procedures and under the supervision of the Owner's representative.

1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.

2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.

3. All air used shall pass through a single control panel.

4. Three (3) individual hoses shall be used for the following connections:

   a. From control panel to pneumatic plugs for inflation.

   b. From control panel to sealed line for introducing the low pressure air.

   c. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

Procedures: All pneumatic plugs shall be seal tested before being used in the actual test installation. One (1) length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against the pressure without bracing and without movement of the plugs out of the pipe.

After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure reaches 4 psig greater than the average back pressure of any ground water that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.

After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

Diameter (inches)	Minimum Allowable Pipe Minutes to Decrease from 3.5 - 2.5 psig Pressure In
4	2.0
6	3.0
8	4.0
10	5.0
12	6.0
15	7.5
18	9.0
21	10.5

B. In areas where ground water is known to exist, the Contractor shall install a one-half (1/2) inch diameter capped pipe nipple, approximately ten (10) inches long, through the manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the ground water shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple.

The hose shall be held vertically, and a measurement of the height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same.)

C. If installation fails to meet the above requirements for the air test, the Contractor shall correct the pipeline until an acceptable test is achieved.

D. The Contractor shall provide as required the proper plugs, weirs, and other equipment required to perform all tests. Testing of each section of sewer installed shall include the portions of service connections that are to be installed under the Contract.

E. Where ground water is confirmed to be high, the Engineer at his option may elect to accept infiltration measurements in lieu of air testing.

F. These tests shall be conducted at all times in the presence of the Engineer. Should a line which has previously been tested indicate any water infiltration, or otherwise appear suspect to the Engineer, the Contractor shall conduct confirmation air tests on the line at no additional costs.

4.2 DEFLECTION TESTING

A. Deflection tests shall be performed on all flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days.

B. No pipe shall exceed a deflection of 5 percent.

C. If the deflection test is to be run using a right ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

END OF SECTION

SECTION 02846

SIGNAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide traffic control signs complying with U.S. Department of Transportation, Federal Highway Administration's "Manual on Uniform on Traffic Control Devices" (MUTCD), local codes, and as specified. See Drawings for type, location, and quantity of signs required.

1.2 RELATED REQUIREMENTS

A. Construction Drawings.

B. Manufacturer's Mounting Instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Signs to meet FHWA requirements NCHRP 350 certification, engineer grade reflective.

B. Provide submittal information for all signs, colors, dimension, lettering, proposed mounting heights, mounting hardware, and posts to the Owner for review and approval prior to installation.

C. Posts galvanized steel meeting the Standards of MDOT.

2.2 SIGNS

To be backed with tan or light brown Dubond at Owner's option or shown on the plans.

To be painted with reflective baked-enamel finish with following colors:

A. "STOP" Signs: (R1-1) 24"x24", Octagon, reflectorized copy and border.

B-C."HANDICAPPED SYMBOL" Signs: (R7-Series) 12"x18", white legend on blue background.

D. "COMPACT CAR PARKING" Signs: 12"x18", red letters on white background.

E. "DO NOT ENTER" Signs: (R5-1) Highway Dept. standard red and white sign except 24"x24" size.

F. "PEDESTRIAN CROSSING SYMBOL" signs (WII_2) black symbol on yellow background.

G-H. Miscellaneous Signs: Size and letters per Manual on Uniform Traffic Control Device recommendations. Overall dimensions shown on the contract drawings.

2.3 POSTS

A. Posts shall be galvanized steel "U" channel post and galvanized steel mounting hardware meeting the requirements of the MDOT specifications.

PART 3 - EXECUTION

A. Prior to installation, the Owner and the Owner's representative shall review the location for each sign. The Owner reserves the right to alter the sign locations.

B. All signs in pedestrian areas shall be mounted with the bottom of the sign set the minimum height at above finish grade permitted by MUTCD. Signs in non-pedestrian areas shall be mounted with the bottom of the sign set the minimum height above finish grade. Set posts vertical and plumb as shown in the plans. Mount signs in accordance with manufacturer's instructions. Check mounting height, replace any posts which are not installed plumb.

C. Install weed control collar when signs are installed in turf areas.

END OF SECTION

SECTION 02930

LAWNS AND GRASSES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all materials and equipment, and do all work required to complete the loaming, seeding and sodding including furnishings and placing topsoil, as indicated on the Drawings and as specified.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 02200, EARTHWORK; Establishment of subgrade elevation.

1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM)

C 136 Sieve Analysis of Fine and Course Aggregates
E 11 Wire-Cloth Sieves for Testing Purposes

1.4 SUBMITTALS

A. Samples: The following samples shall be submitted:

Material	Quantity (lb.)
Seed, each mix	1
Topsoil, from on-site sources	1
Composted Soil Admixture	1
Fertilizer	1

B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

Aluminum sulfate
Fertilizer
Lime

C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials, as applicable:

Grass seed mix	Commercial fertilizer
Ground limestone	Seed mix for sod

1.5 INSPECTION AND TESTING

A. Work will be subject to inspection at all times by the Engineer/Landscape Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with the requirements of Section 01410, TESTING LABORATORY SERVICES, to analyze and test materials used in the construction of the work. Where directed by the Engineer/Landscape Architect the testing laboratory will make material analyses and will report to the Engineer/Landscape Architect whether material conform to the requirements of this specification.

1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification, and by the Contractor when they indicate compliance with the specification, and by the Contractor when they indicate non-compliance.

2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Engineer/Landscape Architect, the Contractor shall provide such auxiliary personnel and services needed to accomplish the testing work and to repair damage caused thereby by the permanent work.

3. Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11.

B. Testing, analyses, and inspection required by the Contractor for his own information or guidance shall be at his own expense.

C. The Contractor shall engage an independent testing agency to perform the following tests and analyses:

Material	Tests and Analysis Required
Topsoil	Mechanical analysis of soil and determination of pH and organic matter content, and nutrient content. Recommendations shall be made by the testing agency as to the type and quantity of soil additives required to bring nutrient content and pH to satisfactory levels for seeding and sodding. Organic admixtures shall be provided and blended to provide an average organic content of 8% with a minimum of any test having 6% organic content by dry weight.

1. Materials shall not be used in construction until test results have been reviewed by the Engineer/Landscape Architect.

2. All costs associated with testing shall be at the expense of the Contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Digging Sod

1. Sod shall not be dug at the nursery or approved source until ready to transport sod to the site of the work or acceptable storage location.

2. Before stripping, sod shall be mowed at a uniform height of 2 in.

3. Cut sod to specified and to standard width and length desired.

B. Transportation of Sod:

1. Sod transported to the Project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury. Closed vehicles shall be adequately ventilated to prevent overheating of the sod.

2. Evidence of inadequate protection following the digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.

3. Sod shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or are in temporary storage.

4. Upon arrival at the temporary storage location or the site of the work, sod material shall be inspected for proper shipping procedures. Should the sod be dried out, the Engineer/Landscape Architect will reject the sod. When sod has been rejected, the Contractor shall at once remove it from the area of the work and replace it with acceptable material.

5. Unless otherwise authorized by the Engineer/Landscape Architect, the Contractor shall notify the Engineer/Landscape Architect at least two working days in advance of the anticipated delivery date of sod material. Certificate of Inspection when required shall accompany each shipment.

C. Handling and Storage of Sod:

1. Sod material shall be handled with extreme care to avoid breaking or tearing strips.

2. Sod shall not be stored for longer than 30 hours prior to installation. Sod shall be stored in a compact group and shall be kept moist. Sod shall be prevented from freezing.

3. Sod that has been damaged by poor handling or improper storage will be rejected by the Architect.

D. Deliver seed in original sealed containers, labeled with analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, location of packaging, and name of seed grower. Damaged packages will not be accepted.

E. Deliver fertilizer in sealed waterproof bags, printed with manufacturer's name, weight, and guaranteed analysis.

1.7 PLANTING SEASON

A. Planting season for seeding shall be as follows:

Item	Planting Period	
	Spring	Fall
Lawn Maintenance Seed Mix	4/15 to 6/15	8/20 to 10/15

B. Planting season for sod shall be as follows:

Item	Planting Period	
	Spring	Fall
Sod	4/15 to 7/1	8/20 to 11/1

C. Planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.

D. Planting season may be extended with the written permission of the Engineer/Landscape Architect.

1.8 ACCEPTANCE

A. Acceptance:

1. The Engineer/Landscape Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.

2. Acceptance of material by the Engineer/Landscape Architect will be for general conformance to specified requirements, and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents.

3. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Engineer/Landscape Architect, the Engineer/Landscape Architect will recommend to the Owner that the work of this Section be accepted.

B. Sod and seed areas will be accepted when in compliance with all the following conditions:

1. Roots are thoroughly knit to the soil;

2. Absence of visible joints (sodded areas);

3. All areas show a uniform stand of specified grass in healthy condition;

4. At least 60 days have elapsed since the completion of work under this Section.

PART 2 - PRODUCTS

2.1 SEED

A. Seed shall be of the previous year's crop with 0.5% or less weed seed, and 1.75% or less crop seed, by weight. Seed shall be dry and free of mold. Seed shall meet the following requirements:

B. Seed Mixture:

1. Standard grade seed of the most recent season's crop. Seed shall be dry and free of mold. Seed mixture shall be suitable as follows:

Name of Seed	% by Weight in Blend	Minimum % Purity	Minimum % Germination
Low Maintenance Lawns			
Kentucky Bluegrass	35%	95%	85%
Creeping Red Fescue	20%	95%	85%
Chewings Fescue	15%	95%	85%
Perennial Ryegrass	15%	95%	85%
Annual Ryegrass	15%	95%	85%
Temporary Seeding Plan			
Perennial Ryegrass	50%	95%	85%
Annual Ryegrass	50%	95%	85%

2.2 SOD

A. Sod shall be a triplex mixture of hybrid bluegrass. Mixture shall contain approximately equal portions of each hybrid component. Hybrids shall include Cheri Kentucky Bluegrass, Flying Kentucky Bluegrass, Glade Kentucky Bluegrass, Baron Kentucky Bluegrass, or comparable equal bluegrass hybrids.

B. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully, and otherwise maintained from planting to harvest.

C. Thickness of Cut: Sod shall be machine cut at a uniform soil thickness of 5/8 in., plus or minus ¼ in., at the time of cutting. Measurement for thickness shall exclude top growth and thatch.

D. Strip Size: Individual pieces of sod shall be cut to the supplier's standards width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus ½ in. on width, and plus or minus 5% on length. Broken strips and torn and uneven ends will not be acceptable.

E. Strength of Sod Strips: Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.

F. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.

G. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 36 hour period unless a suitable preservation method is approved prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Engineer/Landscape Architect prior to its installation.

H. Thatch: Sod shall be free of diseases, nematodes, and soil-borne insects. State Nursery and Plant Material Laws require that all sod be inspected and approved for sale. The inspection and approval must be made by the State Agricultural Department, Office of the State Entomologist.

I. Diseases, Nematodes, and Insects: Sod shall be free of diseases, nematodes, and soil-borne insects. State Nursery and Plant Material Laws require that all sod be inspected and approved for sale. The inspection and approval must be made by the State Agricultural Department, Office of the State Entomologist.

J. Weeds: Sod shall be free of objectionable grassy and broad leaf weeds.

2.3 TOPSOIL

A. Topsoil shall be obtained from a previously established stockpile on the site, to the extent available. Additional topsoil required shall be obtained from off-site sources.

B. Topsoil, whether stripped from site or supplied from off-site, shall be a sandy loam or loam soil as defined by the USDA Soil Conservation Service, Soil Classification System, and shall have the following mechanical analysis:

Sand (0.05-2.0 mm dia. range)	45 to 75	60
Silt (0.002-0.05 mm dia. range)	15 to 35	25
Clay (less than 0.002 m dia. range)	5 to 25	15

1. 95% of topsoil shall pass a 2.0 mm sieve.

2. Topsoil shall be free of stones 1 in. in longest dimension, earth clods, plant parts, and debris. All topsoil shall be screened using a 3/8" screen.

3. Organic matter content shall be an average of 8% of total dry weight with a minimum of any sample being 6%.

C. Topsoil shall have a pH value range of 6.0 to 6.5.

1. If planting soil mixture does not fall within the required pH range, limestone or aluminum sulfate shall be added to bring the pH within the specified limit.

2. If pH is below desired level add ground limestone. If pH is above desired level add aluminum sulfate.

2.4 COMPOSTED SOIL ADMIXTURE

A. Organic composted soil admixture containing industrial residuals and/or municipal biosolids will not be permitted as an additive. The use of an organic composted admixture containing composted animal manure, other approved organic materials or peat will be permitted as a substitute for topsoil if it meets local town ordinance requirements, all Maine Department of Environmental Protection guidelines under Chapter 567 C and must be approved for commercial landscaping. Composted animal manure or other approved organic materials and peat shall be weed seed free. Composted animal manure or other approved organic materials shall be the product of 15 days of thermophilic aerobic decomposition followed by 90 days of curing. Compost will be adequately stabilized, pathogen free with acceptable odor. The material shall pass through a 3/8" mesh screen, be friable and free of stones, sticks, and all objectionable debris. The composted animal manure or other approved organic material source is subject to the review of the Engineer/Landscape Architect.

Typical Product Parameters:

TKN Nitrogen	2.0%
Organic-N	1.44%
Carbon/Nitrogen Ratio	20 to 1
Total Phosphorous	2.20%
Total Potassium	.34%
Organic Matter	79%
Conductivity	6.2 mmhos/cm
pH	7.0
Screen Size	<3/8" available
Density	+/- 800-1200 lbs/cy

2.5 LIMESTONE

A. Ground limestone shall be an agricultural limestone containing a minimum of 85% total carbonates, by weight. Ground limestone shall be graded within the following limits:

Sieve Size	% Passing by Weight
No. 10	100
No. 20	90
No. 100	60

2.6 WATER

A. Water shall be suitable for irrigation and free from ingredients harmful to seeded or sodded areas.

2.7 ALUMINUM SULFATE

A. Aluminum sulfate shall be unadulterated and shall be delivered in containers with the name of the material and manufacturer, and net weight of contents.

B.

2.8 COMMERCIAL FERTILIZER

A. Fertilizer shall conform to the following:

1. When applied as a topsoil amendment, fertilizer shall have an analysis that will deliver appropriate amounts of nitrogen, phosphorus, and potassium as required to remedy deficiencies revealed by testing the topsoil.

2. When used as a top dressing for the maintenance of sod, fertilizer shall conform to the following:

Constituent	% Present by Weight
Nitrogen (N)	10
Phosphorous (P)	0
Potassium (K)	10

a. 50% of nitrogen shall be derived from natural organic source of ureaform.

b. Fertilizer shall be phosphorus free.

c. Potassium shall be derived from muriate of potash containing 60% potash.

B. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.

C. Fertilizers with N-P-K analysis other than that stated above may be used provided that the application rate per square foot of nitrogen, phosphorus, and potassium is equal to that specified. Application rates shall be adjusted to provide 2 pounds of active nitrogen per 1,000 square feet.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Subgrade shall be examined to ensure that rough grading and all other subsurface work in lawn areas and other areas to be seeded is done prior to start of seeding and sodding.

B. Existing subgrade shall be loosened or scarified to a minimum depth of 3 in. prior to spreading topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 2 in., sticks, and other extraneous material.

3.2 PREPARATION OF TOPSOIL

A. Topsoil shall not be spread until it is possible to follow immediately or within 24 hours with seeding or sodding operations. If topsoil is spread prior to this time it shall be cultivated to loosen soil prior to seeding or sodding.

B. Topsoil shall not be placed when subgrade or topsoil material are frozen, excessively wet, or excessively dry.

C. Topsoil shall be spread in a uniform layer, to a thickness, which will compact to the depth required to bring final lawn and grass surfaces to required elevation. Unless otherwise indicated minimum depth of topsoil shall be 6 in. after compaction.

D. Surfaces shall be graded and smoothed, eliminating all sharp breaks by rounding, scraping off bumps and ridges, and filling in holes and cuts.

3.3 APPLICATION OF FERTILIZER AND CONDITIONERS

A. Fertilizer and conditioners shall be applied at the following rates:

1. Aluminum Sulfate – as required by test results of topsoil.

2. Limestone - as required by test results of topsoil.

3. Fertilizer - as required by test results of topsoil.

B. Mixing with topsoil:

1. Fertilizer and conditioners shall be spread over the entire lawn areas at the application rates indicated above.

2. Materials shall be uniformly and thoroughly mixed into the top 4 in. of topsoil by disking, rototilling, or other approved method.

3.4 FINISH GRADING

A. Final surface of topsoil immediately before seeding shall be within $\pm$ 1/2 in. of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in

which water can collect. Stones, roots, and other debris greater than 1 in. in any dimension, which are visible at the surface, shall be removed and the resulting holes filled with topsoil, leaving a uniform planar surface.

B. Finish grade surface with a drag or rake. Round out all breaks in grade, smooth down all lumps and ridges, fill in all holes and crevices. Rolling with a light roller is acceptable, if the surface is scarified afterward.

C. In the event of settlement, the Contractor shall readjust the work to required finished grade.

3.5 SEED APPLICATION

A. Seed shall be broadcast by means of an approved mechanical spreader, to give a uniform application at the following rates:

Seed Application Rate	lb./1,000 S.F.
Seed Mixture - Lawns	6.0

B. Seed shall be applied in two equal applications for uniform coverage; direction of travel of spreader for second pass shall be perpendicular to that of the first pass. Seeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 mph.

1. At the Contractor's option, and with the permission of the Architect, seed may be spread by the hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, lime, fertilizer, and mulch shall be mixed and applied to achieve application quantities specified herein for the conventional seeding method, with mulch applied at the rate of 1,200 lb./acre. Other provisions specified above for conventional seeding shall apply also to hydroseeding.

C. Following seeding the area shall be lightly raked to mingle seed with top 1/8 to 1/4 in. of soil. Area shall then be fine graded. Stones and other debris greater than 1 in. in any dimension which are visible on surface shall be removed. Surface shall be rolled with a hand roller having a weight of 60 to 90 lb./ft. of width, and a minimum diameter of 2 ft.

D. Following seeding and raking, entire area shall be watered by use of lawn sprinklers, or other approved means. Initial watering shall continue until the equivalent of a 2 in. depth of water has been applied to entire seeded surface, at a rate which will not dislodge the seed. Watering shall be repeated thereafter as frequently as required to prevent drying of the surface, until the grass attains an average height of 1/4 in.

Watering methods and apparatus, which may cause erosion of the surface shall not be permitted.

3.6 SODDING

A. Edges of the sodded areas shall be smooth, and all sodded areas shall conform to the design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 in. below adjacent hard surface.

B. Sod shall be placed and all sodding operations completed within 72 hours following stripping from sod source bed.

C. On slopes steeper than 2 to 1, sod shall be fastened in place with suitable wood pins or other approved methods, spaced at not less than 1 pin per square foot.

D. Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Sod shall be carefully placed to insure that it is neither stretched or overlapped. Immediately after laying sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, topsoil shall be used to fill all cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Sod shall not be smothered with excess fill soil.

E. Immediately after sodding operations have been completed, entire surface shall be compacted with a cultipacker roller or other approved equipment weighing 100 to 160 lb./ft. of roller.

F. Completed sod shall immediately be watered sufficiently to uniformly wet the soil to at least 1 in. below the bottom of sod bed.

3.7 MAINTENANCE

A. Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:

Fertilizing
Mowing
Replanting
Resodding
Watering
Weeding

B. Maintenance of seeded areas shall begin upon completion of seeding or and shall continue until acceptance of the athletic fields, until mowing as specified below is completed, or until average height of grass is 1-1/2 in., whichever occurs later.

C. Maintenance of sodded areas shall begin upon completion of sodding and shall continue for 45 days thereafter, unless sodding is not completed until after September 15, in which case maintenance shall continue until the June 15 following.

D. After grass has sprouted, seeded areas, which fail to show a uniform stand of grass shall be replanted as often as necessary to establish an acceptable stand of grass.

1. Scattered bare spots, shall not exceed 72 sq. in. each.

E. First mowing shall be done when average height of grass is 3 in., with mower set to cut at a height of 2 in. Subsequent mowings shall be made at not over two week intervals, with the height of cut set at 2 in. With prior permission of the Owner, mowings during periods of slow growth or dormancy may be spaced at greater intervals.

F. If lawn or grass is established in the fall and maintenance is required to continue into spring months, lawn and grass shall receive an application of lime and fertilizer in the spring. Lime and fertilizer shall be spread in a uniform layer over the entire lawn surface, at the following rates recommended by a soil test administrated at that time.

END OF SECTION

SECTION 02950

TREES, PLANTS, AND GROUND COVERS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all materials and equipment, and do all work required to transplant existing trees and shrubs, and to complete the planting, as indicated on the Drawings and as specified.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 02100 – SITE PREPARATION (Clearing and grubbing and stripping of topsoil)

2. Section 02200 – EARTHWORK (Establishment of subgrade elevations and excavation and backfill)

3. Section 02930 – LAWNS AND GRASSES (Seeding and sodding)

1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute, Inc. (ANSI):
Z60.1 American Standard for Nursery Stock
(Sponsor: American Association of Nurserymen, Inc.)

2. American Society for Testing and Materials (ASTM):
C 136 Sieve Analysis of Fine and Coarse Aggregates
E 11 Wire-Cloth Sieves for Testing Purposes

3. American Wood Preservers' Association (AWPA):

C2 Lumber, Timbers, Bridge Ties and Mine Ties –
Preservative Treatment By Pressure Processes

4. National Arborist Association, 3537 Stratford Rd., Wantagh, NY 11793 (NAA): Ref. 1 Transplanting of Trees and Shrubs in the Northeastern and North Central United States

5. "Hortus Third", A Concise Dictionary of Plants Cultivated in the United States and Canada, Cornell University, L.H. Bailey Hortorium, MacMillian Publishing Co., New York, NY.

1.4 SUBMITTALS

A. Samples: The following samples shall be submitted:

Material	Sample Size or Quantity
Mulch	1 gallon (3.78 L) ziploc bag
Planting soil	1 gallon (3.78 L) ziploc bag
Topsoil from on-site sources	1 gallon (3.78 L) ziploc bag
Topsoil from off-site sources	1 gallon (3.78 L) ziploc bag
Each plant species	Actual representative sample, or picture with scale; include information on sources.

B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

Aluminum sulfate
Antidessicant
Fertilizer
Fungicide
Insecticide
Compost

C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:

Compost
Commercial fertilizer
Limestone

D. Test Reports: Test reports from an approved testing agency indicating compliance with the specifications shall be submitted for topsoil, compost, peat moss, planting soil mixture, and any other materials designated by the Engineer/Landscape Architect.

E. Contractor shall submit a description of mechanical tree spade equipment to be used, and a list of trees to be moved by mechanical tree spade.

1.5 OWNER'S INSPECTION AND TESTING

A. Work will be subject to inspection at all times by the Engineer/Landscape Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Section 01400 – QUALITY REQUIREMENTS to analyze and test materials used in the construction of the work. Where directed by the Engineer/Landscape Architect, the testing laboratory will make material analyses and will report to the Engineer/Landscape Architect whether materials conform to the requirements of this specification.

1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification and by the Contractor when they indicate non-compliance.

2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Engineer/Landscape Architect, shall provide such auxiliary personnel and services needed to accomplish the testing work.

3. Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11.

1.6 CONTRACTOR'S INSPECTION AND TESTING

A. Testing, analyses, and inspection required by the Contractor for his own information or guidance shall be at his own expense.

B. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Engineer/Landscape Architect, to perform the following tests and analyses:

Material	Tests and Analysis Required
Topsoil	Mechanical analysis of soil indicating the percent passing by weight of the following sieve sizes: 1 in., 1/2 in., No. 4, No. 10, No. 100, and No. 200. Determination of pH, organic content, and nutrient content. Recommendations shall be made by the testing agency as to the type

and quantity of soil additives required to bring nutrient content and pH to satisfactory levels for planting.

Compost Determination of moisture absorption capacity, organic matter content, and pH.

C. Materials shall not be used in construction until test results have been reviewed by the Engineer/Landscape Architect.

D. All costs associated with testing shall be at Contractor's expense.

1.7 SOURCE QUALITY CONTROL

A. Identification of plant names shall be as listed in "Hortus Third".

B. Selection of Plant Materials: Submit to the Engineer/Landscape Architect the names and locations of nurseries proposed as sources of acceptable plant material. Inspect all nursery materials to determine that the materials meet the requirements of this section. Proposed materials shall be flagged at the nurseries by the Contractor prior to viewing by the Engineer/Landscape Architect.

1. Schedule with the Engineer/Landscape Architect a time for viewing plant material at the nursery. Trips to nurseries shall be efficiently arranged to allow Engineer/Landscape Architect to maximize his viewing time. A minimum of six weeks shall be allowed for this viewing prior to time that plants are to be dug.

2. Engineer/Landscape Architect may choose to attach his seal to each plant, or representative samples.

3. Where requested by the Engineer/Landscape Architect, photographs of plant material or representative samples of plants shall be submitted.

4. Viewing and/or sealing of plant materials by the Engineer/Landscape Architect at the nursery does not preclude the Engineer/Landscape Architect's right to reject material at the site of planting.

1.8 UNAVAILABILITY OF PLANT MATERIALS

A. No changes or substitutions may be made without prior approval by the Engineer/Landscape Architect, and municipal authority, if applicable. If unavailability of plant material becomes a concern, then submit satisfactory evidence of advertisement for a one-month period in a field-related trade journal or online,

without success, or submit written substantiation that specific material is unavailable from at least six reliable and approved sources. Provide alternative availability data or substitution recommendations for approval prior to purchase and installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Digging Plant Material: Plants shall not be dug at the nursery or approved source until the Contractor is ready to transport them from their original locations to the site of the work or acceptable storage location.

B. Transportation of Plant Material: Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants.

1. Plants shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.

2. The roots of bareroot stock shall be protected from drying out with wet straw or other suitable material while in transit.

3. Unless otherwise authorized by the Engineer/Landscape Architect, notify the Engineer/Landscape Architect at least two working days in advance of the anticipated delivery date of any plant material. A legible copy of the bill of lading, showing the quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Engineer/Landscape Architect.

C. Storage: Unless specific authorization is obtained from the Engineer/Landscape Architect, plants shall not remain on the site of work longer than three days prior to being planted.

1. Plants that are not planted immediately shall be protected as follows:

a. Earth balls shall be kept moist and their solidity carefully preserved.
b. Plants shall not be allowed to dry out or freeze.

2. Bareroot plants may remain on the site of the work only 24 hours before being planted or placed in storage. During this 24-hour period, injury and desiccation of plants on-site shall be prevented.

a. Roots of plants in storage shall first be puddled in a paste solution of prepared planting soil and then watered.

b. Plants shall then be protected and kept moist by "heeling-in" the roots or by placing the plant in a cool moist storage building. The "heeling-in" procedure shall require the plants to be separated and the roots heeled in a suitable moist soil. If plants are stored in a building, the roots shall be covered with a suitable moist mulch.

3. Both the duration and method of storage of plant materials shall be subject to the approval of the Engineer/Landscape Architect.

D. Handling of Plant Materials: Exercise care in handling plant materials to avoid damage or stress.

1.10 REJECTION OF MATERIALS

A. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.

B. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large branches be broken, balls of earth broken or loosened, or areas of bark be torn, the Engineer/Landscape Architect will reject the injured plant.

C. When a plant has been rejected, remove it from the area of the work and replace it with one of the required size and quality.

1.11 PLANTING SEASON

A. Spring Planting: Spring planting may commence as soon as the ground has thawed at the nursery and at the site of planting, and weather conditions make it practicable to work both at the nursery and at the site. The planting period shall be April 1 to October 15.

B. Regardless of the dates specified above, planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.

C. Planting season may be extended only with the written permission of the Engineer/Landscape Architect.

1.12 ACCEPTANCE

A. The Engineer/Landscape Architect will inspect all work for Substantial Completion upon written notice of completion. The request shall be received at least ten calendar days before the anticipated date of inspection.

B. Acceptance of plant material by the Engineer/Landscape Architect will be for general conformance to specified size, character, and quality, and shall not diminish responsibility for full conformance to the Contract Documents.

C. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Engineer/Landscape Architect, the Engineer/Landscape Architect will recommend to the Owner that acceptance of the work of this Section be given.

D. Acceptance in Part:

1. The work may be accepted in parts when it is deemed to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.
2. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

1.13 MAINTENANCE

A. Plant material shall be maintained until the completion of guarantee period and Final Acceptance of work, as described in Part 3 of this Section.

B. Following Acceptance, maintenance of plant material shall become the Owner's responsibility. Provide instructions and service as follows.

1. Provide Owner with typewritten recommended maintenance program at time of Substantial Completion.

2. Make as many periodic inspections as necessary during the guarantee period, at no additional cost to the Owner, to inspect the condition of all plant materials. Submit written report of each inspection to the Engineer/Landscape Architect outlining corrective measures required to keep the guarantee valid.

1.14 GUARANTEE

A. Plants shall be guaranteed for a period of one year after the date of Acceptance by the Owner and Engineer/Landscape Architect.

1. When the work is accepted in parts, the guarantee periods shall extend from each of the partial acceptances to the terminal date of the last guarantee period. Thus, all guarantee periods terminate at one time.

B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.

C. Replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Engineer/Landscape Architect during and at the end of the guarantee period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period.

1. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this Specification.

2. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.

3. The guarantee of all replacement plants shall extend for an additional one-year period from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner may elect one more replacement or credit for each item.

D. At the end of the guarantee period, and no less than five days prior to final inspection, staking and guying materials, and tree wrap and ties shall be removed from the site.

1.15 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the guarantee period, the Engineer/Landscape Architect will, upon written notice of end of guarantee period, inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.

B. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Engineer/Landscape Architect, the Engineer/Landscape Architect will recommend to the Owner that Final Acceptance of the Work of this Section be given.

PART 2 – PRODUCTS

2.1 PLANTS

A. Except as otherwise specified, size and grade of plant materials shall conform to ANSI Z60.1. In no case shall ball size be less than 11 in. in diameter for each inch of caliper.

B. Plants shall have outstanding form; symmetrical, heavily branched with an even branch distribution, densely foliated and/or budded, and a strong, straight, distinct leader where this is characteristic of species. Plants shall possess a normal balance between height and spread. The Engineer/Landscape Architect will be the final arbiter of acceptability of plant form.

C. Plants shall be healthy and vigorous, free of disease, insect pests and their eggs, and larvae.

D. Plants shall have a well-developed fibrous root system.

E. Plants shall be free of physical damage such as scrapes, broken or split branches, scars, bark abrasions, sunscalds, fresh limb cuts, disfiguring knots, or other defects. These defects shall not interrupt more than 25% of the circumference of the plant cambium.

F. Plants shall meet the sizes indicated on the Plant List. Plants larger or smaller than specified may be used only if accepted by the Engineer/Landscape Architect.

G. Where a size or caliper range is stated, at least 50% of the material shall be closer in size to the top of the range stated.

H. Plants shall not be pruned before delivery.

I. Plants indicated as "B&B" shall be balled and burlapped.

1. Unless otherwise permitted by the Engineer/Landscape Architect, plants shall be nursery grown.

2 Plants shall be grown for at least two years under climatic conditions similar to those in the locality of the Project.

3. Nursery grown plants shall be freshly dug. No heeled in plants or plants from cold storage will be accepted, unless otherwise permitted by the Engineer/Landscape Architect.

J. Container-grown plants shall be well rooted and established in the container in which they are growing. They shall have grown in the container for a sufficient length of time for the root system to hold the planting medium when taken from the container, but not long enough to become rootbound. Container grown plants exceeding the sizes indicated in ANSI Z60.1 shall have containers which are not less than 75% of the ball sizes for comparable B&B plant material. Each container plant shall be inspected and root pruned as needed.

1. Canes or Trunk(s) and Branches:

   a. Very well formed and sturdy.
   b. Branching plentiful and uniformly distributed to form a well-balanced plant.
   c. Scars shall be free of rot and not exceed 1/4 the diameter of the wood beneath in greatest dimension unless completely healed (except pruning scars).
   d. Pruning scars clean cut leaving little or no protrusion from the trunk or branch.
   e. Graft union completely healed.
   f. No mechanical or pest damage.
   g. No extreme succulence.

2. Foliage:

   a. Densely supplied with healthy, vigorous leaves of normal size, shape, color, and texture (except shrubs moved bare-root or deciduous shrubs when dormant).
   b. No holes, cavities, or depressed areas caused by broken or dead branches or insufficient foliage.
   c. No chlorosis.
   d. Pest or mechanical damage barely perceptible with no more than 5% of total foliage affected.
   e. No frost or cold damage discernible.

3. Root System:

   a. Sturdily established in container.
   b. Shall not be excessively rootbound except plants deliberately grown rootbound to produce a dwarf plant.

c. No large roots growing out of container.
d. No noxious weeds in container.

K. Bareroot stock, where specified or approved by Engineer/Landscape Architect, shall meet the standards of ANSI Z60.1 and shall conform to the following:

1. Root System. The root system of bareroot stock shall be sufficient to insure plant growth.

2. Bareroot Trees. Bareroot trees shall have a heavy fibrous root system that has been developed by proper cultural treatment, transplanting, and root pruning. The spread of the root system shall be 12 times greater than the trunk diameter plus an additional 6 in.

3. Bareroot Shrubs. Bareroot shrubs shall have a well-developed fibrous root system, with a minimum spread conforming to the following:

Plant Height, ft.	Minimum Spread of Roots, in.
1.5 to 2	10
2 to 3	11
3 to 4	14
4 to 5	16
5 to 6	18
6 to 8	20

2.2 TOPSOIL

A. Topsoil shall be obtained from a previously established stockpile on the site, to the extent that suitable material is available. Additional topsoil required shall be obtained from off-site sources.

B. Topsoil, whether stripped from site or supplied from off-site, shall be a sandy loam as defined by the USDA Soil Conservation Service, Soil Classification System, and shall have the following mechanical analysis:

Textural Class	% of Total Weight	Average %
Sand (0.05-2.0 mm dia. range)	45 to 75	60
Silt (0.002-0.05 mm dia. range)	15 to 35	25
Clay (less than 0.002 mm dia. range)	5 to 25	15

1. 95% of topsoil shall pass a 2.0 mm sieve.

2. Topsoil shall be free of stones 1 in. in longest dimension, earth clods, plant parts, and debris.

3. Organic matter content shall be 4 to 12% of total dry weight.

2.3 COMPOST

A. Compost shall be highly organic dark brown to black containing 6-10% organic matter tested on a dry weight basis with pH between 6.0 – 8.0, free of plants, their roots, debris; other extraneous matter >1 in. diameter and shall be uncontaminated by foreign matter, or substances harmful to plant growth. Do not use soil for planting while in a frozen or muddy condition.

2.4 PLANTING SOIL

A. Planting soil for all plant material except trees shall be a mixture, by volume, of 2 parts existing soil amended with one part compost or topsoil, or with one part sandy fill if heavy soils.

B. Planting soil shall have pH value range of 5.5 to 7.0.

1. If planting soil mixture does not fall within the required pH range, limestone or aluminum sulfate shall be added to bring the pH within the specified limit.

2.5 LIMESTONE

A. Ground limestone shall be an agricultural limestone containing a minimum of 85% total carbonates, by weight. Ground limestone shall be graded within the following limits:

Sieve Size%	Passing by Weight
No. 10	100
No. 20	90
No. 100	60

2.6 WATER

A. Water shall be suitable for irrigation and shall be free from ingredients harmful to plant life.

2.7 ALUMINUM SULFATE

A. Aluminum sulfate shall be unadulterated and shall be delivered in containers with the name of the material and manufacturer and net weight of contents.

2.8 COMMERCIAL FERTILIZER

A. Fertilizer content shall conform to the following:

Constituent	% Present by Weight
Nitrogen (N)	10
Phosphorus (P)	0
Potassium (K)	10

1. 50% of nitrogen shall be derived from natural organic source of ureaform.

2. Phosphorus-free fertilizer shall be used.

3. Potassium shall be derived from muriate of potash containing 60% potash.

B. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.

C. Fertilizers with N-P-K analysis other than that stated above may be used provided that the application rate per square foot of nitrogen, phosphorus, and potassium is equal to that specified.

D. Controlled-release fertilizer shall be equal to the following:

Product	Manufacturer
Agriform 20-10-5	Sierra Chemical Co.
Planting Tablets	Milpitas, CA 95035
EZY-Grow Fertilizer Packet	EZY-Grow - Landscape Specialties

E. Slow-release fertilizer for seasonal plantings shall be Osmocote slow release 14-14-14 analysis.

2.9 MULCH

A. Mulch shall be a 100% fine-shredded pine bark, of uniform size and free from rot, leaves, twigs, debris, stones, or any material harmful to plant growth. Bark shall have been shredded and stockpiled no less than two months and no more than two years before use.

2.10 GUYING AND STAKING MATERIALS

A. Wood Stakes: For trees under 10 ft. in height, straight, sound, rough sawn lumber not less than 2 x 2 in., if square, or 2-1/2 in. diameter, if round. Wire for staking shall be 12 gauge steel.

B. Wire for Guying: Galvanized steel 1 x 19 preformed 3/16 in. diameter.

C. Turnbuckles: Galvanized steel fitted with eyebolts.

D. Deadman: Sound, rough sawn lumber 2 x 4 in., or other material approved by the Engineer/Landscape Architect.

E. Hose: High quality braided rubber hose, 3/4 in. dia. of suitable length, black in color.

F. Polyethylene tie strapping may be used with 2 x 2 pt. wood stakes as described in the installation details.

2.11 ANTIDESICCANT

A. Antidesiccant shall be an emulsion specifically manufactured for plant protection which provides a protective film over plant surfaces which is permeable enough to permit transpiration. Antidesiccant shall be delivered in manufacturer's sealed containers and shall contain manufacturer's printed instructions for use.

B. Antidesiccant shall be equal to the following:

Product	Manufacturer
Wilt-Pruf	Wilt-Pruf Products, Inc. P.O. Box 469 Essex, CT 06426

2.12 FUNGICIDE

A. Fungicide shall be zinc ethylene bisdithiocarbonate (Zineb), or equal.

PART 3 – EXECUTION

3.1 EXAMINATION OF SUBGRADE

A. Examine subgrade and rough grading before planting. Alert Engineer/Landscape Architect to unacceptable rough grading or subgrade.

B. Note that a VRAP geosynthetic warning layer is required for this project, installed 24 inches below finish grade.

1. Cross cut material beneath each shrub and tree and lift corners of the material to lay against rootball. Backfill completely, avoiding air pockets.

3.2 DRAINAGE OF SOILS

A. Test drainage of five plant beds and pits chosen by the Engineer/Landscape Architect shall be done by filling with water twice in succession. The time at which water is put into the pit or bed for a second filling shall be noted. Engineer/Landscape Architect shall then be notified of the time it takes for pit or bed to drain completely. Planting operations shall not proceed until Engineer/Landscape Architect has reviewed test drainage results.

B. Notify the Engineer/Landscape Architect in writing of all soil or drainage conditions that he considers detrimental to growth of plant material. Submit proposal and cost estimate for correction of the conditions for Engineer/Landscape Architect's approval before starting work.

3.3 TRANSPLANTING – GENERAL (AS APPLICABLE)

A. Condition: Deciduous trees 4 in. caliper and larger shall be moved by boxing, be balled and burlapped, or with a tree spade during dormant periods. Deciduous trees smaller than 4 in. caliper shall be moved balled and burlapped or with a tree spade during dormant periods. The size of the tree spade shall be no less than 11 inches diameter per inch of tree caliper.

B. Digging, Wrapping, and Handling: Plants shall be dug and prepared for moving in a manner that will not cause damage to branches, shape, root system, and development during storage.

C. Balled and Burlapped Plants: Balls shall be firmly wrapped with burlap or approved cloth substitute. No balled plant will be acceptable if the ball is cracked or broken, or if the stem is loose in the ball, either before or during transplanting. Balled plants shall be lifted and handled from the bottom of the ball. Protect ball and deliver to the relocation site, plant immediately, and water thoroughly. Ball sizes shall be as recommended in ANSI Z60.1.

D. Bare Root Plants: Plants shall be dug and prepared in such a manner as to provide optimum root mass. Material shall be dormant when dug and root systems shall be kept covered and moist at all times. Upon delivery to relocation site, plant immediately, and water thoroughly. Root spread shall be as recommended in ANSI Z60.1.

3.4 TRANSPLANTING WITH MECHANICAL TREE SPADE

A. Dig hole for tree with same sized equipment as will dig the plant material and transport it to site.

B. Thoroughly mix a slurry mix of the following in the tree pit:*

Material	Quantity*
Planting soil	5 cu. ft.
Fertilizer	Per mfr's recommendation for tree caliper
Water	Enough to fill bottom third of tree pit

* Quantities listed are for 66 in. tree spade. For larger or smaller units, quantities shall be adjusted accordingly.

C. Prior to digging the plant material, all lower branches shall be tied up so that the machine will not damage any limbs during digging.

D. Tree trunk shall be centered in the unit prior to digging.

E. After digging plant material, and prior to transporting, tie tree limbs down and protect tree from drying out during transport. Trees shall be protected by anti-desiccant spray and/or a plastic or fabric cover.

F. Position tree in hole as directed by Landscape Architect or Owner and remove tree spade.

G. Immediately after removal of tree spade, the tree shall be watered completely; all air gaps in slurry mixture shall be filled by working a spade handle or other tool around the entire perimeter of the ball.

H. Tree shall be watered via injection into root ball until entire ball is saturated.

3.5 LAYOUT OF PLANTING AREAS

A. Individual plant locations and outlines of shrub and ground cover areas to be planted shall be staked by the Contractor in ample time to allow inspection by the Engineer/Landscape Architect.

B. Digging shall not begin until locations are approved by the Engineer/Landscape Architect.

C. Location of trees shall be staked using color-coded stakes. A different stake color shall be used for each tree species.

3.6 PREPARATION OF SUBGRADE

A. Subgrade of planting areas shall be loosened or scarified to a minimum depth of 3 in. prior to spreading planting soil. Subgrade shall be brought to true and uniform grade and shall be cleared of stones greater than 2 in., sticks, and other extraneous material.

3.7 PLANT PIT EXCAVATION

A. Planting pits for trees and shrubs shall be excavated to the depth and dimension indicated on the Drawings.

B. Excavation shall not begin until locations are approved by the Engineer/Landscape Architect.

C. Refer to 3.1 regarding VRAP geosynthetic warning layer.

3.8 FILTER FABRIC

A. Filter fabric shall be installed where indicated on the Drawings. Unless otherwise indicated on the Drawings, filter fabric shall be overlapped 6 in. along all edges.

3.9 SPREADING OF SOIL

A. Soil shall be spread and placed to required depths.

1. Topsoil – Lawns and General Areas: 6 inches.
2. Planting Soil – Groundcover and perennial beds: 12 inches.
3. Finish surface elevation of planting soil in planted areas below edge of pavement or top of curb: 4 inches.

B. Surfaces shall be graded and smoothed, eliminating all sharp breaks by rounding, scraping off bumps and ridges, and filling in holes and cuts.

3.10 PLANTING

A. Walls of plant pits shall be dug so that they are vertical and scarified.

B. Plants shall be set as indicated on Drawings. Plants shall have same relationship to finished grade as in the nursery.

C. Plants shall be turned to the desired orientation when required by Engineer/Landscape Architect.

D. Containerized plants shall be removed from container taking care not to damage roots. The side of the root ball shall be scarified to prevent root-bound condition and plant positioned in planting pit.

E. Planting shall be positioned in center of planting pit, set plumb, and rigidly braced in position until all planting soil has been tamped solidly around the ball.

F. Pits for all plant materials except trees shall be backfilled with planting soil. Tree pits shall be backfilled only with existing soil. Soil shall be worked carefully into voids and pockets, tamping lightly every 6 in.

1. When pit is two-thirds full, plants shall be watered thoroughly, and water left to soak in before proceeding.
2. At this time, ropes or strings, burlap or cloth wrapping, and all other ball wrappings and support wires shall be totally removed from ball and planting pit.
3. Add fertilizer tablets and other amendments as specified while backfilling is in process.
4. Remove nursery plant identification tags.

G. Backfilling and tamping shall then be finished and a saucer formed around plant pits as indicated on the Drawings.

H. Saucer shall be filled with water and water left to soak in. Saucer shall then be filled with water again.

I. Following planting of aquatic plant material, 3 in. layer of gravel shall be spread to stabilize soil beneath.

3.11 BULBS AND HERBACEOUS PERENNIALS

A. Prepare flowering plant planting bed by application of fertilizers and pH-altering amendments and thoroughly rototilling into the top 12 in. prior to planting bulbs and flowering plants.

3.12 APPLICATION OF FERTILIZER

A. Fertilizer shall be applied when planting pits are backfilled two-thirds full. Fertilizer application shall be of the type, rate, and timing recommended by the testing agency for each plant type.

B. Slow-release fertilizer

1. Fertilization schedule for trees and shrubs using slow release 4 oz. packet system shall be per manufacturer's recommendations.

2. Fertilizer packets shall be placed 6 to 8 in. deep below top of planting soil around root balls of plants. Packets shall be spaced evenly depending on the number of packets required.

3.13 CHEMICAL APPLICATIONS

A. Immediately after planting, all trunks of deciduous trees shall be sprayed with fungicide, applied as directed by chemical manufacturer.

B. In areas designated for plantings, remedial and preventative measures shall be taken to provide a weed-free and non-toxic media for planting and as a finished landscape product. If necessary, a systemic post-emergent herbicide shall be applied to existing and emergent weeds in prepared planting beds. Applications shall commence well in advance of planting to eliminate competitive weed growth and provide a safe media for planting.

C. Pre-emergent herbicides are recommended for preventative use in areas not seeded.

3.14 STAKING AND GUYING

A. Each tree shall be staked or guyed immediately following planting. Plants shall stand plumb after staking or guying.

B. Duckbill Tree Support Systems shall be installed in strict conformance with manufacturer's published installation instructions.

C. Duckbill Root Ball Fixing Systems shall be installed in strict conformance with manufacturer's published installation instructions.

3.15 MULCHING

A. Mulch shall be applied as follows (entire area listed shall be mulched):

Plant Type	Mulched Area	Mulch Depth, in.
Tree	Saucer	3
Shrub	Saucer or Bed	3
Ground Cover	Bed	3

3.16 PRUNING

A. Each tree and shrub shall be pruned to preserve the natural character of the plant. Pruning shall be done after delivery of plants and after plants have been inspected and approved by the Engineer/Landscape Architect. Pruning procedures shall be reviewed with Engineer/ Landscape Architect before proceeding.

B. Pruning shall be done with clean, sharp tools. Cuts shall be made flush, leaving no stubs. No tree paint shall be used.

C. Dead wood, suckers, and broken and badly bruised branches shall be removed.

3.17 MAINTENANCE OF PLANTING

A. Maintenance shall begin immediately after each plant is planted and shall continue until Final Acceptance. The Contractor shall provide water for irrigation if none is available on site.

B. Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, resetting plants to proper grades and upright position, and

furnishing and applying such sprays as are necessary to keep plantings free of insects and disease, and in a healthy growing condition.

C. Planting areas shall be kept free of weeds, grass, and other undesired vegetative growth.

D. Note: Extend maintenance beyond Substantial or Final Acceptance of Project if necessary to meet above requirements. Engineer/Landscape Architect may withhold funds from Substantial and Final Completion payments as necessary to assure proper performance of maintenance operations.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Work included: Provide labor, materials, and equipment necessary to complete the work of this Section and, without limiting the generality thereof, furnish and include the following:

1. The extent of cast-in-place concrete work is shown on drawings and includes (but not by way of limitation) formwork, reinforcing, cast-in-place concrete, accessories, and casting in of items specified under other Sections of the Specifications or furnished by Owner that are required to be built-in with the concrete.

2. Equipment support pads indicated on mechanical drawings to be installed by the Building Contractor.

1.03 RELATED WORK:

A. Anchor Rods: Section 05120

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following except where more stringent requirements are shown or specified:

1. ACI 211.1-91 "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."

2. ACI 212.3R-04 "Chemical Admixtures for Concrete."

3. ACI 301-89 "Specifications for Structural Concrete."

4. ACI 302.1R-04 "Guide for Concrete Floor and Slab Construction."

5. ACI 304 R-00 "Guide for Measuring, Mixing, Transporting and Placing Concrete."

6. ACI 304.2R-96 "Placing Concrete by Pumping Methods."

7. ACI 306 R-88 "Cold Weather Concreting."

8. ACI 308 R-01 "Guide to Curing Concrete."

9. ACI 309R-05 "Guide for Consolidation of Concrete."

10. ACI SP-66 04 "ACI Detailing Manual."

11. ACI 318-02 "Building Code Requirements for Structural Concrete."

13. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars," eighth edition.

B. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement, polypropylene fiber admixtures, patching compounds, non-shrink grout, waterstops, joint systems, curing compounds, bonding agents, sealers and others as requested by Architect.

B. Shop Drawings:

1. Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315, showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

C. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test if trial batch method is used for proportioning concrete mixes.

E. Strength Tests: Provide required records of strength tests if field experience method is used for proportioning concrete mixes.

PART 2 - PRODUCTS

2.01 FORM MATERIALS:

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Provide welded wire fabric in flat sheets.

C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendation, unless otherwise specified. Wood, brick and other devices are not acceptable.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS:

A. Portland Cement: ASTM C 150, Type I or Type II, unless otherwise acceptable to Architect. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Normal Weight Aggregates: ASTM C 33. Provide from a single source for exposed concrete. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, or ochre which can cause stains on exposed concrete surfaces.

C. Light Weight Aggregates: ASTM C 330.

D. Water: Potable.

E. Air-Entraining Admixture: ASTM C 260.

F. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G containing not more than 1% chloride ions.

G. Normal range water reducing admixture: ASTM C 494 Type A containing no calcium chloride.

H. Accelerating Admixture: ASTM C 494, Type C or E.

I. Calcium Chloride not permitted.

2.04 RELATED MATERIALS:

A. Non-Shrink Cement-based Grout: Provide grout consisting of premeasured, prepackaged materials supplied by the manufacturer requiring only the addition of water. Manufacturer's instructions must be printed on the outside of each bag.

1. Non-shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.

2. Compressive strength: A minimum 28 day compressive strength of 5000 psi when tested in accordance with ASTM C-109.

3. Setting time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.

4. Composition: Shall not contain metallic particles or expansive cement.

B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.

C. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

E. Slab Joint Filler: Semi-rigid, two-part, self-leveling, 100% solids content epoxy control and construction joint filler meeting the following:

Shore A Hardness	ASTM D2240.....	85 or greater
Tensile Strength.....	ASTM D638.....	500 psi "
Adhesion to Concrete	ASTM D4541.....	285 psi "
Solids Content.....		100%

F. Bonding Agent: Provide epoxy adhesive conforming to ASTM C 881 to bond plastic concrete to hardened concrete. Prepare hardened concrete surface and apply bonding agent in compliance with manufacturer's instructions.

G. Sealer: Sikagard 70, water and chloride-ion repellent penetrating sealer manufactured by Sika orapproved alternate. Apply to all exterior concrete flatwork including stairs, ramps and sidewalks in accordance with manufacturer's instructions.

2.05 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. Use material, including all admixtures, proposed for use on the project. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 14 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

C. Proportion design mixes to provide concrete with the following properties:

1. Interior Slab-On-Grade:
   a. Strength: 4000 psi @28 days, 3/4" aggr.
   b. W/C Ratio: 0.48
   c. Entrained Air: non-air-entrained
   d. Slump: 3"±1"

2. Frost Walls, Footings and all other exposed Site Concrete:
   a. Strength: 3000 psi @28 days, 3/4" aggr.
   b. W/C Ratio: 0.58
   c. Entrained Air: 6% ± 1%
   d. Slump: 3"±1"

3. Exterior flatwork including slabs, ramps, stairs and sidewalks:
   a. Strength: 4000 psi @28 days, 3/4" aggr.
   b. W/C Ratio: 0.48
   c. Entrained Air: 7% ± 1%
   d. Slump: 3"±1"
   e. DCI -S Corrosion Inhibitor by Grace Construction Products or Rheocrete CNI Corrosion Inhibitor by Master Builders. 3 1/2 gal/cy. added at Batch Plant.

4. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor, when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

1. Water may be added at the project only if the specified slump and design mix maximum water/cement ratio is not exceeded.

2.06 CONCRETE MIXING:

A. Job-Site Mixing: Not permitted.

B. Ready-Mix Concrete: Must comply with the requirements of ASTM C 94, and as herein specified. Provide batch ticket for each batch discharged and used in work, indicating project name, mix type, mix time and quantity.

1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required by Engineer.

2. When the air temperature is between 85 degrees F. and 90 degrees F., reduce the mixing and delivery time from 1 1/2 hours to 75 minutes, and when the air temperature is above 90 degrees F., reduce the mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMS:

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design, construct, erect, maintain, and remove forms for cast-in-place concrete work in compliance with ACI 347.

C. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

D. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.

F. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

G. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.

I. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

J. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT:

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

1. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

2. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

3. Place reinforcement to obtain specified coverages for concrete protection within tolerances of ACI-318. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

4. Fiber Reinforcing shall be introduced directly into the concrete either at the batch plant or job site at the rate of 1.6 pounds (minimum) per cubic yard. If introduced at the batch plant with the aggregate, no extra mixing time is required. If added at the job site, approximately 3 to 5 minutes mixing at agitating speed is required.

at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS:

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect.

1. Provide keyways at least 1-1/2" deep in construction joints in walls, and slabs; accepted bulkheads designed for this purpose may be used for slabs.

2. Roughened surfaces shall be used between walls and footings unless shown otherwise on the drawings. The footing surface shall be roughened to at least an amplitude of 1/4" for the width of the wall before placing the wall concrete.

3. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

4. Joints in slabs on grade shall be located and detailed as indicated on the drawings. Saw-cutting of joints shall be timed properly with the set of the concrete: Cutting shall be started as soon as the concrete has been hardened sufficiently to prevent aggregate being dislodged by the saw, and shall be completed before shrinkage stresses become sufficient to produce cracking.

3.04 INSTALLATION OF EMBEDDED ITEMS:

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Notify other trades to permit installation of their work.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.

3.05 INSTALLATION OF GROUT

A. Place grout for base plates in accordance with manufacturer's recommendations.

B. Grout below setting plates as soon as practicable to facilitate erection of steel and prior to removal of temporary bracing and guys. If leveling bolts or shims are used for erection grout shall be installed prior to addition of any column load.

C. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

3.06 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating material manufacturer's directions. Do not allow excess form coating to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.07 CONCRETE PLACEMENT:

A. Preplacement Review: Footing bottoms, reinforcement and all work shall be subject to review by the Architect. Verify that reinforcing, ducts, anchors, seats, plates and other items to be cast into concrete are placed and securely held. Notify Architect 48 hours prior to scheduled placement and obtain approval or waiver of review prior to placement. Moisten wood forms immediately before placing concrete where form coatings are not used. Be sure that all debris and other foreign matter is removed from forms.

B. General: Comply with ACI 304, and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide

construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.

2. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

3. Conveying equipment shall be approved and shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:

   a. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.

   b. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long, and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

   c. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete.

   d. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum alloy. Standby equipment shall be provided on the site.

   e. Tined rakes are prohibited as a means of conveying fiber reinforced concrete.

4. Do not use reinforcement as bases for runways for concrete conveying equipment or other construction loads.

C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

2. Use vibrators designed to operate with vibratory equipment submerged in concrete, maintaining a speed of not less than 8000 impulses per minute and of sufficient amplitude to consolidate the concrete effectively. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine, generally at points 18 inches maximum apart. Place vibrators to rapidly penetrate placed layer and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion maintain the duration of vibration for the time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operation.

D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete using internal vibrators during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on plastic surface.

3. Maintain reinforcing in proper position during concrete placement operations.

E. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 deg.F (4 deg.C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg.F (10 deg.C), and not more than 80 deg.F (27 deg.C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators.

4. All temporary heat, form insulation, insulated blankets, coverings, hay or other equipment and materials necessary to protect the concrete work from physical damage caused by frost, freezing action, or low temperature shall be provided prior to start of placing operations.

5. When the air temperature has fallen to or is expected to fall below 40 deg.F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 deg.F.

F. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg.F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3. Wet forms thoroughly before placing concrete.

4. Do not use retarding admixtures without the written acceptance of the Architect.

3.08 FINISH OF FORMED SURFACES:

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This concrete surface shall have texture imparted by form facing material, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 in. in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This as-cast concrete surface shall be obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Related Unformed Surfaces: At tops of walls and grade beams, horizontal offset surfaces occurring adjacent to formed surfaces, strike-off, smooth and finish with a texture matching adjacent unformed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.09 MONOLITHIC SLAB FINISHES:

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or

when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft. when tested with a 10 ft. straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish: Apply trowel finish to monolithic slab surfaces.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/4 in. in 10 ft. when tested with a 10-ft. straightedge. Grind smooth any surface defects which would telegraph through applied floor covering system.

C. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 as herein specified.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

a. Curing shall be continued for at least 7 days in the case of all concrete except high-early-strength concrete for which the period shall be at least 3 days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the specified strength, f'_c. If one of the curing procedures below is used initially, it may be replaced by one of the other procedures any time after the concrete is 1 day old provided the concrete is not permitted to become surface dry during the transition.

3. When the mean daily temperature is less than 40 deg.F, the temperature of the concrete shall be maintained between 50 and 70 deg.F for the required curing period.

   a. When necessary, arrangements for heating, covering, insulation, or housing the concrete work shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

   b. Keep protections in place and intact at least 24 hours after artificial heat is discontinued. Avoid rapid dry-out of concrete due to overheating and avoid thermal shock due to sudden cooling or heating.

   c. Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5 deg.F in any 1 hour or 50 deg.F in any 24 hour period.

B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods:

   a. Keep concrete surface continuously wet by covering with water.

   b. Continuous water-fog spray.

   c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-in. lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows:

   a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 in. and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Protection From Mechanical Injury: During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

3.11 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg.F (10 deg.C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and support.

3.12 REUSE OF FORMS:

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.13 MISCELLANEOUS CONCRETE ITEMS:

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.14 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Architect.

1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, and other projections on surface and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Proprietary patching compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

5. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match

adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

6. Use epoxy-based mortar for structural repairs, where directed by the Architect.

7. Repair methods not specified above may be used, subject to acceptance of the Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. The Owner will employ a testing laboratory to inspect, sample and test the materials and the production of concrete and to submit test reports. Concrete testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board.

B. Concrete shall be sampled and tested for quality control during placement of concrete shall include the following, unless otherwise directed by Architect.

C. Sampling Fresh Concrete: ASTM C 172.

1. Slump: ASTM C 143; one test for each concrete load at point of discharge and one test for each set of compressive strength test specimens. A slump test must be run prior to the incorporation of the CFP fibers per recommendations of ACI 544.

2. Air Content: ASTM C 231 "Pressure method for normal weight concrete." One for each set of compressive strength test specimens.

3. Concrete Temperature: Test hourly when air temperature is 40 deg.F (4 deg.C) and below, and when 80 deg.F (27 deg.C) and above; and each time a set of compression test specimens are made.

4. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

5. Compressive Strength Tests: ASTM C 39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing if required.

a. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 used.

b. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived, if in the Architect's judgement, adequate evidence of satisfactory strength is provided.

c. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

d. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

e. Test results will be reported in writing to Architect and Contractor on the day after tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods, as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 03450

ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes precast concrete units.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast concrete units and connections capable of withstanding design loads within limits and under all existing code criteria.

1.03 SUBMITALS

A. Product Date: For each product indicated.

B. Design Mixes: For each concrete mix.

C. Shop Drawings: Detail Fabrication and installation of precast concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish and types of reinforcement, including special reinforcement.

1. Comprehensive engineering analysis stamped and signed by the qualified professional engineer responsible for its preparation. Analysis shall indicate design loads, member spans, member reinforcement, and connection design and detail for attachment to supporting structure.

D. Samples: For each type of finish, 3-12 inches long.

E. Welding certificates.

F. Material certificates.

1.04 QUALITY ASSURANCE:

A. Fabricator Qualifications: A qualified fabricator who assumes responsibility for engineering precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

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1. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group A, Category A1 – Architectural Cladding and Load Bearing Units.

B. Design Standards: Comply with ACI 318 and the design recommendations in PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete."

C. Quality-Control Standard: Comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

D. Welding: Qualified procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel", and AWS D1.4, "Structural Welding Code-Reinforcing Steel."

E. Sample Panels: Produce a minimum of 1 full-scale sample, approximately 36 inches long, to demonstrate range of finish, color, and texture variations of approved samples.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

B. Lift and support units only at designated lifting and supporting pints shown on Shop Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Steel Reinforcing:

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 69, deformed.

2. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

3. Plain-Steel Wire: ASTM A 496.

4. Deformed-Steel Wire: ASTM A496.

5. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

6. Deformed-Steel Welded Wire Fabric: ASTM A 497 flat sheet.

7. Supports: Manufacture's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 117.

8. Prestressing Strand: ASTM A 416/A 416M, Grade 250 or 270, uncoated, 7-wire, low-relaxation strand.

B. Concrete:

1. Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source. Color samples to be submitted to Design /Builder for approval. Color to be MCTC.

2. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with course aggregates complying with Class 5S.

3. Light-Weight Aggregates: ASTM C 330.

4. Coloring Admixture: ASTM C 979 synthetic mineral-oxide pigments or colored water-reducing as mixtures, temperature stable, nonfading, and alkali resistant.

5. Air-Entraning Admixture: ASTM C 260.

6. Fly Ash Admixture: ASTM C 618, Class C or F.

7. Metakaloin Admixture: ASTM C 618, Class N.

8. Silica Fume Admixture: ASTM C 1240.

C. Steel Connections:

1. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

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ARCHITECTURAL PRECAST CONCRETE

2. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.

3. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

4. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

5. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.

6. Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication and ASTM A 153/A 153M as applicable.

   a. Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.

7. Shop-Primed Finish: Prepare surfaces of non-galvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead and chromate-free, rust-inhibitive primer, complying with performance requirements in FS TT-P-664, SSPC-Paint 25, according to SSPC-PA 1.

D. Sand-Cement Grout: Portland cement, ASTM C 150, Type 1, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2 ½ parts sand, by volume, with minimum water required for placement and hydration.

E. Pre-Cast units: To include pre-cast water table, vertical wall ends and pre-cast sill elements as shown.

2.02 CONCRETE MIXES:

A. Light-Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or filed test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.

2. Maximum Water-Cementitious Materials Ratio: 0.40.

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ARCHITECTURAL PRECAST CONCRETE

B. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

2.03 FABRICATION:

A. Anchorage Hardware: Fabricate with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during pre-casting operations.

B. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing pre-cast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in precast concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.

E. Reinforce precast concrete units to resist handling, transportation, and erection stresses.

F. Prestress tendons for precast concrete units by either pre-tensioning or post-tensioning methods. Comply with PCI MNL 117.

G. Mix concrete according to PCI MNL 117 and requirements in the Section. After concrete batching, no additional water may be added.

H. Place face mix to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover.

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I. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for measuring, mixing, transporting and placing concrete.

1. Place backup concrete to ensure bond with face mix concrete.

J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.

K. Comply with ACI 306.1 procedures for cold-weather concrete placement.

L. Comply with ACI 305 R recommendations for hot-weather concrete placement.

M. Identify pickup pints of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

O. Discard precast concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Design/Builder.

P. Fabricate precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finish panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in-items.

2.04 FINISHES:

A. Finish exposed-face surfaces of precast concrete units to match approved design reference sample and as follows:

1. PCI and APA's "Architectural Precast Concrete – Color and Texture Selection Guide, :" of plate numbers indicated.

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2. Smooth-Surface Finish: Free of pockets, sand streaks, and honeycombs, with uniform color and texture.

3. Textured-Surface Finish: Impart by form liners or inserts to produce surfaces free of pockets, streaks, and honeycombs, with uniform color and texture.

4. Bushhammer Finish: Use power or hand tools to remove matrix and fracture coarse aggregates.

5. Retarded Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.

6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.

7. Horned Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.

8. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.

B. Finish exposed top and bottom surfaces of precast concrete units to match face-surface finish.

2.05 SOURCE QUALITY CONTROL

A. Contractor will employ an independent testing agency to evaluate precast concrete fabricator's quality-control and testing methods.

B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

SECTION 03450

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A. Install precast concrete. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

   1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

B. Anchor precast concrete units in position by bolting, welding, grouting, or as otherwise indicated.

C. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

   1. Repair damaged steel surfaces by cleaning and applying a coat of galvanized repair paint to galvanized and re-priming damaged painted surfaces.

D. Install pre-cast concrete units level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 117, Appendix 1.

E. Repair exposed exterior surfaces of precast concrete units to match color, texture, and uniformity of surrounding precast concrete if permitted by Design/Builder.

F. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt and stains.

END OF SECTION

SECTION 04200

UNIT MASONRY

1. GENERAL

1.1 DESCRIPTION OF WORK

A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

B. Extent of Unit Masonry is shown on the drawings.

C. In addition to work shown on the drawings and specified elsewhere in this Section, build in steel lintels, anchors, inserts and sleeves.

1.2 QUALITY ASSURANCE

A. Standards: Comply with recommendations of Brick Institute of America (BIA), and National Concrete Masonry Assoc. (NCMA).

1.3 SUBMITTALS

A. Issue submittals in accordance with Section 01300, Submittals.

B. Submit product data and installation recommendations for masonry units, cementitious products for mortar and grout, coloring pigments, throughwall flashing, and masonry accessories.

C. Submit samples of exposed masonry units and mortar, illustrating full range of colors and textures.

D. Contractor shall build a 3 foot wide by 4 foot brick wall sample on site for architects approval. Contractor to coordinate installation of sample precast w/ brick sample.

PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Except as shown on Drawings or specified otherwise, all concrete masonry units shall be as follows:

1. Face brick equal to Jumbo Brick

2.3 MORTAR AND GROUT

A. Mortar shall comply with ASTM C 270, BIA Technical Notes 8 and 8A, and local Building Code.

B. Materials shall conform to applicable ASTM specifications including the following:

1. Portland Cement: ASTM 150, Types I, II, or III (do not use Types IA, IIA, or IIIA).

2. Masonry Cement: ASTM C 91.

3. Hydrated Lime: ASTM C 207, Type S only (do not use Type N).

4. Natural or manufactured sand aggregate: ASTM C 144, gradation conforming to Table 1 in BIA Technical Note 8.

5. Masonry cement shall not contain ground limestone.

6. Water: clean, potable, and free of deleterious amounts of acids, alkalies or organic materials.

C. Mortar Type

1. General:

a. Mortar for exterior brick shall be colored, submit samples to Architect for approval. Color to be determined.

b. Use 1800 psi minimum Type S mortar for reinforced masonry and where indicated.

c. Use 750 psi minimum Type N mortar for exterior, above-grade loadbearing and non-loadbearing walls, and for other applications where another type is not indicated.

D. Grout

1. Grout shall conform to ASTM C 476 and to match existing.

2. Fine and coarse aggregate for grout mixes shall be defined in ASTM C 404.

a. Fine grout shall consist of one part portland cement, 0 to 1/10 part lime, 2-1/4 to 3 parts fine sand.

b. Coarse grout shall consist of the fine grout mix described in "a" above plus 1 to 2 parts coarse aggregate.

c. Use coarse grout (pea gravel aggregate) except where minimum horizontal core dimension is under 4 in., in which case use fine grout (sand aggregate). Ordinary concrete (maximum 1 in. aggregate) may be used where minimum core dimension exceeds 6 inches.

E. During cold-weather construction at exterior walls, use Type III (high-early strength) cement and Type S hydrated lime. A non-calcium-chloride-based accelerator such as Dur-o-Wal, Dur-o-Guard, or Euco Accelguard 80 may be used, in quantities recommended by manufacturer for expected ambient temperature. Calcium chloride may not be used. Refer to EXECUTION portion of this Section for general provisions governing cold weather construction.

2.4 METAL REINFORCING, TIES, ANCHORS

A. Acceptable manufacturers: Heckmann Building Products, or approved equal.

B. Brick ties at masonry veneer construction:

1. 14 Ga # 315-D anchor with 3/16 x 4" #316 triangle ties. Min. 2" into bed joints. Ties to be stainless steel.

2. At gypsum sheathing secure anchors through sheathing directly to metal studs with s/s wood screws as recommended by anchorage manufacturer.

3. Maximum spacing: 24 in. o.c. vertically, 16 in. o.c. horizontally or closer spacing as required at expansion joints, corners, floors, etc., or to secure directly to studs.

4. Material: stainless steel.

2.5 THROUGHWALL FLASHING

A. Through-wall flashing: Shall be 7 oz. Asphalt & Copper-Coated Thru-Wall Flashing as manufactured by Sandell Manufacturing Co., Inc., Cambridge, Massachusetts, telephone (617) 491-0540, or approved equal.

B. Through-wall flashing sealant: Shall be Sandell Trowel Mastic, as manufactured by Sandell Manufacturing Co., Inc.

2.6 ROOFING FELT

A. No. 15, asphalt-saturated, unperforated organic roofing felt, complying with ASTM D 226, Type I, 36 inches wide.

2.7 MASONRY ACCESSORIES

A. Weepholes: medium-density polyethylene, 3/8 in. diameter, full depth of outer wythe.

B. Chemical cleaning agents for newly-installed masonry: ProSoco Sure-Klean liquid masonry cleaners or equal by Diedrich, as recommended by manufacturer for particular condition. Recommended cleaners include Sure-Klean No. 600 Detergent, No. 101 Lime Solvent, and Vana Trol.

3. EXECUTION

3.1 MASONRY WORK IN GENERAL

A. Erect all masonry work in compliance with the line and level tolerances specified herein. Correct, or replace, as directed by the Architect, non-conforming masonry work at no additional cost to the Contract.

B. Lay no concrete masonry unit having chipped edges or face defects where such unit or piece would be exposed to view. Remove any such unit or piece, if installed, replace with new matching material, and bear all costs therefore.

C. Examine all Drawings as to requirements for the accommodation of work of other trades. Provide all required recesses, chases, slots, cutouts, and set loose lintels. Place anchors, bolts, sleeves and other items occurring in the masonry work. Take every precaution to minimize future cutting and patching. Closely coordinate the location and placement of such items.

D. Protect all masonry from rain prior to, and during the installation thereof. If the temperature is in excess of 80 degrees F. at time of installation, lightly moisten contact surfaces or masonry units by brushing with water.

E. Lay all masonry in full mortar beds, and completely butter all concealed from view vertical edges with mortar. Completely fill cells of masonry units with mortar where vertical reinforcement is to be installed therein and in other locations specified or indicated on the Drawings.

F. Provide complete protection against breakage and weather damage to all masonry work, including substantial wood boxing around door jambs, over the tops of walls and wherever necessary to protect work at all stages of completion. Protect masonry when not roofed over, at all times when masons are not working on the walls. Apply non-staining tarpaulins or waterproof paper, properly weighted, or nailed, to assure their remaining in place to protect masonry from all possible hazards.

G. Fit masonry into bucks and frames so as not to distort alignment of such items, and fill backs of such items with mortar, except where joints are indicated to receive caulking and sealant and have no compressible filler therein, in which case rake joints to a uniform depth of ¾ inch for proper installation of caulking and sealant material.

H. Use only power saw, equipped with carborundum blade, for cutting exposed masonry, as needed to assure straight, evenly-cut edges.

I. Lay out coursing before setting to minimize cutting closures or jumping bond. Do not spread any more mortar than can be covered before surface of mortar has begun to dry. Do not endanger bond or mortar by moving masonry when once laid. If necessary to re-adjust any items, remove entirely, clean-off mortar, and reset with fresh mortar.

J. Except for cleaning down and pointing, finish all new masonry as the walls and partitions are carried up.

K. Point and fill all holes and cracks in mortar joints with additional fresh mortar; do not merely spread adjacent mortar over defect or use dead mortar droppings. Do all pointing while mortar is still soft and plastic. If hardened, chisel defect out and refill solidly with fresh additional mortar, and tool as specified.

3.2 JOB CONDITIONS

A. Store cement, lime and other cementitious materials under cover in a dry place.

B. Keep steel reinforcing, ties and anchors free from oil, dirt, rust, and other materials which would destroy bond.

C. Store masonry above ground on level platforms which allow air circulation under stacked units. Masonry units shall be dry and free from soil and ice before being laid in wall.

D. Keep installed walls dry and clean at all times. Immediately remove grout or mortar from face of masonry to be left exposed or painted. Protect previously installed elements such as louvers, doors, frames, and windows from mortar droppings and construction damage, using masking elements, dropcloths, etc.

E. Cover exposed walls at end of working day with well-secured canvas tarpaulins. Protect base of exterior walls from splashing mud and mortar by spreading sand, straw, and sawdust or plastic sheeting 3 to 4 ft. horizontally and up face of wall. Turn scaffold boards near wall on edge at end of day to prevent splashing mortar or dirt.

F. Securely brace partially completed walls against wind damage. Walls shall have been completed 24 hours minimum before application of distributed loads, 72 hours before concentrated loads.

G. Comply with cold-weather construction specifications in NCMA-TEK 16 and BIA Technical Note 1A:

1. Maintain masonry above 32 degrees F. for 24 hours minimum using insulated blankets or heated enclosures. Construct windbreaks at wind velocities over 15 mph. Maintain mortar on board at 40 degrees F. minimum, heating mixing water and sand as required.

2. Sprinkle units with high rates of absorption with heated water. Refer to mortar paragraph under PRODUCTS in this Section for provisions governing cold-weather additives to mortar. If standard instead of Type III high-early strength cement must be used, maintain installed masonry above freezing for 48 instead of 24 hours.

3. Do no masonry work at temperatures below 38 degrees F and falling or 35 degrees F and rising, until General Contractor has contacted Architect.

3.3 INSTALLATION

A. Verify that substrate is dry and free from frost, dirt, laitance, loose sand and other material which would prevent satisfactory bond. Lay first course in full mortar bed including face shells and webs of concrete masonry units. Keep cells to be grouted free from mortar.

B. Dampen masonry units as required to prevent excess suction of mortar. Lay concrete masonry units to form continuous unobstructed vertical spaces within wall. Provide full mortar coverage on horizontal and vertical face shells. Also bed webs adjacent to reinforced cores to prevent grout leakage, except omit web bedding at fully grouted walls to permit grout to flow laterally. Lay face brick with full vertical and bed joints, except as specified below to provide weepholes. Cut exposed masonry units, where necessary, with a power saw. Avoid the use (by proper layout) of less-than-half-size units.

C. Install masonry units in the bond pattern indicated, or if none is indicated, in running bond.

D. Step back unfinished work -- toothing is not permitted. Do not adjust installed units -- where necessary, completely remove and reinstall using fresh mortar.

E. Maximum variation of installed walls from plumb, level, or plan grid shall not exceed 1/4 in. in 10 ft. Wall thickness shall not vary more than 1/4 in. plus or minus from dimension shown on drawings.

F. Mortar:

1. Measure materials in calibrated containers, or by similar easily-controlled and maintained method. Do not use shovel measurement.

2. Mix materials in a mechanical mixer at least three minutes with minimum amount of water necessary to produce a workable consistency. Retemper stiffened mortar as required to restore evaporated water, but do not place mortar any later than 2-1/2 hours after mixing.

3. Exposed-to-view joints shall be approximately 3/8 in. wide, to meet coursing shown, tooled when thumbprint hard with a round bar to produce a dense, slightly concave surface well-bonded to masonry edges.

4. After tooling, cut off mortar tailings with a trowel and brush off excess. Concealed joints, including those on cavity side of masonry veneer, and joints in masonry to be plastered or stuccoed shall be struck off flush, with no protrusions.

5. Mortar not tight at time of tooling shall be raked out, pointed with fresh mortar, and retooled. Where sealant is shown, rake out joint 3/4 in., ready for backer rod and sealant specified in Division 7 sealants Section.

G. Through-wall flashing:

1. Install flashing to the profiles shown on the drawings.

2. Masonry and concrete surfaces receiving through wall flashings shall be thoroughly dry, free from loose material, and reasonably smooth. There shall be no slopes that will form pockets or prevent free drainage of water to exterior surfaces of wall.

3. Set flashing in sealant. Hold sealant back 1/4 inch from face of lintel. Hold flashing 1/2 inch back from face of lintel.

4. At wall openings, extend flashing 6 in. beyond each side of opening and turn up to form pan. Fold all corners, do not cut.

5. Lap joints between lengths of flashing 6 in. minimum and seal with mastic. Seal penetrations through flashing with mastic or overlapping piece of flashing.

H. Provide weepholes at 24 inches on center maximum spacing through outer face of masonry at all through-wall flashing.

I. At masonry veneer construction over gypsum sheathing, provide rubber washers or bituminous dampproofing compound at all penetrations made in sheathing board or paper as part of work under this Section, including screw heads and veneer-tie anchorage.

J. Provide openings and chases as required for structural members, ductwork, large pipes, etc. Cut exposed masonry with carborundum saw to ensure straight even edges. Neatly block around and patch penetrations. Provide compressible filler around edges of openings to accommodate vibration and structural deflection. Ensure that joint reinforcement remains uncut or is well-lapped.

K. Provide control and expansion joints at locations shown, and keep clean of mortar droppings. Install Joint Sealers in accordance with Section 07900.

L. Build other work into the masonry work as shown, fitting masonry units around other work, and grouting to secure anchorage.

3.4 ALLOWABLE TOLERANCES FOR MASONRY WORK

A. Maximum variation from true surface level for exposed to view walls and partitions:

1. Unit-to-unit tolerance: 1/8 inch.

2. Surface, overall tolerance: ¼ inch in 10 feet in any direction when tested with ten foot long straightedge. Where both faces or wall or partition will be exposed to view, request and obtain decision from the Architect as to which face will be required to conform to the specified surface level tolerance.

B. Maximum variation from true vertical plumb lines:

1. In lines of walls and arises:

a. ¼ inch in 10 feet.
b. 3/8 inch in any story, or up to 20 feet maximum.
c. ½ inch in 40 feet maximum.

2. For external corner lines, control joints, and other conspicuous lines:

a. ¼ inch in any story, or up to 20 feet maximum.

C. Maximum variation from horizontal level or grades for exposed sills, lintel blocks, and other conspicuous lines:

1. ¼ inch in any bay, or up to 20 feet maximum.

2. ½ inch in 40 feet maximum.

D. Maximum variation of linear building line from an established position in plan and related portions of walls and partitions:

1. ½ inch in any bay or up to 20 feet.

2. ¾ inch in 40 feet maximum.

3.5 WALL AND PARTITION CONSTRUCTION

A. General:

1. Build the masonry walls and partitions in the various combinations and thickness as indicated on the Drawings and as herein specified.

2. Build in anchorage items and loose lintels as the work progresses.

3. Lay first course of masonry on a smooth bed or mortar, after supporting concrete has been cleaned. Fill cells of first course concrete masonry units with mortar in all cases. Completely fill cells of concrete masonry units wherever vertical reinforcing rods are installed therein.

4. For exterior masonry cavity walls, install cavity insulation, through wall membrane flashings, weep wicks, and peastone, as specified herein.

5. Fill pressed metal frames occurring in masonry with mortar, as the masonry is erected.

3.6 GROUT

A. Lay masonry units with core cells vertically aligned and cavities clear of mortar and unobstructed.

B. Permit mortar to cure three (3) days before placing grout.

C. ACI Bulding Code requirements for Masonry Structures and ACI Specifications for Masonry Structures are made part of this specification as are all pertinent sections of the ACI Building Code.

3.6 CLEANING MASONRY

A. Masonry cleaning procedures shall follow recommendations of NCMA-TEK 45 and BIA Technical Note 20 (revised).

B. Dry brush masonry work at end of each day's work.

C. After new mortar has cured 14 days minimum, remove large mortar particles with non-metallic scrapers, chisels, or wooden paddles. Wash off dirt and other foreign materials with clean water and light concentration of soap or detergent.

D. For mortar smears, construction dirt, stains, efflorescence, etc., not removable by above methods, use proprietary cleaners specified under PRODUCTS. Muriatic acid may not be used. Adhere strictly to manufacturer's recommendations.

E. Apply and scrub cleaning solutions with non-metallic fibrous brushes. Thoroughly rinse cleaned area before cleaning solution can dry, using water hosed under moderate pressure.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS:

A. RELATED DOCUMENTS: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.

1.03 RELATED WORK

A. Cast-In-Place Concrete: Section 03300

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges".

   Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the Fabricator as part of his preparation of these shop drawings."

2. AISC "Specifications for Structural Steel Buildings - Allowable Stress Design and Plastic Design", including "Commentary" and Supplements thereto as issued.

3. AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.

4. AWS D1.1-00 "Structural Welding Code".

5. ASTM A6 "General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1. Provide certification that welders to be employed in work have satisfactorily passed AWS Qualification tests.

2. If recertification of welders is required, retesting will be Contractor's responsibility.

C. Fabricator Qualifications: Fabricator must be a member of the American Institute of Steel Construction (AISC), be certified in Category I of the AISC quality Certification Program, or be a member of the Structural Steel Fabricators of New England (SSFNE). Provide certification of at least one of the above.

1.05 SUBMITTALS

A. The Architect shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have reviewed and approved all submittals prior to review by the Architect and Engineer. All review of submittals by the Contractor, Architect and Engineer shall be completed prior to fabrication and installation of any material or product.

B. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint(s).

C. Shop Drawings:

1. Submit shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams. Use of Structural Contract Documents as erection or detail drawings will not be permitted. Include details of cuts, connections, camber, holes and other pertinent data. Indicate welds by standard AWS symbols, and show size, length and type of each weld.

2. Provide setting drawings, templates and directions for installation of anchor rods and other anchorages to be installed by others.

3. Review of shop drawings will be made for size and arrangement of principal and auxiliary members, and strength of connections. Any errors in shop drawing and field dimensions shall be the responsibility of the General Contractor.

D. Connection Design: Submit design calculations prepared and stamped by a Professional Engineer registered in the State of Maine for those connections not tabulated in the AISC "Manual of Steel Construction" (ASD or LRFD).

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor rods and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Structural Steel Wide Flange Shapes: ASTM A992, Grade 50

B. Other Structural Steel Shapes, Plates and Bars: ASTM A36

C. HSS shapes (square, rectangular and round): ASTM A500, Grade B, Fy = 46 ksi

D. Steel Pipe: ASTM A53, Grade B

E. Anchor Rods: ASTM F1554, Grade 36 headed unless otherwise indicated

F. Unfinished Threaded Fastener sand threaded rods: ASTM A307, Grade A, regular low-carbon steel bolts and nuts

1. Provide hexagonal heads and nuts for all connections.

G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325

2. Direct-tension-indicator bolts conforming to ASTM F1852 or direct-tension-indicating washers conforming to ASTM F959 may be used at Contractor's option.

H. Electrodes for Welding: E70XX complying with AWS Code.

I. Structural Steel Primer Paint: Fabricator's standard zinc rich, rust inhibitive primer

J. Non Shrink Cement-Based Grout: See section 03300

K. Galvanizing: ASTM A525, Hot-dipped, G-60 coating

2.02 FABRICATION:

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.

3. Clean steel of oils, grease, etc. that would affect fireproofing adhesion.

B. Connections: Weld or bolt shop connections, as indicated.

1. Bolt field connections, except where welded connections or other connections are indicated.

2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.

C. High-Strength Bolted Connection: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts". Unless otherwise indicated, all bolted connections are to be tightened to the snug tight condition as defined by AISC.

D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

E. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SHOP PAINTING

A. General:

1. Shop prime paint structural steel, except those members or portion of members to be embedded in mortar or concrete.

2. Prime paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only. Do not paint surfaces which are to be welded.

B. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose mill scale, splatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) SP-2.

C. Painting:

1. Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions. Apply primer at a rate to provide dry film thickness given in this specification. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 - EXECUTION

3.01 ERECTION:

A. Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of anchor rods and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Anchor Rods: Furnish anchor rods and other connectors required for securing structural steel to foundations and other in-place work.

1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations. Refer to division 3 of these specifications for anchor bolt installation requirements in concrete.

D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

E. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

F. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

G. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Level and plumb individual members of structure within specified AISC tolerance. Splice members only where indicated and accepted on shop drawings.

H. Erection bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surface.

I. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

J. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

3.02 QUALITY CONTROL:

A. General:

1. The Contractor is responsible for maintaining quality control and for providing a structure that is in strict compliance with the Contract Documents.

2. Inspection and testing services provided by the Owner do not relieve the Contractor of any responsibility for compliance, nor are they intended to limit the quality control responsibilities of the Contractor.

B. The Owner shall engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports. All connections must pass these inspections prior to the installation of subsequent work which they support.

C. The testing agency may inspect structural steel at the fabrication plant before shipment; however, the Engineer reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

D. The testing agency shall conduct tests and state in each report which specific connections were examined or tested, whether the connections comply with requirements, and specifically state any deviations therefrom.

E. Welding: The testing agency shall inspect and test during fabrication of structural steel assemblies, and during erection of structural steel all welded connections in accordance with procedures outlined in AWSD1.1 as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds. Welds deemed questionable by visual inspection, all partial and full penetration welds, and any other welds indicated on the drawings shall be tested by one of the following:

   a. Liquid penetrant inspection: ASTM E165.

   b. Magnetic particle inspection: ASTM E109; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

   c. Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T".

   d. Ultrasonic Inspection: ASTM E164.

4. All welds deemed unacceptable shall be repaired and retested at the Contractor's expense.

F. Bolted Connections: The testing agency shall inspect all bolted connections in accordance with procedures outlined in the AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts".

1. Snug Tight Connections:

   a. The inspector shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.

b. If the inspector does not monitor the installation of bolts, the inspector shall visually inspect the connection to determine that all plies of connected material have been drawn together and conduct tests on a sampling connection bolts to determine if they have been tightened to the snug tight condition. The test sample shall consist of 10% of the bolts in the connection, but not less than two bolts, selected at random. If more than 105 of the tested bolts fail the initial inspection, the Engineer reserves the right to increase the number of bolts tested.

G. The Contractor shall provide access for testing agency to places where structural steel work is being fabricated, produced or erected so that required inspection and testing can be accomplished.

H. The Contractor shall correct deficiencies in structural steel work where test reports indicate noncompliance with requirements. The testing agency shall perform additional tests, at the Contractor's expense, as may be necessary to show compliance of corrected work. Costs associated with Engineer's review and disposition of faulty works shall be borne by Contractor.

END OF SECTION

SECTION 05200

STEEL JOISTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

C. Coordinate work with that of all trades affecting or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Extent of steel joists is shown on drawings, including basic layout and type of joists required.

B. Related Work specified Elsewhere

1. Section 05120 Structural Steel

2. Section 05300 Metal Decking

1.03 QUALITY ASSURANCE:

A. Codes and Standards:

1. Steel Joist Institute (SJI) Standard Specifications, Load Tables and Weight Tables for:

a. Open Web Steel Joists K-Series

2. AWS D1.1 - 00 "Structural Welding Code" - Steel

3. AWS D1.3 - 98 "Structural Welding Code" - Sheet Steel

B. Qualification for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure".

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

2. If recertification of welders is required, retesting will be the Contractor's responsibility.

1.04 SUBMITTALS:

A. The Architect shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have reviewed and approved all submittals prior to review by the Architect and Engineer. All review by the Architect, Engineer and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.

B. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI Specifications".

C. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, jointing and accessories. Include mark, number, type, location and spacing of joists and bridging.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver, store and handle steel joists as recommended in SJI "Specifications". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Steel: Comply with SJI "Specifications".

B. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.

C. Steel Prime Paint: Manufacturer's standard complying with SSPC 15-68T, Type 1 (red oxide) or Federal Specification TT-P-636 (red oxide).

2.02 FABRICATION:

A. General: Fabricate steel joists in accordance with SJI "Specification".

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.

C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI "Specifications and Load Tables".

E. Bridging:

1. Provide horizontal or diagonal type bridging for "open web" joists, complying with SJI "Specifications" and as shown on plans.

2. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

F. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI "Specifications", unless otherwise indicated.

G. Shop Painting:

1. Remove loose scale, heavy rust and other foreign materials from fabricated joists and accessories before application of shop paint.

2. Apply one shop coat of primer paint to steel joists and accessories by spray, dipping, or other method to provide a continuous dry paint film of 2.0 to 3.5 dry mils thickness.

PART 3 - EXECUTION

3.01 ERECTION:

A. General: Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.

B. Placing Joists:

1. Do not start placement of steel joists until supporting work is in place and secured.

2. Place joists on supporting work, adjust and align in accurate location and spacing before permanently fastening.

3. Provide temporary bridging, connections and anchors to ensure lateral stability during construction.

C. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

D. FASTENING:

1. Field weld joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.

2. Bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used.

a. Provide unfinished threaded fasteners for bolted connections, unless otherwise indicated.

E. Touch-up painting: Clean field welds, bolted connections, and abraded areas, and apply same type of paint as used in shop.

END OF SECTION

SECTION 05300

METAL DECKING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. Extent of metal deck is shown on the drawings.

B. Related work specified elsewhere:

1. Section 05120 Structural Steel

2. Section 05200 Steel Joists

1.03 QUALITY STANDARDS

A. Codes and Standards: Comply with provisions of the following codes and standards, except where more stringent requirements are indicated or specified:

1. AISI "Specification for the Design of Cold Formed Steel Structural Members"

2. AWS D1.1 - 00 "Structural Welding Code" - Steel

3. AWS D1.3 - 98 "Structural Welding Code" - Sheet Steel

4. SDI "Design Manual"

B. Qualification of field welding: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."

C. Inspection: Welded Deck is subject to inspection and testing. Expense of removing and replacing portions of decking for testing purposes will be borne by the Owner if welds are

found to be satisfactory. Work found to be defective will be removed and replaced at the Contractor's expense.

1.04 SUBMITTALS

A. The Architect shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have reviewed and approved all submittals prior to review by the Architect and Engineer. All review by the Architect, Engineer and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.

B. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and all accessories. Include manufacturer's certification as may be required to show compliance with these specifications.

C. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Acceptable Manufacturers: The steel deck manufacturer shall be a member of the Steel Deck Institute. Provide evidence of membership.

B. Decking Types:

1. Decking for roof construction shall be prime painted steel roof deck. Paint color shall be manufacturer's standard primer color.

C. Materials:

1. Steel for Painted Deck Units: ASTM A611, Grade C, D or E.

2. Miscellaneous Steel Shapes: ASTM A36.

3. Sheet metal Accessories: ASTM A526, commercial quality.

D. Paint: Manufacturer's baked on, rust inhibitive paint, for application to metal surfaces which have been chemically cleaned and phosphate chemical treated.

E. Flexible closure Strips: Manufacturer standard vulcanized, closed-cell, synthetic rubber.

2.02 FABRICATION:

A. General: Form deck units in lengths to span 3 or more supports, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated. For

roof deck units, provide deck configurations complying with SDI "Roof Deck Specifications," of metal thickness, depth and width as shown.

B. Roof Sump Pans: Fabricate from a single piece of 0.071" min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to the drains, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1 1/2" below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

C. Metal Closure Strips: Fabricate metal closure strips openings between decking and other construction, of not less than 0.045" min. (18 gage) sheet steel or as indicated on the drawings. Form to provide tight fitting closures at open ends of cells or flutes and sides of decking.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. General:

1. Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.

2. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before permanently fastened. Do not stretch or contact side lap interlocks.

3. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

4. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.

5. Coordinate and cooperate with the structural steel erector in locating decking bundles to prevent overloading of structural members.

6. Do not use decking units for storage or working platforms until permanently installed.

B. Fastening:

1. General: Fasten metal deck to supporting steel members as indicated on the Design Drawings. Each deck is to be fastened with a minimum of 5/8" diameter puddle welds spaced not more than 12" o.c. with a minimum of 2 welds per unit at each support. Secure deck to each supporting member in ribs where sidelaps occur. Use welding washers where recommended by the deck manufacturer.

2. Sidelaps: Mechanically fasten sidelaps of adjacent roof deck units between supports as indicated on the drawings, but not less than intervals of 36" o.s., using #12 hex head machine screws or 5/8" diameter puddle welds.

C. Welding: Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

D. Uplift loading: Install and anchor roof deck units to resist gross uplift of 40 lbs. per sq. ft. unless otherwise noted.

E. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.

F. Reinforcement at openings: Provide additional metal reinforcement and closures pieces as required for strength, continuity of decking and support of other work shown.

G. Closure Strips:

1. Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

2. Provide flexible closure strips instead of metal closure strips, at the Contractor's option, wherever their use will ensure complete closure. Install with adhesive in accordance with the manufacturer's instructions.

I. Touch-Up Painting:

1. Painted: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

a. Touch up painted surfaces with same type paint used on adjacent surfaces.

b. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

END OF SECTION

SECTION 05400

LIGHTGAGE METAL FRAMING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF THE WORK

A. Work specified within this Section includes, but is not necessarily limited to, the following:

1. Provide and install lightgage framing for exterior walls as shown on the Drawings.

2. Provide and install lateral strap bracing as required.

3. Provide and install miscellaneous fasteners, hat channels, stiffeners, expansion joints, and accessories necessary to complete the work.

1.03 QUALITY ASSURANCE

A. Materials and installation shall conform to recommendations of the following publications:

1. American Iron and Steel Institute "North American Specification for the Design of Cold-Formed Steel Structural Members" 2001.

2. AWS D1.1-00 "Structural Welding Code" - Steel.

3. AWS D1.3-98 "Structural Welding Code" - Sheet Steel.

4. ASTM C 954-00, "Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. to 0.112 in. Thickness."

5. ASTM C 955-01, "Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging, for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

6. ASTM C 1007-00 "Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories."

7. ASCE 7-02 "Minimum Design Loads for Building and Other Structures".

B. Maximum Allowable Deflections: Deflection limitations, (either horizontal or vertical), include the effect of studs only, not sheathing or facing material. Spans are measured in inches between the attachments to structural steel or concrete.

1. Supporting Masonry or Brick Veneer: 1/600 of span.

2. Supporting other Exterior Material: 1/360 of span.

C. Design wind pressures: Wind pressures shall be calculated in accordance with ASCE 7-02 for Components and Cladding.

D. Slip Track Tolerances: Where non-bearing light gage framing abuts the structure, provide a slip joint capable of accommodating the vertical movement of the structure. Slip joint gaps shall allow for 1" deflection of the structure.

1.04 SUBMITTALS

A. The Architect shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have reviewed and approved all submittals prior to review by the Architect and Engineer. All review of submittals by the Contractor, Architect and Engineer shall be completed prior to fabrication and installation of any material or product.

The Architect's and Engineer's review of shop drawings will consist of a review of the design criteria and loads used for calculations and a review of the type and position of elements and connections to the Primary Structural System. Any errors in calculations, shop drawings and verification of field dimensions shall be the responsibility of the General Contractor.

B. Product Data: Submit Manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications.

1. Steel Studs

2. Anchors and anchor bolts

3. Self-drilling screws

C. Shop Drawings:

1. General: Submit shop drawings showing the following:

a. Stud gages and spacings.

b. Sizes, gages and fastenings for all built-up members including but not limited to headers and jambs.

c. Shop Coatings

d. Type, size, quantity, locations and spacings of all anchorages and self drilling screws.

e. Details of attachment to structure and adjacent work.

f. Supplemental strapping, bracing, splices, bridging, hat channels and other accessories required for proper installation.

g. Critical installation procedures.

D. Design Calculations: Submit design calculations prepared and stamped by a Professional Engineer, registered in the State of Maine illustrating the design of steel stud wall systems and all necessary stiffeners and bracing.

PART 2 - PRODUCTS

2.01 FRAMING MEMBERS

A. Steel Studs:

1. Acceptable manufacturers:
   Dale/Incor
   Marino/Ware
   Dietrich
   Superior

2. Provide channel-shaped studs, runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, stiffeners, fasteners, and other accessories recommended by manufacturer for complete framing system.

3. Steel framing materials shall comply with ASTM A 446, A 570, or A 611, as applicable. Fabricate all components from structural quality sheet steel with the following minimum yield points:

   a. 16 ga. and heavier 50,000 psi

   b. 18 ga., 37,000 psi

   c. 20 ga., 33,000 psi.

4. Manufacture of studs, runners (track), and other framing members shall comply with ASTM C 955.

5. Framing components shall be galvanized per ASTM A 525, minimum G-60 coating.

B. Screws and other attachment devices:

1. Provide a protective coating equivalent to cadmium or zinc plating and comply with ASTM A 165 type NS.

2. Self-drilling screws shall comply with the Industrial Fastener Institute Standard for steel self-drilling and tapping screws (IFI-113).

3. Penetration through jointed materials shall not be less than three (3) exposed threads.

C. Standard Steel Shapes: Standard steel shapes, plates, etc. shall conform to material and finish specifications in Division 5.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Product Storage: Store studs, joists, track etc. on a flat plane. Material damaged (i.e. rusted, dented, bent or twisted) shall be discarded. Protect adhesives and sealants from freezing.

B. Construction Methods: Construction may be either piece-by-piece (stick-built), or by fabrication into panels either on or off site.

C. Material Fit up: All framing components shall be cut squarely or at an angle to fit squarely against abutting members. Members shall be held firmly in position until properly fastened. Prefabricated panels, if used, shall be square and braced against racking.

D. Attachment: Components shall be joined by self-drilling screws, so that connection meets or exceeds required design loads. Wire tying of framing components will not be permitted. Field welding will be permitted only where shown on the drawings or approved by the engineer.

E. Anchorage to Structure: Securely anchor studs and track to floor construction and overhead structure. Provide slip joints where non-bearing vertical studs meet floor or roof structural steel, or as indicated on the drawings.

F. Welding: Shop and field welds shall conform to applicable AWS and AISI standards, and may be fillet, plug, butt or seam type. Touch-up damage to galvanizing caused by welding with zinc-rich paint.

G. Openings: Frame openings larger than 2 ft. square with double studs. Provide suitable reinforcements (double studs, headers, jack studs, cripples, bracing, etc.) at control joint intersections, corners, and other special conditions.

H. Sheathing:

1. Screw-attach sheathing to studs with 1-inch steel drill screws, spaced 3/8 inches from edges and ends, 16 inch o.c. maximum spacing.

2. Install sheathing panels vertically or horizontally, with vertical joints staggered. Install sheathing felt or paper over sheathing panels, using cold adhesive or corrosion-resistant staples, applied horizontally with 2-inch minimum overlap.

3. If not otherwise detailed, carry sheathing paper to within 4 inches of bottom of wall. Leave bottom 4-inch strip endeared, so that base flashing specified in Division 4 masonry section can be installed underneath, with proper overlap.

4. Seal joints between sheathing board and dissimilar materials, using sealant or overlapping strips of felt or building paper.

J. Tolerances: Finished installation shall be level and plumb within a tolerance of 1/8 inch in 10 feet horizontally and vertically. Maximum deviation from plan or section dimension shall not exceed 1/8 inch. Spacing of studs shall not be more than 1/8 inch from design spacing, providing that cumulative error does not exceed requirements of finishing materials.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

1. GENERAL

1.1 REFERENCES

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specifications, apply to work in this section.

B. Rough Carpentry: Section 06100

C. Finish Carpentry: Section 06200

D. Roofing and Flashing: Section 07300

E. Painting: Section 09900

F. American Society of Testing Materials (ASTM)

G. Steel Structures Painting Council (SSPC)

H. National Association of Architectural Metal Manufacturers (NAAMM)

1.2 DESCRIPTION OF WORK

A. Extent of Metal Fabrications is shown on the drawings and includes mezzanine guardrail system and mezzanine edges. .

1.3 QUALITY ASSURANCE

A. Refer to Section 01631, Products and Substitutions, for general provisions covering product selection, substitutions, material storage, and installation.

B. Refer to Section 01400, Quality Control Services, for provisions for testing and inspection.

1.4 SUBMITTALS

A. Issue submittals in accordance with Section 01300, Submittals.

B. Submittals under this section include:

1. Shop drawings showing details of fabrication, assembly, and installation showing all connections to other work.
2. Samples of materials and finished products as may be requested by the Architect.

2. PRODUCTS

2.1 MATERIALS

1. Railing assembly shall withstand a minimum concentrated load of 200 lbs. applied in any direction at any point on top rail. Intermediate rails, balusters, and panel fillers shall be designed for uniform load of not less than 25 lbs./sq. ft. over gross area of guard. Assembly shall comply with all provisions of the applicable Building Codes.

2. Accurately miter and cope intersections, and weld all around. Form rail-to-end post connections and changes in rail direction with mitered corners or radius bends. Form elbow bends and wall returns to uniform radius, free from buckles and twists.

3. EXECUTION

3.1 FABRICATION

A. GENERAL

1. Use materials of size and thickness shown, or if not shown, of required size, grade, and thickness to produce strength and durability in finished product.

2. Provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes on exposed surfaces.

3. Form metalwork to required shapes and sizes, with true lines, curves and angles. Provide necessary rebates, lugs and brackets for assembly and installation. Use concealed fasteners wherever possible. Mill joints to tight hairline fit; cope or miter corners.

4. Welding:
   a. Weld corners and seams continuously; grind exposed welds smooth and flush.
   b. Welding Electrodes and Filler Metal: Type and alloy to match metal to be welded.

5. Anchors and Inserts: Furnish as required for installation in other work. Use copper, cadmium or galvanized anchors and inserts for exterior work.

6. Fasteners
   a. Type and alloy to match metal to be fastened; use Phillips flat-head screws for exposed fasteners if not otherwise indicated.
   b. Provide bolts, nuts, lag bolts, machine screws, wood screws, toggle bolts, masonry anchorage devices, lock washers as required for application indicated and complying with applicable Federal standards. Hot-dip galvanize fasteners for exterior applications to comply with ASTM A 153.

7. Shop Finishing

   a. Comply with NAAMM "Metal Finishes Manual".
   b. Apply shop primer to surface of metal fabrications except those embedded in concrete or galvanized; comply with SSPC-PA1.
   c. Surface Preparation: Comply with SSPC-SP6 "Commercial Blast Cleaning" for exterior work, and with SSPC-SP3 "Power Tool Cleaning" for interior work.

d. Shop Primer: Fabricator's standard, fast-curing, lead-free, "universal" primer complying with performance requirements of FS TT-P-645.
e. Stripe paint edges, corners, crevices, bolts, welds and sharp edges.
f. Protect finished metal items.

3.2 INSTALLATION

A. Perform cutting, drilling and fitting required for installation; set work accurately in location, alignment and elevation, measured form established lines and levels.

B. Provide anchorage devices and fasteners where necessary for installation to other work.

C. Repair or replace damaged items as directed by the Architect.

D. Touch-up shop paint after installation. Clean field welds, bolted connections and abraded areas, and apply same type paint as used in shop.

E. Restore damaged protective coverings after installation. Maintain until other work in same areas is completed. Remove protective coverings and clean exposed surfaces prior to final inspection.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART I - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: The drawings and the general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Work covered by this Section includes the furnishing of all labor, material, equipment and accessories, and the performing of all operations in connection with the wood framing, other carpentry as indicated on the Drawings and/or specified within this Section.

B. The work covered by this Section includes, but is not necessarily limited to, the following:

1. Furnishing and installing all rough carpentry, including miscellaneous grounds, blocking, sills, plates, shoes, shims, and furring, framing, framing anchors, and fasteners.

2. Furnishing and installing plywood wall boards and back up panels and backer boards for telephone and electrical equipment.

3. Drilling concrete and masonry and drilling and tapping of metal work as required for installation of rough carpentry.

4. Any other items of carpentry necessary to complete work properly.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. Finish Carpentry - Section 06200.

B. Flashing and Sheet Metal - Section 07500.

C. Caulking and Sealants - Section 07900.

D. Glazing - Section 08800.

E. Finish Hardware - Section 08710.

1.04 QUALITY ASSURANCE

A. Codes and Standards:

1. International Building Code - 2003

2. AITC Timber Construction Manual - 2004

3. NFPA National Design Specification For Wood Construction - 1991

PART 2 - PRODUCTS

2.01 LUMBER

A. Lumber shall conform to American Softwood Lumber Standard Voluntary Product Standard PS20-05. Lumber shall bear the grade and trademark of the Association under whose rules it is produced and a mark of mill identification.

B. Protect all lumber and keep dry, both in transit and at the job site.

C. All lumber shall be well seasoned and contain not more than 15% moisture content (marked "S-Dry").

D. All two inch nominal framing lumber shall have the following minimum base values, unless otherwise noted:

1. Extreme Fiber Stress in Bending, F_b = 750 psi.

2. Horizontal Shear, F_v = 70 psi.

3. Compression Perpendicular to Grain, $F_{cÁ}$ = 335 psi.

4. Compression Parallel to Grain, F_c = 975 psi.

5. Tension Parallel to Grain, F_t = 325 psi.

6. Modulus of Elasticity, E = 1,100,000 psi.

2.02 PRESERVATIVE TREATED LUMBER

A. The following wood members shall be Southern Yellow Pine Treated with CCA to 0.4 #/CF in accordance with AWPA C-18. Lumber embedded in or in contact with soil shall be treated to 0.6#/CF in accordance with AWPA . Wood shall be air dried or kiln-dried to reduce maximum moisture content to 15 percent. Each piece shall bear the AWPA stamp, indicating the plant number, preservative symbol, symbol of standard, date of treatment and moisture content after treatment:

1. Wood sills plates, rough bucks and frames in exterior masonry wall openings.

2. Wall plates and furring in contact with exterior masonry or concrete.

3. Nailers that are set into, or are in contact with, concrete or masonry.

4. Blocking and nailers for roof deck, sub-fascia members, roof cants and saddles.

5. Lumber in contact with the ground, embedded in or in contact with concrete or masonry and all exterior trim.

B. Cut Surfaces: Cut surfaces of preservative-treated materials shall be brush coated with at least two coats of the same preservative used in the pressure treatment.

C. Odors and Compatibility: Treated wood exposed in the final structure shall be free from objectionable odors and shall not be harmful or corrosive to adjacent materials or anchorages.

D. Plywood Backer Panels:

1. Plywood telephone and electrical backer panels required to be fire-retardant treated, shall be pressure-treated with fire-retardant 2 chemicals to achieve a UL FR-S rating, designating a surface-burning characteristics rating of 25 or less for flame-spread, fuel contributed, and smoke developed, per ASTM E 84, in compliance with AWPA C 20 (lumber) and AWPA C 27 (plywood). Each piece shall be dried to a 15-to-19 percent moisture content after treatment.

2. Acceptable products include: Koppers Dricon, Osmose Flame-Proof, and Hoover Pro-Tex.

3. Strength reduction factors used in the design of fire retardant treated wood shall be in accordance with the NFPA "National Design Specification."

PART 3 - EXECUTION

3.01 INSTALLATION

A. Wood Framing:

1. General Requirements:

a. Wood construction practices shall conform to recommendations of the NFPA "National Design Specification" and the AITC "Timber Construction Manual". Wall framing will conform to the Optimum Value Engineering framing practices detailed in Appendix A of this section.

b. All members are to be installed as shown on the drawings.

c. When individual members have built-in camber, the members shall be placed with camber up.

d. No cutting of holes or notches in trusses for pipe, conduit or other reasons will be allowed.

e. All bearing surfaces shall be horizontal and even over the entire width of support.

f. Accurately and properly fit and brace all work. Secure in proper position and orientation. Framing, studding and blocking shall be as indicated on the Design Drawings, or as required by the work.

g. Cooperate with all other trades as required.

2. Cutting and Patching: Do all cutting, patching, heading and blocking required for work of all trades. Notify Telephone Company to place jacks at rough-in stages.

3. Blocking and Supports:

a. Install 2" nominal blocking (P.T. if in contact w/ metal studs) in stud partitions for anchoring all cabinets, mirrors, towel bars, grab bars, handrail brackets and other items applied to or in the walls.

b. Set all blocking required to erect all exterior and interior woodwork, cabinets, plumbing, electrical and mechanical equipment, rough bucks and blocking for roofing work.

c. Backing Boards: Install 5/8" birch plywood backer boards for electrical and mechanical trades as required.

d. Provide pressure-treated blocking at exterior window openings in steel stud walls.

B. Fastening:

1. Fastening shall be as indicated on the Design Drawings, or in accordance with Table 2304.9.1 of the International Building Code.

2. Framing supported by concrete or masonry shall be anchored with built-in threaded bolts or lags, as indicated on the design drawings. Powder actuated fasteners shall not be substituted, except in the attachment of wall furring strips.

3. Fasteners shall be non-corrosive on exposed and exterior locations.

3.02 CLEAN-UP

A. Keep the premises and working surfaces in a neat, safe, and orderly condition at all times during execution of this portion of the work.

1. At the end of each day, or more often if necessary, remove accumulation of sawdust, cut-ends, and other debris to proper storage areas for disposal.

B. Upon completion of this portion of the work, thoroughly clean up the area.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

1. GENERAL

1.1 GENERAL PROVISIONS: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK:

A. The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

1. All finished carpentry work and millwork as required by Drawings and as specified under this section.
2. Installation of metal and other items furnished by other trades, if specifically noted in these Specifications.

2. PRODUCTS:

2.1 BOARD LUMBER shall comply with the American Lumber Standards Simplified Practice Recommendation No. 16. Grade of board lumber shall be suitable for its intended use. Finish lumber is to be painted and shall be dressed free of tool marks and other objectionable defects. All exposed lumber to be architectural quality grade: Custom.

2.2 INTERIOR TRIM: 1x Window stool .Primed and Painted. All interior trim unless noted otherwise on Drawings or in Specifications to be equal to No. 1 Pine or Poplar. Finger joints shall be allowed. See window details on drawings.

2.3 INTERIOR WALLS: ½" Birch plywood (unfinished). See Wall Type W3 sheet A4 for extent of interior GWB wall finish. Provide 1 X 6 Pine Baseboard (prime and paint) at each side of interior walls and at exterior wall perimeter of Work Room, Storage Room and Mezzanine.

2.4 INTERIOR FINISH OF EXTERIOR WALLS: 5/8" Birch plywood (unfinished) from 9" A.F.F. to 4'-9" A.F.F. See details sheet A3 for extent of GWB wall finish.

2.6 STAIR RISERS AND TREADS: 3/4" APA plywood.

2.6 STAIR RAILINGS: Brosco, #75 (1-1/2" x 1-3/4" round).

2.7 STAIR SKIRTBOARDS: Pine. Primed and painted

2.8 STAIR HANDRAIL BRACKETS: Stanley SP7081, Satin brass finish. Secure with #8 or #10 Brass screws of adequate length for wall condition, minimum 1-1/4" into blocking.

2.9 NAILS: 6d for 1/2" finish stock and 4d finish for thinner wood. Use 8d generally for nailing 3/4" finish to wood wall framing. Use finish nails @ 1'-0" horiz. & vert. for attaching plywood to wood framing at interior walls.

2.10 SCREWS, BOLTS & OTHER FASTENERS: Small head self-tapping stainless-steel screws for attaching ¾" plywood to metal studs @ 1'-0" o.c. vert and 2'-0" horiz. with penetration into framing or blocking adequate to support loads. Where not shown, consult Architect.

3. EXECUTION:

3.1 ALL ITEMS OF MILLWORK shall be carefully erected, leveled and plumbed with tight-fitting joints and square corners, carefully cut and secured. Exposed nails shall be set adequately for putty. Moulds and faces shall be free from hammer or other tool marks, clean-cut and true pattern. All work shall be thoroughly cleaned and sanded to receive the finish. Sharp corners of small members of finished woodwork shall be slightly rounded. All trim baseboards, etc. fastened to walls shall be secured to wall framing members and nails set. Care shall be taken to avoid splitting ends of trim boards.

3.2 INTERIOR TRIM: Install trim with finishing nails and glue where required to assure permanent, tight joints, according to Drawing details.

3.3 STAIRS: Skirtboards and handrails (handrails supported every 4'-0" o.c. minimum) shall be secured into solid blocking (1-1/4" minimum screw depth for handrails). Risers and treads to be glued and screwed together.

END OF SECTION

SECTION 07200

INSULATION AND VAPOR BARRIERS

1. GENERAL:

1.1 GENERAL PROVISIONS: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of the Specifications. The work covered by this section of Specifications consists of the following:

1. Installation of rigid insulation, fiberglass batts exterior walls where shown on Drawings.
2. Vapor barriers to be installed as shown.

2. PRODUCTS:

2.1 Insulation, Unfaced. In exterior walls – Fiberglass Batts, R-19.

2.2 RIGID INSULATION: 2" Blue Board, see Drawings for locations.

2.3 SPRAY FOAM INSULATION: Closed cell polyurethane with R6.8 per inch, see drawings A-3 for extent.

2.4 ROOF INSULATION: Refer to Section 07500 for rigid polyisocyanurate insulation to be installed under EPDM Roofing. See drawings for thickness.

2.5 MOISTURE PROTECTION: 6 mil. clear polyethylene film under slabs.

2.6 SHEATHING PAPER AT ALL EXTERIOR WALLS: 15# asphalt felt. NOTE: No equals will be allowed.

END OF SECTION

Preformed Metal Wall

Section 07410

Fabral
Metal Wall & Roof Systems
8 Elkins Lane
Marlton, NH 08053
Contact: Eric Edwards (774)258-0336

Part 1 - GENERAL

1.01 Section Includes

A. Furnish and install metal wall and panels and accessories in accordance with applicable drawings and this specification. Alternate products to be considered equal must be approved by the Architect via an addendum 10 days prior to bid date.

1.02 Related Sections

A. 05400 Cold-Formed Metal Framing

B. 07200 Building Insulation

C. 07900 Sealants (Joint Sealers)

1.03 Submittals

A. Shop drawings shall be prepared for architect's approval and shall show metal panel wall and/or roof system, including fastening (attachment) methods, joinery, sealing methods, accommodations of thermal movement, accessories required and erection procedures. Details shall not be drawn less than one-half (1/2) size.

B. Samples

1. 1Sample of metered corner panel material shall be furnished.

2. 1 samples of each standard or custom color shall be submitted for Architect's approval.

C. Two copies of manufacturer's literature for the metal panel wall or roof system.

D. A manufacturer's Certificate of Compliance certifying that the metal panel to be supplied meets or exceeds the requirements specified.

1.04 Quality Assurance

A. Alcoa Cladding Systems products establish the level of quality required.

B. Panel system installer shall be experienced with the installation of metal wall and roof systems on projects with similar scope and complexity, and acceptable to panel manufacturer.

C. Panel supplier shall furnish calculations confirming structural adequacy if requested.

D. Painted surfaces of metal panels shall meet all specified criteria printed in the manufacturer's literature. Where possible, field measurements shall be taken prior to metal panel and flashing fabrication.

1.05 Product Delivery, Handling and Storage

A. Protect panel finish per panel manufacturer's recommendations. Store materials in accordance with panel manufacturer's recommendations. Store any mill finish aluminum materials in accordance with the Aluminum Association and manufacturer's recommendations.

Part 2 - PRODUCTS

2.01 Panel System The panel system shall be of such profile and gauge to withstand a load requirement of 5 psf, with a deflection limitation of L/180 for steel.

2.02 All metal panels required to complete the installation shall be manufactured by Alcoa Cladding Systems and consist of:

A. Interior Liner
1/2" Corrugated

Fabricated Form
24 .0236" min. gauge G-90 galvanized steel conforming to ASTM A653-96. (Option) Interior liner panels shall receive a factory applied Colorweld® 100 (polyester) white coating on interior surface.
* Interior liner panels shall have a stucco embossed or non-embossed finish.
* Side and end laps of interior liner panels shall be field or factory caulked with a good grade sealant, tape or vinyl gasket.

B. Subgirts - Fabricated from 16 (.0575" min.) or 18 (.0466" min.) gauge galvanized steel located at each structural girt and spaced not more than 6'0" on centers, depending on exterior profile load carrying capacity. Subgirts are field attached to outstanding ribs of steel liner panels. If aluminum liner panels are used, subgirts must be screw fastened through the liner panel into the structural girt. Subgirts are not required when rigid insulation and corrugated liner panels are specified for sandwich walls; zee-shaped or

channel shaped subpurlins must be used for sandwich roofs, located over the structural purlins and spaced not more than 4'0" on centers. (Consult for use of aluminum subgirts.

C. Flashings and Closures - Metal flashings shall be fabricated from the same metal, gauge and finish as the exterior panels, unless shown otherwise on the drawings. Profile closure strips shall be placed where shown on the drawings or as recommended by manufacturer and fabricated from metal or synthetic rubber.

D. Fasteners - Interior liner panels shall be fastened with:
Four cadmium-plated carbon steel No.14 self-tapping screws per panel per girt or purlin for the corrugated liner panels.

E. Panel Laps - Side laps for all exposed fastened panels shall be: * One corrugation crest for siding and one and one-half or two corrugations for roofing for all Corrugated panels.

2.03 Accessories

A. All exposed fasteners shall be self-tapping 300 series stainless steel.

B. All self-drilling fasteners shall be protected with a corrosion resistant finish.

C. All Sealants (caulking) shall be compatible with panel materials.

PART 3 - EXECUTION

3.01 Inspection

A. Structural steel (or substructure) required for metal panel attachment shall be level and plumb.

B. Structural steel (or substructure) shall be structurally sound as determined by Architect/Engineer.

C. Structural steel (or substructure) shall be free of defects detrimental to metal panel work

D. The contractor shall examine the alignment of the structural steel (or substructure) before installing any metal panels and shall not proceed with installation if the structural steel (or substructure) is not aligned to the tolerances established by the AISC Code of Standard Practice.

3.02 Installation

A. Field erection of all metal panels and accessories to be accomplished using qualified field mechanics and safety practices.

B. Metal panels should be erected level and plumb, in proper alignment and relation to structural steel (or substructure) and established lines. Panel erection must be started correctly and held true to line.

C. Metal panel and accessory erection shall be in accordance with an approved set of shop drawings.

D. Panel and accessory attachments (anchorage) shall be structurally sound, and per engineering recommendations, if required.

E. Where aluminum materials come in contact with dissimilar materials, a bituminous paint or caulking tape shall be installed to insulate between the dissimilar materials. Factory applied protective paint coatings or G-90 galvanized steel is considered adequate insulation.

3.03 Adjusting and Cleaning

A. Replace panels that have received irreparable damage.

B. Repair panels with minor damage.

C. Clean all foreign material from panel (building) gutter system when applicable.

D. Remove strippable film coating (if used) as soon as possible after surrounding material has been installed.

END OF SECTION

SECTION 07500
ROOFING AND FLASHING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Fully adhered white EPDM sheet roofing, tapered and flat roof insulation, elastomeric flashing, metal flashings, metal edge strips and tapered edge strips.

1.02 CODES, REGULATIONS AND STANDARDS

A. Contractor Responsibility: The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State and local codes, regulations and standards pertaining to work practices, hauling, disposal, protection of workers and visitors to the site, and persons occupying areas adjacent to the site. This includes modification of procedures to comply with changes to codes, regulations and standards which occur during the work of this contract. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State and local regulations. The Contractor shall hold the Owner and Owner's Representatives harmless for failure to comply with any applicable work, hauling, disposal, safety, health or other regulations on the part of himself, his employees or his subcontractors.

1.03 QUALITY ASSURANCE

A. Roofing contractor to be approved in writing by the membrane manufacturer. Contractor shall be able to substantiate that he has been trained by the membrane manufacturer.

B. Roofing and flashing workmanship to comply with industry standards. The National Roofing Contractors Association's (NRCA) ***ROOFING AND WATERPROOFING MANUAL*** along with ***ARCHITECTURAL SHEET METAL MANUAL*** as published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) will be used to establish industry standards.

1.04 SUBMITTALS

A. Sample fifteen (15) year watertight warranty for the EPDM membrane.

B. Sample twenty (20) year material warranty for the EPDM membrane.

C. Current EPDM membrane manufacturer's application specifications.

D. Shop drawings of each flashing condition, such as eave, curb, vent, cornice, siding and fascia.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in their original, unopened containers, clearly labeled with manufacturer's name. All material to be stored in waterproof trailers or sheds, up on raised platforms and under lock and key until use. Do not use materials damaged in handling or storage. Replace damaged material with new material. Store adhesives between 60 and 80 degrees F. Should they be exposed to lower temperatures, restore to room temperature for three to five days prior to use.

1.06 WARRANTY

A. A fifteen (15) year watertight warranty and twenty (20) year material warranty shall be issued by the EPDM membrane manufacturer.

B. The roofing contractor shall furnish the Owner with his personal two (2) year watertight warranty.

PART 2 PRODUCTS

2.01 ROOF INSULATION

A. Roof insulation to be 6" thick polyisocyanurate closed-cell foam core with manufacturer's standard facing laminated to both sides, complying with FS HH-I-1972/2, Class 1.

B. Over all foam insulation, install one layer of 1/2" high density fiberboard roof insulation. The high density fiberboard roof insulation to be Structodek by Wood Fiber Industries, Celotex Corp. or approved equal.

2.02 MEMBRANE ROOF SYSTEM

A. Membrane roofing to be fully adhered white .060" EPDM sheet roofing by Carlisle, Versico or approved equal.

B. Use the roof membrane for flashing of curbs and walls per the manufacturer's standard details. Use reinforced EPDM anchor strips to avoid splice joints at walls and edges.

C. Adhesives, sealants, thinner, cleaner and accessories to be furnished by the membrane manufacturer.

D. **Six inch (6") wide seam tape will be required for all field seams.**

2.03 ROOF DRAINS (None)

A. Roof sloped to drain off rear of building.

2.04 FASTENERS

A. Use fasteners recommended by the membrane manufacturer to secure anchor bars and termination bars.

B. Fasteners used to secure roof insulation to the steel deck to be #14-10 Heavy Duty Roofing Fasteners with CR-10 coating, a minimum shank diameter of 0.170" and a thread diameter of 0.125". Pressure plates to be 3" diameter Galvalume plates. Screws and plates to be manufactured by Olympic Fasteners or approved equal. Length, size and accessories to be as required by the EPDM membrane manufacturer selected.

2.05 METAL FASCIA SYSTEM

A. Compression Lock System and Sub Fascia .050" millfinish aluminum. See Drawings

PART 3 EXECUTION

3.01 PREPARATION OF SURFACES

A. Surfaces on which the roofing system is to be applied shall be clean, smooth, dry, free of fins, rot, sharp edges, loose and foreign materials, oil and grease.

3.02 ROOF INSULATION

A. Insulation shall be tightly butted with joints not more than 1/8" in width. Stagger joints with those in layer below. Oriented strand board to be installed with a 1/16"-1/8" gap at all joints.

B. Fasten insulation to the roof deck with the appropriate screws and plates. Fastener quantity and layout must meet all requirements that may be imposed by the EPDM manufacturer to obtain their warranty.

C. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses, leaving no gaps and allowing a complete thermal envelope to be formed.

D. Do not install more insulation in a day than can be covered with membrane before end of day or before start of inclement weather.

3.03 ROOF MEMBRANE

A. Adhere the .060" EPDM membrane to the 7/16" OSB in strict accordance with the manufacturer's specifications.

B. **Six inch (6") wide seam tape will be required for all field seams.**

3.04 FLASHING - - WALLS, PARAPETS, CURBS AND VENTS

A. Use the longest pieces of material which are practical. All flashing and terminations shall be done in accordance with the applicable manufacturer's details.

B. Care must be taken to set the elastomeric flashing so it does not bridge where there is a change of direction (i.e. where a parapet meets the roof deck). This can be accomplished by creasing the membrane into the angle change prior to adhering up the wall. Excess bridging will be cause for rejection and will be re-done at the contractor's expense.

C. Install termination bars at the top of all base flashing, fastening a minimum of 6" on center.

3.05 TEMPORARY WATER CUT-OFF

A. Temporary water cut-offs are to be constructed at the end of each working day to protect the insulation, roofing, building and building interior from damage due to wind, snow and rain.

B. Temporary water cut-offs are to be detailed by the contractor and approved by the manufacturer and Owner.

3.06 CLEAN UP

A. Site clean-up shall be complete and to the satisfaction of the Owner.

B. All roofs, building, landscape and parking areas shall be cleaned of all trash, debris and dirt caused by or associated with this work.

C. Any areas stained, dirtied, discolored or otherwise damaged due to this work shall be cleaned, restored and replaced as required.

D. All debris shall be removed from the premises promptly and the construction area left clean daily.

3.07 INSPECTION AND TESTING

THE OWNER RESERVES THE RIGHT TO INSPECT AND TEST ALL CONSTRUCTION OPERATIONS AND MATERIALS.

A. Any defect or noncompliance discovered by inspection shall be reported to the contractor who shall promptly remove any defective material from the site.
B. The Owner reserves the right to inspect the work or parts of it as he chooses. His failure to inspect the work in progress shall not relieve the contractor of the responsibility for properly executing the contracted work, nor shall it impair the Owner's right to reject deficiencies he may subsequently discover.

PART 4 JOB CONDITIONS

A. Roofing to be applied in dry weather.
B. Completed roof areas shall not be trafficked. The work shall be coordinated to prevent this situation by working toward the roof edges.
C. This project is subject to compliance with all requirements of the Occupational Safety and Health Administration (OSHA). All work on this project must meet the requirements of all applicable state and local codes, laws and ordinances.

END OF SECTION

SECTION 07900

JOINT SEALERS

1. GENERAL:

1.1 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet requirements of these Specifications.

2. PRODUCTS:

2.1 CAULKING MATERIAL

A. Tremco Dymonic or as compatible with adjacent materials; one part polyurethane on exterior walls for caulking joints where siding butts trim and at all junctions as necessary to obtain complete watertight construction and caulking gap between bottom of wall and sheathing foundation wall face.

B. Tremco Latex 839 for general interior caulking.

3. EXECUTION:

3.1 ALL POTENTIAL INFILTRATION cracks & joints to be caulked. Caulking shall be done only by workmen who are thoroughly experienced in this work. Exterior caulking shall be applied around all trim boards-corners, windows, doors, vents, utilities, at top of foundation, and any other infiltration "crack".

3.2 NOTE: Apply caulking under corner boards and window, door trim as trim applied. Apply caulking under flange as window is installed.

3.3 INTERIOR CAULKING shall be applied to seal all penetrations through top plates of interior walls, (due to electrical or plumbing), and at tubs, showers, counter tops, bottom of party walls GWB, and other as shown on Drawings.

3.4 IN GENERAL, caulking to be done prior to (in conjunction with) siding installation. See Drawings for any additional applications. Joints and spaces to be caulked shall be dry and free from dust. Finished caulking "bead" shall be neat and smooth, free of gaps and sags and run continuously. Complete all caulking work and allow to stand for the manufacturer's recommended time period before painting. Prime if required before finish coat of paint is applied.

3.5 NOTE: Vents penetrating siding shall be adequately "Wood Backed" for plumpness and tight seal, and caulked prior to installation.

END OF SECTION

STEEL DOORS AND FRAMES
SECTION 08100

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

A. The CONDITIONS OF THE CONTRACT and all Sections of Division 1 are hereby made a part of this section.

1.02 DESCRIPTION OF WORK:

A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this section. Extent of steel doors and frames required is indicated on drawings and in schedules.

1. Furnish and Install:

a. Steel frames for hollow metal doors

B. Related work specified elsewhere:

1. SECTION 09900: PAINTING

1.03 QUALITY ASSURANCE; SUBMITTALS:

A. Manufacturer: Provide steel doors and frames complying with these specifications from one of the following:

1. CECO
2. Curries
3. Steelcraft

C. Supplier: A recognized hollow metal supplier, with in-house fabrication facilities, who has been furnishing doors and frames in the project's vicinity for a period of not less than five years.

D. Product Data: Submit four copies of manufacturer's technical product data for each item. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and maintenance.

E. Door Schedule: Submit final door schedule in manufacturer's standard format and as outlined below. Coordinate doors, frames and related work to ensure proper size, thickness, hand, function, and fasteners.

1. **NOTE: Contractor shall make all submittals for finish hardware, doors, frames and related items simultaneously, only after proper review and coordination by own staff beforehand.**
2. Final Door Schedule Content: Based on doors and frames in drawings, organize door schedule to indicate complete designations of every item required for each door or opening. Include the following information:
   a. Type, style, hand, size and construction of each item.
   b. Anchors and fastenings to related work.
   c. Corner construction of knocked down frames.
   d. Location of door and frame cross-referenced to indications on drawings both on floor plans and in hardware schedule.
   e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
   f. Mounting locations for hardware.
   g. Door construction and materials.
   h. Gage and finish of all materials.
3. Shop Drawings: Submit separate detail drawings, referenced to door schedule, showing size, hand, construction, fasteners, anchors and all other details pertinent to the fabrication of doors and frames for this project.

1.04 APPROVAL OF SUBSTITUTIONS:

A. Manufacturers and model numbers specified herein are to establish a standard of quality. If products other than those specifically identified herein are to be considered for this Project, they must be submitted for approval of the Architect not less than ten (10) calendar days prior to receipt of General Bids.

B. Requests for approval of substitutions shall be in writing, accompanied by catalog cuts, technical information and physical samples.

C. Approval of substitutions shall only be valid when issued by Architect to all bidders in the form of Addendum.

1.05 REFERENCES:

A. ANSI A115 Series: Standards for Steel Doors and Frames.

B. NFPA 80, NFPA 101.

C. Other applicable building and life safety codes.

D. Door and Hardware Institute: "Recommended Locations for Builder's Hardware.

E. ANSI A117.1: American National Standard Providing Accessibility and Usability for Physically Handicapped People.

F. Other applicable industry standards.

1.06 PRODUCT PACKAGING AND HANDLING:

A. Tag each item or package separately, with identification related to final door schedule.

B. All doors shall be packaged in full cartons and securely banded.

C. Doors and frames shall be received by the contractor at the jobsite and handled in a manner so as not to be damaged. They shall be stored upright in a protected area on wood runners or skids and shall be covered with vented tarpaulins or plastic.

1.07 WARRANTY: Doors and frames specified for this Project shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of Substantial Completion of Project.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Doors shall be manufactured from commercial quality cold-rolled steel sheets. Exterior doors shall be A60 hot-dipped galvanized.

B. Frames shall be manufactured from commercial quality cold-rolled steel sheets. Exterior frames shall be A60 hot-dipped galvanized.

C. Steel shall conform to ASTM standards A366 or A620 and A568 (uncoated), ASTM A526 or A642 and A525 (galvanized).

D. All doors and frames shall be chemically treated for paint adhesion and prime painted to meet performance requirements of ANSI A224.1.

2.02 DOOR FABRICATION:

A. Interior doors shall be 1-3/4" thick, manufactured from two 18 gage steel sheets. A one piece resin-impregnated honeycomb core with sanded edges shall be securely bonded to both face sheets. Doors shall have mechanically interlocked vertical edges, flush face sheets, and hairline seam edges. The top and bottom of the door shall be closed flush by 16 gage steel channels (where concealed door bottoms are specified, bottom channel shall be reversed to allow insertion of door bottom into door web). At contractor option, in lieu of honeycomb cores, doors may be provided with a rigid polystyrene foam core, continuously bonded to the face sheets, and completely filling the door.

B. Exterior doors shall be 1-3/4" thick, manufactured from two 16 gage galvanized steel sheets. The interior of the doors shall be completely filled with a foamed-in place

polyurethane core, chemically bonded to all interior surfaces. Doors shall have mechanically interlocked vertical edges, flush face sheets, and hairline seam edges. The top and bottom of the door shall be closed flush by 16 gage steel channels (where concealed door bottoms are specified, bottom channel shall be reversed to allow insertion of door bottom into door web).

C. All doors shall be handed type with factory preparation for all concealed or mortised Finish Hardware scheduled. Door closer reinforcements shall be provided for all doors whether scheduled to receive closer or not. Reinforce doors for all surface applied hardware.

D. Non-handed doors, and/or filler plates for cutouts not required for scheduled hardware preparation shall NOT be acceptable.

2.03 FRAME FABRICATION:

A. General: Frames shall be knocked down and field assembled type.

B. Standard knockdown frames shall be manufactured form 16 gage steel sheets with 2" face and 5/8" integral stop. Jamb depth to be determined by wall thickness in accordance with the drawings. Supply appropriate anchors for wall construction.

C. Drywall frames shall be manufactured form 16 gage steel sheets with 2" face and 5/8" integral stop and double back bend to grip the partition firmly without marring the wall surface. Jamb depth to be determined by wall thickness in accordance with the drawings. Provide adjustable plumb anchors to insure square and plumb installation. Supply standard floor anchors for bottom of each jamb.

D. Prepare frames for all concealed or mortised hardware and reinforce for all surface applied hardware.

E. Provide plaster guards for all hardware cutouts.

F. Prepare frames to receive pneumatic type silencers: two for each pair frame, three for each single frame.

2.04 FIRE RATED ASSEMBLIES

A. All labeled fire doors and frames shall be of a type tested in accordance with ANSI/UL-10b, ASTM E-152, NFPA-252, or UL-305, and shall provide the degree of fire protection, heat transmission, panic-loading capabilities, and/or smoke control as indicated on the label and required by the drawings.

B. Labeled doors and frames shall bear the label of Underwriters Laboratories, Warnock Hersey, or Factory Mutual and shall meet all requirements of the labeling agencies current procedures and policies.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Doors and frames shall be assembled, installed, and erected plumb and in true alignment and in conformance with manufacturer's recommendations and final approved shop drawings. Preparation for surface applied hardware shall be performed on the jobsite. Frames shall be rigid and securely anchored in place. Doors shall be installed in a manner to achieve functional operation and appearance.

B. Install hardware in compliance with manufactures requirements.

END OF SECTION

SECTION 08360
SECTIONAL DOORS
959 Series Insulated Steel Sectional Doors

PART 1 - GENERAL 1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions, and Division 1 General Requirements, apply to the work of this Section.

1.02 SUMMARY

A. The work of this Section includes upwardacting sectional doors.
B. Related Sections: Other specification sections which directly relate to the work of this Section include, but are not limited to, the following:
   1 Section 05500 Miscellaneous Metal; metal framing and supports.
   2 Section 08710 Finish Hardware; key cylinders for locks.
   3 Section 09900 Painting; field painting.
   4 Section 16100 Electrical; wiring.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each type of sectional door. Include both published data and any specific data prepared for this project.
B. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

1.04 QUALITY ASSURANCE

A. Manufacturer: Sectional doors shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of sectional doors. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years.
B. Installer: Installation of sectional doors shall be performed by the authorized representative of the manufacturer.
C. SingleSource Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
D. PreInstallation Conference: Schedule and convene a preinstallation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Provide sectional doors by Overhead Door Corporation, Dallas, Texas; Contact: Dave Pinkham (207) 415-5281.

2.02 STEEL SECTIONAL DOORS

A. Trade Reference: 595 Series Insulated Steel Doors by Overhead Door Corporation.
B. Sectional Door Assembly: Steel door assembly with rabbeted meeting rails to form weathertight joints and provide fullwidth interlocking structural rigidity. Units shall have the following characteristics:
   1. Panel Thickness: 2"
   2. Exterior Surface: Flush.
   3. Steel: Minimum 16 gauge, galvanized.
   4. Center and End Stiles: 16 gauge.
   5. Standard Springs: 10,000 cycles. (High cycles.)
C. Finish and Color: Factory applied baked on finish. Textured White
D. Windload Design: ANSI/DASMA 102 standards and as required by code.
E. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
F. Lock: Keyed lock.
G. Weatherstripping: Flexible PVC on bottom section. Jamb seals. and Header seals.
H. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
I. Manual Operation: Manual pull rope. (Chain hoist.)
J. Electric Motor Operation: Provide UL listed electric operator and disconnect, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.
   1. Entrapment Protection: Photoelectric sensors.
   2. Operator Controls: Pushbutton and key operated control stations with open, close, and stop buttons for flush and surface mounting, for both interior and exterior location.
   3. Special Operation: to be determined.(Pullrope release automatic opening device, vehicle detector operation, radio control operation, card reader control, photocell operation, door timer operation, commercial light package, explosion and dust ignition proof control wiring.)

PART 3 - EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
B. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.03 ADJUSTING AND CLEANING

A. Test sectional doors for proper operation and adjust as necessary to provide proper operation without binding or distortion.
B. Touchup damaged coatings and finishes and repair minor damage. Clean exposed surfaces using nonabrasive materials and methods recommended by manufacturer of material or product being cleaned.

SECTION 08452

INSULATED TRANSLUCENT FIBERGLASS SANDWICH PANEL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the insulated translucent sandwich panel system as shown and specified. Work includes providing and installing:

1. Flat factory prefabricated structural insulated translucent sandwich panels.
2. Aluminum installation system
3. Aluminum sill flashing

B. Related Sections:

1. Structural Steel/Concrete/Rough Carpentry: Section _____
2. Masonry: Section _____
3. Flashing & Sheet Metal: Section _____
4. Sealants: Section _____
5. Glazing: Section _____

1.2 SUBMITTALS

A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.

B. Submit shop drawings. Include elevations, details and dimensions.

C. Submit manufacturer's color charts showing the full range of colors available for factory finished aluminum.

1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
   a. Sandwich panels: 14" x 28" units
   b. Factory finished aluminum: 5" long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product test reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Test reports required are:
   a. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
   b. Burn Extent (ASTM D 635)
   c. Color Difference (ASTM D 2244)
   d. Abrasion/Erosion Resistance (ASTM D 4060)
   e. Impact Strength (UL 972)
   f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
   g. Bond Shear Strength (ASTM D 1002)

1.2 SUBMITTALS (continued)

h. Beam Bending Strength (ASTM E 72)
i. Panel Insulation U-Factor (NFRC 100)
j NFRC System U-Factor Certification
k. Solar Heat Gain Co-efficient
l. Condensation Resistance Factor (AAMA 1503)

F. Submit current documentation indicating regular, independent quality control monitoring under a nationally recognized building code review and listing program.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten (10) consecutive years and which can show evidence of those materials being satisfactorily used on at least six (6) projects of similar size, scope and location. At least three (3) of the projects shall have been in successful use for ten (10) years or longer.
2. Panel system must be listed by the International Code Council – Evaluation Service (ICC-ES) which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an approved agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with "Acceptance Criteria for Sandwich Panels" as regulated by the ICC-ES.

B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two (2) consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

C. Performance Requirements: The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 DELIVERY STORAGE AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.5 WARRANTY

A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work which fails in materials or workmanship within one (1) year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering and defects in accessories, insulated translucent sandwich panels and other components of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Kalwall Corporation, tel: (800) 258-9777 – fax: (603) 627-7905 – email: info@kalwall.com

2.2 PANEL COMPONENTS

A. Face Sheets

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
   a. Thermoplastic polycarbonate, acrylic faces are not acceptable.
   b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
   c. Face sheets shall not delaminate when exposed to 200°F for 30 minutes per IBC or 300°F for 25 minutes.
2. Interior face sheets:
   a. Flamespread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flamespread rating no greater than 20 and smoke developed no greater than 200 when tested in accordance with UL 723/ASTM E 84.
   b. Burn extent by ASTM D 635 shall be no greater than 1".
3. Exterior face sheets:
   a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3.0 (5.0) CIE Units DELTA E by ASTM D 2244 after 5 (3) years outdoor South Florida weathering at 5 degrees facing south, determined by the average of at least three (3) white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
   b. Erosion Resistance: Exterior face shall have a permanent glass erosion barrier embedded beneath the surface to provide long-term resistance to reinforcing fiber exposure. Exterior face surface loss shall not exceed .7 mils and 40 mgs when tested in accordance with ASTM D 4060 employing CS17 abrasive wheels at a head load of 500 grams for 1000 cycles.
   c. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact equal to 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
4. Appearance:
   a. Exterior face sheets: Smooth, 0.070" thick and Crystal in color.
   b. Interior face sheets: Smooth, 0.045" thick and White in color.
   c. Face sheets shall not vary more than +/- 10% in thickness and be uniform in color.

B. Grid Core

1. Thermally broken I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I- beam shall be no less than 7/16". The I-beam grid shall be machined to tolerances of not greater than +/- .002".
2. I-beam Thermal break: Minimum 1", thermoset. Urethane poured and de-bridged is not acceptable.

C. Laminate Adhesive

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives."
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two (2) exposures to six (6) cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to five (5) separate conditions:
   a. 50% Relative Humidity at 68° F: 540 PSI
   b. 182° F: 100 PSI
   c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
   d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking thermally broken (aluminum) I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat sharp edge.

1. Thickness: 2-3/4"
2. Light transmission: .20
3. Solar heat gain coefficient: .28
4. Overall panel U-factor by NFRC certified laboratory: 2-3/4: thermally broken I-beam 0.23.
5. Complete insulated panel system shall have NFRC certified U-factor of 0.28.
6. Grid pattern: Nominal 12" x 24" shoji.

B. Panels shall deflect no more than 1.9" at 30 psf in 10'-0" span without a supporting frame by ASTM E-72.

C. Panels shall show evidence of withstanding 1200°F fire for minimum one (1) hour without collapse or flame penetration.

D. Thermally broken panels:

1. Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.
2. Minimum CRF of 90 at center of grid cell

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system: Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

1. Thermally broken perimeter system shall have a urethane bridge.

B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

D. Finish: Exposed aluminum to be manufacturer's factory applied finish that meets the performance requirements of AAMA 2604.

1. Color to be selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, supporting structure and installation conditions. Do not proceed with panel erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3. Where aluminum will contact pressure-treated wood; separate dissimilar materials by methods recommended by manufacturer.

3.3 INSTALLATION

A. Install the panel system in accordance with the manufacturer's installation recommendations and approved shop drawings.

1. Anchor component parts securely in place by permanent mechanical attachment system.
2. Accommodate thermal and mechanical movements.
3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.4 CLEANING

A. Clean the panel system inside and outside, immediately after installation, according to manufacturer's written recommendations.

END OF SECTION 08 45 23

SECTION 08520
ALUMINUM WINDOWS

Part 1 – GENERAL

1.1 REFERENCES

A. The general conditions, supplementary conditions and applicable portions of division 1 of the specifications are a part of this section, which shall consist of all labor, equipment and materials necessary to complete all quality control work indicated on the drawings, herein specified or both.

B. The following minimum provisions standards and tolerances shall apply to all work under this contract. Where stricter standards and tolerances are specified, they shall take precedence over these standards and tolerances. Owner reserves the right to define intent of specifications.

C. Manufacturer will have been producing the model window used for this project and under current ownership for at least five years.

D. It will be the bidder responsibility to verify all quantities and type of windows.

1.2 SCOPE

A. The work of this section consists of supply and installation of aluminum windows and related items, as indicated on the drawings and specified herein. Such work includes but is not limited to the following:

1. Awning windows.
2. Screens - Typical at all windows.
3. Field glazing
4. Sealant within window system
5. Hardware, accessories and appurtenances.

1.3 SUBMITTALS

A. Shop drawings showing installation conditions throughout and catalogue cuts shall be submitted for approval. Ship drawings shall include elevations of all windows (minimum scale ½ inch equals 1 foot), and full size details of every conditions indicating thickness of aluminum, fastenings, the size and spacing of anchor, method of glazing, details of operations hardware, method and materials for weatherstripping, and method of attaching screens.

B. Submit color chips for selection by architect.

C. One complete full-size sample window of type proposed for use shall be submitted for approval. Sample shall be complete with hardware, glazing, weatherstripping, anchors, screen and other accessories, and shall be furnished a specified by the architect.

1.4 **PRODUCT HANDLING**

A. All materials shall be delivered, stored, handled, and installed so as not to be damaged or deformed.

1.5 **GUARANTEES AND TEST DATA**

A. Provide manufacturer's guarantees and independent test results indication compliance wit AAMA specifications and performance criteria. Manufacturer's standard guarantee shall be for a minimum of one year.

B. Insulated glass units shall be provided with a five-year warranty unless otherwise approved by the architect.

1.6 **COORDINATION**

A. Coordinate work with that of all other trades affecting or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the contract.

PART 2 – PRODUCTS

2.1 **MANUFACTURER**

A. Aluminum Storefront System, 451T with glass vent awning windows by Kawneer. All glass shall be1" insulated, low-E argon filled.

PART 3 – EXECUTION

3.1 **INSTALLATION**

A. Work Included: Provide labor, materials and equipment necessary to complete the work of the Replacement Window Contact, and with out limiting the generality thereof include:

1. Windows to be installed, plumb and square, and properly shimmed.
2. Windows to be installed in strict accordance with approved shop drawings.

3.2 **CLEANING**

A. Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance and to prevent fouling of weathering surfaces and weatherstripping, and to prevent interference with the operation of hardware.

END OF SECTION

SECTION 09250

GYPSUM BOARD

1. GENERAL

1.1 REFERENCES:

A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

B. NOTE: Selection of Finish colors and patterns in overall color scheme to be made by Architect. Contractor to notify Architect prior to commencing Gypsum Board work, to allow adequate time for color selections, Owner's approval and material ordering lead time.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

A. Drywall installation as required by Drawings and noted in these Specifications.
B. Taping and finishing all walls and ceilings, except where other kind of finish is specified.

2. PRODUCTS

2.1 NOTE: GWB types are shown as U.S.G. brand names "Sheetrock", "Firecode", "Firecode C", "M.R. Board" and "Shaftwall". Substitutions must have equal U.L. and STC ratings. See Drawings for Specific assembly.

2.2 EXTERIOR & INTERIOR WALLS: See rated & non rated assemblies and wall types on the drawings. Interior Panels 5/8 inch thickness installed per manufactures recommendations with screw application.

3. EXECUTION

3.1 THE DRYWALL CONTRACTOR shall inspect all areas affected by his work to ascertain that all work is complete and has been accepted. Defective installations shall be corrected before finished surfaces are painted or sprayed with acoustical material.

3.2 DRYWALL INSTALLATION. Install drywall as shown on plans, noted in the UL Specifications, and as set forth in U.S.G. Handbook. Installation of non-UL rated drywall assemblies on steel studs shall comply with the following minimum requirements:

A. Spacing for attachment members shall not exceed 24" o.c. for walls and 16" o.c. for ceilings. All drywall shall be screwed with approved drywall screws made specifically for the purpose and of length adequate for wall types. On walls, screws shall not be placed more than 16" apart for 16" o.c. framing or 12" apart for 24" o.c. framing. Screw all edges 12" o.c. maximum. See Structural Drawings S3.2 and S3.3 for shear walls sheathing attachment.

B. The drywall contractor may use a few drywall nails to temporarily secure a sheet of drywall before securing with drywall screws. In this event, the drywall nails must be countersunk prior to taping. Corner beads shall be used on all corners and casing beads used whenever Gypsum Board abuts dissimilar material. Caulking to also be applied at these junctions. At all party and unit/corridor walls, Gypsum Board to be set in caulking (for sound).

C. Drywall shall be laid vertically or horizontally. No tapered joints at floor base. See Structural Drawings for shear walls.

D. Note: Gypsum board to be installed behind all tubs and shower units which results in double gypsum board on some bathroom walls. See bathroom drawing sheet.

3.3 ON SURFACES TO BE PAINTED: tape and cement all joints and screw locations with three coats of compound, then sand to smooth finish, acceptable to paint.

3.4 DURING WORK PROGRESS, remove all excess materials and debris resulting from operations, which may disrupt the work of other trades, and after completion leave the premises broom clean.

END OF SECTION

SECTION 09900

PAINTING

1. GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

1. Painting all interior and exterior surfaces as called for Drawings or in these Specifications.

2. Painting interior walls, door trim.

1.2 SUBMITTALS

A. Submit as follows:

1. Manufacturer's data, application instructions, and color chips on all specified products.

2. Provide as maintenance material, a minimum of one gallon of each type and color of paint used on job, in labeled and well-sealed containers, for future touch-up. Also provide typed list of each type and color of paint used on job, including name of distributor from whom paint may be obtained.

2. PRODUCTS

2.1 General

A. Paint: Acceptable manufacturers, unless specific manufacturer is noted: California Products Corporation, Benjamin Moors, Pratt & Lambert, Sherwin-Williams, Tnemec.

B. All products used shall be manufacturer's top quality product for each type of finish specified.

2.2 MATERIALS

A. Where primer is called for, use primer recommended by manufacturer for particular combination of substrate and finish coat. Where painting over shop-applied primers,

verify that finish paint proposed for field application is compatible with shop primers actually used.

B. Exterior Doors: Steel-Clad: Benjamin Moore Ironclad Retardo

C. All Gypsum Walls to be painted: Primer - Benjamin Moore Vinyl Latex Primer Sealer.

D. Finish Gypsum Walls - Benjamin Moore Moorcraft Latex Eggshell.

3. EXECUTION

3.1 JOB CONDITIONS

A. Store materials in sealed containers. Provide a fire extinguisher in storage room. Remove flammable rags and waste from building at end of day.

B. Do not perform exterior work in rain or when precipitation is forecast imminently; or in hot, dry, or windy weather which would cause finish to cure too rapidly, or be marred by windstorm dust; or at temperatures below 40 degrees F.

C. Maintain temperature at interior locations between 50 and 75 degrees F, maximum 80 percent relative humidity, while paint is being applied. Provide adequate ventilation, by mechanical means if necessary, for drying of paint and prevention of condensation and mildew. Do not apply finish in areas in which dust is being generated.

D. Protect finished surfaces and equipment not being painted with masking tape, canvas dropcloths, polyethylene sheets, etc. Items such as lighting switch covers, fixture canopies, and door handles shall be temporarily removed, carefully stored, and replaced after painting, or carefully covered during painting operations.

3.2 PREPARATION

A. Preparation of newly-installed materials to receive finish painting is specified under those Sections installing materials. This includes, but is not necessarily limited to: touch-up of damaged shop coats; taping, sealing and sanding of drywall; patching masonry; sanding finish wood; and cleaning off grease, oil, dirt, mildew, factory-applied protective coatings, and other foreign materials.

B. Before beginning work under this Section, verify that preparation of substrates under other Sections has been done as specified. Thoroughly remove water, dirt, and dust with clean cloths, brooms, or brushes. Allow masonry motar joints to cure as long as possible before beginning paint application, 7 days minimum, 28 days preferably.

3.3 APPLICATION

A. Apply all materials in accordance with the manufacturer's recommendations.

B. Apply materials with suitable brushes, rollers, and spraying equipment. Keep application equipment clean, dry, and free from contaminants. Thoroughly stir materials before applying, and periodically during application.

C. Rate and method of application and drying time between coats shall be strictly in accordance with manufacturer's recommendations.

D. Prepare field test panels in accordance with paragraph 1.4-B.3 of this Section for each type and color of finish specified. Request review of first completed room, color scheme, special items, etc., which shall serve as project standard after approval.

E. Touch-up shop applied primers before field painting.

F. Do not apply first coat until surface is dry to touch. Moisture content of surface shall be within limitations recommended by paint manufacturer.

G. Leave all parts of moldings and ornaments clean and true to detail, without excessive paint in corners and depressions. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping. Paint surfaces visible through grilles one coat flat black.

H. Finish coats shall be smooth, free of brush marks, streaks, laps or pile-up of paint, and skipped or missed areas. Refinish whole wall if unacceptable finish is extensive or of such a nature that it cannot be repaired by normal touch-up.

I. After completion of painting work, remove spilled or spattered paint. Touch-up and repair finishes damaged in any way by work under this Section. Protect finished surfaces.

3.4 EXTERIOR

A. Exterior and interior - Steel-Clad door: Two (2) coats exterior enamel over factory primer. Doors shall be laid flat if sprayed. Doors may be rolled or brushed in place, however with no visible brush marks, drips or imperfections.

3.5 INTERIOR

A. Interior Painting: Paint shall be applied in the following number of coats, primer and finish. Tint all primers to match finish color.

1. Drywall: All interior walls to receive paint: one (1) coat latex base primer-sealer, two (2) finish coats latex eggshell.

END OF SECTION

SECTION 10800

TOILET AND BATH ACCESSORIES

1. GENERAL

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the items listed as indicated on Drawings.

2. PRODUCTS:

2.1 TOILET PAPER HOLDERS: shall be Taymor. Toilet Paper 01-9409.

2.2 SOAP DISH: shall be integral with sink.

2.3 DOUBLE HOOK FOR BATHROOM DOOR: shall be equal to Taymor 01-9402.

2.4 GRAB BARS: Stainless steel, 1 ¼ " diameter, concealed mounting with snap flange, satin finish; Bobrick B-5806 Series, lengths as shown on drawings.

2.5 MIRROR: 18" w x 30" h with Stainless Steel frame. Provide accessories for mounting and mount to meet ADA

2.6 **NOTE**: Blocking for all accessories and grab bars must be provided. See Section 06100 - Rough Carpentry.

2.7 **NOTE**: The contractor shall submit shop drawings on every item specified in this section. There shall be no substitutions without a written explanation from the subcontractor that the specified item is equal with the item specified by the architect. All substitutions shall be approved by the Architect and the Owner.

2.7 MATERIALS - TOILET ACCESSORIES

A. All metal items to be Stainless Steel with Satin Finish.

B. Exposed surfaces to be protected with a factory applied PVC film to be left in place until final clean-up.

C. Mirror to be 1/4" polished plate glass with 10-year guarantee against silver spoilage.

D. Stainless steel tubing: 18 ga., Type 304, seamless welded.

E. Fasteners, screws, and bolts: Hot dip galvanized. Expansion shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component substrate.

F. Adhesive: Epoxy type contact cement.

3. EXECUTION:

3.1 All work shall be done by experienced craftsmen in first-class manner and high-grade finish.

3.2 All installations shall be in accordance with layout shown on plans and in strict conformity with the manufacturer's recommendations and secured into blocking or other framing with screws of adequate length and size to properly support accessories. Grab bars must be able to sustain a 300# direct load pulling down or out on it.

END OF SECTION

DIVISION 15 – PLUMBING & HEATING (DESIGN BUILD)

1. The work to be performed under this Section of the Specifications shall include all labor, material, equipment, transportation and incidentals necessary for the proper execution and completion of all Plumbing and Heating work with the intent that the installation shall be complete in every respect and ready for use.

DIVISION 16 – ELECTRICAL (DESIGN BUILD)

16400 - SERVICE AND DISTRIBUTION

1. The work to be performed under this Section of the Specifications shall include all labor, material, equipment, transportation and incidentals necessary for the proper execution and completion of all Electrical Work with the intent that the installation shall be complete in every respect and ready for use.