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Request for Qualifications

SPECIFICATIONS

S P E C

FOR

ASHFORD PARK SPLASH PAD

PROJECT MANUAL:

CITY OF BROOKHAVEN, GEORGIA

**PROJECT #15089.00
BID # 20-108**

PREPARED BY:

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PROJECT MANUAL

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Request for Qualifications, No 20-108 Ashford Park Splash Pad
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SECTION 01010

SUPPLEMENTAL CONDITIONS

- 1.1 General: These Conditions are a Supplemental Conditions to the General Conditions of the Contract for Construction
- 1.2 Drawings and Specifications: See Cover Sheet of Drawings for list of Contract Drawings.

See Table of Contents of Project Specifications for list of Technical Specification Sections. Pay particular attention to Division 1 of the Specifications as they apply to the General Conditions.
- 1.3 Temporary Equipment: See Section 01600 Materials and Equipment for more detail.
- 1.4 Lifting Devices and Hoisting Facilities: The Contractor shall provide, operate and maintain construction cranes for hoisting materials, as well as other type hoists, as may be required for execution of the work of all trades as identified in the contract documents and specifications. Such apparatus, equipment and construction shall meet the requirements of labor laws and other applicable state and federal laws.
- 1.5 Temporary Support Facilities: See Section 01500 Construction Facilities.
- 1.6 Layout of Site Work: See Section 01050 Field Engineering for general descriptions.

Specific Requirements:

Before commencing any work, the Contractor shall verify all grades, lines, levels and dimensions as indicated on the Drawings. He shall report any errors or inconsistencies to the Landscape Architect before commencing work.

The Contractor shall stake the entire project, both as to location of all construction items as well as finish grades. This stakeout may be accurate or rough, depending on the Contractor's preference. This stakeout shall be made early in the construction process and preserved for reference during construction.

The purpose of the staking, with inspection and adjustment by the Landscape Architect, is to adapt the design to the site rather than allow the design to be forced upon the site. Staking is subject to various degrees of adaptation which can only be determined by the Landscape Architect. This variation is an aesthetic decision, the amount of adjustment most often determined by the existing trees, terrain, soil conditions, utilities, sub-surface water and by other intangibles which are impractical to survey in absolute accuracy.

The Contractor shall notify the Landscape Architect at least five working days before inspection of the stakeout must be made. During the inspection the Landscape Architect will adjust the stakeout as necessary to fit the trees, topography, and all other objects and

conditions on the site. At this time the Landscape Architect will clearly mark all trees and other vegetation to be removed. This staking-inspection process must take place prior to any tree removal, grading, construction, or any other work on the site.

During the inspection, the Contractor shall be at the site along with the person who will superintend the work under this contract.

The staking inspection process shall be repeated for any work not staked and approved or adjusted during the first site visit. No work shall ever be done without the stakeout first being adjusted and approved by the Landscape Architect. All alignment, dimensions and elevation of any grading, excavation, construction, and planting is subject to adjustment to accommodate existing conditions and to save trees and other vegetation.

Any work progress delays caused by inadequate, incomplete or improper staking shall not merit an extension of the contract or delay charges by the contractor.

The Landscape Architect shall have 2 days to respond to any request to come to the site and adjust a stakeout.

The Landscape Architect shall have a minimum of three (3) days to resolve any problems created by unknown conditions discovered during the stakeout or construction.

Contractor shall be responsible to adequately schedule his work to allow constant work to continue. When unknown conditions inhibit the flow of work the contractor shall continue unhindered portions elsewhere on the project and notify the Landscape Architect immediately.

1.7 Unknown Conditions: Subsurface Conditions: Should the Contractor encounter, during the progress of the work, subsurface latent physical conditions at the site, materially differing from those shown on the drawings or specified for unknown conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the drawings and Specifications, the attention of the Landscape Architect shall be called immediately to such conditions before they are disturbed. The Landscape Architect shall thereupon promptly investigate the condition, and if he finds that they do so materially differ, the contract price shall, with the written approval of the Owner, be increased or decreased in accordance with such conditions.

1.8 Geo-Technical Assistance. The Contractor shall coordinate the involvement and schedule of the Geotechnical Consultant for the project.

The Owner will retain at his own expense the services of a qualified geo-technical engineer to advise on all construction techniques involved in the work, including the design, checking and approval of temporary bracing, shoring, underpinning and other items pertinent to the work, and on construction methods for solution of problems which may be encountered. The geo-technical engineer shall be primarily concerned with construction methods necessary to prevent settlement or failure of walkways, foundations and footings, and/or damage to such

surrounding structures as sidewalks, roads, utilities, and embankments on the Owner's property.

- 1.9 Existing Utilities Shown. Existing utility lines shown on the drawings, such as, cables, ducts, conduits, and piping shall, if damaged (unless they are to be abandoned) be immediately repaired, protected, and maintained in use until relocation of same has been completed or shall be cut and capped where directed or shall be prepared for service connections when so required.

Special Note: There is a sanitary sewer line show on the survey of the site. The Contractor shall verify if this line actually exists by uncovering it and surveying it in the field.

- 1.10 Utilities Not Shown. Contractor shall be responsible for securing the services of a utility locator to determine any unknown utilities that may be on the site. Any utilities encountered that are not shown on the drawings and are to remain as active utilities, if inadvertently damaged by the Contractor, shall be repaired by him. An adjustment in the contract price will be made at rates determined by the Contractor and approved by the Landscape Architect. If an extra expense is incurred in protecting and maintaining any utility line not shown on the drawings, an adjustment in the price will be made. Contractor shall not be compensated if the utility was improperly located or omitted by locator if it is deemed that the utility could have been detected.

- 1.11 Inclusion of Accessories: Unless specifically mentioned otherwise, all anchors, bolts, screws, fittings, fillers, hardware accessories, trim and other parts required for, or in connection with, an item of material to make a complete, serviceable, finished and first quality installation shall be furnished and installed as part of the item whether or not shown on the drawings or specified.

- 1.12 Protection: All materials shall be shipped, stored and handled in a manner that will afford protection and insure their being in first class condition at the time they are incorporated in the work.

After installation all materials shall be properly protected against damage to insure their being in first class condition when the project as a whole is completed and accepted by the Owner.

- 1.13 Installation: All items shall be installed in a workmanlike manner in accordance with the best recognized practice of the trade. Manufactured items shall be installed in strict accordance with the manufacturer's printed directions, specifications and/or recommendations. All working parts shall be properly adjusted after installation and left in perfect working order. Unless otherwise indicated, items exposed to weather or subject to flooding shall be installed so as to shed water. Items shall in all cases be installed plumb and true and/or in proper relation to surrounding materials.

Samples: Contractor shall be responsible for preparing samples as required in the technical specifications and to obtain approvals prior to construction of the item.

- 1.14 Reference to Standard Specifications: When standard specifications such as The American Society for Testing and Materials, Federal Specifications, Department of Commerce (Commercial Standards), American Institute of Steel Construction, or other well known public or trade associates are cited as a standard to govern materials, and/or workmanship, such specifications or portions thereof as referred to shall be equally as binding and have the full force and effect as though it were copied into these specifications. Such standard as are mentioned are generally recognized by and available to the trades concerned.
- 1.15 Reference to Manufacture's Publications: Unless otherwise specifically stated, all manufacturer's catalogs, specifications, instructions or other information or literature that are referred to in the specifications shall be considered as the latest edition and/or revision of such publication that is in effect on the date of the Invitation or Advertisement for Bids.
- 1.16 Document Signatures: See General Conditions.
- 1.17. Materials Furnished by Others: Whenever the Contractor or any Subcontractor shall receive items from another contractor or from the Owner for storage, erection or installation, the Contractor or Subcontractor receiving such items shall give receipts for items delivered, and any necessary replacing of item or items received. No adjustment will be made to contract price for increased insurance premiums, except for materials and/or equipment furnished by the Owner and not listed as such in other Contract Documents.
- 1.18. Substitute Materials and Equipment: See Section 01631 Substitutions for more detail.
- Approval, by the Landscape Architect, of substitute materials and equipment shall not relieve the Contractor from his responsibility to supply and install any additional materials, equipment, or labor required to make the substitution properly function within the intent of the Contract Documents, as issued for Bid, whether or not recognized by the Landscape Architect or Contractor. The Contractor shall supply and install such required additional cost to the Owner.
- 1.19. Protection of Existing Structures: The Contractor shall be liable for all damage to existing structures that occurs as a result of his negligence to provide proper and adequate protective measures, including but not limited to buildings, walls, fences, paving, conduits, furniture, pipe, wiring, drains, underground utilities and equipment.
- The Contractor shall be liable for all damage to trees, shrubs, turf and other vegetation. See Tree Penalty Clause in Section 02112, page 2.
- 1.20. Security Considerations: Construction shall not interfere with reasonable access to the adjacent park facilities.
- Contractor shall not interfere with reasonable use of the park and site facilities.
- 1.21. Working Hours: See General Conditions.

- 1.22. Order of Construction: Contractor shall submit a progress schedule at the pre-construction conference outlining the order of his construction process - Priorities within this schedule shall be coordinated with the Owner. See Section 01040 Coordination for more detail.

Sequence of Work. Work is to be processed in an orderly manner. The organization of the Specifications or contract drawings does not necessarily indicate the order of sequence in which work is to be performed. If prior construction or other contractors on the project site shall interfere with this work, the Landscape Architect shall declare the time and date when this project contract can be started on the site.

Contractor shall not be granted extensions or delay charges when it is deemed clearly that Contractor could have continued work on other components of the project or locations on the site without suffering a delay in the process.

- 1.23. Record of Construction Changes and As-Built Documents: On completion of the work, the Contractor shall mark the appropriate contract drawings in indelible ink showing the final locations of all underground installations including, but not limited to, power lines, irrigation lines, sewage lines, drainage lines, septic tanks, fuel tanks, etc. They also shall record the proper location of all installations above ground where they have been changed on the site from designated locations on the plans.

Contractor shall provide a flash drive containing the as-built plans to the Owner upon completion of the project.

- 1.24. Guarantee: See Section 017040 Warranties for more detail descriptions. All landscape materials shall be guaranteed by the Contractor in accordance with Section 02900.

- 1.25. Application for Payment: See Section 01027 Application of Payment for detail instructions.

- 1.26. Certificates for Payment: Upon receipt of Application for Payment, Owner's Representative with the Landscape Architect shall make an inspection and issue to the Contractor a Certificate for Payment or state in writing to the Contractor a Certificate for Payment or state in writing to the Contractor the corrections which must be made according to the plans and Specifications before he shall be paid. These corrections shall be made at once, and the Owner's representative shall issue a Certificate for Payment on their acceptance. The Owner shall pay the full amount of the Certificate within fifteen (15) days after receiving the Certificate for Payment from the Owner's Representative.

- 1.27. Quantities and Measurements:
The following principles shall govern the settlement of disputes which may arise over discrepancies in the contract documents: (a) as between figures given on drawings and the scaled measurements, the scaled measurements shall govern; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings Form of Agreement and the Specifications, requirements of the Form of Agreement shall govern.

- 1.28. Maintenance: The Contractor shall be responsible for all maintenance, as required, until completion and acceptance of the work. Various items of maintenance are indicated in applicable sections of the Technical Specifications, to which the Contractor is referred. The Owner shall become responsible for maintenance upon completion and final acceptance of the work.

END OF SUPPLEMENTAL CONDITIONS

SECTION 01026

SCHEDULE OF VALUES

PART 1 GENERAL

1 SCOPE

The work under this Section includes preparation and submittal of a Schedule of Values.

The Construction Items Bid Schedule may substitute for the Schedule of Values when the project is bid by using a Construction Items Bid Schedule. In that case, Construction Items Bid Schedule can be substituted for Schedule of Values in this Section of the Specifications.

See Section 00-350 Construction Items Bid Schedule
See Section 01027 Application for Payment for more detail.

2 GENERAL

A. Timing of Submittal: Submit to the Landscape Architect, a Schedule of Values allocated to the various portions of the work, within 10 days after Notice to Proceed.

The first progress payment will not be made until the next pay cycle following the Landscape Architect's approval of the Contractor's Schedule of Values.

B. Supporting Data: Upon request of the Engineer, support the values with data which will substantiate their correctness.

C. Use of Schedule: The schedule of values, unless objected to by the Landscape Architect, shall be used only as a basis of the Contractor's Application for Payment.

D. Construction Items Bid Schedule may serve as the Schedule of Values.

E. Construction Items Bid Schedule form is available through the Consultant in Excel electronic format upon request.

3 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Form and Identification

1. Prepare schedule of values on 8-1/2 x 11-inch paper in landscape format.
2. Contractor's standard forms and automated printout may be used.
3. Identify schedule with:
 - a. Title of project and location

- b. Landscape Architect
- c. Name and address of Contractor
- d. Contract designation
- c. Date of submission

B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. Breakdown shall be by number and construction items, for ease of field verification of quantities completed in each line item.

See Section 01027 Applications for Payment for more detail.

C. Format

1. Follow the Construction Items Bid Schedule of the Contract Documents as the format for listing the component items quantities and costs.
2. Identify each item with the number and name of the respective item of the Schedule.

D. For each major line item, list sub-values of major products or operations under the items as shown on the Construction Items Bid Schedule and Bid Form.

E. For the Various Portions of the Work:

1. Each construction item shall exclude any proportional amount of the Contractor's overhead and profit.
2. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials delivered and stored, with taxes paid.
 - b. The total installed value, less Contractor's overhead and profit and less item a. above.
 - c. Copies of the delivery manifest and supplier invoice.

A. Mobilization is identified as a separate line item so the contractor can bill ahead to secure operational capital to begin the project.

B. General Conditions and Overhead shall be shown as a separate line item at the bottom and not calculated into the unit items costs.

C. Additional Items: At the end of the Construction Items Bid Schedule the contractor may add additional line items that he feels were not listed or should be further broken down.

D. In the case where the Construction Items Bid Schedule is used to bid the project, the sum of all the values listed on the Construction Items Bid Schedule plus all

addenda shall equal the Bid Total or Contract Amount as shown on the Bid Form.

END OF SECTION 01026

SECTION 01027

APPLICATIONS FOR PAYMENT

1.1 GENERAL

- A. Coordinate the Construction Items Bid Schedule and Applications for Payment with the Contractor's Schedule of Payment, Submittal Schedule, and List of Subcontracts.
- B. Coordinate preparation of the Construction Items Bid Schedule with preparation of the Contractor's Project Construction Schedule of Work.
 1. Correlate line items in the Construction Items Bid Schedule with other required administrative schedules and forms, including:
 - a. Contractor's Project Construction Schedule.
 - b. Application for Payment forms, including Continuation Sheets.
 - c. List of subcontractors and consultants.
 - d. List of products.
 - e. List of principal suppliers and fabricators.
 - f. Schedule of submittals.
 - g. Schedule of materials stored
 2. Submit the Project Construction Timeline Schedule at the earliest possible date but no later than 7 days before the date scheduled for submittal of the first Application for Payment.
- C. Format and Content: Use the Construction Items Bid Schedule as the format for establishing the Schedule of Payment. Provide at least one-line item for each Unit Item on the Construction Items Bid Schedule as a payment item.
 1. Include the following Project Identification *Ashford Park Splash Pad - City of Brookhaven* –
 - a. Project name and location – *Ashford Park Splash Pad*
 - b. Name of Consultant – *CPL Inc.*
 - c. Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange the Schedule of Payment items in tabular form with separate columns to indicate the following for each item listed:
 - a. Item number.
 - b. Name of the item.
 - c. Total quantity of the item.

- d. Unit price.
 - e. Total price.
 - f. Current work completed by dollar value.
 - g. Previous dollar amount completed.
 - h. Percentage of Item Sum completed to nearest one-hundredth percent.
3. Provide separate backup for each part of the Work where the Application for Payment includes materials or equipment, purchased or fabricated and materials stored, but not yet installed.
 4. Change Orders or Construction Change Directives that change the Contract Sum must be pre-approved before commencing the work or applying for payment. Pre-approved change orders may be attached to the application for payment as a new items line at the bottom of the Payment Schedule after completion and acceptance of the change order work.
 5. Maintain a chronological and on-going Ledger List of minor field deletions or additions to the contract to be attached to each payment request.
 6. Consultant can provide a sample Pay Request if requested by contractor.
- D. Applications for Payment shall be consistent with previous applications and payments as certified by the Owner's Representative and paid to date by the Owner.
- E. Payment-Application Times: Payment dates are indicated in the Agreement. The period covered by each application is the period indicated in the Agreement.
- F. Payment-Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment, or the form supplied by the Owner.
- G. Application Preparation: Complete every entry, including notarization and execution by a person authorized to sign on behalf of the Contractor. The Landscape Architect will return incomplete applications without action.
1. Entries shall match data on the Schedule of Payment and the Contractor's Construction Items Bid Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives approved prior to the last day of the construction period covered by the application.
- H. Transmittal: Submit 3 executed original copies of each Application for Payment to the Owner's Representative within 24 hours. One copy shall be complete, including waivers of lien and similar attachments.
1. Transmit each copy with a transmittal listing attachments and recording appropriate information related to the application.

- I. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of lien from every entity who may file a lien arising out of the contract and related to the work covered by the payment.
1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Submit each Application for Payment with Contractor's waiver of lien for the period of construction covered by the application.
 - a. Submit final Applications for Payment with final waivers from every entity involved with performance of the Work covered by the application who may file a lien.
 4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner.
- J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:

Provisions of the contract regarding payment shall supersede any applicable provisions of the Georgia Prompt Payment Act.

1. List of subcontractors.
 2. List of principal suppliers and fabricators.
 3. Schedule of Payments.
 4. Contractor's Construction Schedule (*preliminary if not final*).
 5. Submittal Schedule (*preliminary if not final*).
 6. List of Contractor's staff assignments.
 7. Copies of necessary building permits.
 8. Copies of required licenses from governing authorities.
 9. Certificates of insurance and insurance policies.
 10. Performance and payment bonds.
 11. Traffic control plan if required
- K. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

1. Administrative actions and submittals that shall precede or coincide with this application include the following:

Provisions of the contract regarding payment shall supersede any applicable provisions of the Georgia Prompt Payment Act:

- a. Occupancy permits.
- b. Warranties and maintenance agreements.
- c. Test/adjust/balance records.

- d. Maintenance instructions.
 - e. Meter readings.
 - f. Changeover information related to Owner's occupancy.
 - g. Final cleaning.
 - h. Application for reduction of retainage and consent of surety.
 - l. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:
 - L. Retainage: Client shall retain 10% of all approved pay requests until substantial completion of the project. Retainage may drop to 5% until final inspection and acceptance with approval of the Owner.
 1. Completion of Project closeout requirements.
 2. Completion of items specified for completion after Substantial Completion.
 3. Transmittal of Project construction records to the Owner.
 4. Certified As-Built survey.
 5. Proof that taxes, fees, and similar obligations were paid.
 6. Removal of temporary facilities and services.
 7. Change of door locks to Owner's access.
 8. Fulfillment of all erosion control measures.
 - M. Final Ledger: Contractor shall request payment for 100% of all construction items as shown on the Construction Schedule and Payment Request. The final tabulation of the ledger will be either a subtraction from the total contract or an addition. In the case of subtractions, the contractor shall enter the total deleted at the bottom of the request. In the case of an addition, the Landscape Architect shall prepare a final change order for approval by the Contractor and Owner.
- 1.2 PRODUCTS (Not Applicable)
- 1.3 EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01035

MODIFICATION PROCEDURES

1.1 GENERAL

- A. Minor Changes in the Work: The Landscape Architect will issue instructions authorizing changes in the Work that do not alter the contract amount on AIA Form G710.
- B. Owner-Initiated Change Order Proposal Requests: The Landscape Architect will issue a description of proposed changes in the Work that require adjustment to the Contract Sum or Time. The description may include supplemental or revised Drawings and Specifications.
1. Proposal requests are for information only (RFI). Do not consider them an instruction to stop work or to execute the proposed change.
 2. Within 20 days of receipt of a Change Request, submit an estimate of costs necessary to execute the change for the Owner's review.
 - a. Include an itemized list of products required and unit costs, with the total amount of purchases.
 - b. Use unit costs from the Schedule of Values. If unit costs have to change, submit detail documentation to explain the need to change a unit price.
 - c. Indicate taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - d. Indicate the effect the change will have on the Contract Time.
- C. Contractor-Initiated Proposals: When unforeseen conditions require modifications, the Contractor may submit a request for a change to the Landscape Architect.
1. Describe the proposed change. Indicate reasons for the change and the effect of the change on the Contract Sum and Time.
 2. Include an itemized list of products required and unit costs, with the total amount of purchases.
 3. Indicate taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Additional work already included on the Schedule of Values shall be submitted at the same price as originally quoted unless otherwise agreed prior to submittal.
- D. Proposal Request Form: Use AIA Document G709.
- E. Allowance Adjustment: Base Change Order Proposals on the difference between the purchase amount and the allowance, multiplied by the measurement of work-in-place. Allow for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs only where indicated as part of the allowance.

2. Prepare explanations and documentation to substantiate margins claimed.
 3. Submit substantiation of a change in work claimed in the Change Orders related to unit-cost allowances and quantities.
- F. Submit claims to increase costs due to a need to change an allowance, whether for purchase order amount or handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of authorization to proceed. The Owner will reject claims submitted later than 21 days.
1. Do not include indirect expense in cost amount unless the Work has changed from that described in Contract Documents.
 2. No change to indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.
- G. Construction Change Directive: When Owner and Contractor disagree on the terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714 instructing the Contractor to proceed with a change.
1. The Construction Change Directive contains a description of the change and designates the method to be followed to determine change in the Contract Sum or Time.
- H. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completing the change, submit an itemized account and supporting data to substantiate Contract adjustments.
- I. Change Order Procedures: Upon the Owner's approval of a Proposal Request, the Architect will issue a Change Order on AIA Form G701.
- J. Contractor shall submit Requests for Information (RFI) whenever items or parts of the central documents are unclear or incorrect. Contractor shall maintain a list of Requests by number and date with responses from the Architect.
- K. Unit Item Cost: When changes effect unit items for which costs have already been established, change request must utilize the agreed unit prices for additions or deletions.
- L. Unit Item Cost Changes: Unit item costs previously accepted by the Owner may be subject to change if the contractor submits sufficient documentation to verify the need for such a change.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01040

COORDINATION

1.1 GENERAL

- A. This Section includes requirements for coordinating construction operations including, but not necessarily limited to, the following:
1. Coordination drawings.
 2. Administrative and supervisory personnel.
 3. Coordinate with Project Landscape Architect/Engineer.
 4. Clearing and protection.
 5. Coordinating with Property Officer or Owner's Representative
 6. Staking Layout and Utility Locations
 7. Utilities connections and coordination with all utility providers.
 8. Coordinate with adjacent tenants.
 9. Coordinate with tenant associations and groups
 10. Coordinate with Municipal, Regional, and National agencies to close streets and control traffic.
 11. Coordination with the County Health Department and WaterSplash provider.
 12. Coordination between various sub-contractors.
 13. Coordination between other on-site contractors.
 14. Coordination with other contractors engaged by the Client or utility.
 15. Coordination of sleeves, pipe holes, and other items to assist subcontractors
- B. See Section 01013 Sequencing Conditions

1.2 COORDINATION

- A. Coordinate construction to assure efficient and orderly installation of each portion of the Work. Coordinate operations that depend on each other for proper installation, connection, and operation.
1. Schedule operations in a sequence required to obtain the best results where installation of one part depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to assure maximum accessibility for maintenance, service, and repair.
 3. Make provisions to accommodate items scheduled for later installation.
 4. Schedule operations with Parks Director to avoid interference with pre-scheduled operations by tenants.
 5. Coordinate regularly with the tenant groups on site to insure cooperation and notification.
 6. Coordinate with local permitting agencies to secure timely approvals of the work.
 7. Coordinate with local law enforcement to execute a Traffic Control Plan.

- B. Where necessary, prepare memoranda for distribution to each party involved, outlining procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
 2. Notify Owner when pre-scheduled operations may constitute a hardship for the contractor.
 3. Prepare weekly reports during construction to be given to industrial park tenant
- C. Administrative Procedures: Coordinate scheduling and timing of required procedures with other activities to avoid conflicts and assure orderly progress. Such activities include, but are not limited to, the following:
1. Preparation of schedules.
 2. Delivery and processing of submittals.
 3. Progress meetings.
 4. Project closeout activities
- D. Conservation: Coordinate construction to assure that operations are carried out with consideration for conservation of energy, water, and materials.
1. At the request of the Owner, salvage materials and equipment involved in performance of, but not incorporated in, the Work.
 2. Deliver salvaged items to location to be specified by the owner.
- E. Coordination Drawings: Prepare coordination drawings if needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space necessitates maximum utilization of space for efficient installation of different components.
1. Show the relationship of components shown on separate shop drawings.
 2. Indicate required installation sequences.
 3. Comply with requirements contained in Section "Submittals."
- F. Staff Names: On date of Pre-Construction meeting, submit a list of the Contractor's staff assignments, including the superintendent and other personnel assigned to the Project. Identify individuals and their responsibilities. List their addresses and telephone numbers.
1. Provide copy of list to the owner and Landscape Architect/Engineer.
 2. Post copies in the Project meeting room, the temporary field office, and each necessary telephone number.
 3. Contractor shall always maintain a list of site tenants and their contact information on site in the construction trailer.

G. Subcontractor Assistance:

It is the Contractor's duty to coordinate with his subcontractors in advance so that pipe holes, sleeves, inserts, etc., for subcontractors are installed as work progresses. This includes coordination with other independent Contractors working on related work.

1.3 **PRODUCTS** (Not Applicable)

1.4 **EXECUTION**

- A. Inspection of Conditions: Require Installers of major components to inspect substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected. Provide photographs and daily reports of the inspected conditions.
- B. Coordinate temporary enclosures with inspections and tests to minimize the need to uncover completed construction.
- C. Clean and protect construction in progress and adjoining materials, during handling and installation. Apply protective covering to assure protection from damage.
- D. Clean and maintain completed construction as necessary through the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- E. Limiting Exposures: Supervise construction to assure that no part is subject to harmful, dangerous, or damaging exposure. Such exposures include, but are not limited to, the following:
 - 1. Excessive static or dynamic loading.
 - 2. Excessive internal or external pressures.
 - 3. Excessively high or low temperatures.
 - 4. Water exposure
 - 5. Solvents and chemicals.
 - 6. Abrasion.
 - 7. Soiling, staining, and corrosion.
 - 8. Combustion.
- F. Tenant Delivery Schedules: Coordinate with the Property Officer and tenant organizations to schedule and accommodate delivery schedules to various tenants.

END OF SECTION 01040

SECTION 01045

CUTTING AND PATCHING

1.1 GENERAL

- A. Cutting and Patching Proposal: Submit a proposal describing procedures in advance of the time cutting and patching will be performed. Request written approval by the Project Landscape Architect/Engineer to proceed. Include the following:
1. Describe extent of cutting and patching. Describe how action will be performed and indicate why it cannot be avoided.
 2. Describe changes to existing construction. Include changes to structural elements, operating components, changes to the building's appearance and/or other significant visual elements.
 3. List products to be used and firms that will perform work.
 4. Indicate dates and completion timeline for cutting and patching to be performed.
 5. Utilities: List utilities that will be disturbed or relocated and those that will be temporarily out-of-service. Indicate dates and timeline of service that will be disrupted.
 6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
 7. Approval to proceed does not waive the Project Landscape Architect/ Engineer's right to later require complete removal and replacement of unsatisfactory work.
- B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would affect their load-carrying capacity or load-deflection ratio.
1. Obtain written approval from the Project Engineer before cutting and patching the following structural elements:
 - a. Foundation construction.
 - b. Bearing and retaining walls.
 - c. Asphalt roads and parking.
 - d. Utility lines or storm pipes.
 - e. Brickwork or sidewalks.
 - f. Free standing walls of fences.
- C. Operational Limitations: Do not cut and patch operating elements in a manner that would reduce their capacity to perform as intended. Do not cut and patch operating elements in a manner that would increase maintenance or decrease operational life or safety.
1. Obtain permission for operating utility provider before cutting a utility.

2. Advise the Property Officer and tenants of any utility shut down before work begins.
 3. Obtain written approval from the Landscape Architect before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Fire protection systems.
 - c. Electrical wiring systems.
 - d. Public address system.
 - e. Traffic control systems.
 - f. Gas, water, phone, power, cable or other utility systems.
- D. Visual Requirements: Do not cut and patch exposed construction in a manner that would, in the Project Landscape Architect's opinion, reduce the structure's aesthetic qualities. Do not cut and patch in a manner that would result in visual evidence of cutting and patching. Remove and replace any construction cut and patched that is deemed visually unsatisfactory by the Project Landscape Architect and Owner.
1. Retain the original Installer to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer, engage a recognized experienced and specialized firm:
 - a. Ornamental metal.
 - b. Matched-veneer brickwork.
 - c. Stucco and ornamental plaster.
 - d. New Asphalt roads and parking
- E. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged in such a manner as not to void warranties.

1.2 PRODUCTS

- A. Use materials identical to existing materials. Use materials that visually match adjacent surfaces to the fullest extent possible if identical materials are unavailable. Use materials whose performance will equal that of existing materials.

1.3 EXECUTION

- A. Examine surfaces to be cut and patched and conditions under which work is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action:
1. Before proceeding, meet with parties involved. Review areas of potential interference and conflict for the tenants of the parks. Coordinate procedures and resolve potential conflicts before proceeding:
- B. Temporary Support: Provide temporary support of work to be cut.

- C. Protection: Protect existing construction to prevent damage. Provide protection from adverse weather conditions for portions that might be exposed during cutting and patching operations.
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Avoid cutting pipe, conduit, or ductwork serving the project site or business, but scheduled to be removed or relocated until provisions have been made to bypass them.
- F. Performance: Employ skilled workmen. Proceed at the earliest feasible time and complete without delay:
 - 1. Coordinate construction so as to install necessary components and/or perform construction (i.e. subsequent fitting and patching required to restore surfaces to their original condition).
- G. Cutting: Cut using methods that will not damage elements retained or adjoining construction. Comply with the original Installer's recommendations:
 - 1. Use hand or small power tools designed for sawing or grinding, (i.e. not hammering and chopping). Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. To avoid marring finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
 - 4. Comply with requirements of applicable Division 2 Specification Sections where cutting and patching requires excavating and backfilling.
 - 5. Where services are required to be removed, relocated, or abandoned, by-pass utility services before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- H. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances:
 - 1. Inspect and test patched areas to demonstrate integrity of the installation.
 - 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - 3. Where removing walls or where partitions extend from one finished area into another, patch and repair ground and wall surfaces. Provide an even surface of uniform color and appearance. Remove ground and wall coverings and replace with new materials to achieve uniform color and appearance.

- a. Where patching occurs in a smooth painted surface, extend final paint coat over entire surface containing the patch after the area has received primer and second coat.
4. Patch, repair, or rehang ceilings as necessary to provide an even-plane surface of uniform appearance.
- I. **Cleaning:** Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar items. Clean piping, conduit, and similar features before applying paint or finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01050

FIELD ENGINEERING

1.1 GENERAL

- A. This Section specifies requirements for field-engineering services including, but not limited to, the following:
 - 1. Land survey work to locate easement, utilities, and subterranean objects.
 - 2. Civil engineering services to assure positive drainage.
 - 3. Location of underground utilities.
 - 4. Geotechnical monitoring.
 - 5. Field adjustments to layout.
 - 6. Erosion Control measurements.
 - 7. Splash Pad installation
 - 8. Prefabricated shelter installation
 - 9. Design/Build Services.
- B. Submit a certificate certifying location and elevation of improvements.
- C. Project Record Documents: Submit a record of Work performed and record copy of survey data collected in the field. TerraMark has already surveyed the entire site and the survey is available to the contractors in Cad format upon request.
- D. Surveyor Qualifications: Engage a land surveyor registered in the state where the Project is located.
- E. Geotechnical Data: When required, engage qualified Geotechnical Engineers familiar with the conditions of the site and approved by the Owner.
- F. Professional Design Services: Secure design consultants and engineers licensed in the state and approved by the Owner.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

- A. Identification: The surveyor will identify existing control points and property line corner stakes. Boundaries are indicated on the existing survey by TerraMark.
- B. Verify layout information, in relation to property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without written approval. Report destroyed reference points or requirements to relocate reference points because of changes in grades.
 2. Replace destroyed Project control points. Base replacements on the original survey control points and property corner pins.
- C. Field locate adjacent street right-of-way lines on the ground to use as reference during staking and construction.
- D. Existing Utilities: The existence of underground utilities and construction is not guaranteed. Verify location of underground utilities and other construction before beginning site work or excavation.
1. Prior to construction, verify location and invert elevation at points of connection to storm sewers, and water-service piping, and underground utility boxes.
 2. Locate existing lateral sanitary sewer line as shown on the existing site survey.
- E. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and to locate each element. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
 2. As construction proceeds, check every element for line, level, and plumb.
- F. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.
1. Record deviations from lines and levels. Advise the Architect when deviations exceed tolerances. On Project Record Drawings, record deviations that are accepted and not corrected.
 2. On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
- G. Site Improvements: Locate and lay out site improvements, including pavements, stakes grading, fill and topsoil placement, conduit locations, utility slopes, and invert elevations.
- I. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing granite curbs, structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities and utility providers having jurisdiction.
- J. Geotechnical Monitoring: Contractor shall coordinate the services of the Owner's Geotechnical Engineer to take the soil borings necessary to verify the construction requirements for the following project elements are acceptable.

1. Sidewalk stabilization.
 2. Curb stabilization.
 3. Retaining wall foundations.
 4. Splash pad foundations and columns
 5. Road surfaces.
- K. Subsurface Conditions: Contractor is responsible to correct all subsurface conditions necessary to insure the structural integrity of all elements of the project. Reference each section of the Technical Specifications for detailed execution requirements.

END OF SECTION 01050

SECTION 01095

REFERENCE STANDARDS AND DEFINITIONS

1.01 GENERAL

- A. Definitions: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated" refers to graphic representations, notes, or schedules on the Construction Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.
- C. Where the word or words "as directed", "as required", "as approved", "as permitted" "as selected", "as requested", "as authorized", or words of like effect are used in the specifications or on the drawings, the Contractor shall understand that direction, requirement, approval or permission of the Landscape Architect is intended. Similar words "approved", "acceptable", "satisfactory", or words of like import mean approved by, acceptable to or satisfactory to the Landscape Architect.
- D. "Approved": When used in conjunction with the Project Landscape Architect's action on the Contractor's submittals, applications, and requests, is limited to the Project Landscape Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the work.
- F. "Furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install" describes operations at the project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer" is the Contractor, or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, who performs a particular construction activity including installation, erection, application, or similar

operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 2. Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter."
- J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the project. The extent of the project site is shown on the Construction Drawings and may or may not be identical with the description of the land on which the project is to be built.
- K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- L. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-division format and "Master Format" numbering system.
1. Abbreviated Language: Language used in the Specifications is abbreviated. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Streamlined language is generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
- M. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- N. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.
- O. Copies of Standards: Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.
- P. Abbreviations and Names: Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Inc.'s "Encyclopedia of Associations," which is available in most libraries.
- Q. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the work.
- R. Engineer, Architect, Landscape Architect, all indicate the design consultant responsible to the Owner for observing the construction of the project.

1.02 PRODUCTS (Not Applicable)

1.03 EXECUTION (Not Applicable)

END OF SECTION 01095

SECTION 01200

PROJECT MEETINGS

1.1 GENERAL

- A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
1. Preconstruction conferences.
 2. Preinstallation conferences.
 3. Progress meetings.
 4. Weather Records and Calendar
 5. Special sub-contractor pre-installation meetings
 6. Final punch list inspection
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction. Review responsibilities and personnel assignments.
- C. Attendees: Authorized representatives of the Owner, Landscape Architect, and their consultants; the Contractor and its superintendent; major subcontractors; and other concerned parties shall attend.
1. Participants shall be familiar with the Project and authorized to conclude matters relating to the Work.
- D. Agenda: Discuss items that could affect progress, including the following:
1. Tentative construction schedule.
 2. Critical work sequencing.
 3. Submittal of Shop Drawings, Product Data, and Samples.
 4. Use of the premises.
 5. Special Feature schedules
 6. Weather conditions and schedule
 7. Sequencing and Traffic Control
- E. Preinstallation Conferences: Conduct a conference before each activity that requires coordination with other operations.
- F. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation shall attend. Advise the Landscape Architect of scheduled meeting dates.
1. Review the progress of other operations and preparations for the activity under consideration at each preinstallation conference, including requirements for the following:

- a. Compatibility problems and acceptability of substrates.
 - b. Time schedules and deliveries.
 - c. Manufacturer's recommendations.
 - d. Warranty requirements.
 - e. Inspecting and testing requirements.
2. Record significant discussions and agreements and disagreements, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Landscape Architect.
 3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate actions necessary to resolve problems and reconvene the conference.
- G. Progress Meetings: Conduct progress meetings at the Project Site at regular intervals as agreed in the contract. Notify the Owner and the Architect of scheduled dates. Coordinate meeting dates with preparation of the Payment Request.
- H. Attendees: The Owner, Architect, and other entities concerned with current progress or involved in planning, coordination, or future activities shall be represented. Participants shall be authorized to conclude matters relating to the Work.
- I. Agenda: Review and correct or approve minutes of the previous meeting. Review items of significance that could affect progress. Include topics for discussion appropriate to Project status.
1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule. Determine how to expedite construction behind schedule; secure commitments from parties involved to do so. Discuss revisions required to insure subsequent activities will be completed within the Contract Time.
 2. The schedule shall indicate the dates for the starting and completion of various stages of construction and shall be revised monthly as required by the conditions of the work.
 3. Review the present and future needs of each entity present, including the following:
 - a. Time.
 - b. Sequences.
 - c. Status of submittals.
 - d. Deliveries and off-site fabrication problems.
 - e. Temporary facilities and services.
 - f. Quality and work standards.
 - g. Change Orders.

- h. Daily reports and weather conditions
 - i. Shop drawings and submittals
 - j. Onsite inspections and adjustments
 - k. Traffic control plan
 3. Reporting: Distribute meeting minutes to each party present and to parties who should have been present. Include a summary of progress since the previous meeting and report.
 4. Schedule Updating: Revise the Contractor's Construction Schedule after each meeting where revisions have been made. Issue the revised schedule concurrently with the report of each meeting.
 7. Record Drawings: Contractor shall maintain a current and complete set of all Contract Documents on-site at all times.
 8. Review 'Requests for Information' and resolve.
 9. Review 'Change Orders' and resolve.
 10. Review pay requests and schedule of payments.
 11. Resolve on-site issues and adjustments.
 12. Review weather reports and status of schedule and delays.
- J. Daily Construction Reports: Contractor shall prepare a daily report recording events on the site. Submit duplicate copies to the Landscape Architect at weekly intervals. Include the following information:
 1. Daily record showing work engaged, completed, and started
 2. List of subcontractors at the site
 2. High and low temperatures, general weather conditions.
 3. Accidents and unusual events.
 4. Stoppages, delays, shortages, and losses.
 5. Meter readings and similar recordings.
 6. Emergency procedures.
 7. Orders and requests of governing authorities.
 8. Services connected, disconnected.
 9. Equipment or system tests and startups.
 10. Substantial Completions authorized
 11. Materials delivered or stored
 12. Inspection or testing completed
 13. Official visitors to the site
- K. Construction Records: Contractor shall maintain the following reports and records for review at each Program Meeting. See Section 1300 submittals for more detail of each report.
 1. As Built Field Set:
Set of plans kept inside for the purpose of updating and recording all changes and modifications. Update with red lines to record changes as they occur. Update

with red lines to record changes as they occur. Said redlines must be issues in Meeting Minutes.

2. Request for Information (RFI) Book:
Sequential record of all requests and their subsequent answers.
3. Shop drawings and approved site field changes
4. Documents and Samples of special product to the Site:
5. Change Orders:
Sequential record of all accepted or pending change orders with backup data.

L. Documents and Samples at the Site:

In addition to instruments mentioned in this section, include copies of all Requests for Payment and correspondence between Landscape Architect and Contractor. Maintain all copies in orderly files in Contractor's job site office. Records shall be available for reference during all on-site project meetings.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01300

SUBMITTALS

1.1 GENERAL

- A. Submittal Procedures: Coordinate submittal preparation with construction, fabrication, other submittals, and activities that require sequential operations. Transmit in advance of construction operations to avoid delay.
1. Coordinate submittals for related operations to avoid delay because of the need to review submittals concurrently for coordination. The Landscape Architect reserves the right to withhold action on a submittal requiring coordination until related submittals are received.
 2. Processing: Allow 2 weeks for initial review. Allow more time if the Landscape Architect must delay processing to permit coordination. Allow 2 weeks for reprocessing.
 - a. No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.
 3. Submittal Preparation: Place a permanent label on each submittal for identification. Provide a 4- by 5-inch (100- by 125-mm) space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of the Architect/Landscape Architect.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
 4. Submittal Transmittal: Package each submittal appropriately. Transmit with a transmittal form. The Architect will not accept submittals from sources other than the Contractor.

5. Transmittal Form: Use AIA Document G810. On the form, record requests for information and deviations from requirements. Include Contractor's certification that information complies with requirements.
- B. Contractor's Construction Schedule: Prepare a horizontal bar-chart-type, contractor's construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first working day of each week. Use the same breakdown of Work indicated in the "Schedule of Values." See Section 01026 Indicate estimated completion in 10 percent increments. As Work progresses, mark each bar to indicate actual completion.
1. Submit on date of Pre-Construction Meeting.
 2. Prepare the schedule on stable transparency, or other reproducible media, of width to show data for the entire construction period.
 3. Secure performance commitments from parties involved. Coordinate each element with other activities; include minor elements involved in the Work. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
 4. Coordinate with the Schedule of Payment, list of subcontracts, Submittal Schedule, payment requests, and other schedules.
 5. Indicate completion in advance of Substantial Completion. Indicate Substantial Completion to allow time for the Architect's procedures necessary for certification of Substantial Completion.
 6. Phasing: Show how phased completion affects the Work.
 7. Work Stages: Indicate important stages for each portion of the Work.
 8. Area Separations: Provide a separate time bar to identify each construction area for each portion of the Work. Indicate where each element must be sequenced with other activities.
- C. Submittal Schedule: After developing the Contractor's Construction Schedule, prepare a schedule of submittals. Submit within 10 days of submittal of the Construction Schedule.
1. Coordinate with list of subcontracts, Schedule of Values, list of products, and the Contractor's Construction Schedule.
 2. Prepare the schedule in chronological order. Provide the following information:
 - a. Date for first submittal.
 - b. Related Section number.
 - c. Submittal category (Shop Drawings, Product Data, or Samples).
 - d. Name of the subcontractor.
 - e. Description of the Work covered.
 - f. Date for the Architect's final approval.

3. Schedule Distribution: Distribute copies of the Contractor's Construction Schedule and the Submittal Schedule to the Architect, Owner, subcontractors, and parties required to comply with submittal dates. Post copies in the field office.
 - a. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their Work and are no longer involved in construction activities.
 - b. Updating: Revise the schedule after each meeting or activity where revisions have been made. Issue the updated schedule concurrently with the report of each meeting.
- D. Daily Construction Reports: See Section 1200 for more detail
- E. Shop Drawings: See Section 01340 for more detail about Shop Drawings. See Shop Drawings in respective Technical Sections as identified.

Do not use Shop Drawings without an appropriate final stamp indicating action taken.
- F. Product Data: Collect Product Data into a single submittal for each element of construction. Mark each copy to show applicable choices and options. Where Product Data includes information on several products, mark copies to indicate applicable information.
 1. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 2. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
 3. Submittals: Submit 2 copies; submit 4 copies where required for maintenance manuals. The Landscape Architect will retain one and return the other marked with action taken.
 - a. Unless noncompliance with Contract Documents is observed, the submittal serves as the final submittal.
 4. Distribution: Furnish copies to installers, subcontractors, suppliers, and others required for performance of construction activities. Show distribution on

transmittal forms. Do not proceed with installation until a copy of Product Data is in the Installer's possession.

- a. Do not use unmarked Product Data for construction.
- G. Samples: Submit full-size Samples cured and finished as specified and identical with the material proposed. Mount Samples to facilitate review of qualities.
1. Include the following:
 - a. Specification Section number and reference.
 - b. Generic description of the Sample.
 - c. Sample source.
 - d. Product name or name of the manufacturer.
 - e. Compliance with recognized standards.
 - f. Availability and delivery time.
 2. Submit Samples for review of size, kind, color, pattern, and texture, for a check of these characteristics, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed. Where variations are inherent in the material, submit at least 3 units that show limits of the variations.
 - a. Refer to other Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar characteristics.
 - b. Refer to other Sections for Samples to be incorporated in the Work. Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
 - c. Samples not incorporated into the Work, or designated as the Owner's property, are the Contractor's property and shall be removed from the site.
 3. Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from standard choices. The Architect will review and return submittals indicating selection and other action.
 4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. One set will be returned marked with the action taken. Maintain sets of Samples, at the Project Site, for quality comparison.
 - a. Unless noncompliance with Contract Documents is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

5. Distribution of Samples: Distribute additional sets to subcontractors, manufacturers, and others as required for performance of the Work. Show distribution on transmittal forms.
- H. Quality Assurance Submittals: Submit quality-control submittals, including design data, certifications, manufacturer's instructions, and manufacturer's field reports required under other Sections of the Specifications.
 1. Certifications: Where certification that a product or installation complies with specified requirements is required, submit a notarized certification from the manufacturer certifying compliance.
 - a. Signature: Certification shall be signed by an officer authorized to sign documents on behalf of the company.
- I. Sample Panels:
 1. Contractor shall construct sample panels in accordance with the Technical Specifications for review and approval by Landscape Architect.
 2. Samples shall be prepared in advance of construction sequencing to allow time for modifications and approvals.
 3. Contractor shall allow Landscape Architect five days to respond to a request to see a sample.
 4. Full scale construction of any work requiring a pre-approved sample shall not begin until after Landscape Architect issues a statement of approval.
- J. Architect's Action: Except for submittals for the record or information, where action and return are required, the Architect will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility.
 1. Action Stamp: The Architect will stamp each submittal with an action stamp. The Architect will mark the stamp appropriately to indicate the action taken.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01300

SECTION 01340
SHOP DRAWINGS

PART 1 GENERAL

1.01 SCOPE

- A. The work under this Section includes submittal to the Owner's Representative of shop drawings, product data and samples required by the various sections of these Specifications. The following item will require shop drawings.
1. Polygon Pavilion: See Section 05513 Prefabricated Shelter
 2. Chain link fence details.
 3. WaterSplash playground / splash pad circulation details and calculations. See Appendix.
- B. Electronic Submittals: The Client prefers electronic submittals of Shop Drawings to the Client Website.
- C. Submittal Contents: The submittal contents required are specified in each section of the Project Manual Technical Specifications. Owner prefers electronic submittals.
- D. Project Drawings include typical sections and details of the proposed Modular Block Wall for reference relative to height and location. These details are provided to the contractor for use in understanding the extent of the wall and the need to develop Shop Drawings.
- D. Definitions: Submittals are categorized as follows:
1. Shop Drawings
 - a. Shop drawings shall include technical data, drawings, diagrams, procedure and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.
 - b. Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail Shop Drawings. Show dimensions and note dimensions that are based on actual field measurements. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawings to be used in connection with the Work without appropriate final "Action" markings by the Project Landscape Architect for Owner's Representative.

2. Product Data

- a. Product data includes standard printed information on materials, products and systems, not specially prepared for this project, other than the designation of selections from among available choices printed therein.
 - b. Collect required data into one submittal for each unit of work or system and mark each copy to show which choices and options are applicable to the Project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked and special coordination requirements.
3. Samples
- a. Samples include both fabricated and un-fabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.
 - b. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Project Landscape Architect's selection is required. Prepare samples to match the Project Landscape Architect's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and "kind" by the Project Landscape Architect. Project Landscape Architect will note "test" samples, except as otherwise indicated, for other requirements, which are the exclusive responsibility of the Contractor.
4. Miscellaneous submittals related directly to the Work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the Work but not processed as shop drawings, product data or samples.

1.02 ROUTING AND SUBMITTALS

- A. Submittals and routine correspondence shall be routed as follows:
1. Supplier to Contractor (through product representative if applicable)
 2. Contractor to Owner's Representative to review/approve submittals.
 3. Owner to forward to Landscape Architect or other professionals prior to submitting back to Contractor if deemed necessary.
 4. Project Landscape Architect to Owner's Representative to Contractor
 5. Contractor to Supplier

PART 2 PRODUCTS

2.01 Manufacturer's Literature

- A. Where content of submitted literature from manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for the Owner's Representative and Project Landscape Architect's review.
- B. Submit the number of copies which are required to be returned (not to exceed (3) three) plus three copies which will be retained by the Owner's Representative.

2.02 Samples

- A. Samples shall illustrate materials, equipment or workmanship and established standards by which completed work is judged.
- B. Unless otherwise specifically directed by the Owner or Project Landscape Architect, all samples shall be of the precise article proposed to be furnished.
- C. Submit all samples in the quantity which is required to be returned plus one sample which will be retained by the Owner's Representative.

2.03 Colors

- A. Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Owner's Representative for review and selection.
- B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

PART 3 EXECUTION

3.01 Contractor's Coordination of Submittals

- A. Prior to submittal for the Owner's Representative to review, the Contractor shall use all means necessary to fully coordinate all material, including the following procedures:
 - 1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.
 - 2. Coordinate as required with all trades and all public agencies involved.
 - 3. Submit a written statement of review and compliance with the requirements of all applicable Technical Specifications as well as the requirements of this Section.

4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the Contract Documents.
- B. Each copy of the shop drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Owner's Representative without the Contractor's stamp will be returned to the Contractor for conformance with this requirement.
- C. The Owner may back charge the Contractor for costs associated with having to review a particular shop drawing, product data or sample more than two times to receive a "No Exceptions Taken" mark.
- D. Grouping of Submittals
 1. Unless otherwise specifically permitted by the Owner's Representative, make all submittals in groups containing all associated items.
 2. No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble the shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to the Owner's Representative along with Contractor's comments as to compliance, non-compliance or features requiring special attention.
- E. Schedule of Submittals
 1. Within 30 days of Contract award and prior to any shop drawing submittal, the Contractor shall submit a schedule showing the estimated date of submittal and the desired approval date for each shop drawing anticipated. A reasonable period shall be scheduled for review and comments. Time lost due to unacceptable submittals shall be the Contractor's responsibility and a measure of time allowance for resubmittal shall be provided. The schedule shall provide for submittal of items which relate to one another to be submitted concurrently.

3.02 Timing of Submittals

- A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.
- B. In scheduling, allow sufficient time for the Owner's Representative and Project Landscape Architect's review following the receipt of the submittal.

3.03 Reviewed Shop Drawings

A. Owner's Representative Review

1. Allow a minimum of 30 days for the Owner's Representative initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Owner's Representative will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow a minimum of two weeks for reprocessing each submittal. Advise the Owner's Representative on each submittal as to whether processing time is critical to progress of the Work, and therefore the Work would be expedited if processing time could be foreshortened.
 2. Acceptable submittals will be marked "No Exceptions Taken". A minimum of three copies will be retained by the Owner's Representative for Project Landscape Architect's and the Owner's use and the remaining copies will be returned to the Contractor.
 3. Submittals requiring minor corrections before the product is acceptable will be marked "Make Corrections Noted". The Contractor may order, fabricate and ship the items included in the submittals, provided the indicated corrections are made. Drawings must be resubmitted for review and marked "No Exceptions Taken" prior to installation or use of products.
 4. Submittals marked "Amend and Resubmit" must be revised to reflect required changes and the initial review procedure repeated.
 5. The "Rejected - See Remarks" notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.
 6. Only two copies of items marked "Amend and Resubmit" and "Rejected - See Remarks" will be reviewed and marked. One copy will be retained by the Project Landscape Architect and the other copy with all remaining unmarked copies will be returned to the Contractor for resubmittal.
- B. No work or products shall be installed without a drawing or submittal bearing the "No Exceptions Taken" notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Project Landscape Architect's stamp and approved by the Owner.
- C. Substitutions: In the event the Contractor obtains the Owner's Representative approval for the use of products other than those which are listed first in the Contract Documents, the Contractor shall, at the Contractor's own expense and using methods approved by the Project Landscape Architect, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.

- D. Use of the “No Exceptions Taken” notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Owner’s Representative and or Project Landscape Architect’s review shall not relieve the Contractor of responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.04 Resubmission Requirements

- A. Shop Drawings
1. Revise initial drawings as required and resubmit as specified for initial submittal, with the resubmittal number shown.
 2. Indicate on drawings all changes which have been made other than those requested by the Owner’s Representative.
- B. Project Data and Samples: Resubmit new data and samples as specified for initial submittal, with the resubmittal number shown.

END OF SECTION 01340

SECTION 01400

QUALITY CONTROL

1.1 GENERAL

- A. Quality control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Landscape Architect.
- B. Contractor Responsibilities: Unless they are the responsibility of another entity, Contractor shall provide inspections and tests specified elsewhere and required by authorities having jurisdiction. Costs for these services shall be included in the Contract Sum.
 - 1. Where inspections and tests are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform these services. Costs for these services are included in the Contract Sum.
 - 2. Where inspections and tests are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.
 - 3. Where inspections and tests are the Owner's responsibility, the Owner will engage the services of a qualified independent testing agency to perform those services. Payment will be made from the Inspection and Testing Allowance, as authorized by Change Orders.
 - a. Where the Owner engages an agency to test or inspect part of the Work and the Contractor is required to engage an entity to test or inspect the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless the Owner agrees in writing.
- C. Retesting: The Contractor is responsible for retesting where results of inspections and tests prove unsatisfactory and indicate noncompliance with requirements.
 - 1. The cost of retesting is the Contractor's responsibility where tests performed indicated noncompliance with requirements.
- D. Auxiliary Services: Cooperate with agencies performing inspections and tests. Provide auxiliary services as requested. Notify the agency in advance of operations to permit assignment of personnel. Auxiliary services include the following:
 - 1. Providing access to the Work.
 - 2. Furnishing incidental labor and facilities to assist inspections and tests.
 - 3. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

4. Providing facilities for storage and curing of test samples.
 5. Delivering samples to testing laboratories.
 6. Providing preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 7. Providing security and protection of samples and test equipment.
- E. Duties of the Testing Agency: The testing agency shall cooperate with the Landscape Architect and the Contractor in performing its duties. The agency shall provide qualified personnel to perform inspections and tests.
1. The agency shall notify the Landscape Architect and the Contractor of irregularities or deficiencies observed in the Work during performance of its services.
 2. The agency shall not release, revoke, alter, or enlarge requirements or approve or accept any portion of the Work.
 3. The agency shall not perform duties of the Contractor.
- F. Coordination: Coordinate activities to accommodate services with a minimum of delay. Avoid removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling inspections, tests, taking samples, and similar activities.
- G. Submittals: The testing agency shall submit a certified written report, in duplicate, of each inspection and test to the Landscape Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection or test through the Contractor.
1. Submit additional copies of each report to the governing authority, when the authority so directs.
 2. Report Data: Reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample taking and testing.
 - k. Comments or professional opinion on whether inspected or tested Work complies with requirements.

- l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting.
- H. Qualifications for Service Agencies: Engage inspection and testing service agencies that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
1. Each agency shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

- A. Repair and Protection: Upon completion of inspection, testing, and sample taking, repair damaged construction. Restore substrates and finishes. Comply with Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities and protect repaired construction.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for inspection and testing.

END OF SECTION 01400

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.1 GENERAL

- A. Summary: This Section specifies construction facilities and temporary controls including temporary utilities, support facilities, and security and protection facilities.
- B. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, fire department, and rescue squad rules.
 - 5. Environmental protection regulations.
- C. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."
- D. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.
- E. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. Submit reports of tests, inspections, meter readings, and procedures performed on temporary utilities. At the earliest time, change over from use of temporary service to use of permanent service.

1.2 PRODUCTS

- A. Materials: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
 - 1. Lumber and Plywood: Comply with Division 6 Section "Rough Carpentry." Provide UL-labeled, fire-treated lumber and plywood for temporary offices and

- sheds. Provide exterior, Grade B-B high-density concrete form overlay plywood for signs. Provide 5/8-inch- (16-mm-) thick exterior plywood for other uses.
2. Roofing Materials: UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of temporary offices, shops, and sheds.
 3. Paint: Comply with Division 9 Section "Painting."
 - a. For exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
 - b. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
 - c. For interior walls of temporary offices, provide 2 coats interior latex-flat wall paint.
 4. Tarpaulins: Waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
 5. Water: Potable water approved by local health authorities.
 6. Open-Mesh Fencing: 0.120-inch- (3-mm-) thick, galvanized 2-inch (50-mm) chain link fabric fencing 6 feet (2 m) high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches (38 mm) I.D. for line posts and 2-1/2 inches (64 mm) I.D. for corner posts.
- B. Equipment: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
1. Water Hoses: 3/4-inch (19-mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long. Provide adjustable shutoff nozzles at hose discharge.
 2. Electrical Outlets: Properly configured, NEMA-polarized outlets. Provide outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
 3. Electrical Power Cords: Grounded extension cords. Use hard-service cords where exposed to abrasion and traffic.
 4. Lamps and Light Fixtures: General service incandescent lamps. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
 5. Heating Units: Temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
 6. Fire Extinguishers: Hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - a. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

1.3 EXECUTION

- A. Installation, General: Use qualified personnel to install temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
1. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
 2. Conditions of Use: Keep temporary facilities clean and neat in appearance. Operate safely and efficiently. Relocate as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.
- B. Temporary Utility Installation: Engage the local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
1. Arrange with company and existing users for a time when service can be interrupted to make connections for temporary services.
 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.
 5. Temporary Water Service: Install temporary water service and distribution piping of sizes and pressures adequate for construction. Maintain service until permanent water service is in use. Sterilize piping prior to use.
 6. Temporary Electric Power: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear. Install service underground.
 - a. Power Distribution: Install wiring overhead and rise vertically where least exposed to damage.
 - b. Temporary Lighting: Provide temporary lighting with local switching to fulfill security requirements and illumination for construction operations and traffic conditions.
 7. Temporary Heat: Provide temporary heat for curing or drying of completed installations or for protection of installed construction from adverse effects of low

temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations. Coordinate ventilation requirements to produce ambient condition required and minimize consumption of energy.

- a. Heating Facilities: Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel oil heaters with individual space thermostatic control. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
8. Temporary Telephones: Provide telephone service for each personnel engaged in construction. Provide a separate line for each temporary office and first aid station on site. Provide a dedicated telephone line for a fax machine in the field office. At each telephone, post a list of important telephone numbers.
 9. Sanitary Facilities: Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers.
 - a. Toilets: Install self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
 - 1) Provide separate facilities for male and female personnel.
 - b. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up. Dispose of drainage properly. Supply cleaning compounds.
 - 1) Provide safety showers, eyewash fountains, and similar facilities for safety, and sanitation of personnel.
 - c. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled drinking-water units.
 10. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
 - a. Filter out soil, construction debris, chemicals, and similar contaminants that might clog sewers or pollute waterways.

- b. Connect temporary sewers to the municipal system, as directed by sewer department officials. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.
 - c. Provide earthen embankments and similar barriers in and around excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rains.
- C. Support Facilities Installation: Locate field offices, storage sheds, and other construction and support facilities for easy access and in coordination with the Owner. Maintain facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
 1. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet (9 m) of building lines. Comply with requirements of NFPA 241.
 2. Field Offices: Provide heated and air-conditioned, insulated, weather tight temporary offices of size to accommodate personnel at the Project Site. Provide offices on foundations adequate for normal loading. Provide units with lockable entrances, operable windows, and serviceable finishes. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:
 - a. Furnish field offices with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase. Equip with a water cooler and toilet complete with water closet, lavatory, and medicine cabinet unit with a mirror.
 3. Storage and Fabrication Sheds: Install sheds equipped to accommodate materials and equipment involved. Sheds may be open shelters or fully enclosed spaces within the building.
 4. Temporary Paving: Construct temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Comply with Division 2 Section "Hot-Mixed Asphalt Paving."
 - a. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
 - 1) Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.
 - b. Delay installation of the final course of permanent paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.

- c. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.
5. Dewatering Facilities and Drains: For temporary drainage and dewatering operations not directly associated with construction, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain excavations and construction free of water.
6. Temporary Enclosures: Provide temporary enclosures for protection of construction from exposure, foul weather, other construction operations, and similar activities. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions.
 - a. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. (2.3 sq. m) or less with plywood or similar materials.
 - b. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
7. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees.
8. Temporary Elevator Use: Refer to Division 14 Sections for elevators.
9. Project Signs: Install project identification and other signs where indicated to inform the public and persons seeking entrance to the Project. Support on framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs. Engage an experienced sign painter to apply graphics. Comply with details indicated.
10. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
11. Waste Collection and Disposal: Collect waste daily. Comply with requirements of NFPA 241. Enforce requirements strictly. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
 - a. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80° F (27° C).
12. Pest Control: Retain an exterminator or pest control company to perform extermination and control procedures at regular intervals so the Project will be free of pests at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
13. Stairs: Provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

- D. Security and Protection Facilities Installation: Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion.
1. Temporary Fire Protection: Until permanent facilities supply fire-protection needs, install and maintain temporary fire-protection facilities of types needed to protect against controllable fire losses. Comply with NFPA 10 and NFPA 241.
 - a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell. Maintain unobstructed access to fire extinguishers.
 - b. Store combustible materials in containers in fire-safe locations.
 - c. Prohibit smoking in hazardous fire-exposure areas.
 - d. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
 2. Permanent Fire Protection: At the earliest date, complete installation of the permanent fire-protection facility and place into operation and use. Instruct key personnel on use of facilities.
 3. Barricades, Warning Signs, and Lights: Comply with code requirements for erection of barricades. Paint with appropriate colors, graphics, and warning signs. Where appropriate and needed, provide lighting, including flashing red or amber lights.
 4. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates to enclose the entire site or the portion sufficient to accommodate construction.
 - a. Provide open-mesh, chain link fencing with posts set in a compacted mixture of gravel and earth.
 - b. Provide plywood fence, 8 feet (2.5 m) high, framed with four 2-by-4-inch (50-by-100-mm) rails, and preservative-treated wood posts spaced not more than 8 feet (2.5 m) apart.
 5. Covered Walkway: Erect a protective covered walkway along the adjacent public street. Coordinate with entrance gates. Comply with regulations of authorities having jurisdiction.
 - a. Construct walkways, if needed, using wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection. Extend back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner.

6. Security Enclosure and Lockup: Install temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, and theft. Provide a secure lockup where materials and equipment are of value and must be stored.
 7. Environmental Protection: Operate temporary facilities and conduct construction in ways that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making equipment to hours that will minimize complaints.
- E. Operation: Enforce discipline in use of temporary facilities. Limit availability to intended uses to minimize waste and abuse.
- F. Maintenance: Maintain facilities in operating condition until removal. Protect from damage by freezing temperatures and similar elements. Maintain temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid damage.
- G. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect during excavation.
- H. Termination and Removal: Remove each temporary facility when the need has ended, when replaced by a permanent facility, or no later than Substantial Completion. Complete or restore permanent construction delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
 2. Remove temporary paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with oil, asphalt and other petrochemical compounds, and substances that might impair growth of plant materials or lawns. Repair or replace paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
 3. At Substantial Completion, clean and renovate permanent facilities used during the construction period.
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace worn parts and parts subject to unusual operating conditions.
 - c. Replace burned out lamps.

END OF SECTION 01500

SECTION 015639

TREE CARE AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Sections.
 - 1. Section 02060 "Site Demolition" for temporary site fencing.
 - 2. Section 02100 "Site Preparation" Clearing" for removing existing trees and shrubs.
 - 3. Appendix A; Blackburn Tree Conservation Instructions.
- C. Caliper: Diameter of a trunk measured by a diameter tape at 48 inches above the ground for trees larger than 4-inch size.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line, unless otherwise indicated.
- F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of the following:
 - 1. Organic Mulch: 1-pint volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
 - 2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
 - 3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.
- C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 - 1. Species and size of tree. Large 50" Oak
 - 2. Location on site plan. Along entrance road adjacent to playfield.
 - 3. Reason for pruning. Preserve the life of the tree
 - 4. Description of pruning to be performed. See Appendix A *Blackburn Tree Instructions*.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- D. Existing Conditions: Tree is currently in the edge of the entrance road of the park and its roots spread out under the existing asphalt. Pavement has been lifted by the root growth.
 - 1. Contractor shall carefully document the existing conditions by photo or video.
 - 2. Contractor must identify any existing wounds or damage to the tree or root system that is visible or discovered during the process.

1.4 QUALITY ASSURANCE

- A. Arborist Qualifications. Licensed arborist in jurisdiction where Project is located.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed prescriptive tree care and protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Pre-prescription Care Conference: Conduct conference at Project site with arborist and landscape architect.
 - 1. Review methods and procedures related to prescriptive tree care and protection including, but not limited to, the following:
 - a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
 - b. Enforcing requirements for protection zones.
 - c. Arborist's responsibilities.
 - d. Field quality control.

1.5 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and

other objects more than 1 inch in diameter; and free of weeds, roots, and toxic and other non-soil materials.

1. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.
- B. Topsoil: Imported or manufactured topsoil complying with ASTM D 5268.
- C. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
1. Type: Wood and bark chips.
 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 3. Color: Natural.
- D. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by Architect.
1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet apart.
 - a. Height: 4 feet.
 - b. Color: High-visibility orange, nonfading.
 2. Gates: Single or Double swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches.
- E. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
1. Size and Text: As shown on Drawings.
 2. Lettering: 3-inch-high minimum, black characters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION.

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 27 inches above the ground.

- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.
 - 1. Apply 3-inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

3.3 TREE- AND PLANT-PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 50 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
- E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
 - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 - 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 02200 "Earthwork."
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:
 - 1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
 - 2. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
 - 3. Cut branches with sharp pruning instruments; do not break or chop.
 - 4. Do not apply pruning paint to wounds.
- B. Chip removed branches and spread or stock pile over areas identified by Landscape Architect or dispose of off-site. Add nitrogen to all fresh mulch to accelerate decomposition.

3.6 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.7 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.8 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed root cutting and tree and shrub repairs.
 - 2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
 - 3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
 - 4. Perform repairs within 24 hours.
 - 5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Plant and maintain new trees as specified in Section 02900 "Plants."
- C. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch-diameter

holes a minimum of 12 inches deep at 24 inches oc. Backfill holes with an equal mix of augured soil and sand.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 01600

MATERIALS AND EQUIPMENT

1.1 GENERAL

- A. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock.
1. "Named Products" are items identified by the manufacturer's product name, including make or model number or designation, shown or listed in the manufacturer's published product literature.
- B. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
- C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.
- D. Product List: A list of products required is included at the end of this Section. Prepare a schedule in tabular form showing each product listed. Include the manufacturer's name and proprietary product names for each item listed. Coordinate product list with the Contractor's Construction Schedule and Submittal Schedule.
1. Form: Prepare product list with information on each item tabulated under the following column headings:
 - a. Related Specification Section number.
 - b. Generic name used in Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 2. Within 60 days after date of commencement of the Work, submit 3 copies of the product list. Provide a written explanation for omissions of data and variations from Contract requirements.
 3. The Architect will respond within 2 weeks of receipt of the list. No response within this period constitutes no objection to listed manufacturers or products but does not waive the requirement that products comply with Contract Documents. The Architect's response will include a list of unacceptable products.
- E. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected.
- F. Nameplates: Except for required labels and operating data, do not attach manufacturer's nameplates or trademarks on surfaces exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
- G. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
1. Schedule delivery to minimize long-term storage and to prevent overcrowding construction spaces. Coordinate with installation to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 2. Deliver products in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 3. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 4. Store products to facilitate inspection and measurement of quantity or counting of units. Store heavy materials away from the structure in a manner that will not endanger the supporting construction.
 5. Store products subject to damage by the elements aboveground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

1.2 PRODUCTS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: Procedures governing product selection include the following:
1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
 2. Semiproprietary Specification Requirements: Where Specifications name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.
 - a. Where products are specified by name, accompanied by the term "or equal," comply with provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 4. Descriptive Specification Requirements: Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that provides the characteristics and otherwise complies with requirements.
 5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply and are recommended for the application. Manufacturer's recommendations may be contained in product literature or by the manufacturer's certification of performance.
 6. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
 7. Visual Matching: Where Specifications require matching a Sample, the Architect's decision on whether a product matches will be final. Where no

product in the specified category matches and complies with other requirements, comply with provisions concerning "substitutions" for selection of a matching product in another category.

8. Visual Selection: Where requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product that complies with other requirements. The Architect will select the color, pattern, and texture from the product line selected.

1.3 EXECUTION

- A. Comply with manufacturer's instructions for installation of products. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01631

SUBSTITUTIONS

1.1 GENERAL

- A. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed after award of the Contract are considered requests for substitutions. The following are not a request for substitutions:
1. Substitutions requested during the bidding period and accepted by Addendum prior to award of the Contract.
 2. Revisions to the Contract Documents requested by the Owner.
 3. Specified options included in the Contract Documents.
 4. Contractor's compliance with regulations issued by governing authorities.
- B. Substitution Request Submittal: The Architect/Engineer or Client Representative will consider requests for substitution received within 60 days after commencement of the Work.
1. Submit 3 copies of each request for substitution. Submit requests according to procedures required for change-order proposals.
 2. Identify the product or method to be replaced in each request. Include related Specification Section and Drawing numbers.
 3. Provide documentation showing compliance with the requirements for substitutions and the following information:
 - a. Coordination information, including a list of changes needed to other Work that will be necessary to accommodate the substitution.
 - b. A comparison of the substitution with the Work specified, including performance, weight, size, durability, and visual effect.
 - c. Product Data, including Drawings and descriptions of products and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the substitution on Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. Certification that the substitution conforms to the Contract Documents and is appropriate for the applications indicated.
 - h. The Contractor's waiver of rights to additional payment or time that may become necessary because of the failure of the substitution to perform adequately.

4. Architect's Action: If necessary, the Architect will request additional information within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection within 2 weeks of receipt of the request. Acceptance will be in the form of a change order.
 - a. Use the product specified if the Architect cannot make a decision within the time allocated.

1.2 PRODUCTS

- A. Conditions: The Architect will receive and consider a request for substitution when one or more of the following conditions are satisfied. Otherwise, the Architect will return the requests without action except to record noncompliance with these requirements.
 1. Extensive revisions to the Contract Documents are not required.
 2. Changes are in keeping with the intent of the Contract Documents.
 3. The specified product cannot be provided within the Contract Time. The Architect will not consider the request if the specified product cannot be provided as a result of failure to pursue the Work promptly.
 4. The request is related to an "or-equal" clause.
 5. The substitution offers the Owner a substantial advantage, in cost, time, or other considerations, after deducting compensation to the Architect for redesign and increased cost of other construction.
 6. The specified product cannot receive approval by a governing authority, and the substitution can be approved.
- B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction not complying with the Contract Documents do not constitute an acceptable request for substitution, nor do they constitute approval.

1.3 EXECUTION (Not Applicable)

END OF SECTION 01631

SECTION 01700

CONTRACT CLOSEOUT

1.1 GENERAL

- A. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.
- B. Substantial Completion: Before requesting inspection for certification of Substantial Completion, complete the following:
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the Work claimed as substantially complete.
 - a. Include supporting documentation for completion and an accounting of changes to the Contract Sum.
 - 2. Advise the Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 - 4. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 5. Deliver tools, spare parts, extra stock, and similar items.
 - 6. Changeover locks and transmit keys to the Owner.
 - 7. Complete startup testing of systems and instruction of operation and maintenance personnel. Remove temporary facilities, mockups, construction tools, and similar elements.
 - 8. Splash pad operation and maintenance training by the Splash Pad equipment provider.
 - 9. Complete final cleanup requirements, including touchup painting.
 - 10. Touch up and repair and restore marred, exposed finishes.
- C. Inspection Procedures: On receipt of a Request for Inspection, the Landscape Architect will proceed or advise the Contractor of unfilled requirements. The Landscape Architect will prepare the Certificate of Substantial Completion following inspection or prepare a Punch List to advise the Contractor of construction items that must be completed or corrected before the certificate will be issued.
 - 1. The Landscape Architect will repeat inspection when requested and assured that the Work is substantially complete.
 - 2. Results of the completed inspection will form the basis of requirements for final acceptance.

- D. Final Acceptance: Before requesting inspection for certification of final acceptance and final payment, complete the following:
1. Final payment request with releases and supporting documentation. Include insurance certificates where required.
 2. Submit a statement, accounting for changes to the Contract Sum.
 3. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
 4. Submit final meter readings for utilities, a record of stored fuel, and similar data as of the date of Substantial Completion.
 5. Submit consent of surety to final payment.
 6. Submit a final settlement statement.
 7. Submit evidence of continuing insurance coverage complying with insurance requirements.
- E. Re-inspection Procedure: The Landscape Architect will re-inspect the Work upon receipt of notice that the Work has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.
1. Upon completion of re-inspection, the Landscape Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Landscape Architect will advise the Contractor of Work that is incomplete or obligations that have not been fulfilled but are required in the form of a Punch List.
 2. If necessary, re-inspection will be repeated.
- F. Record Document Submittals: Do not use record documents for construction. Protect from loss in a secure location. Provide access to record documents for the Landscape Architect's reference.
- G. Record Drawings: Maintain a set of prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing most capable of showing conditions fully and accurately. Give attention to concealed elements.
1. Mark sets with red pencil. Use other colors to distinguish between variations in separate categories of the Work.
 2. Organize record drawing sheets into manageable sets. Bind with durable-paper cover sheets; print titles, dates, and other identification on the cover of each set.
 3. Upon completion of the work, submit one reproducible copy of the Record Drawings to the Owner.
- H. Record Specifications: Maintain one copy of the Project Manual, including addenda. Mark to show variations in Work performed in comparison with the text of the Specifications and modifications. Give attention to substitutions and selection of options and information on concealed construction. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Landscape Architect for the Owner's records.
 2. Submit complete copies of all testing data and shop drawings to the Owner.
- I. Maintenance Manuals: Organize operation and maintenance data into sets of manageable size. Bind in individual, heavy-duty, 2-inch (51-mm), 3-ring, binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include the following information:
1. Emergency instructions.
 2. Spare parts list.
 3. Copies of warranties.
 4. Wiring diagrams.
 5. Shop Drawings and Product Data.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

- A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires maintenance to provide instruction in proper operation and maintenance. Include a detailed review of the following items:
1. Maintenance manuals.
 2. Spare parts, tools, and materials.
 3. Lubricants and fuels.
 4. Identification systems.
 5. Control sequences.
 6. Hazards.
 7. Warranties and bonds.
 8. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following:
1. Startup and shutdown.
 2. Emergency operations and safety procedures.
 3. Noise and vibration adjustments.
- C. Final Cleaning: Employ experienced cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Complete the following operations before requesting inspection for certification of Substantial Completion.
1. Remove labels that are not permanent labels.

2. Clean transparent materials, including mirrors and glass. Remove glazing compounds. Replace chipped or broken glass.
 3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
 5. Clean the site of rubbish, litter, and foreign substances. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even-textured surface.
- D. Pest Control: Engage a licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.
- E. Removal of Protection: Remove temporary protection and facilities.
- F. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials and dispose of lawfully.

END OF SECTION 01700

SECTION 01740

WARRANTIES

1.1 GENERAL

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
 - 2. Refer to Section 02900 for plant material warranties.
 - 3. All conditions of this Section shall also apply to warranties stated in other sections.
 - 4' Refer to WaterSplash manual for warranties on products and materials.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- D. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- G. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise

available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 2. Where the Contract Documents require a special warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- H. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.
1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- I. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- J. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

- A. List of Warranties: As follows:
Irrigation, Planting, Fountain, Lighting, Electrical and any other products under warranty.
- B. Schedule: Provide warranties on products and installations as specified in the included Sections: Division 2, thru Division 16.

END OF SECTION 01740

CONTRACTOR WARRANTY FORM

PROJECT: CITY OF BROOKHAVEN – ASHFORD PARK IMPROVEMENTS

LOCATION: BROOKHAVEN, GEORGIA

OWNER: CITY OF BROOKHAVEN

GENERAL CONTRACTOR:

We _____, contractor

(Company Name)

for _____, as described in Specification Section (s)

(list trade)

_____ do hereby warrant

(list appropriate sections of specifications)

that all labor and materials furnished and work performed in conjunction with the above referenced project are in accordance with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials or workmanship for a period of one year from Date of Substantial Completion and that all street signs will be free from defects due to defective materials or workmanship for a period of seven years from Date of Substantial Completion.

This warranty commences at 12:00 noon on _____

and expires at 12:00 noon on _____. Should any defect develop during the warranty period due to improper materials, workmanship or arrangement, the defect shall, upon written notice by the Owner, be repaired or replaced by the undersigned at no expense to the Owner.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

DATE: _____ FOR: _____
(COMPANY NAME)

BY: _____

TITLE: _____

END OF SECTION 01740A

SUBCONTRACTOR WARRANTY FORM

PROJECT: CITY OF BROOKHAVEN – ASHFORD PARK IMPROVEMENTS

LOCATION: BROOKHAVEN, GEORGIA

OWNER: CITY OF BROOKHAVEN

SUBCONTRACTOR:

We _____, subcontractor
(Company Name)

for _____, as described in Specification Section (s)
(list trade)

_____ do hereby warrant
(list appropriate sections of specifications)

that all labor and materials furnished and work performed in conjunction with the above referenced project are in accordance with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials or workmanship for a period of one year from Date of Substantial Completion and that all street signs will be free from defects due to defective materials or workmanship for a period of seven years from Date of Substantial Completion.

This warranty commences at 12:00 noon on _____ and expires at 12:00 noon on _____. Should by any defect develop during the warranty period due to improper materials, workmanship or arrangement, the defect shall, upon written notice by the Owner, be repaired or replaced by the undersigned at no expense to the Owner.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

DATE: _____ FOR: _____
(COMPANY NAME)

BY: _____

TITLE: _____

END OF SECTION 01741

SECTION 02060

SITE DEMOLITION

PART 1 GENERAL

1.01 SCOPE

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

Due to close proximity of utilities on the roadside, some of the demolition should be performed by small lightweight equipment.

Contractor shall secure permission of City of Brookhaven before working in the ROW of Redding Road or crossing the right-of-way.

Demolition items shall consist of the removal of curb, asphalt, shelter, trees, drainage structures, and other items within the limits of construction. Relocation items shall consist of signs, fire hydrants, utility poles, and any other element within the limits of construction.

Utilities: Contractor shall notify and secure permission from utility companies effected by the demolition.

Code Compliance: Contractor shall comply with all applicable codes, ordinances, rates, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction over the project.

Demolition process and construction procedures shall not interfere with traffic on Redding Road or endanger vehicles or drivers on the street or within the park.

1.02 SUBMITTALS

The Contractor shall submit a written traffic control and safety plan, to include a detailed demolition procedure, to the Owner's Representative and Landscape Architect for approval at least ten (10) days before demolition begins. The demolition procedure shall include a detailed description of the methods and equipment to be used for each operation and the sequence of work. The demolition procedures shall provide for safe conduct of the work, and protection of the property, which is to remain undisturbed and coordination with other work or operations, which may be in progress.

1.03 PERMITS

Contractor is responsible for securing all permits necessary to demolish and dispose of all demolition items and to use local roadways for access and egress. Contractor shall secure any and all permits to allow work to be executed in the ROW of Redding Road.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 EXPLORATORY TRENCHING:

- A. In all locations where, underground utilities may exist or are known to exist, the Contractor shall dig exploratory trenches in line with proposed new utilities to discover true depth, size, and location of existing utilities before beginning utility construction.
- B. Contractor shall notify all utility companies of their excavation schedule prior to actual excavation.

3.02 DEMOLITION

- A. All site material shall be removed as necessary for construction.
- B. Utilities: The location of existing utilities is approximate and shall be field verified prior to beginning demolition. If the elevation or location is substantially different from that shown on the plans or if a conflict exists, the Landscape Architect shall be notified. Any damage or unauthorized interruption of existing utilities shall be the sole responsibility of the Contractor and shall be repaired at contractor's expense.
- C. Any element, or part thereof, remaining below grade shall be mechanically fractured so that subsurface water will freely pass through the slab or floor of the structure, and so that no void will remain after backfilling the work site to grade as shown on the Drawings.
- D. The Contractor shall be responsible for removing all existing service connections to the site and permanently plugging the pipes where required in accordance with requirements of the utility companies concerned. The Contractor shall contact all utility companies prior to beginning work to coordinate disconnection of active utilities, removal or relocation of meters and marking existing underground utilities.
- E. The Contractor will be responsible for any damage caused to other site elements and shall be held liable for any and all repairs, replacement of parts or renovations required to restore any structure, portion of structure, equipment or items, not intended for demolition. The Contractor shall restore any damaged elements to their condition prior to demolition provided the damage was result of the demolition. If the Contractor does not repair any such damage immediately, or if the repairs are not suitable to the Owner, the Owner reserves the right to have such repairs made by another party and deduct the cost of required repairs from money due Contractor.
- F. All salvageable materials shall remain the property of the Brookhaven Parks Department and shall be cleaned and stored on the Owner's property as directed by the Owner's Representative.

- G. Any underground fuel, storage, septic or other tanks encountered shall be demolished according to the most recent environmental standards.
- H. Any contaminated soils discovered on site shall be removed at owners' expense. Contractor shall report such conditions to the Landscape Architect immediately.
- I. Any materials left on the site by other construction crews shall be brought to the attention of the Owners Representative and removed per his instructions.
- J. Demolition along Redding Road ROW lines must be performed carefully and meticulously. Contractor shall protect the existing service utilities from damage.
- K. Demolition of the asphalt under the Oak trees designated to be saved shall be done in accordance with Section 015639.

3.03 DISPOSAL

- A. All materials, which are not delivered to the Owner as specified above, shall become the property of the Contractor, and shall be demolished, moved or otherwise disposed of at the option of the Contractor by a method approved by the Owner. All debris shall be disposed of off-site by the Contractor. No burial, salvage or sale of demolished materials on site will be allowed.
- B. All demolished elements and materials shall be removed from the work site by the Contractor.
- C. All demolished elements and materials, which are either left in place or removed to the disposal site shall be in a non-hazardous condition.
- D. Manhole frames and covers to be removed are the property of the Owner and shall be delivered to a place designated by the Owner's Representative.
- E. Poles, transformers, equipment that belongs to respective utility companies and designated for removal or salvage shall be delivered to the respective utility company.
- F. All items marked salvage shall be removed and delivered to the county parks maintenance facility for storage.
- G. All unusable rock excavated on the site shall be removed and disposed of according to local codes and regulations.

3.04 COORDINATION:

- A. Demolition of curbs and asphalt on Redding Road shall be carefully coordinated to avoid danger for vehicles on the street.

- B. Traffic Control and Safety: Contractor shall work with City of Brookhaven and local Police officials to prepare a traffic control and safety plan and process for the execution of work along Redding Road. Traffic Control plan may be provided to the Owner after the contractor is selected.

END OF SECTION 02060

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Conditions of Section 02112 Tree Protection and Clean Up shall apply to this section. Related Sections 02060 Demolition, 02540 Erosion and Sediment Control,

1.2 SCOPE:

- A. This Section describes materials and equipment to be utilized and requirements for their use in preparing the work site for construction. The Contractor shall furnish all materials, equipment and labor necessary to complete the work. Precautionary measures that prevent damage to existing trees and other site features to remain are part of the Work.
- B. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.
- C. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.
- D. Construction Access shall conform to all erosion control protection requirements.
- E. Contractor shall always maintain reasonable access to the park for use of the citizens.
- F. Contractor shall coordinate with the Owner's Representative to be aware of special events taking place in the park and to take reasonable measures to accommodate the events.

1.3 CLEARNG AND GRUBBING:

- A. Within the limits schematically identified on the Drawings, the site will be cleared and grubbed to prepare for construction.
- B. The Contractor shall verify existing conditions on the site, and examine all adjoining roadways to the site, which in any way may affect completion of the work. Report to the Landscape Architect or Owner's Representative in writing any condition which will prevent the proper performance of the proposed site construction work. The site premises shall be accepted as found. The Landscape Architect and Project Engineer assume no responsibility for conditions of the site.

C. Clearing:

1. All vegetable growth such as trees, shrubs, brush, logs, upturned stumps and roots of down trees, and all other similar debris shall be removed where shown on the Drawings and disposed of properly by the Contractor as specified below. Cultivated growth shall be removed and trees felled as necessary within the limits of construction work site and as indicated on the drawings.
2. Any construction activities, including trench excavation and fill compaction, which could detrimentally impact existing trees larger than 10-inch diameter (defined as DBH) or their root systems shall be reviewed by and coordinated with the Landscape Architect and City Arborist.
3. Where the tree limb structure interferes with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the appropriate utility.
4. All buildings, fences, lumber piles, trash and obstructions, except utility poles, shall be removed as noted on the Drawings and disposed of by the Contractor. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.
4. All paving and curbs adjoining any excavation area or embankment that may be damaged or buried shall be carefully removed, stored and replaced.
5. All trees that are designated to be saved but the roots have been damaged shall have their exposed roots carefully cut using a hand-held saw. The exposed end of the roots shall be coated with Orange Shellac and covered with aged hardwood mulch.

D. Grubbing:

Remove all stumps, roots and root clusters having a diameter of one inch or larger to a depth of at least two feet below subgrade elevation for concrete structures and at least one foot below the subgrade under walks, paving and in areas to receive landscape planting.

E. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of properly by the Contractor as specified below. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and walkways or two feet below finish grade, whichever is lower. Refer to Section 02112 of the specifications for additional requirements.

F. Tree Protection fencing shall be kept in good order. See detail on drawings.

1.4 TESTING AND INSPECTION SERVICES:

- A. Soil testing will be performed by an independent testing laboratory approved by the Owner. Payment for soil testing shall be made by the Owner.
- B. The soils testing laboratory is responsible for the following:
 - 1. Compaction tests in accordance with ASTM D 698.
 - 2. Field density tests for each one-foot of lift; one test for each 2,500 square feet of fill.
 - 3. Inspecting and testing stripped site, subgrades and proposed fill materials.
- C. The Contractor's duties relative to testing include:
 - 1. Notifying the laboratory of conditions requiring testing.
 - 2. Coordinating with the laboratory for field-testing.
 - 3. Providing representative fill soil samples to laboratory for test purposes. Provide 50-pound samples of each fill soil.
 - 4. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.
- D. Inspection:
 - 1. Earthwork operations, suitability of excavated materials for fill and backfill, and placing and compaction of fill and backfill is subject to inspection. The Geo-Technical Engineer will observe earthwork operations and provide recommendations as necessary for subgrade improvement.
 - 2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer to verify suitable bearing and construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Maintain benchmarks, monuments and other reference points. Re-establish, at no cost to the Owner, any such reference points if disturbed or destroyed.
- B. Maintain tree protection fencing and erosion control fencing.

3.2 CLEARING:

- A. Clear areas required for access to site and execution of the work.
- B. Remove trees and shrubs within the area to be cleared. All trees to be saved within the grading limits are shown on the Drawings. Coordinate removal of trees and shrubs with the Landscape Architect or Owner's Representative.

3.3 STAKING:

- A. The Contractor shall stake the entire site, both as to location of major construction items as well as finish grades. This stakeout may be accurate or rough, depending on the Contractor's preference. See Paragraph 1.6 of Section 01010 Supplemental Conditions.
- B. The purpose of the staking, with inspection and adjustment by the Landscape Architect, is to adapt the design to the site rather than allow the design to be forced upon the site. Staking is subject to various degrees of adaptation, which can only be determined by the Landscape Architect. This variation is an aesthetic decision; the amount of adjustment most often is determined by the existing trees, terrain, and soil conditions sub-surface water and by other intangibles, which are impractical to survey in absolute accuracy.
- C. The Contractor shall notify the Landscape Architect and Owners Representative at least three (3) working days before inspection of the stakeout must be made. During the inspection the Landscape Architect will adjust the stakeout as necessary to fit the trees, topography and all other objects and conditions on the site. At this time, the Landscape Architect will clearly mark all perimeter trees and other vegetation to be removed. This staking-inspection process must take place prior to any tree removal, grading, construction, or any other work on the site.
- D. During the inspection, the Contractor shall be at the site along with the person who will superintend the work under this contract.
- E. The staking-inspection process shall be repeated for any work not staked and approved or adjusted during the first site visit. No work shall ever be done without the stakeout first being adjusted and approved by the Landscape Architect. All alignment, dimensions and elevation of any grading, excavation, construction and planting is subject to adjustment to save trees and other vegetation.

3.4 TOPSOIL REMOVAL:

- A. Topsoil is defined as a friable sandy loam surface soil found at a depth of not less than 4". Satisfactory topsoil is reasonable free of subsoil, clay lumps, stones, roots, debris, and other objects over 2" in diameter.
- B. Topsoil of reusable quality shall be stripped from the site to be cleared, cleaned of objectionable materials and stockpiled on site for reuse in turf and plant bed areas.
- C. Where trees are to remain standing, stop topsoil stripping a sufficient distance from such trees to prevent damage to the main root system.

- D. Topsoil shall be stockpiled in storage piles where directed by the Owner and Landscape Architect. It shall not be stockpiled under trees or over constructed elements. Construct piles to drain freely of surface water. Cover piles, if necessary, to prevent erosion and dust.

3.5 DISPOSAL OF REFUSE:

- A. The refuse resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream, body of water, or in any street or ditch. In no case shall any material be left on the site or shoved onto abutting private properties.
- B. Contractor may not dispose of refuse by burning or burial on site. All refuse must be removed and properly disposed of offsite.
- C. This is an active park and the contractor shall take great care to not damage any of the site outside the construction limits nor dispose of refuse materials on the site.

3.6 STAGING AREA:

Several site locations may be available to the Contractor for use in staging and storage within the Park. These sites must be pre-approved by the Owner prior to utilization.

END OF SECTION 02100

SECTION 02112

TREE PROTECTION AND CLEANUP

PART 1 GENERAL

1.01 SCOPE

- A. Tree Protection, selective site clearing, and pruning shall be accomplished in all areas to be graded or covered by new construction. Operations include but are not limited to the following:
 - 1. Staking of the plan on the site, removal of existing vegetation, selective pruning as directed by the Landscape Architect or City Arborist in the field, removal of miscellaneous structures, topsoil stripping, protection of existing trees designated to remain, erosion control and facilities protection.
 - 2. Woodland pruning and clearing within the limits of work as defined on the construction documents and drawings.
 - 3. See Section 015639 – Tree Care and Protection for treating existing trees.
 - 4. See Appendix A of the Project Manual: Blackburn Tree Conservations Instructions.

1.02 QUALITY ASSURANCE

- A. Code Compliance: The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.
- B. Qualification of the Workmen: The Contractor shall provide at least one person who shall be present always during tree clearing and grubbing operations and who shall direct the trimming of roots and limbs where required. The Contractor shall provide at least one person who is qualified in the various other trades involved including demolition, protection of property and erosion control.

1.03 JOB CONDITIONS

- A. Dust Control: Use all means necessary to prevent the spread of dust during performance of the work of this Section. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the work on the site and surrounding areas.
- B. Erosion Control: Install and maintain berms, swales and bales as required to trap waterborne soil particles. As work progresses, relocate and/or add to erosion control system as necessary.
- C. Protection: Use all means necessary to protect existing objects designated to remain and, in the event of damage, immediately make all repairs and replacements necessary to the approval of the Landscape Architect or Owner's Representative at no additional cost to the Owner.

- D. Tree Protection: Protect existing trees and other vegetation indicated to remain in place with county approved tree protection fencing set to the critical root zone of trees to be saved. Protect existing trees against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fences, barricades, or guards as required to protect trees and vegetation to be left standing.
- F. Water existing trees and other vegetation, which are to remain and are within the limits of the contract work as required to maintain their health during the course of construction operations. Trees should have a minimum of 1" of water per week under the drip line of the trees either by natural rainfall or supplemental watering by the Contractor.
- G. Provide protection for roots over 1 1/2" diameter that are cut during construction operation. Coat any cut faces with emulsified asphalt, or other acceptable coating, especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots with wet burlap to prevent from drying out; provide earth cover as soon as possible.
- H. Repair or replace trees and vegetation damaged by construction operations, in a manner acceptable to the Landscape Architect. Tree damage repair shall be performed by a qualified tree surgeon. Replace trees, which cannot be repaired and restored to full-growth status, as determined by the tree surgeon.
- I. Protect tree root system from damage due to deleterious materials in solution caused by run-off or spillage during mixing of construction materials or drainage from stored materials. Protect root system from flooding, erosion or excessive wetting resulting from de-watering operations.

PART 2 PRODUCTS

2.01 TEMPORARY BARRICADES:

- A. Unless otherwise approved by the Landscape Architect or City Arborist, use only new and solid lumber of utility grade or better to construct temporary barricades around trees and areas designated to remain undisturbed.

2.02 PRUNING PAINT:

- A. Use only a pruning paint specifically formulated for horticultural application to cut or damaged plant tissue and approved by the Landscape Architect for use on this work. Preferably, use 'Orange Shellac' as pruning paint when available.

PART 3 EXECUTION

3.01 SITE INSPECTION:

- A. Prior to any work of this section, carefully inspect the entire site and all objects designated to be removed and all objects to be preserved. Locate all existing utility lines traversing the site and determine the requirements for the protection of those designated to remain.

3.02 SCHEDULING:

- A. Schedule all work in a careful manner with all consideration for neighbors and the general public, in conformance with local noise ordinances.
- B. Notify the Landscape Architect at least five (5) full working days prior to commencing any work of this section.

3.03 DISCONNECTION OF UTILITIES:

- A. Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed, performing all such work in accordance with the requirements of the utility company or agency involved.

3.04 STAKING: See Section 01010 Supplemental Conditions paragraph 1.6.

- A. All lines, grades, levels and benchmarks shall be established and maintained by the Contractor.
- B. Before commencing any work, the Contractor shall verify all grades, lines, levels and dimensions as indicated on the Drawings. He shall report any errors or inconsistencies to the Landscape Architect and Owner's Representative before commencing work.
- C. The Contractor shall stake the entire site, both as to location of all construction items as well as finish grades. This stakeout may be accurate or rough, depending on the Contractor's preference. This stakeout may be made early in the construction process and preserved for reference during construction.
- D. The purpose of the staking, with inspection and adjustment by the Landscape Architect, is to adapt the design to the site rather than allow the design to be forced upon the site. Staking is subject to various degrees of adaptation, which can only be determined by the Landscape Architect. This variation is an aesthetic decision, the amount of adjustment most often determined by the existing trees, terrain, soil conditions, sub-surface water and by other intangibles which are impractical to survey in absolute accuracy.
- E. The Contractor shall notify the Landscape Architect at least five (5) working days before inspection of the stakeout must be made. During the inspection the Landscape Architect will adjust the stakeout as necessary to fit the trees, topography and all other objects and conditions on the site. At this time the Landscape Architect will clearly mark all trees and other

vegetation to be removed. This staking-inspection process must take place prior to any tree removal, grading, construction, or any other work on the site.

- F. During the inspection, the Contractor shall be at the site along with the person who will superintend the work under this contract.
- G. The staking-inspection process shall be repeated for any work not staked and approved or adjusted during the first site visit. No work shall ever be done without the stakeout first being adjusted and approved by the Landscape Architect. All alignment, dimensions and elevation of any grading, excavation, construction and planting is subject to adjustment to save trees and other vegetation.

3.05 DEMOLITION:
See Section 02060

3.06 MULCH:

- A. 1" topping of pine straw shall be placed as mulch in all disturbed areas within the limits of the work without digging into or breaking up the surface roots of trees.
- B. Trees to be protected shall have a 3" layer of aged hardwood mulch covering their root zones out to the driplines.

3.07 CLEARING:

- A. Clear the site of brush, rubbish, grass, weeds and any other plants designated by the Landscape Architect to be removed. No trees shall be removed, or limbs and roots cut without prior approval of Landscape Architect or Owner's Representative.
- C. Remove all stumps, roots and root clusters having a diameter of one inch or larger to a depth of at least two feet below subgrade elevation for concrete structures and at least one foot below the subgrade under walks, asphalt roadway and in areas to receive heavy grading. Do not remove stumps in areas to remain natural.

3.08 GRADING:

- A. Grading shall be kept at a minimum order to reduce the impact of the construction on the natural systems. All grading work shall be confined to the limits of construction work.
- B. Contractor shall use equipment and tools that do not expand beyond the limits of construction.
- C. Disruption of the existing grade should be kept at a minimum and fill used whenever possible to create uniform surfaces for paved surface materials. No form of root rake shall be used.
- D. Near existing trees, grading work should be kept to hand labor and tools rather than heavy machinery.

- E. Vehicles may not turn or park under the tree preservation areas.
- F. Staging and operations may occur in the open areas where there are no trees. Any damage to existing lawn grasses as a result of construction operations shall be repaired.

3.09 FILL PLACEMENT OVER TREE ROOTS:

- A. Where fill dirt is necessary to establish acceptable finished grades over tree roots, contractor shall use the following method:
 1. Rake away the existing mulch and humus.
 2. Cover the area with #57 stone to within 3" of finish grade.
 3. Lay filter fabric over top of the #57 Stone
 4. Lay 3" of Topsoil over the filter cloth.
 5. Cover the topsoil with 3" of pine straw or aged hardwood mulch.

3.10 EROSION CONTROL:

- A. Install erosion control measures (i.e. silt fencing, rip rap, straw bales, check dams) as necessary during construction to prevent erosion of disturbed areas and prevent damage to downstream property from runoff and silt.

3.11 SILT CONTROL:

- A. Prior to any grading or on-site construction, the Contractor shall install silt barriers in all adjacent locations necessary to prevent eroded material from silting paved areas, creeks and adjacent lots.

3.12 CLEANUP:

- A. Contractor shall be responsible for removing all rubbish, refuse, soil, waste, and other products or elements resulting from the construction effort.
- B. All the natural mulch areas disturbed by the construction activity shall be repaired by raking back to natural grade and covering with 1"-layer pine straw mulch. All pruning rubbish shall be removed from the site or ground and spread as mulch in the natural areas.

END OF SECTION 02112

SECTION 02125B

**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
(NPDES) COMPLIANCE**

PART 1 - GENERAL

1.01 SCOPE

- A. The work specified in this Section consists of the following under the requirements for Authorization to Discharge under the National Pollutant Discharge Elimination System (NPDES), Storm Water Discharges Associated with Construction Activities, under the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD).
- Notice of Intent (N.O.I.) – Electronic submittal to EPD by Owner
 - Updates to the Erosion, Sedimentation, and Pollution Control (ES&PC) Plan – By Landscape Architect
 - Comprehensive Monitoring Plan (CMP) – By Landscape Architect
 - Compliance Inspections and Monitoring – By Contractor
 - Notice of Termination (N.O.T.) – By Owner after appraisal of site by Landscape Architect.

1.03 QUALITY ASSURANCE

- A. Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.
- B. Provide all materials and promptly take all actions necessary to monitor, document and achieve effective erosion and sedimentation control in accordance with the National Pollutant Discharge Elimination System (NPDES), Storm Water Discharges Associated with Construction Activities, under the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD) and these Specifications.
- C. The temporary and permanent erosion and sedimentation control measures shown on the Erosion, Sedimentation, and Pollution Control (ES&PC) Plan are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation shall be updated on the ES&PC Plan and submitted to the Designer for approval by the Contractor at no additional cost to the Owner.

PART 2 - EXECUTION

2.01 NOTICE OF INTENT

- A. Issuance of the Notice of Intent (N.O.I.) and other related requirements is the responsibility of the Owner.

2.02 EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN UPDATES

- A. Project Civil Engineer has prepared the ES&PC Plan for the Discovery Boulevard Property Improvements in accordance with Georgia's new NPDES Permit for Storm Water Discharges Associated with Construction Activities. To meet the requirements of the permit, the Project Civil Engineer that prepared the ES&PC Plan has provided the required Engineer's certification on the plans.
- B. Upon direction from the Owner's Representative, the Project Civil Engineer will conduct the initial inspection of the Best Management Practices (BMPs) for the construction site. The permit requires that the Engineer certifying the ES&PC Plan must also perform the initial BMP inspection.
- C. Per the NPDES regulations, the ES&PC Plan is a dynamic document. The project Civil Engineer is responsible for updating the ES&PC Plan if needed. Major changes and amendments to the ES&PC Plan must be certified by a licensed professional engineer, including changes in design, construction, operation, or maintenance which has a significant effect on the potential for the discharge of pollutants to waters of the state. Appropriate Certification of the ES&PC Plan site change updates shall be the responsibility of the General Contractor and the project Civil Engineer.

2.03 COMPREHENSIVE MONITORING PLAN

- A. The Contractor shall prepare the Comprehensive Monitoring Plan (CMP), as required under the NPDES permit. The purpose of the CMP is to define the methods used to monitor performance of on-site BMPs and storm water runoff. The plan shall include sampling strategies and monitoring locations for the site, along with details of the record keeping and reporting requirements applicable to the site. The plan shall also include example record keeping and reporting forms to assist with the documentation necessary to maintain compliance under the permit. The CMP shall be provided in an oversized 3-ring binder, and all records and inspection logs kept in a central on-site location.
- B. Per the NPDES regulations, the CMP is a dynamic document and major changes and amendments to the Plan, such as changing sampling locations, must be certified by a licensed professional. The Contractor who prepared the CMP will be responsible for updating and certifying the CMP.

2.04 ON-SITE COMPLIANCE INSPECTIONS AND MONITORING

- A. The Contractor shall provide daily, weekly, monthly, and rainfall dependent BMP inspections and associated storm water monitoring, as required under the permit. According to the permit, inspections and monitoring shall be conducted by "Qualified Personnel" under the supervision of the Primary Permittee. For this project, the Contractor is the Operator and shall perform all daily inspections and BMP maintenance. A summary of inspections required under the permit, are as follows.
- B. Daily - Daily inspections must be conducted of petroleum storage usage and handling areas and construction entrances/exits by "Qualified Personnel". In addition, daily rainfall data must be recorded.
- C. Weekly - Qualified personnel shall inspect site BMPs at least once every 7 calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater.
- D. Monthly - Inspections are required monthly until a N.O.T. is submitted for areas that have undergone final stabilization.
- E. Qualifying Rainfall Event - Sampling after each qualifying rainfall event is required until the N.O.T. is submitted with the final sampling data. Qualifying sampling events as measured by the on-site rain gauges provided by the Contractor and monitored by the Owner, are defined under Section 6, subsection d.3. of the General NPDES Permit No. GAR100001, effective August 1, 2018.
- F. All monitoring results will be recorded onto appropriate forms and provided in the CMP binder, so all records and inspection logs can be kept in a central on-site location. All monitoring results shall also be submitted monthly to Georgia Environmental Protection Division (EPD) as required under the permit.

2.05 NOTICE OF TERMINATION

- A. At completion of construction, the Contractor is responsible for preparing and submitting the N.O.T. form. The N.O.T must be approved by the Designer/Landscape Architect before submittal. Final acceptance of this project by the Cobb County PARKS will not be issued until the N.O.T. requirements have been satisfied.

END OF SECTION 02125B

SECTION 02125

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE:

- A. Work described in this section includes the containment of sediment transport, control of erosion and treatment of pollutants prior to, during and throughout all construction operations; establishment of permanent vegetative cover and continued maintenance of said measures in accordance with Part III, paragraph 3.4 of this section.
- B. This Section also specifies removal of temporary erosion and sedimentation controls.
- C. Temporary and permanent erosion and sedimentation controls include grassing and mulching of disturbed areas and structural barriers at those locations, which will ensure that erosion during construction will be maintained within acceptable limits. Acceptable limits are as established by the Georgia Erosion and Sedimentation Control Act of 1975, as amended, Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations and laws of local, state, and municipal authorities having jurisdiction. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor.
- D. Land disturbance activity shall not commence until a Land Disturbance Permit has been issued by governing authority.
- E. All control measures shown on the Drawings are to be considered the minimum required; additional measures may be required. Provide same as required.
- F. Contractor is solely responsible for protection of downstream properties from encroachment or damage from soil erosion and/or the discharge of pollutants by water or air to any areas off the Project site.

1.02 SUBMITTALS:

- A. Four complete copies of engineering data, including shop drawings, for all products shall be submitted to the Landscape Architect and Engineer for approval.
- B. Schedule of operations: Submit schedule of exact dates operations including program of erosion, sediment and pollution control measures, maintenance of all said measures including control facilities, structures and devices and vegetative practices. Show anticipated starting and completion dates for land-disturbing activities including excavation, filling and rough grading, finished grading, construction of temporary and permanent control measures, and disposition of temporary erosion sediment and pollution control measures.

1.03 PROJECT CONDITIONS:

- A. Furnish and install all control measures prior to or concurrent with any land disturbance activity. The Contractor is responsible for the initial provision and installation of all control measures and then the continued provision and installation of all measures throughout all construction operations and all sequences of construction operations.
- B. Schedule grading operations to allow permanent erosion control to take place in the same construction season. Avoid or minimize exposure of soils to winter weather. Maintain all controls until vegetative cover has been established.
- C. Construct and maintain temporary control measures until such time as permanent measures are effective in control of erosion, sediment and pollution from the site. Extent of measures shall be responsibility of Contractor.
- D. Stop all erosion, sediment or pollution from leaving the site and encroaching on downstream or surrounding properties.
- E. Temporary grassing shall be applied to all disturbed areas left idle for 72 hours.
- F. Contractor is responsible for all quantities of all control measures regardless if shown on the Drawings. The extent of soil erosion control measures shown on the Drawings should be considered minimum.
- G. All expenses related to the removal, relocation, replacement and/or rerouting of any and all existing utilities or other built, stored, stockpiled items of any kind, surface or subsurface is the responsibility of the contractor and will be included in the Contract Sum.

1.04 QUALITY ASSURANCE:

- A. Procedures shall comply with "Manual for Erosion and Sediment Control in Georgia", latest edition published by the Georgia Soil and Water Conservation Committee." Contractor is required to keep a log book on site documenting his inspection of all control devices (minimum once/week and within 24 hours of any storm event) and noting any corrections or modifications. General Contractor must also file a "Notice of Termination" when the site is finally stabilized, and all stormwater management systems have been constructed and have been proven to be functioning in accordance with the Design Concept(s).
- B. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at no additional cost to the Owner
- C. Reference the Drawings for any other procedural manuals, publications, permits or other field guidelines required for the Contractor to obtain, understand and utilize in the performance of his work. Be reference of same, said materials are made a part of these Specifications.
- D. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. Any additional erosion and sedimentation control

measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at no additional cost to the Owner.

- B. Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.
- C. Provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Georgia Erosion and Sedimentation Control Act of 1975 as amended (OCGA §12-7-1, et. seq.), local ordinances, other permits, local enforcing agency guidelines and these Specifications.
- D. Basic Principles:
 - 1. Coordinate the land disturbance activities to fit the topography, soil types and conditions.
 - 2. Minimize the disturbed area and the duration of exposure to erosive elements.
 - 3. Provide temporary or permanent stabilization to disturbed areas immediately after rough grading is complete.
 - 4. Safely convey run-off from the site to a stable outlet to prevent flooding and damage to downstream facilities resulting from increased runoff from the site.
 - 5. Retain sediment on-site that was generated on-site.
 - 6. Minimize encroachment upon watercourses.
- E. Implementation:
 - 1. The Contractor is solely responsible for the control of erosion within the Project site and the prevention of sedimentation from leaving the Project site or entering waterways.
 - 2. The Contractor shall install temporary and permanent erosion and sedimentation controls, which will ensure that runoff from the disturbed area of the Project site shall pass through a filter system before exiting the Project site.
 - 3. The Contractor shall provide temporary and permanent erosion and sedimentation control measures to prevent silt and sediment from entering any waterways and any designated wetland areas.
 - 4. The Contractor shall limit land disturbance activity to those areas shown on the Drawings.
 - 5. The Contractor shall maintain erosion and sedimentation control measures within disturbed areas on the entire site at no additional cost to the Owner until the final acceptance of the Project. Maintenance shall include mulching, re-seeding, clean out of sediment barriers and sediment/detention ponds, replacement of washed-out or undermined rip rap and erosion control materials, to the satisfaction of the Owner and Landscape Architect.

PART 2 - PRODUCTS

2.01 SEDIMENT BARRIER:

- A. Silt Fence:
 - 1. Type A silt fence shall meet the requirements of Section 171 of the Georgia Department of Transportation Standard Specifications, latest edition.
 - 2. Type C Silt Fence is a combination of Type A silt Fence with woven wire reinforcement. Type C Silt Fence reinforcement shall meet the requirements of Section 171 of Georgia D.O.T. Specifications. Netting shall be ½ - inch, galvanized steel, chicken wire mesh.
 - 3. Silt fence fabric shall be an approved product on the Georgia DOT Qualified Product List No. 36, latest edition.
- B. Hay Bales: Hay bales shall be clean, seed-free cereal hay, rectangular in shape and contain five cubic feet or more of material.
- C. Concrete Blocks: Concrete blocks shall be hollow, non-load-bearing type.
- D. Plywood shall be 3/4-inch thick exterior type.
- E. Filter stone shall be crushed stone conforming to Georgia Dept. of Transportation Table 800.0IH, Size Number 3.
- F. Erosion Control socks to be used where tree roots should not be cut by silt fence trencher.

2.02 CONSTRUCTION EXIT STONE:

- A. Use sound, tough, durable stone resistant to the action of air and water. Slabby or shaley pieces will not be acceptable, aggregate size shall be in accordance with the National Stone Association Size R-2 (1.5 to 3.5-inch stone) or Type 3 riprap stone conforming to Section 805.01 of the Georgia Department of Transportation Standard Specifications.

2.03 CONCRETE:

- A. Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94.

2.04 RIP RAP:

- A. Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and unless noted otherwise, stone riprap shall be Type 1.
 - 1. Type 1 Rip Rap: Size and gradation shall conform to Section 805.01 of the Georgia DOT Standard Specification for Type 1 Stone Dumped Rip Rap.
 - 2. Type 3 Rip Rap: size and gradation shall conform to Section 805.01 of the Georgia DOT Standard Specifications for Type 3 Stone Dumped Rip Rap.
 - 3. River Stone: Where designated Contractor shall use river stone comparable to Type 1.

2.05 PLASTIC FILTER FABRIC:

- A. All plastic filter fabric shall conform to the Georgia Department of Transportation Standard Specifications, Section 881.06 for non-woven filter fabrics on most applications for this project, except for underneath riprap areas or stone construction entrances.
- B. A plastic filter fabric shall be an approved product on the Georgia Department of Transportation Qualified Product List No. 28, latest edition.
- C. Filter fabric for silt fences shall be a 36" Georgia DOT approved pervious sheet of synthetic polymer filaments non-woven from continuous filaments with wire fence backing. Filter fabric shall be of type recommended by its manufacturer for the intended application. The filter fabric shall meet the following requirements:
 - 1. APS 600 Series Silt Stop, as manufactured by Applied Polymer Systems, Woodstock, Georgia, Contact Steve Iwinski (678) 494-5998.
 - 2. GeoPolymer as manufactured by GeoStop.
 - 3. Soil Mulch Polymer as manufactured by Soil Mulch.
- D. Polymer shall be applied utilizing a hydro seeder mix of appropriate seed, fertilizer, lime and mulch for the same acre or without seed/fertilizer/lime/mulch mix.
- E. Follow all manufacturers' instructions and recommendations. Do not mechanically disturb treated areas after application. (This does not include foot traffic as necessary to install erosion control blanket).
- F. Contractor shall furnish and install as necessary a minimum 200 lbs. of erosion control polymer for incidental "touch-up" or "point source erosion areas".
- G. Furnish two forms of synthetic polymer:
 - 1. Emulsion polymer for hydro seeder application with 30% active strength.
 - 2. Powder polymer for hand spreading with an active strength of 95%.

2.06 GRASSING:

- A. Grassing materials shall meet the requirements of the following sections of the Georgia Department of Transportation Standard Specifications, latest edition:

Material	Section
Topsoil	893.01
Seed and Sod	890
Fertilizer	891.01
Agricultural Lime	882.02
Mulch	893.02
Inoculants	893.04

- B. Seed species shall be provided as shown on the Drawings.

- C. Mulch Binder: Mulch on slopes exceeding 3 (horizontal) to 1 (vertical) shall be held in place by the use of a mulch binder, as approved by the Project Landscape Architect. The mulch binder shall be non-toxic to plant and animal life and shall be approved by the Project Landscape Architect.
- D. Water: Water shall be free of excess and harmful chemicals, organisms and substances, which may be harmful to plant growth or obnoxious to traffic. Salt or brackish water shall not be used. Water shall be furnished by the Contractor.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Temporary and permanent erosion and sedimentation control measures shall prevent erosion and prevent sediment from exiting the site. If, in the opinion of the Owner or Project Landscape Architect, the Contractor's temporary erosion and sedimentation control measures are inadequate, the Contractor shall provide additional maintenance for existing measures or additional devices to control erosion and sedimentation on the site at no additional cost to the Owner.
- B. All erosion and sedimentation control devices and structures shall be inspected by the Contractor at least once a week and immediately after to each rainfall occurrence. Any device or structure found to be damaged shall be repaired or replaced by the end of the day.
- C. All erosion and sedimentation control measures and devices shall be constructed and maintained as indicated on the Drawings or specified herein until adequate permanent disturbed area stabilization has been provided and accepted by the Project Landscape Architect. Once adequate permanent stabilization has been provided and accepted by the Project Landscape Architect, all temporary erosion and sedimentation control structures and devices shall be removed.

3.02 TEMPORARY EROSION CONTROL DEVICES:

- A. Construct temporary sediment barriers of silt fence at all points where surface water flows from construction area bypassing a temporary sediment traps if the area is subject to soil erosion; or as otherwise indicated on Drawings or as deemed necessary by inspectors.
- B. Install temporary sediment traps and temporary sediment basins in accordance with the location and details shown on the Drawings. Remove accumulated sediment when they are one-third full of silt continually until permanent vegetative cover is established.
- C. Install construction exit as indicated on Drawings. Maintain to prevent tracking and flow of mud onto public roads.

- D. Construct diversion berms, dikes (2'-0" wide x 1'-6" tall) or ditches at the tops of all slopes or otherwise indicated on the Drawings. Machine compact these elements and plant temporary seed until permanent vegetative cover can be established.
- E. Maintain temporary barriers until permanent erosion control measures are established. Repair and replace barriers damaged or displaced by construction activity

3.03 SEDIMENT CONTROL:

A. Construction Exit:

1. Construction exit(s) shall be placed as shown on the Drawings and as directed by the Project Landscape Architect. A construction exit shall be located at any point traffic will be leaving a disturbed area to a public right-of-way, street, alley, sidewalk, or parking area.
2. Placement of Construction Exit Material: The ground surface upon which the construction exit material is to be placed shall be prepared to a smooth condition free from obstructions, depressions or debris. The plastic filter fabric shall be placed to provide a minimum number of overlaps and a minimum width of one foot of overlap at each joint. The stone shall be placed with its top elevation conforming to the surrounding roadway elevations. The stone shall be dropped no more than three feet during construction.
3. Construction Exit Maintenance: The Contractor shall regularly maintain the exit with the top dressing of stone to prevent tracking or flow of soil onto public rights-of-way and paved surfaces as directed by the Project Landscape Architect.
4. Construction Exit Removal: Construction exit(s) shall be removed and properly disposed of when the disturbed area has been properly stabilized, the tracking or flow of soil onto public rights-of-way or paved surfaces has ceased and as directed by the Project Landscape Architect.

B. Sediment Barriers:

1. Sediment barriers shall include, but are not necessarily limited to, silt fences, hay bales, and any device, which prevents sediment from exiting the disturbed area.
2. Silt fences and hay bales shall not be used in any flowing stream, creek or river.
3. Sediment barriers shall be installed as shown on the Drawings and as directed by the Owner or Project Landscape Architect.
4. Sediment barriers shall be maintained to ensure the depth of impounded sediment is no more than one-half of the original height of the barrier or as directed by the Project Landscape Architect. Torn, damaged, destroyed or washed-out barriers shall be repaired, reinforced or replaced with new material and installed as shown on the Drawings and as directed by the Owner or Project Landscape Architect.
5. Sediment Barrier Removal:
 - a. Sediment barrier shall be removed once the disturbed area has been stabilized with a permanent vegetative cover and the sediment barrier is no longer required as directed by the Project Landscape Architect.
 - b. Accumulated sediment shall be removed from the barrier and replaced and stabilized on site as directed by the Owner or Project Landscape Architect.
 - c. All non-biodegradable parts of the barrier shall be disposed of properly.

- d. The disturbed area created by barrier removal shall be permanently stabilized.
- C. Sediment Boxes: All inlet grates shall be covered with sediment boxes during grading operations and shall remain so covered until all open areas are permanently stabilized against erosion.

3.4 GROUND COVER

- A. Protect all exposed soils with mulching (temporary measure) and vegetative ground cover (permanent measure).
- B. Ground cover consists of temporary seeding on all graded areas which will not receive final grading or permanent planting within three (3) days.
- C. All grassing or planting operations shall include mulching as stabilization until ground cover by planting is effective.
- D. Reseed as required until full vegetative coverage is established.

3.5 MAINTENANCE

- A. Inspect all control elements after each rainfall event and a minimum of every two (2) weeks when no rainfall event(s) occur. Clear all debris and accumulated sediment from behind barriers when half full so their functional capacity is not reduced. Repair and replace any and all damaged measures of any kind.
- B. Maintain all erosion, sedimentation, pollution control measures for delivery of correct pond volume for a period of thirty (30) calendar days.

3.6 REMOVAL OF TEMPORARY EROSION CONTROL DEVICES

- A. Remove all debris resulting from temporary erosion control from Project site.
- B. Control dust from disturbed areas by means of mulching, irrigation, calcium chloride or other method subject to the Engineer's review.

3.07 CLEAN-UP:

- A. Dispose of all excess erosion and sedimentation control materials in a manner satisfactory to the Owner and Landscape Architect.
- B. Final clean up shall be performed in accordance with the requirements of these Specifications and to the satisfaction of the Owner and Landscape Architect.

END OF SECTION 02125

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY OF WORK

- A. This Section includes earthwork as shown on the drawings and specified herein. Included is:
 - 1. Preparation of subgrade for walks and pavement.
 - 2. Preparation of granular base for pavement.
 - 3. Excavation and backfilling for utilities systems.
 - 4. Excavation and backfilling for structure footings, foundations, and retaining walls.
 - 5. Site grading and filling to indicated elevations.

1.03 SUBMITTALS

- A. Test Reports: Submit copies of following reports directly to the Engineer
 - 1. Test reports on borrow material.
 - 2. Field density test reports.
 - 3. One optimum moisture-maximum density curve for each type of soil encountered.
- B. Based on testing service reports and inspection, subgrade or fills which have been placed at below specified density, provide additional compaction and testing at no additional expense to Owner.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork and site grading in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Services: Owner will engage testing and inspection service, to include testing of soil materials proposed for use in work and field facilities for quality control testing during earthwork and site grading operations. All test reports must be signed by a licensed engineer.
- C. Tests for Proposed Soil Materials: Test soil materials proposed for use in work and promptly submit test result reports. Provide one optimum moisture-maximum density curve for each type of soil encountered in subgrade fills. Determine the maximum densities in accordance with ASTM D 698. Testing service will determine suitability of materials to be used as fill. For borrow materials, perform a mechanical analysis (ASTM 422), plasticity index (ASTM 424), moisture-density curve (ASTM D 698).

1.05 PROJECT CONDITIONS

- A. Subsoil: Promptly notify soil testing service of unsuitable sub-surface conditions.
- B. Existing Utilities: Locate existing underground utilities in areas of work before starting earthwork operations. Where utilities are to remain in place, provide adequate means of protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner, and public and private utility companies, in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utilities services have been provided. Demolish and completely remove from site underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.
- C. Use of Explosives: Use of explosives is not permitted.
- D. Temporary Protection: Barricade open excavations made as part of earthwork operations and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction. Protect bottoms of excavations and soil beneath and around foundations from frost and freezing. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods, as required to prevent cave-ins or loose dirt from entering excavations.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

- A. Backfill and Fill Materials: Use satisfactory soil materials, complying with the American Association of State Highway and Transportation Officials (AASHTO) Designation M145, soil classification groups A-1, A-2-4, A-2-5, and A-3. Fill to be free of rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable, and other deleterious matter, as determined by the soils testing service.
- B. Granular Base: Properly graded mixture of natural or crushed gravel or crushed stone that will readily compact to required density. Use material complying with applicable sections of the current edition of "Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges".

PART 3 EXECUTION

3.01 EXCAVATION

- A. General: Establish extent of grading and excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels and elevations. Obtain approval from the Architect.
- B. Excavation Classifications: The following classifications of excavation will be made when unanticipated rock excavation is encountered in work. Do not perform such work until material to be excavated has been cross-sectioned and classified by soils testing laboratory. Rock excavation will be paid for at established unit prices, upon approval of Architect.
- C. Earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
- D. Rock excavation consists of removal and disposal of materials encountered that cannot be excavated with a 3/4 cubic yard capacity power shovel without drilling, or continuous use of a ripper or other special equipment, except such materials that are classified as earth excavation.

- E. Trench rock excavation consists of removal and disposal of material classified as rock where the least horizontal dimension of required excavation is greater than three feet. Intermittent drilling that may be performed to increase production and is not necessary to permit excavation of material encountered will be classified as earth excavation.
- F. Mass rock excavation consists of removal and disposal of material classified as rock where the least horizontal dimension of required excavation is greater than three feet. Intermittent drilling that may be performed to increase production and is not necessary to permit excavation of material encountered will be classified as earth excavation.
- G. Rock payment lines are limited to the following:
 - 1. Two feet outside of concrete work for which forms are required, except footings.
 - 2. One foot outside perimeters of footings.
 - 3. In pipe trenches, 6" below invert elevation of pipe and 2' wider than the outside diameter of pipe, but not less than 3' minimum trench width.
 - 4. Near outside dimensions of concrete work where no forms are required.
 - 5. Under slabs on grade, 6" below bottom of concrete slab.
- H. Unauthorized excavation consists of removal of materials beyond indicated elevations or side dimensions without the specific direction of the Architect. Replace unauthorized excavation by backfilling and compacting as specified for authorized excavations of same classification, unless otherwise directed by Architect.
- I. There will be no additional compensation for excavation, backfilling, concrete fill, or other cost due to unauthorized over-excavation in any direction. The Contractor is responsible for all additional testing costs associated with over-excavation.
- J. Quoted unit prices shall include full compensation for labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, de-watering, backfilling, compacting, and other necessary items for complete installation.
- K. Unit prices for the following items, as set forth in the form of Proposal and as provided in the General Conditions, will apply in the event additions to

the work are required and authorized by a written order from the Architect to the Contractor.

1. Mass Rock Excavation (per cu. yd.)
 2. Trenched Rock Excavation (per cu. yd.)
- L. Additional Excavation: When excavation has reached required subgrade elevations, notify soil testing laboratory to allow for inspection of conditions. If unsuitable materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by soils testing laboratory.
- M. De-watering: Prevent surface water and subsurface or ground water from flowing into excavations, and flooding project site and surrounding area. Do not allow water to accumulate in excavations. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other de-watering system components necessary to convey water away from site. Convey water removed from excavations and rain water to collecting or run-off areas. Do not use trench excavations for site utilities as temporary drainage ditches.
- N. Material Storage: Stockpile excavated materials classified as satisfactory soil material where directed, until required for fill. Place, grade and shape stockpiles for proper drainage. Maintain excavated soil materials separately from topsoil stockpile. Dispose of excess unsatisfactory soil material, trash and debris, as specified.
- O. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.
- P. Excavation for Trenches: Dig trenches to uniform width required for particular item to be installed, sufficiently wide to provide working room. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.

3.02 COMPACTION

- A. General: Control soil compaction during construction, providing the minimum percentage of density specified for each area classification.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with

ASTM D 698; and not less than following percentages of relative density, determined in accordance with ANSI/ASTM D 4318, D 4253 AND D 4254, for soils which will not exhibit well-defined moisture-density relationship:

1. Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material to not less than 90% of the maximum dry density.
 2. Pavements: Compact top 12" of subgrade and each layer of backfill or fill material to not less than 95% of the maximum dry density.
- C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3.03 BACKFILL AND FILL

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- B. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" loose depth for material compacted by hand-operated equipment. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content of soil material. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approval, and recording location of underground utilities, as required.

3.04 GRADING

- A. General: Uniformly grade areas within limits of site grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades. Degree of finish required will be that ordinarily obtainable from either blade-grader or scraper operations.

- B. Grading Around Trees: Where excavating, filling, or grading is required within branch spread of trees that are to remain, perform work as follows:

When trenching occurs around trees that are to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots.

- C. Unpaved Areas: Finish areas to receive topsoil to within not more than 1" above or below required subgrade elevations, compacted as specified, and free from irregular surface changes.

- E. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, dicing, and any moisture or aerating required to provide optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape to line, grade, and cross-section as indicated.

3.05 PAVEMENT SUBBASE COURSE

- A. General: Subbase course consists of placing subbase course material, in layers of specified thickness, over subgrade surface to support a pavement base or surface course. See other Division - 2 sections for paving specifications.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.
- C. Placing: Place subbase course material on prepared subgrade conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

3.06 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.07 DISPOSAL OF EXCESS AND WASTE MATERIALS

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

END OF SECTION 02 200

SECTION 02411.9

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of picnic structure.
 - 2. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.
 - 2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 3. Division 01 Section "Execution" for cutting and patching procedures.
 - 4. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

- A. Remove: Detach items from existing shelter and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.4 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property in the Park.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Coordination for shutoff, and capping, of electrical services.
 - 3. Coordination of Owner's continuing public use of portions of the park.
- C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- D. Pre-demolition Photographs or Video: Submit before Work begins.
- E. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.5 LEED REQUIREMENTS

- A. LEED Requirements Not Applicable:

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit to the owner a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.

1.8 PROJECT CONDITIONS

- A. Park Patrons will use portions of the playground immediately adjacent to selective demolition area. Conduct selective demolition so citizens use will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove no items:
- C. Notify Architect of discrepancies between existing conditions and drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work. If such material is encounter, report it immediately to the Owner's representative.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 1 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used park facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent park facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of the park.
 - 2. Comply with requirements for temporary enclosures for dust control, as specified in Division 01 Section "Temporary Facilities and Controls."

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Do not use cutting torches until work area is cleared of flammable materials.
 - 3. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 5. Dispose of demolished items and materials. Comply with requirements in Division 1 "Construction Waste Management and Disposal."]
- B. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area
 5. Protect items from damage during transport and storage.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Landscape Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their new locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.]
- B. Masonry: Demolish in small sections. Cut masonry at junctures using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut sections of area to be demolished, then break up and remove.
- D. Roofing: Remove all existing roofing than
1. Remove existing roof membrane, flashings, copings, and roof accessories.
 2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02411.9

SECTION 02465

DESIGN / BUILD - IRRIGATION SYSTEM DESIGN

PART 1- GENERAL

Conditions stated in the general and specific conditions shall apply to this section.

General contractor shall secure the design services of a qualified and certified Irrigation Designer to prepare irrigation Shop Drawings to conform to the conditions of the project.

Irrigation Designer shall prepare a complete set of irrigation Shop Drawings based on the grading, drainage, and planting plans as issued for construction by the Landscape Architect.

General Contractor and Irrigation Designer shall inspect the site conditions to prepare a set of proposed Shop Drawings that conform to the existing conditions of the site and proposed landscape materials installation.

Proposed irrigation Shop Drawings shall conform to good irrigation practices and meet current local regulations and standards.

General Contractor shall be responsible for determining the water source and securing the PSI and GPM of the available water source.

Irrigation Designer shall include tap, meter, valve, meter box, backflow preventer and all other components required by the local jurisdiction in which the system will be constructed.

General Contractor is responsible for delivering and testing a complete and functional system as defined in Section 02810 Site Irrigation.

1.1 SYSTEM DESCRIPTION

- A. The irrigation Shop Drawings shall include all sprinklers, valves, piping fittings, controller, wiring, all of sizes and types as necessary to give a complete coverage of all trees, shrubs, ground cover, turf and other plant materials. The system shall be constructed to grades and conform to areas and locations as shown on the grading and planting plans, and as exist on the site.
- B. Spacing of the sprinkler heads or quick coupling valves and pipe routes shall be shown on the proposed drawings
- C. Unless otherwise specified or indicated on the drawings, the construction of the sprinkler system shall include the furnishing, installing, and testing of all mains,

laterals, risers and fittings, sprinkler heads, gate valves, control valves, controllers, electric wire, controls, backflow preventers, enclosures, and other necessary specialties and the removal and/or restoration of existing improvements, excavating and backfill, and all other work in accordance with the plans and specifications a required for a complete system.

- D. Irrigation Contractor shall coordinate with the General Contractor and the local water company to attach to the water system. Contractor shall include all equipment necessary to connect to the indicated water source as needed for a functional system.
- E. Impact fees shall be covered by the cost of construction and paid for by the contractor.
- F. Contractor shall coordinate this new system with any old system that may already exist and is being retained on the project.

1.2 QUALITY ASSURANCE

- A. Site Conference: Before any design work is started, a conference shall be held between the Contractor, Irrigation Designer and the Owner's Representative concerning the work under this contract.
- B. Finished irrigation Shop Drawings shall be submitted to the Owner's Representative or Landscape Architect for approval before construction begins.
- C. General Contractor shall maintain continuously a competent superintendent, satisfactory to the Owner's Representative on the work during progress with authority to act or him in all matter pertaining to the work.
- C. It is the Irrigation Contractor's responsibility to coordinate, schedule, and cooperate with the other Contractors to enable work to proceed rapidly and efficiently.
- D. Irrigation Contractor shall confine his operations to the area to be improved and to the areas allotted him by the Irrigation Designer and General Contractor for material and equipment.
- E. Irrigation Contractor shall take all necessary to protect the existing site conditions, vegetation and any existing irrigation systems.
- F. Irrigation Contractor shall coordinate with Owner's Representative to locate any existing valves and other surface elements.

- G. Final Inspection: Contractor shall demonstrate to the Owner's Representative and Landscape Architect that the system is completely operational and functional for final approval of the installed system.

1.3 SUBMITTALS

- A. General: Submit in accordance with Shop Drawings, Product Data, and Samples.
- B. Shop Drawings and Equipment Product Information:
 - 1. Prior to purchasing materials, submit product information on all sprinkler heads, automatic valves, quick coupling valves, controller, and pipe to be used on the project.
 - 2. Contractor shall review Shop Drawings and data to supply actual precipitation rates and times for each zone.
 - 3. Contractor shall be responsible for locating and marking all underground utilities within the irrigation zone prior to construction.
 - 3. Prior to trenching, Contractor shall submit proposed trenching equipment to Owner's Representative for approval.
- C. Record Drawings and Instructions
 - 1. Upon completion of installation, furnish one set of reproducible and one set of printed Record Drawings showing all sprinkler heads, valves, drains, and pipelines to scale with dimensions. These drawings shall have dimensions from easily located stationary points as they relate to all valves, mainlines, and wire. Clearly note all approved substitutions of size, material, etc. Complete, concise instruction sheets and parts lists covering all operating equipment and weathering techniques shall be bound into folders and furnished to the Owner in three (3) copies. Submission of this information is a requirement for final acceptance.

1.4 SITE CONDITIONS

- A. Irrigation Contractor shall examine the site, landscape plans, specifications and check out the existing irrigation system and controls. He shall report any deficiencies existing in the system.
- B. Irrigation Contractor shall coordinate the location of necessary sleeving with the General Contractor to assure access.

- C. General Contractor shall be responsible for ensuring that the proper sleeving is installed to accommodate the Irrigation Shop Drawings.
- D. Adjustment of the sprinkler heads and automatic equipment will be done by the Irrigation Contractor, upon completion of installation, to provide optimum performance.
- E. After completion, testing, and acceptance of the sprinkler system, the Irrigation Contractor shall verbally instruct the Owner's personnel in the operation and maintenance of the sprinkler system. All written instruction shall be included in the bound maintenance package as stated in Paragraph 1.3 - Submittals.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Pipe sizes shall conform to those shown on the Shop Drawings. No substitutions of smaller pipe sizes will be permitted, but substitutions of larger size may be approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection.
- B. All piping (2 1/2) two and one half and larger will be equipped with gaskets.
- C. All fittings for pipes two and one half (2 1/2) inches or larger will be equipped with gaskets.
- D. All piping downstream of electric valves, sizes (3) inches and smaller, shall be rigid unplasticized PVC 200 PSI working pressure extruded from virgin parent material of the type specified on the drawings. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles and permanently marked with the manufacture's name, material, size, and schedule type. Pipe must bear the NFS seal.
- E. All mainline piping and underground piping under continuous pressure shall be rigid unplasticized PVC-Class 200 PSI working pressure extruded from virgin parent material of the type specified on the drawings. The pipe shall be homogeneous throughout and free from visible cracks, holes, and foreign materials, blisters, wrinkles and dents.
- F. All plastic fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, slip joint ring tight seal, or screwed connections NO fitting made of other material shall be used except as hereinafter specified.

- G. Slip fitting socket tapers shall be so sized that a dry unsoftened pipe end conforming to these special provisions can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only Schedule 80 pipe may be threaded.

2.2 SLEEVES

- A. All sleeves shall be Class 200 PVC or stronger. All sleeves are required at every crossing indicated on design drawings. (Size Noted). See detail on plans.
- B. All sleeves shall be installed under proposed pavement areas prior to subgrade and base construction.
- C. Sleeves shall have a minimum horizontal separation of 18” and a maximum of twenty-four (24) inch clearance below bottom of curb.
- D. All sleeves shall have a minimum horizontal separation of twenty-four (24) and maximum of thirty-six inches from center to center.
- E. Stub up sleeve pipe twelve (12) inches above ground surface and cap. Paint cap with fluorescent orange paint for easy identification.
- F. The location of all sleeves shown on the plans is schematic. The contractor shall make any adjustments necessary to accommodate existing vegetation, utilities, or other existing conditions.
- G. If the road crossings are designated as being bore locations the bore must be ample size to accommodate the size sleeve specified.

2.3 CONTROL SYSTEM

- A. The automatic controllers shall be as shown on the Shop Drawings and shall be made by the same manufacturer as valves.
- B. Install Rain Check or Mini-Click type shut off device (or equal) to override the control timer in the event of rain.

2.4 CONTROL WIRE

- A. Control wire shall be type UF, UL approved, for direct burial and shall be gauge 14 or larger for the control wire and gauge 12 or larger for common wire.
- B. Joining of underground wires shall be made with watertight connectors in valve boxes. No splicing between boxes is acceptable.

- C. All wire connections in valve boxes; first example shall stay open until the Irrigation Designer approves.

2.5 IRRIGATION VALVES

- A. Zone Control Valves
 - 1. Globe-type diaphragm valves of normally closed design, with bronze bodies or heavy-duty plastic and covers to be shown on the Shop Drawings. Operation accomplished by means of an integrally mounted heavy-duty 24-volt AC solenoid complying with National Electrical Code, Class II Circuit, solenoid coil potted in epoxy resin within a plastic-coated stainless-steel housing. Solenoids shall be completely waterproof, suitable for direct underground burial. Provide a flow stem adjustment in each valve.

2.6 VALVE BOXES

- A. All valves shall be installed in thermoplastic valve access boxes of the size required to permit access to the valve. Valve boxes shall include black thermoplastic locking covers. Manufacturer - Ametek or approved equal.
- B. All valve boxes shall be installed on at least a two (2) cubic foot gravel base to provide foundation and drainage.
- C. All valve box elevations shall be ½” below finished grade.
- D. All valve boxes must be located in plant beds if possible.
- C. All valve boxes must meet requirements of the local water authority or jurisdiction over the water source.

2.7 THRUST BLOCKS

- A. Place one cubic ft. of concrete for each inch of pipe diameter for thrust block. Thrust shall not allow vertical or horizontal movement of pipe in any direction unless otherwise noted on design. Thrust blocking shall be provided on all piping three (3) inch diameter and larger.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

- A. Trenches for pipe sprinkler lines shall be excavated of sufficient depth and width to permit proper handling and installation by any other method the Contractor may desire if approved by the Owner, pipe manufacturer, and Irrigation Designer. The

backfill shall be thoroughly compacted and evened off with the adjacent soil level. Selected fill dirt or sand shall be used if soil conditions are rocky. In rocky areas the trenching depth shall be two (2) inches below normal trenching depth to allow for this bedding. The fill dirt or sand shall be used in filling (4) inches above the pipe. The remainder of the backfill shall contain no lumps or rocks larger than three (3) inches. The top twelve (12) inches of backfill shall be topsoil, free of rocks, subsoil, or trash. Any open trenches or partially backfilled trenches left overnight or left unsupervised shall be barricaded to prevent undue hazard to the public.

- B. The Contractor shall backfill in six (6) inch compacted lifts as needed to bring the soil to its original density.
- C. In the spring following the year of installation, the Irrigation Contractor shall repair any settlement of the trenches by bringing them to grade with topsoil and seeding with the existing lawn type(s). Watering and maintenance of the repaired areas shall be the Owner's responsibility.

3.2 INSTALLATION OF PLASTIC PIPE

- A. Plastic pipe shall be installed in a manner that permits expansion and contraction as recommended by the manufacturer.
- B. Plastic pipe shall be cut with a handsaw or hacksaw with the assistance of a square in sawing vice or in a manner to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.
- C. All plastic-to-plastic joints shall be solvent weld joints or slip seal joints. Only the solvent recommended for the pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer. The Contractor shall assume full responsibility for the correct installation.
- D. The joints shall be allowed to set at least twenty-four (24) hours before pressure is applied to the system on PVC pipe.

3.3 CONTROLLER AND ELECTRICAL CONNECTIONS

- A. All electrical connections shall conform to the National Electrical Code, latest edition.
- B. Control wires installed beneath walks, drives, or other permanent surfaces shall be placed in sleeves.

- C. Wires shall be spliced only at valve boxes.
- D. Leave twenty-four (24) inch loop of wire at each valve for expansion/contraction and servicing.
- E. Controllers and valves shall be from the same company e.g. (Rain Bird, Toro or approved equal).
- F. 120 VAC electrical power supply to the controller location shall be supplied by others.

3.4 FLUSHING AND TESTING

- A. After new sprinkler piping and risers are in place and connected for a given section and all necessary division work has been completed and prior to the installation of sprinkler heads, all control valves shall be opened, and a full head of water used to flush out the system.
- B. Sprinkler main shall be tested under normal water pressure for a period of twelve (12) hours. If leaks occur, repair and repeat the test. Give Designer twenty-four hours notice prior to testing.
- C. Testing of the system shall be performed after completion of the entire installation and any necessary repairs shall be made at the Contractor's expense to put the system in good working order before final payment by the Owner.
- D. Adjustment of the sprinkler heads and automatic equipment will be done by the Irrigation Contractor upon completion of installation to provide optimum performance. Minor adjustments during the guarantee period will be made by the Owner.
- E. After completion, testing, and acceptance of the system, the Irrigation Contractor will instruct the Owner's personnel in the operation and maintenance of the system.

PART 4.0 – CODES, PERMITS, WARRANTY, AND GUARANTEE

4.1 CODES AND ORDINANCES

- A. All material and operations shall conform to all applicable codes and ordinances. It is the Irrigation Contractor's responsibility to investigate and follow all regulations.

4.2 PERMITS AND FEES

- A. The General Contractor shall obtain, at his expense, all required permits and shall pay all required fees. Any penalties imposed due to failure to obtain any permit or pay any fee shall be the responsibility of the General Contractor.

4.3 WARRANTY AND GUARANTEE

- A. The General Contractor shall furnish a certificate of warranty registration and a written guarantee of work and materials for a one-year period from the date of final acceptance of the Irrigation System by the Owner and landscape Architect.
- B. Irrigation Contractor shall provide operation manuals, details, and product data to the Owner.
- C. Irrigation Contractor shall demonstrate controller and manual valve operations to owner's maintenance personnel.

END OF SECTION 02465

SECTION 02511
ASPHALT PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials and equipment required to complete all paving, patching, crack sealing, overlaying and preparation of subgrade for all areas to receive paving and other items necessary to complete the work.
- B. Streets to be worked on are as shown on the Drawings.

1.02 REFERENCE STANDARDS

- A. Materials and methods of construction of base and pavement shall conform to the requirements of State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition.

1.03 JOB CONDITIONS

- A. Store materials only in areas designated for Contractor's use.
- B. Paving operations shall not begin until all underground work of other grades has been completed and all storm drainage structures raised as required in areas which are to be paved.
- C. Asphalt paving shall be done in dry weather when subgrade is sufficiently stable to be properly compacted. Ground moisture shall not be sealed under paving. All work shall be in accordance with applicable section of the Reference Standards.

1.04 SUBMITTALS

- A. Contractor shall submit design mix specification sheet for shop drawing review by the engineer.

PART 2 - MATERIALS

2.01 ASPHALTIC CONCRETE MIXTURES

- A. Asphaltic concrete mixtures shall conform to section 828 – Hot Mix Asphaltic Concrete Mixtures, of the State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition.

2.02 GRADED AGGREGATE BASE (NOT USED IN THIS PROJECT)

- A. Graded aggregate base shall conform to section 815 – Graded Aggregate, of the State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition.

2.03 PAVEMENT DESIGN

- A. Road Resurfacing - Superpave HMA, measured after compaction. (Per Plan)
- B. Road Patching – One and a half (1.5) inches of 9.5mm Superpave HMA; one (1) inch or more (up to 6 inches, maximum), depending on the depth of the existing pavement section, of 19mm Superpave HMA, measured after compaction

2.04 ROAD STRIPING PAINT

- A. Road striping line paint shall be in accordance with the State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition. The color shall be yellow or white to match existing color.

2.05 CRACK SEALING

- A. Crack sealing shall be in accordance with Georgia DOT Standard Specifications, Section 407 of the State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition, and any other sections of the State of Georgia *Standard Specifications Construction of Transportation Systems*, that may be referenced in Section 407.

PART 3 - INSTALLATION

3.01 INSPECTION

- A. The paving sub-contractor shall examine all areas to be repaired. Any defects which may adversely affect proper installation of this work shall be reported to the City Engineer in writing and shall have been corrected before start of this work. Beginning of work shall signify acceptance of surfaces by the paving sub-contractor.

3.02 SUBGRADE STABILIZATION

- A. The subgrade in areas receiving patching and/or edge repair shall be proof rolled as specified in Section 221, of the State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition. All defective areas that pump or shove, or are found to be soft, shall be removed

and satisfactorily repaired, as specified below, and test rolled again as specified in Section 221 of the State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition. Subgrade shall be stabilized by removing soft soil and replacing with graded aggregate base.

3.03 BASE

- A. Graded aggregate base, after compaction, shall be smooth and true to established profiles and sections and shall be of the average thickness of six eight (8) inches, varying at no point by no more than three-eighths (3/8) inch.

3.04 PATCH AND EDGE REPAIR

- A. After removing damaged existing asphalt, a course of 19mm Superpave HMA shall be constructed to a minimum of the greater of one (1) inch thick or as thick as the depth of existing pavement, but in no case more than 6 inches thick, as identified above. A course of 9.5mm Superpave HMA shall be constructed at the top of the patch to a thickness of one and a half (1.5) inches. Thickness shall be measured after compaction. Top of patch shall be flush with existing pavement before milling.

3.05 BINDER COURSE (NOT USED IN THIS PROJECT)

- A. After removing damaged existing asphalt by milling operation, a binder course of 9.5mm Superpave HMA shall be constructed a minimum of one (1) inch thick or as thick as the depth of existing pavement, but in no case more than 8 inches thick, as identified above. Thickness shall be measured after compaction.

3.06 CRACK SEALING

- A. Crack Seal all longitudinal and transverse cracks.
- B. Crack Sealing shall be performed for the segment(s) of road shown on the Drawings.
- C. Crack Sealing quantities are expressed in road linear feet. Each road has two lanes. Where a road has more than two lanes, an adjustment will be made to the estimated quantity.

3.07 TACK COAT AND PRIMER COAT

- A. The area to be repaired shall be swept clean of all debris. Apply a primer or tack coat of hot tar at the rate of four tenths (0.4) gallon per square yard. Primer coat (RC70) shall be applied to graded aggregate base and tack coat (AC30) shall be applied to existing asphalt.

3.08 TOP COURSE

- A. Following the binder course, and after sufficient time has passed to determine that the binder course and road base are performing properly, apply

Superpave HMA, measured after compaction, as identified above and thoroughly roll evenly in place. Thickness shall be measured after compaction. Type and thickness per plan.

3.09 TESTING THICKNESS

- A. The Contractor, at his expense, will core the asphalt every 1,000 linear feet with a minimum of two (2) cores per road to determine the average thickness of the surface course. The core locations shall be approved by the City Engineer after paving prior to coring.
- B. The average thickness of all specimens shall be at least the specified thickness of the surface course. The average thickness of the cores per road shall be within three sixteenths (3/16) inches of the required thickness. No one core shall have a deficiency of one quarter (1/4) inch.
- C. If the core thickness or average thickness is outside the range stated in 3.08.B, the contractor shall pay the Owner Liquidated Damages in the amount using the following formula:

Liquated Damages (\$) = (LxWxD) x (148/2000) x (\$75/ton), where

L= road length, feet

W= road width, feet

D= depth of deficiency, feet

3.10 CLEAN UP

- A. At the completion of the work, the Contractor shall clean up all scraps, rubbish and surplus materials caused by this work and haul them away from the site.
- B. Remove all asphaltic materials from adjacent surfaces and leave in neat, clean and orderly condition.

3.11 GUARANTEE

- A. Contractor shall provide the Owner with a one (1) year guarantee and maintenance agreement on all asphalt paving.

END OF SECTION 02511

SECTION 02513

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes painted markings applied to asphalt and concrete pavement.
- B. Related Requirements:
 - 1. Section 071800 "Traffic Coatings" for painting whole areas of building floors and pavements with coatings having an integral wearing surface.
 - 2. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement.
 - 3. Section 099123 "Interior Painting" for painting interior concrete surfaces other than pavement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site during regular project meeting.
 - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
 - a. Pavement aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
- B. Shop Drawings: For pavement markings.
 - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
 - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Sections 652, 653, and 657 of the Georgia Department of Transportation for pavement-marking work within a State or County ROW.
- B.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.2 PAVEMENT-MARKING PAINT.

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248; colors complying with FS TT-P-1952.
 - 1. Color: As indicated. – White
- B. Pavement-Marking Paint: MPI #32, solvent-borne traffic-marking paint.
 - 1. Color: As indicated. - White
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 - 1. Color: As indicated. – White
- D. Pavement-Marking Paint: MPI #97, latex traffic-marking paint.
 - 1. Color: As indicated. - White
- E. Thermoplastic Pavement Marking: In accord with GDOT Standard 653.
- F. Preformed Plastic Pavement Markings: In accord with GDOT Standard 657.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 02513

PART 1 - GENERAL

1.01 SCOPE:

- A. This work shall consist of furnishing all labor, materials and equipment necessary for the construction of concrete curb and concrete combined curb and gutter which shall consist of straight curb and monolithic curb and gutter respectively, constructed of Portland cement concrete, at the locations, and to the lines, grades, cross-section, form and dimensions indicated on the Drawings or as directed by the Owner and in conformity with the provisions and requirements set out in these Specifications.
- B. Concrete curb and combined curb and gutter shall include all necessary excavation, unless otherwise indicated, and subgrade preparation; backfilling, and final clearing up; and completion of all incidentals thereto, as indicated on the Drawings or as directed by the Landscape Architect.
- C. Staking requirements outlined in Supplemental Conditions shall apply to this section.

1.02 PRODUCT HANDLING:

- A. Protection: Use all means necessary to protect concrete materials before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT:

- A. Concrete reinforcement shall conform to the requirements of ASTM A 615, (Grade 60) and applicable criteria within Section 03300 of these specifications.

2.02 CONCRETE AND RELATED MATERIALS:

- A. General: Concrete and related materials including, but not necessarily limited to, joint materials, membranes and curing compounds shall conform to Section 03300 of these Specifications.
- B. Class: All concrete shall be Class "A" (compressive strength at 28 days = 4,000 psi) conforming to applicable requirements of Section 03300 of these specifications.
- C. Water used in mixing concrete shall be fresh, clean, potable water free from injurious amounts of oil, acid, alkali, vegetable, wastewater and/or organic matter. Water shall be considered as weighing 8.33 pounds per gallon.
- D. Admixtures shall meet the following requirements:
 - 1. Except as herein specified, no curative or hardening admixtures shall be used.

2. An air entrainment agent capable of providing three to six percent air shall be used. Air entraining admixtures, which are added to concrete mixtures, shall conform to ASTM C 260 for Air Entraining Admixtures for Concrete.
- E. Sub-base shall be constructed of durable material such as crushed stone, crushed limestone, bank-run gravel, blast furnace slag or steam-boiler cinders. Minimum depth of sub-base below curbing shall be 2-inches.
- F. Joint filler shall be a non-extruding joint material conforming to AASHTO M213 for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (non-extruding and resilient bituminous types). The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint unless otherwise specified by the Owner.

2.03 OTHER MATERIALS:

All other materials, not specifically described, but required for complete and proper installation of the work of this Section shall be as selected by the Contractor subject to the approval of the Project Landscape Architect.

PART 3 - EXECUTION

3.01 EARTHWORK:

- A. General: All earthwork shall be performed in accordance with Section 02200 of these Specifications and as specified in this Section.
- B. Backfilling:
 1. After the concrete has set sufficiently, the spaces on both sides of the gutter and combined curb and gutter shall be backfilled, and the materials compacted and left in a neat condition.
 2. Curbs to be used in the construction of asphalt pavements shall be backfilled prior to placement of base material.

3.02 INSTALLATION:

- A. Concrete Reinforcement: All concrete reinforcement shall be installed in accordance with ASTM A615.
- B. Forming:
 1. Forms shall be metal and of an approved section. They shall be straight, free from distortions, and shall show no vertical variation greater than 1/8-inch in 10 feet, and shall show no lateral variation greater than 1/4-inch in 10 feet from the true plane surface on the vertical face of the form.
 2. Forms shall be of the full depth of the structure and be so constructed as to permit the inside forms to be securely fastened to the outside forms.
 3. Securely hold forms in place true to the lines and grades indicated on the Drawings.
 4. Wood forms may be used on sharp turns and for special sections as approved by the Owner.

5. Where wooden forms are used, they shall be free from warp and the nominal depth of the structure.
 6. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
 7. The supply of forms shall be sufficient to permit their remaining in place at least 12 hours after the concrete has been placed.
- C. Concrete: Concrete shall be placed in accordance with Section 03300 of these Specifications.
- D. Joints:
1. Joints shall be constructed as indicated on the Drawings and as specified.
 2. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.
 3. Thoroughly spade and compact the concrete at the faces of all joints to fill all voids.
 4. Install expansion joint materials at the point of curve at all street returns.
 5. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
 6. Place contraction joints every 10 feet along the length of the curbs and gutters.
 7. Form contraction joints using steel templates or division plates which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place.
 8. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or shall be notched to permit the reinforcement to be continuous through the joint.
 9. Contraction joints shall be a minimum of 1-1/2-inches deep.
- E. Finishing:
1. Strike off the surface with a template and finish the surface with a wood float using heavy pressure, after which contraction joints shall be made and the surface finished with a wood float or steel trowel.
 2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius indicated on the Drawings.
 3. Finish edges with an approved finishing tool having a 1/4-inch radius.
 4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
 5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.
- F. Concrete Curing:
1. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the structure shall be completely coated and sealed with a uniform layer of curing compound.
 2. The compound shall be applied in one or two applications as directed by the Owner. When the compound is applied in two increments, the second application shall follow the first application within 30 minutes.
 3. The compound shall be applied continuously by means of an automatic self-propelled, pressure sprayer as approved by the Owner at the rate directed by the Owner, but not less than one gallon per 200 square feet of surface.
 4. The equipment shall provide adequate stirring of the compound during application.

5. Should the method of applying the compound not produce uniform coverage, its use shall be discontinued, and the curing shall be by another method approved by the Owner.
- G. Protection:
 1. Provide and use sufficient coverings for the protection of the concrete in case of rain or breakdown of curing equipment.
 2. Provide necessary barricades and lights to protect the work and rebuild or repair to the approval of the Owner. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor at no additional expense to the Owner.
- H. Driveway and Sidewalk Ramp Openings:
 1. Provide driveway openings of the widths and at locations as indicated on the Drawings and directed by the Project Landscape Architect.
 2. Provide sidewalk ramp openings as indicated on the Drawings in conformance with the applicable regulations and as directed by the Project Landscape Architect.

3.03 PATCHING:

- A. Inspect, patch and repair all concrete in accordance with the requirements of these Specifications.

3.04 ROAD AND DRAINAGE EXCAVATION:

- A. Site excavation, as indicated on the Drawings or as directed by the Owner, shall be performed in accordance with the requirements of Section 02200 of these Specifications.

3.05 SUBGRADE PREPARATION:

- A. The subgrade shall be formed by excavating to the required depth below the finished surface of the respective types, in accordance with the dimensions and designs indicated on the Drawings or as directed by the Owner, and shall be of such width as to permit the proper installation and bracing of forms. The subgrade shall be compacted by hand tamping and all soft, yielding or unsuitable material shall be removed and backfilled with satisfactory material and again compacted thoroughly and finished to a smooth and unyielding surface. The finished grade shall be to the dimensions and design indicated on the Drawings or as directed by the Owner for the bottom of the proposed construction.

3.06 CLEANING:

- A. All excess or unsuitable material shall be disposed of in a manner satisfactory to the Owner.
- B. Final clean up shall be performed in accordance with the requirements of these Specifications.
- C. All material becoming the property of the Owner shall be stored in a manner and at locations near or on the Project as directed by the Owner.

END OF SECTION 02521

SECTION 02530

SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior gravity-flow, non-pressure sanitary sewerage piping, with the following components:
 - 1. Precast concrete manholes.
 - 2. Inflow protection inserts
 - 3. PVC pipe installation
 - 4. Connection of Splash Pad equipment to the existing sanitary system

1.3 DEFINITIONS

- A. PE: Polyethylene plastic.
- B. PP: Polypropylene plastic.
- C. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Piping.
 - 2. Inflow protection inserts
- B. Shop Drawings: For the following:
 - 1. Manholes: Include plans, elevations, sections, details, and frames and covers.

- C. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.3 PIPE AND FITTINGS

- A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals, color: green.
- B. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 26, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals, color: green.
- C. PE, ASTM Pipe: ASTM D 3035, DR 11; with PE compound number required to give pressure rating not less than 100 psi.
 - 1. Molded PE Fittings: ASTM D 3350, PE resin, butt-fusion type, made to match PE pipe dimensions and class.
- D. Ductile Iron Pipe and Fittings:
 - 1. Available Manufacturers:

- a. United States Pipe and Foundry Company.
 - b. Griffin Pipe Products Company.
 - c. American Cast Iron Pipe Company
2. Lining: All ductile iron pipe and fittings shall be lined with an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. Basis of design: United States Pipe and Foundry Company Protecto 401

2.4 MANHOLES

- A. Designed Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
1. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 2. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
 3. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- inch intervals.
 4. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
 5. Protective Coating: Plant applied water based, fiber reinforced, emulsified-asphalt damp proofing; 15-mil minimum thickness applied to exterior, below grade surfaces.
 6. Manhole Frames and Covers: Neenah Foundry, Inc. Model R-1642 (24") or Model R-1557 (30") or equivalent for built-up manholes; Neenah Foundry, Inc. Model R-6078 (30") or equivalent for cast-in-slab conditions. All lids to be heavy duty. Include indented top design with lettering cast into cover, using wording "SANITARY SEWER". Include countersunk stainless-steel tamper-proof bolts in lid as locking device, where indicated on the drawings.
 - a. Material: ASTM A 48/A 48M, Class 35 gray iron, unless otherwise indicated.

2.5 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.

- B. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
 - 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 2. Benches: Concrete, sloped to drain into channel.

2.6 INFLOW PROTECTION INSERTS

- A. Available Manufacturers:
 - 1. FRW Industries.
- B. Size: To fit manhole frame and lids as installed.
- C. Insert Body: Acrylonitrile Butadiene Styrene plastic that meets Federal Standard LP1183 and ASTM D256, D638, D790, D792, D785 D648. Thickness shall be between 3/32 inches and 6/32 inches. A 1" wide polyester lifting strap shall be attached to the body by means of a 3/16-inch stainless steel rivet.
- D. Gasket: Factory installed closed cell neoprene. The gasket adhesive and the gasket material shall be suitable for either wet or dry conditions of use.
- E. Relief Valve: Medium density polyethylene body, designed to relieve pressure at 1 p.s.i. or less, leak down rate of not more than 10 gallons/24 hours, easily removable.

2.7 MISCELLANEOUS MATERIALS

- A. Paint: SSPC-Paint 16.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING APPLICATIONS

- A. Buried Gravity-Flow, Non-pressure Sewer Piping, Depth of bury up to 14 feet: Use the following pipe materials for each size range: NPS 10 and smaller: PVC sewer pipe and fittings, SDR 35, gaskets, and gasketed joints.

- B. Buried Gravity-Flow, Non-pressure Sewer Piping, Depth of bury over 14 feet: Use the following pipe materials for each size range: NPS 10 and smaller: PVC sewer pipe and fittings, SDR 26, gaskets, and gasketed joints.
- C. Buried Force-Main, Pressure Piping: Use the following pipe materials for each size range where shown:
 - 1. NPS 4 to NPS 8: Ductile iron pressure pipe; ductile-iron compact fittings, gaskets, and gasketed joints.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated. Service connections shall utilize wye fittings for connection to sewer main.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or combination of both.
- F. Install gravity-flow, non-pressure, piping according to the following:
 - 1. Install piping pitched down in direction of flow, at slope indicated.
 - 2. Install piping with 48-inch minimum cover.
 - 3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
- G. Install force-main, pressure piping according to the following:
 - 1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
 - 2. Install piping with 48-inch minimum cover.
 - 3. Install ductile-iron pressure piping according to AWWA C600.
 - 4. Install PE pipe according to ASTM D 2774 and ASTM F 645.

- H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.4 PIPE JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 2 Section "Piped Utilities - Basic Materials and Methods." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, non-pressure, drainage piping according to the following:
 - 1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

3.5 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 4 inches above finished surface elsewhere, unless otherwise indicated.
- E. Install inflow protection inserts in all manholes located in paved areas.
- F. At completion of work provide the Owner with locking keys to tamper-proof manhole lids.

3.6 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318/318R.

3.7 PAINTING

- A. Clean and prepare concrete manhole surfaces for field touch-up painting. Remove loose efflorescence, chalk, dust, grease, oils, and release agents. Roughen surface as required to remove glaze. Paint the following concrete surfaces as recommended by paint manufacturer:
 - 1. Precast Concrete Manholes: All exterior.

3.8 IDENTIFICATION

- A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
 - 1. Use detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.9 FIELD QUALITY CONTROL

- A. All pipe lines and structures shall be made as watertight as possible.
- B. Sewers shall not be tested until at least 30 days after installation and backfill.
- C. Inspect interior of piping and manholes to determine whether line displacement or other damage has occurred.
 - 1. Submit separate report for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping or manholes.
 - d. Infiltration: Water leakage into piping or manholes.
 - e. Exfiltration: Water leakage from or around piping or manholes.
 - 3. Replace defective piping or manholes using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- D. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Test completed piping systems according to requirements of authorities having jurisdiction and the requirements herein.
 - 2. Schedule tests and inspections by authorities having jurisdiction with at least 48 hours' advance notice.
 - 3. Submit separate report for each test.
 - 4. Deflection Tests: Test PVC piping to insure passage of ball or cylinder of size not less than 95 percent of piping diameter.
 - a. The test shall be conducted without the use of mechanical pulling devices.

- b. If deflection exceeds 5%, the failing pipe section shall be removed and replaced and the test repeated.
 5. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following, if groundwater levels are below the invert of the sewer being tested:
 - a. Test plastic gravity sewer piping according to ASTM F 1417.
 6. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following if groundwater levels are above the invert of the sewer being tested:
 - a. Close openings in system and fill with water.
 - b. The hydrostatic test shall be performed with a minimum positive head of 2 feet above the top of the crown of the pipe, or the existing groundwater levels, whichever is higher
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Allowable leakage is maximum of 100 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
 7. Manholes: Perform air test according to ASTM C 1244.
- E. Leaks and loss in test pressure constitute defects that must be repaired.
 - F. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.
- 3.10 CLEANING
- A. Clean interior of piping and manholes of dirt and superfluous material.

END OF SECTION 02530

SECTION 02630

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes storm drainage on the site.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete structures.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. RCP: Reinforced Concrete Pipe

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.
- B. Force-Main Pressure Ratings: At least equal to system operating pressure, but not less than 150 psig (1035 kPa).

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Polymer-concrete, channel drainage systems.
 - 2. Plastic, channel drainage systems.

3. Stainless-steel drainage systems.
4. Backwater valves, cleanouts, and drains.
5. Plastic dry wells.
6. Stormwater disposal systems.

- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products meeting the specifications.

See Editing Instruction No. 1 in the Evaluations for cautions about naming products and manufacturers.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

- A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Wall C, for gasketed joints.
 - 1. Gaskets: ASTM C 443, rubber.

2.4 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.
 - 1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
- B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.
 - 1. Material for Concrete Pipe: ASTM C 443, rubber.

2.6 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
 - 1. Diameter: 48 inches minimum, unless otherwise indicated.
 - 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 - 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 - 4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
 - 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

6. Gaskets: ASTM C 443, rubber.
 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
 8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 9. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 60 inches deep.
 10. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
 2. Gaskets: Rubber.
 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
 4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 5. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 6. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
- E. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.7 CATCH BASINS

- A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
 3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 4. Gaskets: ASTM C 443, rubber.
 5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 7. Steps: ASTM C 478, individual steps or ladder. Omit steps for catch basins less than 60 inches deep.
 8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic, Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Gaskets: Rubber.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step.

- Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Bottom, Walls, and Top: Reinforced concrete.
 2. Channels and Benches: Concrete.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.
1. Size: 24 by 24 inches minimum, unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
- E. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.8 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy-duty frames and grates according to utility standards.
- E. Curb Inlets: Vertical curb opening, of materials and dimensions indicated.
- F. Gutter Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates.
- G. Combination Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates.
- H. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.
 - 1. Material: ASTM A 536, Grade 60-40-18 minimum, ductile-iron casting.
 - 2. Material: ASTM A 48, Class 30 minimum, gray-iron casting.
 - 3. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.10 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
 - 1. Cement: ASTM C 150, Type II.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
- B. Portland Cement Design Mix: 3000 psi minimum, with 0.45 maximum water-cementitious ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 psi minimum, with 0.45 maximum water-cementitious ratio.
 - 1. Include channels and benches in manholes.

- a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 1) Invert Slope: 1 percent through manhole.
 - 2) Invert Slope: 2 percent through manhole.
 - 3) Invert Slope: None.
 - b. Benches: Concrete, sloped to drain into channel.
 - 1) Slope: 8 percent.
 - 2) Slope: 4 percent.
2. Include channels in catch basins.
- a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 1) Invert Slope: 1 percent through catch basin.
 - 2) Invert Slope: 2 percent through catch basin.
 - 3) Invert Slope: None.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.11 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregular size and shape, graded stone.
 1. Average Size: NSA No. R-5, screen opening 5 inches.
- C. Filter Stone: NSA No. FS-2, No. 4 screen opening, average-size, graded stone.
- D. Energy Dissipators: NSA No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

- A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

- A. General: Include watertight, silttight, or soiltight joints, unless watertight or silttight joints are indicated.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: Use the following:
 - 12. NPS 4 and NPS 6: High Density Polyethelene pipe and fittings, connecting bands, and banded joints.
 - 25. NPS 8 to NPS 15: High Density Polyethelene pipe and fittings, connecting bands, and banded joints.
 - 34. NPS 18 to NPS 36: High Density Polyethelene pipe and fittings, connecting bands, and banded joints.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
 - 1. Use the following pipe couplings for nonpressure applications:
 - a. Sleeve type to join piping, of same size, or with small difference in OD.
 - b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
 - c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

- B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.5 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
 2. Install piping with 12-inch minimum cover.
- F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
- K. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation

- C. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
 - 1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.
- D. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Form continuous concrete channels and benches between inlets and outlet.
- C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 24 inches above finished surface elsewhere, unless otherwise indicated.
- D. Install precast concrete manhole sections with gaskets according to ASTM C 891.
- E. Construct cast-in-place manholes as indicated.
- F. Install fiberglass manholes according to manufacturer's written instructions.

3.8 CATCH-BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.9 STORM DRAINAGE INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

- E. Construct energy dissipators at outlets, as indicated.

3.10 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.11 DRAINAGE SYSTEM INSTALLATION

- A. Assemble and install components according to manufacturer's written instructions.
- B. Assemble and install stainless-steel drainage systems according to ASME A112.3.1 and manufacturer's written instructions.
- C. Install with top surfaces of components, except piping, flush with finished surface.
- D. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- E. Embed channel sections and drainage specialties in 4-inch (100-mm) minimum concrete around bottom and sides.
- F. Fasten grates to channel sections if indicated.
- G. Assemble trench sections with flanged joints.
- H. Embed trench sections and drainage specialties in 4-inch (100-mm) minimum concrete around bottom and sides.
- I. Make piping connections and install stainless-steel piping with gasketed joints between system components.

3.12 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
- B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.

3.14 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. **Abandoned Piping:** Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
 - 3. Pump remaining pipe full of grout.

- B. **Abandoned Structures:** Excavate around structure as required and use one procedure below:
 - 1. Remove structure and close open ends of remaining piping.
 - 2. Remove top of structure down to at least 36 inches (1000 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
 - 3. Backfill to grade according to Division 2 Section "Earthwork."

3.15 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plug in end of incomplete piping at end of day and when work stops.
 - 3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. **Alignment:** Less than full diameter of inside of pipe is visible between structures.
 - b. **Deflection:** Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. **Infiltration:** Water leakage into piping.
 - e. **Exfiltration:** Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION 02630

SECTION 02665

WATER MAINS & ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE:

- A. This Section describes products to be incorporated into the water mains and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable.
- C. Tap Fee, meter and backflow preventor for the Splash Park.
- D. All installations shall be installed in accordance with the local water authority and inspected by appropriate agents of that authority.

1.2 QUALIFICATIONS:

- A. If requested by the Engineer, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years within the local jurisdiction of the project.

1.3 SUBMITTALS:

- A. Four complete sets of shop drawings and engineering data for all products shall be submitted to the Landscape Architect for approval.

1.4 TRANSPORTATION AND HANDLING:

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.
- B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front-end loader. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

1.5 STORAGE AND PROTECTION:

- A. Store all pipes, which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.
- C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.
- D. Stored mechanical and push-on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.
- E. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

1.6 QUALITY ASSURANCE:

- A. The manufacturer shall provide written certification to the Engineer that all products furnished comply with all applicable requirements of these Specifications.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS AND ACCESSORIES

- A. Ductile Iron Pipe (DIP):
 - 1. Ductile iron pipe shall be manufactured in accordance with AWWA C151 with a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi, and 10 percent minimum elongation. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings:

Pipe Sizes (inches)	Pressure Class (psi)
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4 - 12	350
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2. Flanged pipe minimum wall thickness shall be equal to Special Class 53. Flanges shall be furnished by the pipe manufacturer.
3. Pipe and fittings shall be cement lined in accordance with AWWA C104. Pipe and fittings shall be furnished with a bituminous outside coating.
4. Fittings shall be ductile iron and shall conform to AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi.
5. Joints:
 - a. Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Push-on and mechanical joints shall conform to AWWA C111. Restrained joints shall be American "LOK-FAST", "FLEX-RING" or "LOK-RING", Clow "SUPER-LOCK", or U.S. Pipe "TR FLEX" or "LOK-TYTE". No field welding of restrained joint pipe will be permitted.
 - b. Flanged joints shall meet the requirements of ANSI B16.1, Class 250.
6. Provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of 1/8-inch thick, cloth reinforced rubber; gaskets may be ring type or full-face type.
7. Bolts and Nuts:
 - a. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.
 - b. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimensions shown in AWWA C111/ANSI A21.11.
 - c. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.
 - d. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.
 - e. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A 194, Grade 8.
8. Mechanical joint glands shall be ductile iron.
9. Ductile iron pipe shall be encased with polyethylene film where shown on the Drawings. Polyethylene film shall have a minimum thickness of 8 mils.
10. Pipe bosses shall be welded-on ductile iron body type and shall be faced and tapped for AWWA C110 flange connection. All welding, fabrication and

outlet hole drilling shall be performed by the manufacturer. Outlets shall be free of burrs. Sizes shall be as indicated on the Drawings. The bosses shall be welded on minimum Class 51 ductile iron pipe.

11. Thrust collars shall be welded-on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end.
12. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

B. Polyvinyl Chloride Pipe (PVC):

1. All PVC pipe shall have belled ends for push-on type jointing and shall conform to AWWA C900, ductile iron pipe equivalent outside diameters. The pipe shall have a Dimension Ratio (DR) of 14 and shall be capable of withstanding a working pressure of 200 psi. Pipe shall be supplied in minimum lengths of 20 feet.
2. All fittings shall be of cast or ductile iron meeting the requirements of AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi. Fittings shall be cement lined in accordance with AWWA C104. Fittings shall be furnished with a bituminous outside coating. Special adapters shall be provided, as recommended by the manufacturer, to adapt the PVC pipe to mechanical jointing with cast or ductile iron pipe, fittings or valves.
3. Detection tape shall be provided over all PVC water mains.
4. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards, including the National Sanitation Foundation. Additionally, each piece of pipe shall be stamped "NSF Approved".

C. Copper Pipe:

1. Pipe shall be hard drawn copper tubing, ASTM B 88, Type K. Fittings shall be sweat type wrought copper, ANSI B16.22.
2. Where required, sweat to screw adapters shall be cast bronze ANSI B16.18, wrought solder joint ANSI B16.22. Unions shall be cast bronze or bronze with solder connections. Joints shall be made with 95/5 solder for Type K pipe.

- D. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color-coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, "Caution Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2-inches when buried less than 10-inches below the surface. Tape width shall be a minimum of 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

2.2 GATE VALVES (GV):

- A. All gate valves shall have mechanized joint ends and shall open counterclockwise.
- B. 3-Inches in Diameter and Smaller: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded or solder type as appropriate. Valves shall have a minimum 200 psi working pressure for water. Valves shall be made in the U.S.A. Gate valves shall be equal to Crane No. 428 (threaded) or Crane No. 1334 (solder end).
- C. 4-Inches Through 12-Inches in Diameter: Gate valves 4-inches through 12-inches shall be resilient wedge type conforming to the requirements of AWWA C509 rated for 200 working pressure.
 - 1. Valves shall be provided with two O-ring stem seals with one O-ring located above and one O-ring below the stem collar. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. At least one anti-friction washer shall be utilized to further minimize operating torque. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.
 - 2. The valve gate shall be made of cast iron having a vulcanized, synthetic rubber coating, or a seat ring attached to the disc with retaining screws. Sliding of the rubber on the seating surfaces to compress the rubber will not be allowed. The design shall be such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
 - 3. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to AWWA C550, latest revision.
 - 4. Gate valves 4 through 12-inches shall be manufactured by American-Darling, Mueller or M & H Valve.

2.3 FIRE HYDRANTS (FH):

- A. All fire hydrants shall conform to the requirements of AWWA C502 for 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 5-1/4-inches.
- B. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.
- C. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.
- D. Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat

ring shall be bronze and shall screw into a bronze retainer.

- E. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.
- F. The operating nut shall match those on the existing hydrants. The operating threads shall be totally enclosed in an operating chamber, separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or an oil reservoir.
- G. Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain, which shall be fully closed whenever the main valve is opened.
- H. Hose and pumper connections shall be breech-locked, pinned, or threaded and pinned to seal them into the hydrant barrel. Each hydrant shall have two 2-1/2-inch hose connections and one 4-1/2-inch pumper connection; all with National Standard threads and each equipped with cap and non-kinking chain.
- I. Hydrants shall be furnished with a mechanical joint connection to the spigot of the 6-inch hydrant lead.
- J. Minimum depth of bury shall be 4.5 feet. Provide extension section where necessary for proper vertical installation and in accordance with manufacturer's recommendations.
- K. All outside surfaces of the barrel above grade shall be painted with enamel equal to Koppers Glamortex 501 in a color to be selected by the Owner.
- L. Hydrants shall be traffic model and shall be American-Darling B-62-B, Mueller Super Centurion or M & H Valve 929.

2.4 VALVE BOXES (VB) AND EXTENSION STEMS:

- A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5.25-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve-operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the United States.
- B. All valves shall be furnished with extension stems, as necessary, to bring the operating nut to within 30-inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a setscrew to secure the coupling to the

valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to Mueller A-26441 or M & H Valve Style 3801.

2.5 VALVE MARKERS (VM):

- A. The Contractor shall provide a concrete valve marker as detailed on the Drawings for each valve installed. Valve markers shall be stamped "Water".

2.6 TAPPING SLEEVES AND VALVES (TS&V):

- A. Tapping sleeves shall be cast or ductile iron of the split-sleeve, mechanical joint type. The Contractor shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The tapping sleeve and valve shall be supplied by the valve manufacturer. Tapping sleeves shall be American-Darling, Mueller or M & H Valve.

2.7 CORPORATION COCKS AND CURB STOPS:

- A. Corporation cocks and curb stops shall be ground key type, shall be made of bronze conforming to ASTM B 61 or B 62, and shall be suitable for the working pressure of the system. Ends shall be suitable for flared tube compression type joint. Threaded ends for inlet and outlet of corporation cocks shall conform to AWWA C800; coupling nut for connection to flared copper tubing shall conform to ANSI B16.26. Corporation cocks and curb stops shall be manufactured by Mueller or Ford.

2.8 MANHOLES AND PRECAST CONCRETE PRODUCTS:

- A. Provide precast concrete products in accordance with the following:
 - 1. Precast Concrete Sections:
 - a. Precast concrete sections shall meet the requirements of ASTM C 478. The minimum compressive strength of the concrete in precast sections shall be 4,000 psi. The minimum wall thickness shall be one-twelfth of the inside diameter of the base, riser or the largest cone diameter.
 - b. Transition slabs which convert bases larger than four feet in diameter to four-foot diameter risers shall be designed by the precast concrete manufacturer to carry the live and dead loads exerted on the slab.
 - c. Seal joints between precast sections by means of rubber O-ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of AASHTO M-198. Sealant shall be pre-formed type with a minimum nominal diameter of 1-inch.
 - d. Butyl rubber sealant shall be equal to Kent Seal No. 2 or Concrete Sealants CS 202.

2. Plastic Steps: Manhole steps of polypropylene, molded around a steel rod, equal to products of M.A. Industries may be used.

3. Floor Door:
 - a. Door shall be single or double leaf type as shown on the Drawings.
 - b. The frame shall be 1/4-inch extruded aluminum alloy 6063-T6, with built-in neoprene cushion and with strap anchors bolted to the exterior. Door leaf shall be 1/4-inch aluminum diamond plate, alloy 6061-T6, reinforced with aluminum stiffeners as required. Stainless steel hinges shall be bolted to the underside and pivot on torsion bars that counterbalance the door for easy operation. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. The door shall be built to withstand a live load of 150 pounds per square foot, and shall be equipped with a snap lock and removable handle. Bituminous coating shall be applied to exterior of frame by the manufacturer. The door shall also be provided with a hasp and padlock in addition to the built-in locking mechanism. Padlocks for all doors shall be keyed alike.

2.9 RETAINER GLANDS:

- A. Retainer glands shall be Megalug Series 1100, as manufactured by EBAA Iron, or Uni-Flange Series 1400, as manufactured by Ford Meter Box Company.

- B. Retainer glands shall be provided at all mechanical joints, including fittings, valves, hydrants and other locations as shown on the Drawings.

- C. Retainer glands shall be one of the following types:
 1. Set Screw Type: Setscrew type retainer glands shall be ACIPCO A-90857, EBAA Iron Series 100, Union Foundry Figure 176, or Tyler. Compact/light weight retainer glands shall not be provided on the Project. The minimum working pressure and minimum weight, excluding set screws and gasket material, shall be as follows:

Retainer Gland Size, inches	Minimum Working pressure, psi	Minimum Weight, pounds
4	350	6.5
6	350	11.8
8	250	16.5
10	250	22.0

2. Wedge Type: Wedge type retainer glands shall be MEGALUG, Series 1100 as manufactured by EBAA Iron, Inc.

2.10 HYDRANT TEES:

- A. Hydrant tees shall be equal to ACIPCO A10180 or U.S. Pipe U-592.

2.11 VALVE KEYS:

- A. The Contractor shall provide to the Owner one valve key for every five valves provided, but no more than three and not less than one valve key. Valve keys shall be 72-inches long with a tee handle and a 2-inch square wrench nut. Valve keys shall be furnished by the valve manufacturer. Valve keys shall be equal to Mueller A-24610 or ACIPCO No. 1303.

2.12 CONCRETE:

- A. Concrete shall have a compressive strength of not less than 3000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. For job mixed concrete, submit the concrete mix design for approval by the Engineer. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

PART 3 - EXECUTION

3.1 FIRE FLOW TEST:

- A. Fire Flow Test Required: A fire flow test may be required for all water connections made to the Water System which serve more than one single structure, single meter residential unit. The fire flow test will determine the adequacy of the existing County water lines to provide a sufficient flow of water without excessive head loss to the proposed development. In general, a fire flow test will not be required in areas known to have sufficient flow and pressure as determined by some prior test.
- B. Test to be performed by County or Independent Engineer: The fire flow test shall be conducted by the County or the County's designee at the developer's expense or by an independent Georgia Registered Professional Engineer acceptable to Cobb County.
- C. Test Sites: The test site shall be either approved or selected by the Water System prior to the test being conducted.
- D. Procedures: The fire flow test shall consist of four components:
 1. Fire hydrant flow test. The maximum obtainable fire hydrant flow, and the residual pressure at such flow, shall be determined.
 2. Twenty-four (24) hour continuous recording of system static pressure.
 3. The elevation (MSL) of the fire hydrant(s) being tested plus the elevation of the highest point in the subdivision must be provided.

4. Calculation of “available flow” at 20 psi residual based on the following equation: $0.54Q = \frac{P-20}{P_s - P_r} \times Q_m$

Where:

Q = “available flow” at 20 psi residual (gpm)

P_s = system average static pressure (psi)

P_r = system residual pressure (psi)

Q_m = measured fire hydrant flow (gpm)

- E. Minimum Allowable flows: The minimum “available flow” as calculated above shall be as follows:

1. 1000 gpm @ 20 psi for single family residential.
2. 1500 gpm @ 20 psi for multi-family, commercial, industrial and all other facilities other than single family residential.

- F. Failed Tests:

1. If the fire flow test indicates an insufficient “available flow”, a second test may be conducted following a search by the County or developer, as required by the County, for closed valves, partially closed valves or other restrictions. If, once the valves have been opened and restrictions removed, the second flow test also fails, the developer shall provide the County with a detailed engineering study by a Georgia Registered Professional Engineer which outlines the water system improvements necessary to achieve the minimum allowable flow. The County will review the proposed solutions for all developments, which fail to achieve the required “minimum allowable flow” on a case-by-case basis.
2. If any retests are required subsequent to the first retest due to problems found in the developer’s project, the developer will be charged for these tests.

3.1 EXISTING UTILITIES AND OBSTRUCTIONS:

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the Owner. The Contractor shall call the Utilities Protection Center (UPC) (325-5000 or 1-800-282-7411) as required by Georgia law (Code Section 25-9-1 through 25-9-13) and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours (three business days) prior to construction to verify the location of the existing utilities.

- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.
1. Provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only 10 days after original notice. The Contractor shall ensure, at the time of any excavation, that a valid utility location exists at the point of excavation.
 2. Expose the facility, for a distance of at least 200 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
 3. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
 4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The Contractor shall provide the Engineer an updated copy of the log bi-weekly, or more frequently if required.
- C. Conflict with Existing Utilities:
1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the Engineer. Where such relocation of the water main is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.
 2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The Contractor may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the Engineer. Where such relocation of the water main is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.
- D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.
- E. Water and Sewer Separation:

1. Water mains should maintain a minimum 10-foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the 10-foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of 18-inches above the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of 18-inches.
2. The water main, when installed below the sewer, shall be encased in concrete with a minimum 6-inch concrete depth to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.
3. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

3.2 PIPE DISTRIBUTION:

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No pipe shall be strung further along the route than 500 feet beyond the area in which the Contractor is actually working without written permission from the Owner. The Owner reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.
- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

3.3 LOCATION AND GRADE

- A. The Drawings show the alignment of the water main and the location of valves, hydrants and other appurtenances.
- B. Construction Staking:
 1. The base lines for locating the principal components of the work and a benchmark adjacent to the work are shown on the Drawings. Base lines shall

be defined as the line to which the location of the water main is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line. The Contractor shall be responsible for performing all survey work required for constructing the water main, including the establishment of base lines and any detail surveys needed for construction. This work shall include the staking out of permanent and temporary easements to ensure that the Contractor is not deviating from the designated easements.

2. The level of detail of survey required shall be that which the correct location of the water main can be established for construction and verified by the Landscape Architect. Where the location of components of the water main, e.g. tunnels and fittings, are not dimensioned, the establishment on the location of these components shall be based upon scaling these locations from the Drawings with relation to readily identifiable land marks, e.g., survey reference points, power poles, manholes, etc.

C. Reference Points:

1. The Contractor shall take all precautions necessary, which includes, but is not necessarily limited to, installing reference points, in order to protect and preserve the centerline or baseline established by the Engineer.
2. Reference points shall be placed, at or no more than three feet, from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to the Engineer for use, prior to verifying reference point locations. Distances between reference points and the manhole centerlines shall be accurately measured to 0.01 foot.
3. The Contractor shall give the Landscape Architect reasonable notice that reference points are set. The reference point locations must be verified by the Engineer prior to commencing clearing and grubbing operations.

D. After the Contractor locates and marks the water main centerline or baseline, the Contractor shall perform clearing and grubbing.

E. Construction shall begin at a connection location and proceed without interruption. Multiple construction sites shall not be permitted without written authorization from the Engineer for each site.

F. The Contractor shall be responsible for any damage done to reference points, base lines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, base lines, center lines and temporary bench marks as a result of the operations.

3.4 LAYING AND JOINTING PIPE AND ACCESSORIES:

A. Lay all pipe and fittings to accurately conform to the lines and grades established by

the Engineer/Landscape Architect.

B. Pipe Installation:

1. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves and hydrants shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.
3. All pipe, fittings, valves, hydrants and other appurtenances shall be examined carefully for damage and other defects immediately before installation.

Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.

3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe-containing dirt shall be laid.
4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
6. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.
7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.
8. Provide detection tape for all non-metallic pipe. Detection tape shall be buried 4 to 10-inches deep. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finish grade surface.

C. Alignment and Gradient:

1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

- D. Expediting of Work: Excavate, lay the pipe and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted

pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the Engineer.

E. Joint Assembly:

1. Push-on, mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
2. Each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100 percent.
3. The Contractor shall internally inspect each pipe joint to insure proper assembly for pipe 24-inches in diameter and larger after the pipe has been brought to final alignment.

E. Cutting Pipe: Cut ductile iron pipe using an abrasive wheel saw. Cut PVC pipe using a suitable saw; remove all burrs and smooth the end before jointing. The Contractor

shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.

G. Lining Repair: Repair epoxy linings and recoat spigot ends of cut pipe with an epoxy coating as specified in Part 2 of this Section and as specified below:

1. Remove all burrs and areas of loose lining materials by sanding or scraping to bare metal.
2. Remove oil and lubricants used during field cutting.
3. Lining shall be stripped back a minimum of 1-inch from the spigot end into well-adhered lined areas.
4. Roughen 1 to 2-inches of good lining with a rough grade (40 grit) emery paper, rasp or small chisel, to allow an overlap between new and existing lining.
5. Apply lining repair material in the number of coats required to match the thickness requirements as specified in Part 2 of this Section and in accordance with the manufacturer's recommendations.

H. Valve and Fitting Installation:

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the Engineer. Valves shall be closed before being installed.
2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve.

Valves shall be installed in the closed position.

3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve-operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 30-inches beneath finished grade so as to set the top of the operating nut 30-inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the Engineer.
4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
4. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Drawings or directed by the Engineer, valve markers shall be installed 6-inches inside the right-of-way or easement.

I. Hydrant Installation:

1. Prior to installation, inspect all hydrants for direction of opening, nozzle threading, operating nut and cap nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage and cracks. Defective hydrants shall be corrected or held for inspection by the Engineer.
2. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the roadway, with pumper nozzle facing the roadway, except that hydrants having two-hose nozzles 90 degrees apart shall be set with each nozzle facing the roadway at an angle of 45 degrees.
3. Hydrants shall be set to the established grade, with the centerline of the lowest nozzle at least 12-inches above the ground or as directed by the Engineer.
4. Each hydrant shall be connected to the main with a 6-inch branch controlled by an independent 6-inch valve. When a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with coarse sand from the bottom of the trench to at least 6-inches above the drain port opening in the hydrant to a distance of 12-inches around the elbow.
5. When a hydrant is set in clay or other impervious soil, a drainage pit 2 x 2 x 2 feet shall be excavated below each hydrant and filled with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of 6-inches above the drain port.
6. Hydrants shall be located as shown on the Drawings or as directed by the Engineer. In the case of hydrants that are intended to fail at the ground-line joint upon vehicle impact, specific care must be taken to provide adequate soil

resistance to avoid transmitting shock moment to the lower barrel and inlet connection. In loose or poor load bearing soil, this may be accomplished by pouring a concrete collar approximately 6-inches thick to a diameter of 24-inches at or near the ground line around the hydrant barrel.

3.5 CONNECTIONS TO WATER MAINS:

- A. Make connections to existing pipe lines with tapping sleeves and valves, unless specifically shown otherwise on the Drawings.
- B. Location: Before laying pipe, locate the points of connection to existing water mains and uncover as necessary for the Engineer to confirm the nature of the connection to be made.
- C. Interruption of Services: Make connections to existing water mains only when system operations permit. Operate existing valves only with the specific authorization and direct supervision of the Owner.
- D. Tapping Saddles and Tapping Sleeves:
 - 1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.
 - 2. Prior to attaching the saddle or sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.
 - 3. Before performing field machine cut, the water tightness of the saddle or sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, which will induce a test pressure as specified in this Section. No leakage shall be permitted for a period of five minutes.
 - 4. After attaching the saddle or sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one- percent hypo chlorite solution.
- E. Connections Using Solid Sleeves: Where connections are shown on the Drawings using solid sleeves, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line.
- F. Connections Using Couplings: Where connections are shown on the Drawings using couplings, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, plugging and backfill.

3.6 THRUST RESTRAINT:

- A. Provide restraint at all points where hydraulic thrust may develop.

- B. Retainer Glands: Provide retainer glands on fire hydrants and all associated fittings, valves and related piping. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the setscrews. The Contractor shall furnish a torque wrench to verify the torque on all setscrews, which do not have inherent torque indicators.
- C. Harnessing:
1. Provide harness rods only where specifically shown on the Drawings or directed by the Engineer.
 2. Harness rods shall be manufactured in accordance with ASTM A 36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.
 3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90-degree bend eyebolts.
 5. Eyebolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eyebolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eyebolts shall be of the same material and coating as the harness rods.
- D. Hydrants: Hydrants shall be attached to the water main by the following method:
1. For mains 12-inches and smaller, the isolation valve shall be attached to the main by connecting the valve to the hydrant tee.
 2. For mains larger than 12-inches, the isolation valve shall be attached to the main by providing an anchor coupling between the valve and welded outlet, or tapping saddle.
 3. The isolation valve shall be attached to the hydrant by providing an anchor coupling between the valve and hydrant, if the hydrant and valve are less than two feet apart. Otherwise, provide ductile iron pipe with retainer glands on the hydrant and valve.
- F. Thrust Collars: Collars shall be constructed as shown on the Drawings. Concrete and reinforcing steel shall meet the requirements as specified in this Section. The welded-on collar shall be designed to meet the minimum allowable load shown on the Drawings. The welded-on collar shall be attached to the pipe by the pipe manufacturer.
- F. Concrete Blocking:
1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop, except where other exclusive means of thrust restraint are specifically shown on the Drawings.
 2. Concrete shall be as specified in this Section.
 3. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by the Engineer. Pour blocking against undisturbed earth. Increase

dimensions when required by over excavation.

3.7 INSPECTION AND TESTING:

A. Pressure and Leakage Test:

1. All sections of the water main subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.
2. Each segment of water main between main valves shall be tested individually.
3. Test Preparation:
 - a. For water mains less than 24-inches in diameter, flush sections thoroughly at flow velocities, greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. For water mains 24-inches in diameter and larger, the main shall be carefully swept clean, and mopped if directed by the Engineer. Partially open valves to allow the water to flush the valve seat.
 - b. Partially operate valves and hydrants to clean out seats.
 - c. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipes, valves and appurtenances will be pressure tested.
 - d. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed as detailed on the Drawings with a meter box.
 - e. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure.
 - f. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.
 - g. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
4. Test Pressure: Each valved section of newly laid pipe shall be subjected to a hydrostatic pressure equal to the pressure rating of the pipe being tested. Each pressure test shall be measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gage with graduation not greater than 5 psi.
5. Leakage:
 - a. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to

return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.

- b. The Owner assumes no responsibility for leakage occurring through existing valves.
6. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

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

Where: L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

As determined under Section 4 of AWWA C600.

If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.

7. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.

3.8 DISINFECTING PIPELINE:

- A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C601 for the continuous-feed method and these Specifications.
- B. Specialty Contractor: Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the Contractor shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water.
- C. Chlorination:
 - 1. Apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated water for 24 hours.
 - 2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24-hour period.
 - 3. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. Re-chlorinate if required results are not obtained on all samples.

- D. Disposal of Chlorinated Water: Reduce chlorine residual of disinfection water to less than one milligram per liter if discharged directly to a body of water or to less than two milligrams per liter if discharged onto the ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. Flush all lines until residual is equal to existing system.
- E. Bacteriological Testing: After final flushing and before the water main is placed in service, the Contractor shall collect samples from the line and have tested for bacteriological quality in accordance with the rules of the Georgia Department of Natural Resources, Environmental Protection Division. Testing shall be performed by a laboratory certified by the State of Georgia. Re-chlorinate lines until required results are obtained.

3.9 PROTECTION AND RESTORATION OF WORK AREA:

- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.
 - 1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
 - 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
 - 6. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
- B. Man-Made Improvements: Protect, or remove and replace with the Landscape Architect's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the Work.
- C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the Landscape Architect. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks.

Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, woodpiles, or trash piles will be permitted on the work site.

- E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.

3.10 ABANDONING EXISTING WATER MAINS:

- A. General: Abandon in place all existing water main segments indicated on the Drawings to be abandoned. Perform abandonment after the new water main has been placed in service and all water main services have been changed over to the new main. Salvage for the Owner, existing fire hydrants, valve boxes, valve markers, and other materials indicated on the Drawings or located on water mains abandoned.
- B. Capping and Plugging: Disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the Drawings or directed by the Engineer. Provide a watertight pipe cap or plug and concrete blocking for restraint to seal off existing mains indicated to remain in service. Seal ends of existing mains to be abandoned with a pipe cap or plug or with a masonry plug and minimum 6-inch cover of concrete on all sides around the end of the pipe. The Contractor shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged.
- C. Salvaging Materials: Salvage existing fire hydrants, valve boxes, valve markers and other materials as indicated on the Drawings and deliver salvaged items in good condition to the Owner's storage yard. Coordinate delivery and placement of salvaged materials in advance with the Owner.
- D. Blow-Off Piping: Remove existing blow-off piping, located on segments of water mains to be abandoned, to a minimum of two feet below finished grade. Seal the end of remaining piping as specified above in paragraph B. Blow-off piping removed becomes the property of the Contractor.
- E. Pavement Removal and Replacement: Perform any necessary pavement removal and replacement in accordance with the details on the Drawings.

END OF SECTION 02665

SECTION 02668

WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.01 SCOPE:

- A. The work covered by this Section includes furnishing all materials and equipment, providing all required labor, and installing water lines, service connections, and all appurtenant work and fees according to these Specifications.
- B. Connections to the county or city water main and all materials within and including the water meter/backflow preventer vault shall be furnished and installed by the DeKalb County Department of Watershed Management. The Contractor shall connect water service lines to piping stub-outs provided outside the meter vault. The Contractor shall be responsible for coordinating this work and schedule with DeKalb County.
- C. General: Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable.

1.02 QUALIFICATIONS

If requested by the Engineer, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two (2) years.

1.03 SUBMITTALS

Complete shop drawings and engineering data for all products shall be submitted to the Engineer in accordance with the General Conditions of these Specifications.

1.04 TRANSPORTATION AND HANDLING

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.
- B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front-end loader. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

1.05 LOCATIONS:

- A. Locations shall be directed by the Engineer and the City of Brookhaven along the route of the water mains.

1.06 SERVICE COMPATIBILITY:

- A. It is the intent of these Specifications that the water service connections shall duplicate those presently being provided by the Owner to be compatible with their service maintenance procedures.

1.07 STORAGE AND PROTECTION

- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.
- C. Stored mechanical and push-on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not make contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.
- D. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

1.08 QUALITY ASSURANCE

The manufacturer shall provide written certification to the Engineer that all products furnished comply with all applicable requirements of these Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS AND CONSTRUCTION:

- A. Service Line:
 - 1. Polyvinyl Chloride Pipe (PVC):
 - a. All PVC pipe shall have glued joints and belled ends for push-on type jointing and shall conform to ASTM D 1785. The pipe shall be Schedule 80, and shall be capable of withstanding a working pressure of 160 psi and 200 psi hydrostatic test pressure. Pipe shall be supplied in minimum lengths of 20 feet.
 - b. All fittings shall be of the same material, strength, and dimension as the pipe. Fittings shall be solvent weld socket type conforming to ASTM D 2466. Solvent cement shall conform to ASTM D 2564.
 - 2. Steel Pipe and Fittings

- a. Pipe shall be furnished in accordance with AWWA C200 Standard Section 2.1, manufactured to meet the requirements of ASTM A 139, Grade A, B, C or D, or ASTM A 53, Grade A or B. The steel pipe shall be Grade A Black Steel, Schedule 40 Pipe and capable of withstanding a working pressure of 160 psi and 200 psi hydrostatic test pressure. All steel pipe and fittings shall be UL approved and adhere to applicable NFPA Standards.
 - b. All fittings shall be of the same material, strength and dimension as the pipe. All installation shall be in strict accordance with the manufacturer's recommendations and NFPA requirements.
 - c. Pipe shall be cement mortar lined in the shop in accordance with AWWA C205 Standards. Cement mortar lined pipe shall be studded as required to maintain roundness during shipping and handling and shall have ends capped prior to shipment. The nominal diameter of cement mortar lined pipe shall be the inside diameter after lining.
 - d. Pipe shall be protected by shop applied coating with extruded polyethylene coating over a mastic adhesive. Fittings and joints shall be coated and wrapped outside with prefabricated multi-layer, cold-applied polyethylene tape coating in accordance with AWWA C209 Standard. The total thickness of coating shall be 70 mils, consisting of a primer and two wraps of 35 mil tape.
 - e. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that all steel pipe and specials were manufactured in accordance with AWWA C200 and NFPA requirements.
3. Detection tape shall be provided over all service lines.
 4. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards, including the National Sanitation Foundation. Additionally, each piece of potable water piping shall be stamped "NSF Approved".
- B. Valves and Accessories:
1. Valves: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded or solder type as appropriate. Valves shall have a minimum 200 psi working pressure for water (125 psi working pressure for steam). Valves shall be made in the U.S.A. Gate valves shall be equal to Crane No. 428 (threaded) or Crane No. 1334 (solder end).
 2. Post Indicator Valves:
 - a. Each valve shown on the Drawings with the designating "P.I.V." shall be equipped with an indicator post conforming to the requirements of NFPA No. 24. Operation shall be by wrench. One wrench shall be provided for each post indicator valve.
 3. Corporation Cocks and Curb Stops:
 - a. Corporation cocks and curb stops shall be ground key type, shall be made of bronze conforming to ASTM B61 or B62 and shall be suitable for the working pressure of the system. Ends shall be suitable for compression type joint. Threaded ends for inlet and outlet of corporation cocks shall conform

to AWWA C800; coupling nut for connection to flared copper tubing shall conform to ANSI B16.26.

- b. Corporation cocks and curb stops shall be equal to Mueller.

PART 3 - EXECUTION

3.01 EXISTING UTILITIES AND OBSTRUCTIONS

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the Owner. The Contractor shall call the Utilities Protection Center (UPC) (325-5000 or 1-800-282-7411) as required by Georgia law (Code Section 25-9-1 through 25-9-13) and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours (three business days) prior to construction to verify the location of the existing utilities.
- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.
 1. Provide the required notice to the utility owners and allow them to locate their facilities according to all applicable local and state regulations. Field utility locations are valid for only 10 days after original notice. The Contractor shall ensure, at the time of any excavation, that a valid utility location exists at the point of excavation.
 2. Expose the facility, for a distance of at least 100 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
 3. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
 4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The Contractor shall provide the Engineer an updated copy of the log monthly, or more frequently if required.
- C. Electronic Locator: Have available during water line installation an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.
- D. Water and Sewer Separation
 1. Water mains should maintain a minimum 10-foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the 10-foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of 18-inches above the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of 18-inches.
 2. The water main, when installed below the sewer, shall be encased in concrete with a minimum 6-inch concrete depth to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.

3. No water main shall pass through, or make contact with, any part of a sanitary sewer manhole or septic field.

3.02 INSTALLATION

- A. Relocation of Service Lines:
 1. Before disconnecting the existing line, the existing corporation in the main shall be closed.
 2. Existing service lines shall be field-located by the Contractor. The Contractor shall be responsible for locating existing water meters, relocating the meters and meter boxes as necessary, and determining the existing size service line to reconnect the meters to the new water mains. All service lines installed under existing pavement, including streets, driveways and sidewalks, shall be installed as directed by the City of Brookhaven.
 3. The Contractor shall be prepared to make emergency repairs to the water system, if necessary, due to damage by others working in the area. In conjunction, with this requirement, the Contractor shall furnish and have available at all times, a tapping machine, for the purpose of making temporary water service taps or emergency repairs to damaged water services.
- B. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter to the service line, or the existing private service line, shall be provided by the Contractor. To minimize out of service time, the Contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.

3.03 LAYING AND JOINTING PIPE AND ACCESSORIES

- A. Lay all pipe and fittings to accurately conform to the lines and grades established by the Engineer. Trench shall be excavated below bottom of pipe and a minimum depth of cover for all water lines shall be 30-inches. Pipe shall be laid in a Class C backfill bed as indicated on the Drawings.
- B. Pipe Installation
 1. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves and hydrants shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water line materials be dropped or dumped into the trench.
 2. All pipe, fittings, valves, hydrants and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.
 3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall

be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.

4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
6. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.
7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.
8. Detection tape shall be buried 4 to 10-inches deep. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finish grade surface.

C. Alignment and Gradient

1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

D. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the Engineer.

E. Valve and Fitting Installation

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the Engineer. Valves shall be closed before being installed.
2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be

installed where depth of bury places the operating nut in excess of 30-inches beneath finished grade so as to set the top of the operating nut 30-inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the Engineer.

4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

3.04 TESTING

A. General

1. Tests may be conducted on completed pipe line or any completed portion that can be isolated from other sections previously tested or not complete.

B. Testing Water and Fire Lines:

1. Flush line to remove all dirt and debris prior to testing.
2. Fill line or section of line at least 24 hours prior to testing. Allow all air to escape through open valves.
3. If no outlet is available at a high point of line, provide a tap, fitted with a corporation stop, to release air at the high point.
4. Test pressure to be held for 2 hours. A calibrated water source shall be used by test pump to maintain test pressure.
5. Test pressure to be 150 lb/sq. inch at test gate.
6. Allowable leakage for black steel or polyvinyl chloride pipe to be computed from this requirement: 65 U.S. gallons per 24 hr/mi of pipe per inch of nominal size.
7. For copper pipe, no leakage shall be allowed.
8. If more water is used to make up leakage than is allowed, the line is to be made tight.
9. Retesting shall be made until the requirements are met.

3.05 DISINFECTING WATER MAINS

A. General

1. Disinfection of potable water lines shall be done in accordance with the Standard for Disinfecting Water Mains prepared by the American Water Works Association, (AWWA C601).
2. Fire protection lines need not be disinfected.

3.06 PROTECTION AND RESTORATION OF WORK AREA

A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.

1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as

- a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
- B. Man-Made Improvements: Protect, or remove and replace with the Owner's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the Work.
 - C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the Owner. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
 - D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.
 - E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.

END OF SECTION 02668

SECTION 02700

GROUTING OF SANITARY AND STORM SEWER LINES

PART 1 - GENERAL

1.1 CLEANING

A. The term “cleaned” shall mean the removal of all sand, dirt, roots, grease and all other solids or semi-solid materials from the sewer lines. Grouting repairs shall be conducted immediately following cleaning.

1. Cleaning Equipment

a. The contractor shall provide all equipment necessary for cleaning the sanitary sewers. The equipment used shall be suitable for the sewer conditions and degree of cleaning necessary. The equipment shall meet the following criteria:

1) Mechanically powered equipment:

a) A heavy-duty power rodding machine shall be capable of rodding distances of up to 1,000 feet in one step-up. It shall have the ability to spin the rod either clockwise or counterclockwise, but able to be pushed straight out or pulled back without rotating the machine. It shall also be capable of pulling pipe-size swabs or brushes back through the pipeline for cleaning and flushing purposes. A heavy-duty bucket machine shall be used on dragline work to clean the pipeline with buckets, brushes, scrapers, swabs or other similar devices in order to effectively remove the debris and provide a clean sewer or service lateral.

2) Hydro cleaning Equipment:

a) Hydraulic high-pressure sewer cleaners used for sanitary and storm sewer cleaning shall be specifically designed and constructed for such cleaning. The sewer cleaner shall have a minimum usable water capacity of 600 gallons and pump capable of delivering at least 30 gallons per minute (GPM) at 1,000 psi. Pressure to the nozzle shall be regulated by a relief valve adjustable from 1-1,500 psi minimum.

b. Satisfactory precautions shall be taken to protect the sewer from damage that might be inflicted by the improper use of cleaning equipment. Sewers or service laterals damaged, as a result of the Contractor’s operations shall be promptly repaired by the Contractor at no cost to the City. This includes damage caused by any materials (liquid or solid) that are blown or pushed back in residents’ home through the sewer laterals.

c. All equipment, devices and tools required for this Contract shall be owned (or leased) and operated by the Contractor.

2. Cleaning Sewers
 - a. Selection of sewer cleaning equipment shall be based on the conditions of the sewers at the time the work commences. If cleaning an entire reach of sewer cannot be completed from one manhole, the Contractor shall move to another manhole to complete the work. If the Contractor cannot successfully complete the work after relocating his equipment, the City shall be notified immediately.
 - b. Remove all sludge, dirt, sand, grease, roots, and other materials from the pipe and collect and remove resulting debris from the downstream manhole of the sewer section being cleaned. Passing material from section to section which could be detrimental to pumping equipment or cause accumulations in wet wells will not be permitted. When necessary, an approved dam or weir shall be constructed in the downstream manhole in such a manner that construction debris and solids will be trapped and retained.
 - c. All roots must be removed prior to grouting. If roots are detected during the sealing of joint/defects/service laterals in a reach, the Contractor will be required to remove his grouting equipment from the line, re-clean to effect root removal and reinsert the grouting equipment to the point where the grouting was stopped and continue the operation.
 - d. Existing flows shall not be interrupted for periods longer than one hour without prior written approval from the City. Sewage diverted during cleaning operations shall be returned to the sanitary system and not discharged into the streams or storms drain system. Cleaning of these sewers by means of hydraulic high-pressure jetting will be permitted.
3. Disposal of Debris
 - a. Under no circumstances shall sewage or solids be dumped onto the ground surface, streets or into ditches, catch basins or storm drains.
 - b. All solids or semi-solids resulting from the operations shall be removed from the site by the Contractor. Trucks hauling solids or semi-solids from the site shall be watertight so that no leakage or spillage will occur.
 - c. Disposal shall be at a suitable site selected by the Contractor and approved by the appropriate jurisdictional personnel.
4. Re-Cleaning
 - a. If pipeline is found not to be properly cleaned in the opinion of the City, the television and grouting equipment shall be removed and the sewer re-cleaned at no additional expense to the City.

1.2 GROUTING

- A. Prior to commencement of joint air testing, the test equipment shall be positioned on a section of sound sewer pipe between pipe joints, and a demonstration performed as described herein. The procedure will demonstrate the authenticity of the air test equipment, as no joint will test in excess of the pipe capability. Should it be found that the barrel of the sewer pipe will not meet the joint test requirements, then the

requirements will be modified to within the pipe integrity limits. If this test cannot be performed successfully, the Contractor shall be instructed to repair or otherwise modify his equipment and re-perform the test until the results are satisfactory to the City. This test may be required at any other time during the joint testing program if the City suspects the testing equipment is not functioning properly.

1. Pipe grouting equipment – general requirements
 - a. The Contractor shall submit his equipment list to the City.
 - b. The Contractor shall allow the City to inspect his equipment. It shall be approved prior to use in the field.
 - c. The Contractor shall also demonstrate to the City the operation of and information provided by any gauges, motors or other readouts relating to the pipe and grouting work. This shall include the air test pressure gauge, the linear footage counter, volume of sealing material, etc.
 - d. No work shall be considered for payment where measurement equipment and/or measuring techniques are unacceptable to the City at any time during the joint sealing program.
2. Chemical Grout Equipment
 - a. Equipment shall be a remote controlled grout injection rig type with inflatable diaphragms or packers at each end and other suitable approved devices which can be positioned to completely isolate each joint or break in the pipe and simultaneously permit sewage flow.
 - b. Equipment shall consist of two (2) open chemical tanks as the chemicals reservoir, from which two (2) positive displacement electric pumps are fed for chemical injection with a combined discharge of no less than 5 GPM are pressures ranging from 1 to 800 psi.
 - c. All components in the catalyst system shall be stainless steel, plastics or neoprene. Standard construction materials may be used for the components of the grout and inhibitor system.
3. Grouting materials for pipe
 - a. The sealing materials shall be a chemical grout and catalyst system. The chemical grout used shall have a documented service of satisfactory performance in similar usage. The grout used shall be Avanti AV-100®, AV-118® or approved equal.
 - b. All the materials shall be delivered to the site in undamaged, unopened containers bearing the manufacturer's original labels. Invoices or other means of providing delivery no more than three months prior to use shall be provided to the Engineer.
 - c. Materials shall have the following minimum properties:
 - 1) A controllable reaction of from five (5) seconds to no more than six (6) hours, at a temperature from ambient to freezing.
 - 2) Viscosity of approximately 2.0 centipoise water which can be increased with additives.
 - 3) Viscosity to remain constant throughout the reaction period.
 - 4) The ability to tolerate some dilution and react in moving water.

- 5) The final reaction shall produce a continuous, irreversible, impermeable, nonporous still gel in pure form, or a stabilized soil in the ground that will not become rigid or brittle.
 - 6) Root inhibitors, such as dichlobenil, shall be incorporated in the mix when roots are present in the joints. If a root inhibiting grout is unavailable from the grout manufacturer, the Contractor shall incorporate Casoron W50, dichlobenil or equal, at no cost to the City, into the grout mix in a quantity and manner recommended by the manufacturer. In so doing, the Contractor specifically covenants and agrees with the City that it shall make no claim against the City for any damages that it may incur as a result of any adverse effect the chemical Casoron W50, dichlobenil or equal may have upon the Contractor's equipment.
 - 7) Use of catalyst containing dimethyl propionitrile (DMAPN) is prohibited.
 - 8) Sealing materials, in place, shall contain no less than 10% of the acrylic base material by volume.
- d. The specified materials are considered toxic and irritants to skin and eyes. Therefore, personnel thoroughly familiar with the handling of the chemicals involved shall do the mixing, handling, and pumping of the chemicals. Proper protection outerwear, including eye protection and respirators for dust inhalation protection, shall be used while mixing or when otherwise exposed to by close contact.
- 1) Chemical Grout
 - a) The chemical grout shall consist of an intimate mixture of dry Acrylamide and dry N.N. – Methylene-biscrylamide, in such proportions that dilute aqueous solutions, when properly catalyzed, will form still gels.
 - b) The grout must make a true solution at concentrations as high as the pounds per gallon water.
 - c) The chemical solution shall have the ability to tolerate groundwater dilution, and to react in moving water.
 - d) The solution shall have the ability to tolerate groundwater dilution, and to react in moving water.
 - e) The solution shall have a viscosity of less than 2 cps which remains constant until gelatin occurs.
 - f) The reaction time shall be controllable from 5 seconds to 6 hours, at temperatures from ambient to freezing.
 - 2) Catalyst
 - a) The catalyst for the chemical grout shall be Ammonium Persulfate
 - 3) Activator
 - a) The activator shall be Triethanolamine (T). Activators shall be used with catalyst for all applications at ambient temperature or below.
 - 4) Dye Tracers

- a) Dyes may be added to the chemical grout solution for ease in identification. Fluorescein, at concentrations of less than 20 ppm, may be used for this purpose. All other dyes must be checked for possible undesirable prior to use.
 - 5) Insoluble (particulate) Additives
 - a) Any inactive solid such as clay or diatomaceous earth may be mixed with the grout as a filler, in any amounts compatible with pumpability and does not affect the quality of the grout. Bentonite may be used to increase the viscosity and strengthen the gel.
 - 6) Other Additives
 - a) The effects of additives not specifically mentioned above must be determined by test, prior to approval for field use.
4. Joint Air Tests
- a. The Contractor shall be required to air test all sanitary sewer line joints prior to any grouting to determine if the potential for joint leakage exists. The air testing procedures will be as described herein.
 - b. Joint air testing shall be performed by a void pressure monitoring system. This shall be accomplished by applying a positive air pressure to the joint, allowing time for the system to stabilize and measure the amount of pressure drop over a given length of time.
 - c. Testing shall be accomplished by isolating the area to be tested with the packer of grouting rig and applying a positive pressure into the void area. Continuous monitoring of the void pressures shall be maintained at all times by means of a pressure testing unit. The pressure meter sensing device shall be located within the void area and accurately transmit this pressure to a readout device located at the technicians TV monitor control panel. The system shall display gauge pressure to the nearest tenth (1/10th) psi and shall respond to and record any change on the void pressure instantly. All pressure measurements shall be made at the void area.
 - d. Testing procedures shall generally consist of applying pressure of ½ psi per foot of depth plus one to two psi or a maximum of 10 psi onto each void area created by the testing device. Where sewers are extremely shallow, deep or in poor condition, the City will adjust the required pressure accordingly. Once the specified pressure in the void area has been displayed on the meter above ground, the application of pressure shall be stopped, and a five-second stabilization period shall commence. The meter shall be observed for 20 seconds and should the pressure in the void area drop more than ½ psi, the joint will have failed the test.
 - e. Upon completing the air testing of each joint, the packer shall be deflated. Should the void pressure meter fail to drop to zero, the Contractor shall be instructed to clean his equipment, or make the necessary repairs to provide for an accurate Void Pressure reading.

- f. Any joint failing the air test prior to grouting shall be sealed as specified herein and retested by the same void pressure method and procedures following sealing to verify the effectiveness of the sealing. This procedure will be repeated until the joint passes the test. Additional sealing and retesting after the initial sealing and retesting shall be at no cost to the City.
5. Sealing Joints
 - a. The Contractor shall be required to seal any or all pipe joints, leaks, breaks, holes and other sources of possible groundwater infiltration within a sewer line or service lateral as may be observed on recorded television inspection, and as described herein. Any joint that is sealed shall subsequently be tested by air testing procedures described herein. Costs related to the air test following the sealing will not be measured for payment nor constitute additional cost to the Contract Price, but will be considered as incidental to the Contract.
 - b. All pipe joints and breaks shall be sealed by an internal, chemical grouting method. The method used shall not damage, break, move or cause settlement of sewer pipe or manhole structures, and shall be such that the original cross-sectional area and shape of the interior of the sewer shall not be permanently reduced or changed. Any sewer that the City may deem damaged as a result of the Contractor's operations shall be promptly repaired to the City's satisfaction at no expense.
 - c. Sealing materials that set to be hard, rigid product capable of intrusion into the sewer line will not be acceptable.
 - d. If roots were detected during the television inspection, these roots shall be removed immediately prior to any grouting operations. Costs related thereto will not be measured for payment nor constitute additional cost to the Contract Price, but will be considered as incidental to the Contract, unless chemical root removal is recommended by the City.
 - e. If, as determined by the City, concrete sewer pipe had become corroded to the degree that a positive air test cannot be achieved, the Contractor shall direct the back pressure gaging be monitored to determine a proper seal.
 6. Application of Chemical Grout
 - a. Provide chemical grouting of sewer joints, leaks, and breaks in the pipe by forcing sealing materials into and through any or all pipe line joints, leaks, or breaks, from within the sewer pipe. If grouting operations restrict or prevent simultaneous sewage flow passage, approved plug or by-pass pumping will be required. Maximum interruption of existing flows shall be limited to one hour unless the City gives prior written approval.
 - b. The grouting injection rig shall be positioned over the sewer joint, leak, or break in the pipe by means of a closed circuit television camera in the line. Accurate measurement of the location of the joint to be sealed shall be made, using a portion of the grouting rig as "Datum" or measurement

point shall also be measurement point. Such measurement or point shall also be used to record measurement of the repaired joint. The grouting device shall be an open ended cylindrical casing type of a size less than the pipe diameter with two cables connected to both ends to pull it back and forth or positioning it in the line. Any inflatable sleeves that require extreme pressure to “seat” against the periphery of the pipe causing pipe fracture will not be allowed. The sleeves shall be pneumatically expanded from the center to both ends. When in an inflated state, two widely spaced annular bladders shall have been formed, each of elongated shape and producing an annular void around the center portion of the casing. Expansion shall be regulated by precise pressure gages and control. No device which is expanded mechanically will be allowed. The pneumatically expanded sleeves shall seat against the inside periphery of the pipe in such a way as to form a voided area completely isolated from the remainder of the line. Two conduits shall pass through one end of the casing and shall be adapted to supply the sealing material, under pressure, to the space at the center of the casing. Into the isolated area, through hose lines leading from above ground, the chemical sealant shall be pumped with instant reading, metered flow controlled, proportioning pumps with pressure in excess of groundwater pressures.

- c. The television, pumping, grouting and air pressure monitoring equipment shall be integrated so that proportions, quantities, and void pressure for materials and sealing can be instantly monitored and regulated in accordance with the type and size of the joint, break in the pipe or leak, void pressure changes and the rate of flow of the sealing solution in relation to the back pressures in order to effect a seal with a minimum amount of material.
- d. In the event that large voids are encountered on the outside of the sewer, including the possibility of “piping” holes to the ground surface which could cause excessive use of grout, a change in operating pressures and pumping rates shall be made so as to avoid excessive use of grout. In such instances, changes in operating procedure shall be accomplished by reducing pressures and pumping rates followed by a termination of pumping until a temporary “set” of the gel is obtained on the outside of the pipe, and then, after sufficient lapse of time, followed by an increase in pressure and resumption of pumping until a proper seal of joint or break in the pipe is obtained.
- e. Upon completion if the injection, the grouting rig shall be moved forward, wiping away the excess grout and allowing the television camera to move to a suitable position for inspection and/or air test. Each joint, cracks or holes shall then be again air tested as specified hereinbefore. Should any joint fail to pass the air test, it shall be released and retested until the test requirements can be met. If the repair or the other break in the pipe or

groundwater leak is deemed to defective by the Owner, the rig shall be moved back into position and the grouting process repeated, with possible modification of the grout composition, until proper sealing of the joint or break in the pipe has been obtained.

- f. The excess grouting material removed from the joint or break by the grouting equipment shall be flushed or pushed forward to the next downstream manhole, removed from the sewer system and disposed of by the Contractor, as specified for disposal of debris resulting from cleaning operations. In no case shall excess grout material from succeeding sections be allowed to accumulate and be flushed down the sewer. The Contractor shall make a tight seal with his equipment at each joint or break to be grouted. If a tight seal is not secured, the Contractor shall remove the equipment and make such adjustments as are necessary to make a tight seal.

7. Monitoring Operations

- a. The Contractor shall provide for monitoring by closed circuit television in a manner which shall provide clear and visible pictures of the positioning of group equipment as well as the finished joint.
- b. Suitable metering devices shall be attached to the internal inspection equipment so that the exact location of the equipment within the pipeline can be noted at all times.

8. Records

- a. For each section of sewer grouted, complete, accurate videotape and typed records shall be kept of joint sealing performed in each manhole section. The records shall include:
 - 1) Identification of the manhole section sealed.
 - 2) The location of each joint sealed.
 - 3) Sealing pressure used.
 - 4) Number of gallons of sealant used.
 - 5) A statement indicated the sealing results (passed or failed) for each joint sealed.
- b. A copy of the typewritten records shall be given to the Owner upon completion of the project.
- c. Title of the video tape records shall be given to the Owner upon completion of the project.
- d. These records shall show the location of each operation or point on information relative to the centerline distance from adjacent manholes clearly defined. Measurement of location shall be readable at ground level by means of a measuring device. Marking on cable or the like will not be allowed. As each repair is accomplished, notations shall be made on a pertinent location record showing amount to the repair or directed by the City.

9. Obstructions

- a. Obstructions may be encountered during the course of the sealing operations that prevent the travel of the packer and camera. Should an obstruction not be passable, the Contractor shall withdraw the equipment and begin sealing operations from the opposite end. Of the sewer each. Should additional obstructions be encountered after the reemployment and no means are available for passing the obstructions without damage to the equipment, then the remaining sections of the sewer not sealed shall be excluded from the work requirements of the Contract. Costs related to difficulties encountered during sealing operations will not be measured for payment nor constitute any additional costs to the Contract Price, but will be considered as incidental to the Contract.
10. Supervision
- a. Supervision of grouting shall be under the responsibility of a person with a minimum of five (5) years of experience in the application of chemical grout for infiltration control. This person shall be present at all times chemicals are mixed and applied, have overall responsibility for record keeping, and responsibility for safety procedures for protecting all personnel involved with the grouting operation. The name of this person shall be given to the City prior to beginning the grouting work.
11. Guarantee
- a. All work performed by the Contractor shall be guaranteed for a period of one year after the completion and acceptance of the Contract. After a section between manholes has been leak-sealed and accepted by the Engineer, any and all sewer lines joints which develop renewed leakage during the guarantee period shall be resealed by the Contractor at no cost to the Owner. However, the Contractor will not be held responsible for leaks which develop in sewer line joints and are due to structural failure of pipeline or settlement not attributable to his operations.
 - b. Prior to expiration of the one-year guarantee period, the Owner may select several sewer sections for an initial retest. The manhole sections selected shall be representative of the majority of the grouting work originally performed. The initial re-test area shall consist of no more than 15% of the lineal feet contained in the original report.
 - c. Within the initial re-test area the Contractor shall re-test all previously grouted joints. Any joint failing the re-test shall be re-grouted. If the failure rate of the re-tested joints is 5% or less of the total joints re-tested, the work shall be considered satisfactory and no further re-testing will be necessary. However, if in the initial re-test area, the number of joints to fail exceeds 5% of the total joints re-tested, then all previously grouted joints shall be re-tested. All joints which fail shall be re-grouted.
 - d. In order to ensure that re-testing and any necessary re-grouting will be performed, 2% of the total Contract in cost will be retained in escrow until the re-testing has been satisfactorily completed.

END OF SECTION 02700

SECTION 02723

INLETS

PART 1 - GENERAL

1.1 SCOPE:

- A. The work covered by this Section shall consist of furnishing all materials for and constructing complete, all curb type inlets at the locations shown on the Drawings or designated by the Engineer.
- B. Curb type inlets shall be constructed to the size, shape and dimensions and at the locations shown on the Drawings or as directed by the Engineer. Inlets may be constructed either of brick or concrete masonry at the option of the Contractor. They shall be provided with cast iron frames and gratings as specified herein and shown on the Drawings.
- C. Each inlet shall be connected to a nearby storm sewer as indicated on the Drawings by means of appropriate storm sewer and suitable fittings.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Concrete shall be 4,000 psi concrete conforming to the applicable requirements of Section 03300 of these Specifications.
- B. Steel reinforcement shall conform to the requirements of Section 03300 of these Specifications.
- C. Brick shall conform to ASTM C 32, Grade SM. Sand for mortar shall conform to ASTM C 144. Hydrated lime shall conform to ASTM C 206.
- D. Frames and gratings shall be of the type shown on the Drawings. Iron castings shall conform to ASTM A 48, Class 30. All castings shall be true to pattern in form and dimensions, free from faults, sponginess, cracks, blowholes and other defects affecting their strength. Bearing surfaces between cast frames and gratings shall be machined, fitted together and match marked to prevent rocking. All castings shall be thoroughly cleaned and painted or coated with a coal tar pitch varnish.
- E. All reinforced concrete pipe and special fittings shall be reinforced concrete culvert, storm drain, and sewer pipe conforming to the latest requirements of ASTM C 76. Pipe shall be of the Class III and shall have circular reinforcement for circular pipe. All applicable subsections of Section 02720 of these Specifications shall apply to the work of connecting the inlet to the sewer.
- F. Precast Concrete Sections:

1. Precast concrete sections shall consist of a flat slab top section, and a base section conforming with the typical details as shown on the Drawings.
2. Precast concrete sections shall be manufactured, tested and marked in accordance with the latest provisions of ASTM C 478.
3. The minimum compressive strength of the concrete for all sections shall be 4,000 psi.
4. The maximum allowable absorption of the concrete shall not exceed eight percent of the dry weight.
5. The circumferential reinforcement in the riser sections and base wall sections shall consist of one line of steel and shall be not less than 0.17 square inch per lineal foot.
6. The ends of each reinforced concrete riser section and the bottom end of the top section shall be so formed that when the risers and the top are assembled, they will make a continuous and uniform structure.
7. Joints of the sections shall be of the tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to the applicable provisions of ASTM C 443, latest revision, or filled with an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints", Type 1, Rope Form.
8. Each section shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar after installation.
9. Cast iron manhole steps shall be installed in each section in accordance with the details on the Drawings.

- G. Joint materials for concrete pipe shall be in accordance with the requirements of Section 02720 of these Specifications.

PART 3 - EXECUTION

3.01 EXCAVATION:

- A. Excavation shall be in accordance with the requirements of Section 02200 of these Specifications.

3.02 CAST-IN-PLACE CONCRETE CONSTRUCTION:

- A. Forms for concrete shall be constructed of such materials and in a manner meeting the requirements of Section 03300 of these Specifications.
- B. Cast-in-place inlets shall be constructed in place with the base, walls and top all monolithically cast using removable forms of a material and design approved by the Engineer.
- C. The vertical forms, vertical and horizontal wall spacers, steps and placing cone must be carefully positioned and firmly clamped in place before any placement is made. The wall spacers must be located 90 degrees from each other. The forms shall be firmly supported

with bottom of forms at the proper elevation to permit the base to be deposited through the vertical forms.

- D. The base shall be deposited down through the wall forms onto undisturbed earth or rock bearing. It shall be evenly distributed around the walls and vibrated both inside and outside the forms until there is a minimum slope of 60 degrees from the bottom of the forms to the bearing surface both inside and outside of the inlet. When this is complete and before additional concrete is added, the concrete must be carefully vibrated on each side of each pipe.
- E. The base shall be concentric with the inlet and have a minimum diameter of 16-inches greater than the outside diameter of the inlet, and 10-inch minimum thickness under the lowest pipe. Minimum wall thickness shall be 6-inches.
- F. Additional concrete must be deposited in evenly distributed layers of approximately 18-inches with each layer vibrated to bond it to the preceding layer. The wall spacers must be raised as the placements are made. The concrete in the area from which the spacer is withdrawn shall be carefully vibrated. Excessive vibration shall be avoided.
- G. If adjustment of the frame elevation is called for, concrete "do-nut" sections or brick shall be used.
- H. Form marks and offsets shall not exceed 1-inch on the outside surface of the inlet. Form marks and offsets shall not exceed 1/2-inch inside of the inlet. All offsets on the inside surface shall be smoothed and rubbed so there is no projection or irregularity capable of scratching a worker or catching and holding water or solid materials. Honeycombed areas shall be completely removed immediately upon removal of the forms and replaced with a Class "A" concrete as directed by the Engineer.
- I. Should circumstances make a joint necessary, a formed groove or reinforcing dowels shall be required in the top of the first placement for shear protection. Immediately before the second placement is made, the surface of the cold joint shall be thoroughly cleaned and wetted with a layer of mortar being deposited on the surface.

3.03 BRICK CONSTRUCTION:

- A. Brickwork shall be constructed using one part Portland cement to two parts clean sand, thoroughly mixed to workable plastic mixture. Not over 20 pounds of hydrated lime per sack of cement may be added. No retempered mortar shall be used. Brick shall be laid with mortar joints 3/8-inch thick. The inside of the inlet shall be neatly finished with cement mortar 1/2-inch thick.
- B. Each sixth brick course shall be a "Stretcher" course. Inside joints shall be trowel struck flush joints to provide smooth, clean surfaces. Joints shall be broken in successive

layers. Wall thickness for inlets 12 feet and less deep shall be 8-inches. Wall thickness for the portion of inlets over 12 feet deep shall be 12-inches.

- C. After the foundation has been prepared and has been approved by the Engineer, the bottom shall be constructed to the required line and grade. After the bottom has been allowed to set for a period of not less than 24 hours, the inlet shall be constructed thereon, care being exercised to form the incoming and outgoing sewer pipe into the wall of the inlet at the required elevation.
- D. Manhole steps shall be inserted into the wall of the manhole at the proper locations and elevations as the work progresses and shall be securely embedded in the masonry.

3.04 PRECAST CONCRETE CONSTRUCTION:

- A. After the base section has been set, and inverts formed, the precast sections shall be placed thereon, care being exercised to form the incoming and outgoing pipes into the wall of the inlet at the required elevations.
- B. Masonry work shall be allowed to set for a period of not less than 24 hours. Outside forms, if any, then shall be removed and the inlet backfilled and compacted. All loose or waste material shall be removed from the interior of the inlet. The inlet grate then shall be placed and the surface in the vicinity of the work cleaned off and left in a neat and orderly condition.

3.05 INVERTS:

- A. All inverts shall be of 3,000 psi concrete meeting the requirements of Section 03300 of these Specifications, and shall conform to the shape indicated on the Drawings or as directed by the Engineer. The invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in directions of flow through the inlet shall be made to a true curve with as large a radius as the size of the inlet will permit.

3.06 INLET AND OUTLET PIPE:

- A. Each piece of pipe and special fitting shall be carefully inspected before it is placed and no defective pipe shall be placed in an inlet. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the groove uphill. Trench bottoms found to be unsuitable for foundations shall be corrected in accordance with Section 02200 of these Specifications prior to installation of pipe in inlets.
- B. Pipe placed in the walls for outlet connections shall extend through the wall and beyond the outside surface of the walls to allow for connections, the end of the pipe being placed flush with the inside face of the wall. Masonry shall be carefully constructed around the pipe for the full wall thickness so there will be no leakage around the outer surface.

3.07 CASTINGS:

- A. Cast iron frames shall be set accurately to line and finished elevation so that subsequent adjustments will not be necessary.
- B. Where inlets are constructed in paved areas or integral with curb and gutter, the top surface of the frame and grate shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement or curb and gutter.
- C. Frames shall be set in full cement mortar beds as shown on the Drawings set in place to match the finished concrete surface.

3.08 CLEANING:

- A. After completion of the inlet, the interior shall be thoroughly cleaned of all excess materials, the grating placed and all unused materials, tools, equipment and debris removed from the area.
- B. After the masonry and frames have had sufficient time to set, but in no case less than 24 hours after placement, the space around the inlet shall be backfilled and tamped to the required grade.
- C. Final cleaning shall be performed in accordance with the requirements of the General Conditions of these Specifications.

END OF SECTION 02723

SECTION 02808

WATERING AND IRRIGATION

PART 1 -GENERAL

1.1 SYSTEM DESCRIPTION

- A. The contractor shall install a temporary irrigation system in order to establish installed plant material.
- B. Contractor shall submit a plan for a temporary system to the Owner's Representative for review and approval prior to installation, and obtain approval as warranted by all governing agencies having jurisdiction.
- C. The system shall be designed to provide full and complete coverage of all landscaped areas of the site indicated on the landscape plan
- D. In the event no temporary irrigation system is provided, the contractor shall develop an irrigation system in accordance with Section 02810 Site Irrigation System.
- E. Shop Drawings: Contactor shall prepare Shop Drawings for the system installed to conform to the appropriate specifications.
- F. Shop Drawings: Contactor shall prepare Shop Drawings for the system to conform to the appropriate specifications.

1.2 PERMENANT IRRIGATION:

See Section 02810 Site Irrigation System for instructions on how to proceed on a Permanente Irrigation System in whole or part on the site.

1.3 QUALITY ASSURANCE

- A. Installer: All requirements as stated in Section 02810 shall apply to this section.
- B. Submittals: Submittal shall be in accordance with Shop Drawings, Product Data, and Samples.
- C. Shop Drawings and Equipment Product Information:
 - 1. Prior to purchasing materials, submit product information on all sprinkler heads, automatic valves, quick coupling valves, controller, drip lines and pipe to be used on the project.
 - 2. Contractor shall review drawings and data to supply actual precipitation rates and times for each proposed zone in the maintenance package.

3. Prior to trenching, Contractor shall submit proposed trenching equipment and process to Designer for approval.
- D. Mulch should be inspected every 3 months to ensure a depth of 4-inches and replenished where necessary until end of the plant warranty period. See Section 02900 for mulch.
- E. Site Conditions: The Contractor shall examine the site prior to preparing any plans and specifications (i.e. system requirements).

PART 2 - PRODUCTS

- A. General: Specific requirements of any materials included in the temporary system and is identified in Section 02810, shall conform to the requirements of said section.
- B. Materials: All materials used in the design of the temporary system, including sprinkler heads, valves, valve boxes, controllers, pumps, backflow preventors, rain and freeze sensors, drip equipment, wire, electrical connections, and PVC pipe and fittings, shall meet minimum industry standards. Manufacturer and model must be specified.
- C. Use of tree camel ooze tubes or tree gator bags for trees are acceptable.
- D. Upon Completion of Work, clear grounds of debris, superfluous materials and all equipment. Remove from site to satisfaction of the Owner's Representative.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

- A. Watering after installation and water transportation is the sole responsibility of the contractor.
- B. Installation: The installation process and requirements for the Temporary System shall conform to the requirements for installation as defined in Section 02810 Site Irrigation.
- C. Temporary Irrigation system shall be limited to a period of one year.
- D. System shall be placed below ground and equipped with a Reduced Pressure Backflow Preventer and meter in accordance with the local codes and requirements.
- E. Meter shall be removed after one-year period or when turf is established.
- F. Reinforced Turf; See Section 02950 for special instructions on how to install irrigation for this system of turf installation Manual Watering:

- G. The contractor is responsible for removing the temporary system after substantial completion is obtained.
- H. Watering System: If no temporary system is proposed, the contractor shall develop a schedule for manual watering of plants. This schedule should be included in any maintenance agreement and/or bonding of landscape material and should indicate the party responsible for performing the manual watering. The duration of the schedule of manual watering should be equal to the duration of the bond period or 12 months starting from the installation date, whichever is greater. The schedule should also indicate the amount of water to be applied per week. The following irrigation rates are offered as a guideline; However, the supplier of the landscape material should be consulted for their recommendations.
- a. Trees: Shall be watered daily for first month, every other day for months 2-4, and weekly for months 5-12. Apply 8 gallons per 4" caliper tree per application. Adjust rate to local rainfall amount. (Assume 30 gallons per tree for every one (1) inch of rainfall.)
 - b. Shrubs: Shall be watered daily for first month, every other day for months 2-4, and weekly for months 5-12. Apply 1 gallon per shrub per application. Adjust rate to local rainfall amount. (Assume 2 gallons per shrub for every one (1) inch of rainfall.)
 - c. Turf: Shall receive 1-inch of irrigation per week for April through September and ½ inch of irrigation for October through March. Adjust the rate to account for local rainfall amount.
 - d. Native Grass Beds: Water every other day for the first month, continue watering after that only during extended or forecasted dry periods, and then, only once per week.

PART 4.0 – CODES, PERMITS, WARRANTY, AND GUARANTEE

4.1 CODES AND ORDINANCES

- A. All materials, installation parameters, and operations shall conform to all applicable codes and ordinances. It is the Contractor's responsibility to investigate and follow all regulations. Contractor is responsible to verify applicable codes and ordinances prior to submitting bid. Before bid submittal, it is the Contractor's responsibility to notify the Irrigation Consultant/Designer at least 5 days before bid submittal, of any changes due to code or ordinance discrepancies. If the Contractor does not comply with this process and notification, the Contractor shall be responsible for the necessary installation change and redesign costs for non-compliance.

4.2 PERMITS AND FEES

- A. The Contractor shall obtain, at his expense, all required permits and shall pay all required fees. Any penalties imposed due to failure to obtain any permit or pay any fee shall be the responsibility of the Contractor.

4.3 WARRANTY AND GUARANTEE

- A. The Contractor shall furnish a certificate of warranty registration and a written guarantee of work and materials for period of the temporary system from the date of final acceptance of the Irrigation System by the Owner and the Designer to date of removal of the system or one year.

END OF SECTION 02808

SECTION 02830

CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of the chain link security fences, gates, and concrete post foundations is indicated on drawings.

1.2 QUALITY ASSURANCE

- A. Provide chain link fences as complete units provided by a single contractor including necessary erection accessories, fittings, and fastenings.
- B. Installer Qualifications: Engage an experienced Installer who has at least (3) three years of experience and has completed at least five chain link fence projects with same material and of similar scope to that indicated for this project with a successful construction record of in-service performance.
- C. Reference Standard: Fencing shall be installed in accordance with the Standards and Quality specified by the Chain link Fence Manufacturer's Institute.

1.3 SUBMITTALS

- A. Product Data: Submit technical data and installation instructions for metal fencing, fabric, gates, posts, and accessories.
- B. Details showing details of fences, posts, and post installation, gate swing, hardware, and accessories. Design must conform to the Chain Link Fence Manufacturer's Institute.
- C. Samples for verification of PVC color in form of 6-inch lengths of actual fabric wire to be used in color selection.
 - 1. Include similar samples of polymer coating applied on posts, rails, and accessories in color selected. Color shall be Black.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for fences shown on the drawings in relation to the playing field and existing fence locations. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Dimensions indicated for pipe, roll-formed, and H-sections are outside dimensions, exclusive of coatings. All materials are to be coated in the same manner and color as specified herein.
- B. Manufacturer: Subject to compliance with requirements, provide products of one of the followings:
 - 1. PVC Black Coated Galvanized Steel Fencing, Frame, Fabric, and all hardware:
 - a. Anchor Fence, Inc.
 - b. Southeastern Wire
 - c. Master Halco
 - d. Or approved equal
- C. Posts: All specified posts shall be schedule 40
- D. Rails: All specified rails shall be SS20

2.2 STEEL FABRIC

- A. Fabric: PVC coated No. 6 or 9 gauge based on details. Fused and thermally bonded size steel wires, 2" mesh, with top and bottom selvages knuckled.
 - 1. Provide one-piece fabric widths for fencing up to 4'.
 - 2. Steel Fabric Finish: Hot dip galvanized, ASTM A641-71a (2002). Comply with ASTM F 668 (2002), Type 2B, Class 2B.
 - 3. No. 6 gauge fabric shall be used on the lower 10' of the backstops only.

2.3 PVC COATING

- A. Fused and thermally bonded 9 gauge (core) 8 finish, total thickness, minimum 10 mils meeting, ASTM D-792 (2002). Color shall be in accordance with Chart A of this specification. Manufacturer's Standard Colors (black).
- B. All posts, accessories, attachments, fasteners, caps, etc., for fencing shall be PVC coated to match.

2.4 FRAMING AND ACCESSORIES

- A. Steel Framework, General: Galvanized steel, ASTM A 120 or A 123 (2003), with not less than 1.8 oz. zinc per sq. ft. of surface.

1. Fittings and Accessories: Galvanized ASTM A 153 (2003), with zinc weights per Table I.
 2. Steel Framework Finish: Provide framework, fittings and accessories in accordance with manufacturer's standard thermally bonded polyvinyl chloride (PVC) plastic resin finish over galvanizing, not less than 10 mils (0.010") thick. Color to match chain link fabric.
- B. End, Corner, and Pull Posts: Minimum sizes and weights as follows:
1. 3.0" OD steel LCX pipe – gate, fencing and corner posts.
 2. 2.5" OD steel LCX pipe –lines posts.
- C. Line Posts: Space 6' - 0" oc. maximum, unless otherwise indicated, of following minimum sizes and weights:
1. 2.0" OD steel LCX pipe - fencing.
- D. Gate Posts: Provide posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows (Double Drive =D/D, Walk Gate = W/G):
- | | | |
|-------------------|------------------|------------|
| <u>Gate Width</u> | <u>Gate Post</u> | <u>LCX</u> |
| 5' W/G | 3.0" OD pipe | LCX pipe |
- E. Wire Ties: 9 gauge. Aluminum to match PVC coated fabric material.
- F. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.
- G. Post Tops: Provide weathertight dome closure cap with loop to receive tension wire or top rail; one cap for each post of matching color.
- H. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.
- I. Stretcher Bar Bands: Space not over 15" oc., to secure stretcher bar to end, corner, pull, and gate posts.

2.5 GATES

- A. Fabrication: Fabricate frames for gates from metal and finish to match fence framework. Assemble gate frames by welding for rigid connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of

fabric, hardware and accessories. Space frame members maximum of 5' apart unless otherwise indicated.

1. Provide same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges. Attach stretcher bars to gate frame at not more than 15" oc.
- B. Swing Gates: Fabricate perimeter frames of minimum 2.5" OD round LCX Pipe.
- C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153 (2003), and in accordance with the following:
1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 90° gate opening. Provide 1 pair of hinges for each leaf.
 2. Latch: Top plunger operation from either side of gate, with padlock eye as integral part of latch.
- D. Double Gates: Provide gate stops for double gate, consisting of mushroom type flush plate with anchors, set in concrete and designed to engage center drop-rod or plunger bar. Including locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
- E. Provide miscellaneous hardware required for complete installation of removable and non-removable sleeved posts, as required.
- F. Concrete: Provide concrete consisting of Portland cement, ASTM C 150 (2003), aggregates ASTM C 33 (2003), and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3500 psi using at least 6 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 5% to 6% entrained air. Excess concrete and refuse shall be removed from the site.
- G. Bottom Tension Wire: 7-gauge galvanized coil steel tension wire attached along the bottom of the fence, 24' on center with HOG ring.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate fencing installation with layout of existing fences. Do not begin work until client has accepted the stakeout.
- B. Excavation: Drill or hand excavate (posthole digger) holes for posts to diameters and spacing shown, in firm, undisturbed or compacted soil.
- C. Setting Posts: Center and align posts in holes 6" above bottom of excavation.

1. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.
- D. Top Rails: Run Rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.
- E. Intermediate, Bottom Rails: Provide center rails where indicated. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.
- F. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.
- G. Fabric: Pull fabric taut and tie to posts and rails. Install fabric on field side of fence, and anchor framework so that fabric remains in tension after pulling force is released.
- H. Stretcher Bars: Thread through or clamp to fabric 4" oc., and secure to posts with metal bands spaced 15" oc.
- I. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- J. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing. Wire turns shall be to the outside of the playing field.
 1. Tie fabric to line posts, with wire ties spaced 12'. c. Tie fabric to rails and braces, with wire ties spaced 24" oc.
- K. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side or outside the playing field. Pen ends of bolts or score threads to prevent removal of nuts.
- L. Grounding Rods: Install grounding rods to all 3" corner posts on the backstops or T-Ball backstop.

3.2 FINAL CLEAN-UP

Contractor shall remove all refuse, extra and discarded parts from the site. Refuse shall not be disposed of on the premises of the park property.

END OF SECTION 02830

SECTION 02843

HANDRAILS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

1.02 DESCRIPTION OF WORK

- A. The work covered by this Section includes furnishing all labor, materials and equipment required to furnish and install semi-rigid deep beam steel handrail, including all posts, fastenings, anchorage and appurtenances required for a complete installation as shown on the Drawings and/or specified herein.

1.03 SUBMITTALS

- A. Submit complete shop drawings and engineering data in accordance with the requirements of Section 01300 of these Specifications.

1.04 STORAGE AND PROTECTION

- A. Handrail, posts and accessories shall be stored above ground on suitable wood blocking so as not to bend or deflect excessively under their own weight. Handrail and posts will be stored with one end elevated to facilitate drainage. Handrail shall be kept free of dirt, grease, asphalt and other injurious materials.
- B. Materials with evidence of corrosion or rust shall not be used.

1.05 QUALITY ASSURANCE

- A. The Contractor shall submit to the Project Landscape Architect written evidence that the handrail and accessories are in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the handrail supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Project Landscape Architect may require that the Contractor furnish test reports from an independent testing laboratory on certified samples of handrail stock.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Rail elements shall be corrugated sheet steel beams conforming to the requirements of AASHTO M180, except beams shall be galvanized. Rail elements shall be furnished in standard laying lengths with pre-punched holes for fastening to posts.
- B. Posts and offset pieces shall be steel, and of the section, weight and length shown on the Drawings. The steel shall conform to ASTM A 35 and shall be galvanized in accordance with ASTM A 123.
- C. All splice and rail bolts shall be flat rounded, headed bolts with oval shoulders to prevent turning. All bolts and nuts shall be 5/8-inch in size, shall conform to ASTM A 307 and shall be galvanized in accordance with ASTM A 153.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Handrail shall be installed at the locations shown on the Drawings or directed by the Project Landscape Architect. Handrail shall be installed in accordance with the Drawings and approved manufacturer's shop drawings and installation instructions.

END OF SECTION 02843

SECTION 02870

SITE FURNISHINGS & FENCE

PART I GENERAL

1.1 SECTION INCLUDES

- A. Benches as shown on drawings and as specified herein.
- B. Picnic Tables as shown on the drawing and details.
- C. Trash Receptacles as shown on the drawings and details.
- D. 5' Metal Security Fence around the splash pad with gate.

1.2 SUBMITTALS

- A. Contractor shall submit minimum of two (2) sets of color options for Owner.
- B. Contractor shall consult the project Site Detail sheet for more information.

1.3 Manufactures: All products and installation shall conform to the requirements of the manufactures' specifications.

PART 2 PRODUCTS

2.1 BENCHES:

- A. Manufacturer: Victor Stanley, PO Drawer 330, Dunkirk, MD 20754
Toll Free: 1 800-368-2573: Tel (301) 855- 880: Website: Victorstanley.com
- B. Benches shall be RBF-28 Steelsites RB Series.
- C. Local Sales Representative: Hasley Recreation, Inc. Flowery Branch, Ga.
Sales@hasley-recreation.com 770 965- 4042
- D. Anchor bolts are not provided by manufacturer.
- E. Finish: Coated with zinc rich epoxy then finished with polyester powder coating
- F. Metal components are steel shot-blasted, etched, phosphatized, preheated and electrostatically powder coated with T.G.I.C. polyester power coating.
- G. Color; Black Powder coated.
- H. Assembly: This product is shipped fully assembled

2.2 PICNIC TABLE

- I. Manufacturer: Victor Stanley, PO Drawer 330, Dunkirk, MD 20754
Toll Free: 1 800-368-2573: Tel (301) 855- 880: Website: Victorstanley.com
- J. Picnic Tables shall be all steel, ST-5 Homestead Series
- K. Local Sales Representative: Hasley Recreation, Inc. Flowery Branch, Ga.
Sales@hasley-recreation.com 770 965- 4042
- L. Metal components are steel shot blasted, etched, phosphatized, preheated and electrostatically powder coated with T.G.I.C. polyester power coating.
- M. Finish: Grey IPE Slats
- N. Color; Black Powder coated.
- O. Assembly: This product is shipped partially assembled

2.3 TRASH RECEPTACLES:

- P. Manufacturer: Victor Stanley, PO Drawer 330, Dunkirk, MD 20754
Toll Free: 1 800-368-2573; Tel (301) 855- 880; Website: Victorstanley.com
- Q. Trash Receptacles shall be SD-242 Ironsites Series.
- R. Local Sales Representative: Hasley Recreation, Inc. Flowery Branch, Ga.
Sales@hasley-recreation.com 770 965- 4042
- S. Anchor bolts are not provided by manufacturer.
- T. Finish: Coated with zinc rich epoxy then finished with polyester powder coating
- U. Metal components are steel shot-blasted, etched, phosphatized, preheated and electrostatically powder coated with T.G.I.C. polyester power coating.
- V. Color; Black Powder coated.
- W. Assembly: This product is shipped fully assembled

2.4 FENCES:

- X. Manufacturer: Ameristar 1555 N. Mingo Tulsa, OK 74166
Toll Free: 1 888-333-3422; Website: Ameristarfence.com
- Y. Fences shall be 5' Montage Majestic Steel Fence and gate.
- Z. Local Sales Representative: Hasley Recreation, Inc. Flowery Branch, Ga.
Sales@hasley-recreation.com 770 965- 4042
- AA. Latch shall be Vertical Pull Model MLVPS2BGA, DD technologies.
- BB. Finish: Coated with zinc rich epoxy then finished with polyester powder coating
- CC. Metal components are steel shot-blasted, etched, phosphatized, preheated and electrostatically powder coated with T.G.I.C. polyester power coating.
- DD. Color; Black Powder coated.
- EE. Assembly: This product is shipped partially assembled

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Restore damaged finishes and test for proper function. Clean and protect work from damage.
- C. Contractor has to provide the anchor bolts to attach the bench and trash receptacle to the surface.
- D. Install site elements in accordance with the manufacturer's recommendations.

3.2 BENCHES

- A. Install benches where indicated on plans flush and level with surrounding pavement surfaces.

- B. Install anchor bolts not provided by manufacturer to attach to the surface. Benches must be set flush and leveled at all times.

3.3 PICNIC TABLE

- A. Table does not come with an attachment option but sits on the surface.
- B. Contractor and Client can devise an attachment if that becomes an issue.

3.4 TRASH RECEPTACLE

- A. Installation: Install per manufacture's specifications. See detail on Construction Documents.
- B. Concrete: See Section 03310 for Concrete Base Specifications.

3.5 SECURITY FENCE

- C. Installation: Install fence per manufacture's specifications. See site detail on Construction Documents.
- D. Concrete: See Section 03310 for Concrete Base Specifications around the posts.
- E. Install 5' gate in accordance with manufacturers specification.

END OF SECTION 02870

SECTION 02900

LANDSCAPE MATERIALS

PART 1 GENERAL

1.01 SCOPE

1.02 QUALITY OF WORK AND MATERIALS

The Contractor shall have minimum five years successful experience in the field and shall furnish all materials and perform all work in accordance with these specifications, drawings, and instructions provided by the Landscape Architect or Owner's representative hereafter also referred to as Landscape Architect. The work shall include everything shown on the drawings and required by the specifications and everything to which in the judgment of the Landscape Architect is incidental to what is shown on the drawings or required by the specifications. Workmanship and materials shall be of the best quality and shall be in strict accordance with the intention of the drawings, specifications and samples. The Contractor shall cooperate with the Landscape Architect so that no error or discrepancy in the drawings or specifications shall cause defective or inappropriate materials to be used or poor workmanship to be allowed and so that the work may proceed in the most efficient and effective manner.

1.03 WEATHER

Plant only during weather conditions favorable to landscape construction and to the health and welfare of plants. Contractor to notify Landscape Architect immediately if directed to commence planting operations in conditions detrimental to plant health.

1.04 PROTECTION

- A. Before commencing work, all trees and shrubs which are to be saved must be protected from damage by the placement of fencing flagged for visibility or some other suitable protective procedure approved by the Owner. No work may begin until this requirement is fulfilled.
- B. In order to avoid damage to roots, bark or lower branches, no truck or other equipment shall be driven or parked within the drip line of any tree, unless the tree overspreads a paved way.
- C. The contractor shall use any and all precautionary measures when performing work around trees, walks, pavements, utilities, and any other features either existing or previously installed under this Contract.
- D. The Contractor shall adjust depth of earthwork and loaming when working immediately adjacent to any of the aforementioned features in order to prevent disturbing tree roots, undermining walks and pavements, and damage in general to any existing or newly incorporated item.
- E. 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. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection. All plants shall be kept moist, fresh, and

protected. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.

1.05 PERCOLATION TEST

- A. The Contractor shall be responsible for determining existing sub-surface drainage conditions for areas to be planted or sodded. The Contractor shall include as a part of his proposal the cost for making the following percolation tests in any area where he is uncertain about adequate sub-surface drainage. Report unacceptable areas to Landscape Architect/Owner's Representative for instructions.
- B. Percolation tests shall be made as follows:
1. Wait at least 24 hours after rain and dig test pit 12 inches square or 13 1/2 inches in diameter to depth of bottom of plant bed and remove all loose soil. (If standing water is visible, notify Landscape Architect).
 2. Quickly fill pit bottom with 6 inches (approximately 3 1/4 gallons) of water.
 3. Record length of time from filling until disappearance of water and divide number of minutes by 6 to give average time of 1 inch fall.
 4. Compare 1-inch time with following table:

1 inch in 0 - 3 minutes indicates rapid absorption
1 inch in 3 - 5 minutes indicates medium absorption
1 inch in 5 - 30 minutes indicates slow absorption
1 inch in over 60 minutes indicates impervious soil
 5. In plant bed areas where sub-soil conditions do not percolate or the bed is enclosed by pavement, curbs, walks or other hard construction, the contractor shall install a 4" drain line that allows the sub-surface of the bed to drain to the storm system or out to day light on the nearest slope.
- C. Planting shall not begin until planting area drainage has been approved by owner's representative.

1.06 SUBMITTALS

- A. It is the responsibility of the Contractor, before ordering or purchasing materials, to provide (2) photographs of each tree type with description to the Landscape Architect for review and approval. Contractor shall tag and deliver palms and trees that match approved sample photographs. Landscape Architect will decide final approval of all plant material on site.
- B. The Contractor is to submit certification tags from trees, shrubs, seed, and sod verifying type and purity.
- C. Materials: Samples of materials as listed below shall be submitted for inspection on the job site, or as otherwise determined by the Landscape Architect.

Material

Sample

Mulch	1 Bag
Peat Moss	1 Bale
Pine Straw	1 Bale
Top Dressing Sand	1 Cup

- D. Plants shall be subject to inspection and approval at the place of growth, or upon delivery to the site, as determined by the Landscape Architect, for quality, size and variety. Such prior approval will not impair the right of inspection and rejection at the site during progress of the work or after completion, for size and conditions of balls or roots, latent defects or injuries. Rejected plants shall be removed immediately from the site. Notice requesting inspection should be submitted by the Contractor at least one week prior to anticipated date.
- E. Typical samples shall be furnished from each separate source of supply. Approved samples shall be stored on the site and protected until furnishing of material is completed. Plant samples may be planted in permanent positions, but labeled as samples.
- F. Upon approval of samples by the Landscape Architect, delivery of materials may begin.

1.07 QUALITY OF PLANTS

- A. Plants shall in all cases conform with requirements of the following:
 - 1. Georgia State Plant Board Codes and Standards.
 - 2. Georgia Nurseryman and Grower's Association Approved Planting Practices.
 - 3. Bailey, Hortus III
 - 4. American Standard for Nursery Stock with the latest versions of rules and grading adopted by the American Association of Nurserymen, Inc.
- B. Unless specifically noted otherwise, all plants shall be of selected specimen quality, exceptionally heavy, symmetrical, tightly knit, so trained or favored in their development and appearance as to be superior in form, number of branches, compactness and symmetry. All plants shall have a normal growth habit, be free of disease, show vigorous health and have a well developed root system.
- C. Plants shall be free of disease, insect pests, eggs or larvae.
- D. Plants shall not be pruned before delivery.
- E. Trees with abrasion of the bark, sunscalds, disfiguring knots or fresh cuts of limbs over one and one-fourth inches (1-1/4") which have not completely callused shall be rejected.
- F. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. All plants shall have been grown under climatic conditions similar to those in the locality of the site of the project under construction or have been acclimated to such condition for at least two (2) years.
- G. The root system of each shall be well provided with fibrous roots. All parts shall be sound, healthy, vigorous, well branched and densely foliated when in leaf.
- H. Container stock shall be delivered to the site in first class condition. Plants shall have stakes in containers where required to support the plants. Plants furnished in containers shall not be

handled by the stem, but only by the containers. Plants that are root bound by their containers shall not be accepted.

- I. Balled and burlapped plants (BB) shall be dug with firm, natural balls of soil and of sufficient size to encompass the fibrous and feeding roots of the plants. No plants moved with a ball shall be planted if the ball is cracked or broken, except upon special approval. Plants balled and burlapped shall be handled by the stems.
- J. Plants marked "BR" in the Plant List shall be dug with bare roots. The roots shall not be cut within the minimum spread specified in the Plant List. Care shall be exercised that the roots do not dry out in moving.

1.08 PLANT MATERIAL SIZE AND MEASUREMENT

- A. Plants shall be measured when branches are in their normal position.
- B. Shrubs shall meet the size requirements stated in the Plant List. The measurements are to be taken from the ground level to the average height of the shrub and not to the longest branch. Height and spread dimensions specified refer to the main body of the trees (measured from the crown of the roots to the tip of the top branch) and shall be not less than the minimum size designated.
- C. Caliper measurements shall be taken at a point on the trunk six inches (6") above natural ground line for trees up to four inches (4") in caliper, and at a point 12 inches (12") above the natural ground line for trees exceeding four inches (4") in caliper.
- D. If a range of size is given, no plant shall be less than the minimum size, and not less than 50% of the plants shall be as large as the upper half of the range specified.
- E. The measurements specified are the minimum size acceptable and, where pruning is required, are the measurements after pruning.
- F. All dimensions on Schedule shall be the minimum acceptable size. Plants larger in size than specified in the Plant List may be used if approved by the Landscape Architect. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased in proportion to the size of the plant.
- G. The minimum acceptable ball size for trees shall be 11" diameter per 1" caliper taken 6" above the ground for trees up to and including 4" caliper. Caliper shall be measured 12" above the ground for trees larger than 4" caliper. In special cases the ball size may be reduced as directed or approved by the Landscape Architect.

1.09 NOTIFICATION OF DELIVERY

Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hours in advance of the anticipated delivery date of any plant materials.

1.10 RIGHT OF REJECTION

The Landscape Architect reserves the right to inspect and reject plants at any time and at any place. Plants held on site for longer than 2 months must be approved by Landscape Architect before installation

1.11 MAINTENANCE

All planting shall be protected and maintained by the Contractor until time of final acceptance as defined in the guarantee. Maintenance shall include but is not limited to watering, weeding, cultivating, removal of dead material, resetting plants to proper grades or upright position, lawn mowing, fertilizing, and other necessary operations. The Contractor will be responsible for maintenance until 90 days after the time of acceptance. The Contractor shall submit, in writing, maintenance instructions for use by the Owner in caring for the plants.

1.12 PLANT GUARANTEE

- A. All plants, grass and trees shall be guaranteed to be alive and healthy one year after the date of final acceptance. Contractor shall be responsible for maintaining the plant installations for 30 days after final acceptance. The Contractor is responsible for providing adequate maintenance for one year to any plant, including grass, or tree that is dead or not showing satisfactory growth. After a 90 day period, it shall be replaced, or conditions contributing to unsatisfactory growth corrected. All replacements shall be of the original quality and shall be of a size equal to that attained by adjacent plants or trees of the same species. Replacement plant material shall be guaranteed to be alive at the beginning of the following growing season. Only one replacement will be required for each dead grass area. The number of replacements for other plant materials is not limited.
- B. The guarantee may become void if it is determined that plant material kill or unsatisfactory growth results from Owner negligence. The decision for determination of responsibility for damage shall rest solely with the owner's representative.

1.13 FINAL GRADING AND CLEAN UP

After all work has been completed and all soil settled and final finished grading completed, clean-up and adjustments shall be made to insure proper depth of topsoil, proper drainage, proper grades adjacent to walks and curbs, proper slope of plant beds, etc. Remove any soil, peat moss, mulch or plant materials from walks and paving, leaving the areas broom clean.

1.14 DAMAGED/DISTURBED AREAS

- A. Plant or grassed areas damaged during the process of work by other contractors shall be called to the attention of the General Contractor and Landscape Architect in writing within one week of the occurrence, to settle disputes over party responsible for damages.
- B. Damaged areas will be repaired within a timely period to Landscape Architect's satisfaction.

1.15 FINAL APPROVAL

The Landscape Architect shall have the final approval for acceptance of the landscaping.

PART 2 - PRODUCTS:

2.01 GENERAL:

- A. Water: All water necessary for planting and maintenance shall be of satisfactory quality to sustain the growth of plants and shall not contain harmful, natural or man-made elements

detrimental to plants. Water meeting the above standard shall be furnished by the Contractor and all arrangements for securing water and any expenses of transporting to the site and dispersal on the site shall be the responsibility of the Contractor.

- B. Commercial Fertilizer: Provide a complete fertilizer, uniform in composition, dry and free flowing, delivered to the site in the original unopened containers, each bearing the manufacturer's statement of analysis, meeting the following requirements:
- 12% nitrogen, 5% phosphoric acid, 8% potash; with nitrogen derived from 6.6% uramite, 3% sewage sludge and 2.4% ammonium nitrate or approximate equal.
- C. Lime: Shall be agricultural grade high calcium ground limestone and shall be of such fineness that 90% will pass through a No. 10 sieve and not less than 50% through a No. 50 sieve.
- D. Soil Test: Revise fertilizer analysis, quantities of fertilizer and lime as dictated by soil tests made prior to planting.
- E. Hardwood Mulch: Shall be aged for a minimum of three years and ground to a fine texture. Mulch shall be fresh, clean, free from sticks, cones, leaves and other debris.
- F. Pine Straw Mulch: Shall be fresh, clean, free from sticks, cones, leaves and other debris. Pine straw mulch shall be used and maintained as a two inch (2") top dressing in all plant beds and around all trees planted by the Landscape Contractor. Single trees or shrubs shall be mulched to the outside edge of the saucer. Depth to be minimum three inches (3") at final acceptance.
- G. Topsoil: Where required shall be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well-drained areas, free from substances harmful to plant growth, and free from clay lumps, stones, stumps, roots, or similar substances two inches or more in diameter. The source and material shall be approved by the Landscape Architect before placing on site. Topsoil shall be free from noxious grass and weeds.
- H. Fertilizer: For grass areas: See planting details for specific requirements.
- I. Pre and Post emergent Herbicide: Contractor to have a licensed herbicide applicator with a minimum three years experience performing all herbicide applications to lawns, trees and shrubs. Herbicides shall be utilized as necessary to control weeds in bed, tree plantings and turf areas unless applicable codes or ordinances stipulate otherwise. Contractor is responsible to be familiar with all applicable local, state and federal codes, ordinances and regulations.
- J. Staking Material:
1. Trees: Stakes for guying trees under shall be No. 2 Southern Pine, 2 x 2, 36", pressure treated with waterborne preservatives complying with AWPB LP-22.
- L. Guying: Galvanized Steel Turnbuckles with #12 gauge, multi-strand galvanized steel wire.

2.02 GENERAL:

- A. See Planting Plan and schedule for plants required. Quantities necessary to complete the work shown on the drawings shall be furnished. Although quantity estimates have been carefully made, the Landscape Architect assumes no liability for omissions or errors.
- B. All plants shall conform to the measurements specified on the Plant List. Such measurements shall be made in accordance with methods stated in section 02900, #1.08. Plants that meet the requirements specified on the Plant List, but which do not possess a normal balance between height and spread will not be accepted. All plants shall be fresh dug, sound, healthy, vigorous, well branched and free of disease and insect egg and larvae and shall have adequate root systems. Trees for planting in rows shall be uniform in size and shape. All materials shall be subject to approval by the Landscape Architect. Where any requirements are omitted from the Plant List, the plants furnished shall be normal for the variety. Plants shall be pruned prior to delivery only upon the approval of the Landscape Architect.
- C. Container Grown Material: All container grown materials shall be healthy, vigorous, well-rooted and established in the containers in which they are sold. They shall have tops which are of good quality and are in a healthy growing condition.
- D. An established container grown plant shall be transplanted into a container and grown in that container sufficiently long for the new fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container.
- E. The container shall be sufficiently rigid to hold the ball shape protecting the root mass during shipping.
- F. Container stock shall be delivered to the site in first class condition. Plants shall have stakes in containers where required to support the plants. Plants furnished in containers shall not be handled by the stems, but only by the containers. Plants root bound in containers shall not be accepted.
- F. Sod: Sod shall be a species recommended by an experienced local A.N.A.-certified nursery, grown in a nursery equipped for the production of such sod and capable of meeting the published State Standards for Certification. It shall have been mowed regularly, fertilized and fumigated and shall be free of diseases and harmful insects at the time of delivery. Sod shall be delivered in strips one foot wide and two feet or longer as soil and species permit or in rolls not over six feet long. Sod shall have a minimum of one-inch thickness including roots and soil. Sod bearing holes or thinned root pad, i.e. less than ½” shall be rejected. Sod shall be free of weeds, nut grass, crab grass and other invasive plants.
 - 1. Sprigs: It shall be alive and viable at time of planting.
 - 2. Seeds: All seed shall be certified stock and appropriately labeled. Contractor shall deliver empty seed bags to Landscape Architect on site.

PART 3 - EXECUTION

3.01 GENERAL

- A. Planting operations shall be conducted under favorable weather conditions preferably during the period from October 1 to April 1. The Contractor has the option and assumes full responsibility for planting in unseasonable conditions.
- B. Planting of grass shall be accomplished during recommended season dependent on specified grass and planting method.
- C. Protect roots or balls of plants at all times from sun and drying winds, water and freezing, as necessary until planting.

3.02 PLANTING PROCEDURE:

- A. Cleaning up before commencing work: The Contractor shall clean up work and surrounding areas of all rubbish or objectionable matter. All mortar, cement and toxic material shall be removed from the surface of all plant beds. They must not be stirred with the soil. Extensive clean up work will not be required under this contract. Should the Contractor find such conditions beneath the soil which shall in any way adversely affect the plant growth, he shall immediately call it to the attention of the Landscape Architect. Failure to do so before planting shall render the Landscape Contractor liable for subsequent problems arising from unacceptable subsoil conditions. Use approved herbicide to eliminate temporary plant material as directed.
- B. Stake Out: Stake tree or plant locations and secure approval of them from the Landscape Architect before digging pits, and make adjustments as directed. Locate no tree closer than two feet from pavement or structures.
- C. Planting soil mixture: for trees shall consist of 1/3 topsoil, 2/3 thoroughly pulverized existing soil mixed with 1 1/2 pounds of fertilizer per inch of tree caliper or 10 pounds per cubic yard or 7 1/2 oz. per bushel; and five pounds lime per cubic yard.
- D. Planting Hole: for ball up to two feet in diameter shall be twice the diameter of the ball. Diameter of hole for ball two feet and greater shall be two feet larger in diameter than diameter of ball. Excavate pits with vertical sides.
- E. Large Plastic Containers: Cut off bottom of containers over 5 gallons, place plant and containers in planting hole, cut the container on two sides, removing the remaining part of the container. Examine roots to insure that roots have not begun to circle the container. If roots have begun to circle the plant, Contractor may realign the roots in the hole. If root circling is too severe, plant must be rejected and returned to supplier.
- F. Baskets: Remove rim and handles after placing in the hole. Break or slit sides in several places.
- G. Wire Baskets: After placing in planting hole, remove all twine and rope used to secure wire basket and burlap. Bend or cut the wire and pull away from the root ball. Slit and remove all burlap from the top of the ball at least 1/3 of the way down sides or further as possible. Backfill and cover top of ball with mulch.
- H. Trees and Shrubs: Trees shall be set straight and at such level that after settlement the plant crown shall be 8" above grade; shrubs shall stand 1" - 2" above grade mounded. Each plant

shall be set in the center of the pit. Backfill mixture shall be thoroughly tamped around the ball and shall be settled by water after tamping. A water holding saucer shall be formed with extra soil. Do not handle the tree by the trunk or use the trunk to straighten or adjust the location. (See Details)

- I. Fill: Fill hole with soil mixture and fertilizer as required. Pack lightly with feet. Add more wet soil. Do not cover top of ball with soil, only with mulch. Make sure no burlap is exposed since exposed burlap acts as a wick causing excessive loss of water.
- J. Water Basin: Build basin around all plants or trees which stand alone and are not in larger mulched beds. A water holding earth dam shall be built on the outside of the hole to form a basin to hold water, it shall be 4 - 6" high of soil firm enough to remain in place. If necessary, bring in soil. See Detail.
- K. Pruning: Each tree shall be pruned to preserve the natural character of the plant as directed by the Landscape Architect. All soft wood or sucker growth and all broken or badly damaged branches shall be removed with a clean cut. All pruning cuts over 1/2" in diameter shall be painted over with an approved tree paint.
- L. Guying or Staking: Shall be done immediately after planting. Trees shall stand plumb after staking or guying in accordance with the drawings.

3.03 FINISH GRADING

Prior to applying mulch, plant beds and pine straw covered areas shall be stirred 4" deep to loosen soil mixture. Fine grade areas until all bumps and depressions are removed and until the grade conforms to requirements of the grading plan. Eliminate any water pockets and verify surfaces drain away from all buildings. The minimum surface slope of plant beds shall be four percent. Minimum surface slope in lawn areas shall be two percent.

3.04 MULCHING

On completion of planting, all ground cover areas shall be covered with 3" layer of pine straw. All annual bed areas shall be covered with 2" depth of mini-nuggets manufactured by Joe K. Smith or approved equal (phone 524-4286).

3.05 WEED CONTROL (HERBICIDE)

Immediately after planting and applying the mulch, apply 2% granular "Chipco" Ronstar at the rate of 3 pounds per 1,000 square feet. This is slightly more than 2 1/2 pounds of active ingredient per acre. Apply to all plant beds, ground cover and pine straw ground cover. Protect lawns and any susceptible plants.

3.06 GRASSING

- A. General: Includes soil preparation, applying fertilizer, planting and maintenance as required to produce an acceptable stand of grass on areas shown on planting plan.
 - 1. Any damage to planting soil by erosion, construction equipment, construction operations, or other damage shall be repaired prior to application of fertilizer. Finished surface shall be smooth and even.

- B. Soil Preparation: After the area to be grassed has been brought to finished grade, prepare the soil by thoroughly loosening the area by plowing, discing, harrowing, or scarifying until these areas are friable, well pulverized and acceptable to the Landscape Architect. Any irregularities in the surface resulting from the above operation or from other operations by the contractor, shall be smoothed out before any subsequent operations are begun. All roots and stones larger than 1 1/2" in any dimension, stumps and other foreign material detrimental to final grading, proper bonding, the rise of capillary moisture, or the proper growth of the desired plantings shall be removed.
1. The completed surface shall conform to the finished grades or subgrades shown and shall have a smooth pulverized surface at the time of planting. Any irregularities shall be corrected before the lime and fertilizer are placed.
 2. Spread lime and fertilizer over the prepared surface before turning. Fertilizer and lime shall be sufficient to correct irregularities in the soil based on soil tests for the specified turf. Turn the soil one last time the day before planting or placing sod.
- C. Sodding: (When required by the Construction Schedule)
1. Prepare planting bed as described for seeded areas except that fine graded soil shall be 1 inch below finished grade established by the grading plan.
 2. Stored sod of the species required in the schedule shall be kept moist prior to laying. Wet all areas prior to sodding.
 3. Wet all areas immediately prior to sodding.
 4. Unroll the sod on the prepared soil. Lay the strips parallel with the strip ends staggered as in bricklayers' running bond pattern. Press each successively laid strip snugly up against the one next to it. Fill cracks, holes, joints with clean, loose sand, free of all grass and plant seeds.
 5. Watering, fertilizing and rolling shall be done by the Contractor as described under "Maintenance of Sodded Areas" below.
- D. Maintenance of Sodded Areas: The Contractor shall be responsible for maintaining sodded areas by properly watering, weeding and mowing the grass until an acceptable stand has been produced, and been accepted by the Owner and a minimum of 30 days thereafter.
1. A stand shall be considered acceptable when 95% of the total sodded area has been covered with grass and no bare areas greater than one square foot exist. All cracks, joints, dips, pits and other irregularities in the surface must have been corrected by top dressing with sand.
 2. The Contractor shall be responsible for re-sodding all bare areas greater than one square foot with the specified mixture and for repairing and re-sodding wash-outs and eroded areas to the original finished grade.
 3. Sodded areas shall be mowed when the grass attains a height of 2 inches and as required thereafter until the acceptance of the stand. Reel type mowers, kept well

sharpened, shall be used. Turf shall not be accepted until all sod has knitted together and tacked to the soil.

4. All lawn areas shall be given a top dressing of fertilizer to provide 100 pounds available nitrogen per acre when the grass has attained a satisfactory growth and the first mowing has been performed. Nitrogen shall be derived from Ammonium Nitrate or Nitrate of Soda.
5. Contractor shall be responsible to administer a final top dressing of sand to the turf to fix all dips, pits, cracks, etc., for up to 6 months after final acceptance of a lawn field of play.

3.07 SEEDING

- A. Area: All exterior ground within the limit of contract, except surfaces occupied by buildings, structures, paving, and except areas indicated to be undisturbed or mulched, shall be seeded or planted as shown on drawings.
 1. Furnish topsoil
 2. Finish grading
 3. Prepare seedbed
 4. Seed and maintain areas as indicated on the drawings.
- B. Seed Bed Preparation: Grade areas to finish grades, filling as needed or removing surplus dirt and floating areas to a smooth, uniform grade as indicated on grading plans. All lawn areas shall slope to drain. Where no grades are shown, areas shall have a smooth and continual grade between existing or fixed controls (such as walks, curbs, catch basin, elevational steps or building) and elevations shown on plans. Roll, scarify, rake and level as necessary to obtain true, even lawn surfaces. All finish grades shall meet approval of the Landscape Architect, before grass seed is sown. Loosen soil to a depth of six inches (6") in lawn areas by approved method in the specifications and grade to remove ridges and depressions. Remove stones or foreign matter over two inches (2") in diameter from the top two inches (2") of soil. Float lawn areas to approximately finish grades.
- C. Seed beds should be permitted to settle or should be firmed by rolling before seeds are broadcast.
- D. Seeding should not be performed in windy weather.
- E. Seeding shall be done in two (2) directions at right angles to each other.
- F. Lawn areas shall be seeded by sowing evenly with an approved mechanical seeder at the rate of a minimum of three (3) pounds per 1,000 square feet. Culti-packer or approved similar equipment may be used to cover the seed and to form the seedbed in one operation. In areas inaccessible to culti-packer, the seeded ground shall be lightly raked with flexible rakes and rolled with a water ballast roller. After rolling, seeded areas are to be lightly mulched with wheat straw.
- G. If the project completion date prohibits in-season planting, the Contractor shall prepare for out-of-season seeding or sodding so that all lawns shall be completed and ready for acceptance at time of project completion, without additional cost to the Owner. Lawn maintenance shall be the same as for other planting.

- H. Lawns shall be maintained by the Contractor for at least 30 days after sodding and 60 days after seeding, or as long as is necessary to establish a uniform stand of the specified grasses, or until substantial completion of the project or until acceptance of lawns, whichever is later.
- I. In the event that lawn operations are completed too late in the Fall for adequate germination and/or growth, maintenance shall continue into the following growing season or until a uniform stand of the specified grasses has been established.
- J. Water seeded areas twice the first week to a minimum depth of six inches (6") with a fine spray and once per week thereafter as necessary to supplement natural rain to the equivalent of one-inch (1") or to a six inch (6") depth.
- K. The surface layer of soil for seeded areas must be kept moist during the germination period. After first cutting, water as specified above.
- L. Make weekly inspections to determine the moisture content of the soil and adjust the watering schedule established by the irrigation system installer to fit conditions.
- M. After grass growth has started, all areas or parts of areas which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded in accordance with the plans and as specified herein. Such areas and parts of areas shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass at no additional cost to the Owner.
- N. Watering shall be done in such a manner and as frequently as is deemed necessary by the Landscape Architect to assure continued growth of healthy grass. All areas of the site shall be watered in such a way as to prevent erosion due to excessive quantities applied over small areas and to avoid damage to the finished surface due to the watering equipment.
- O. Water for the execution and maintenance of this work shall be provided by the Owner at no expense to the Contractor. The Contractor shall, however, furnish his own portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport the water from the available outlets and apply it to the seeded areas in an approved manner.
- P. Mowing of the seeded areas shall be initiated when the grass has attained a height of one and one-half to two inches (1-1/2" to 2"). Grass height shall be maintained between one and one-half inches (1" to 1-1/2") at subsequent cuttings depending on the time of year. Not more than one third (1/3) of the grass leaf shall be removed at any cutting and cutting shall not occur more often than ten (10) days apart.
- Q. When the amount of invading grass is heavy, it shall be removed to prevent destruction of the underlying turf. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed or, in the case of rank growths, shall be uprooted, raked and removed from the area by methods approved by the Landscape Architect.
- R. Protect seeded areas against trespassing while the grass is germinating. Furnish and install fences, signs, barriers or any other necessary temporary protective devices. Damage resulting from trespass, erosion, washout, settlement or other causes shall be repaired by the Contractor at his expense.
- S. Remove all fences, signs, barriers or other temporary protective devices after final acceptance.

END OF SECTION 02900

SECTION 02921

TOPSOIL

PART 1 - GENERAL

1.01 SCOPE

- A. Topsoil for planting shall consist of a rich, friable soil conforming to the requirements and provisions set out in these Specifications, or as approved by the Project Landscape Architect and obtained from locations indicated on the Construction Drawings. Topsoil shall be placed at the locations indicated on the Construction Drawings, set out in the Specifications or as directed by the Project Landscape Architect and in conformity with the provisions and requirements set out in the Specifications.

- B. Suitable topsoil which has been stripped from the project site shall be stockpiled as directed by the Project Landscape Architect. Stockpiled topsoil shall be redistributed in areas indicated on the Construction Drawings and later used before additional topsoil is hauled to the site. Unsuitable material shall not be included in these stockpiles and shall be removed from the project site. The amount of stockpiled topsoil obtained from the site shall be measured by the Project Landscape Architect using the cross-section method and this material shall be excluded from that quantity of material paid for under the of Section 02200 of these Specifications.

PART 2 - MATERIAL

2.01 MATERIAL

- A. Topsoil for planting shall be a rich, friable loam containing a large amount of humus obtained from natural north Georgia woodlands, (the purpose of this is to assure a natural "A" soil horizon with adequate michorizal content). Topsoil shall be original surface sandy loam, topsoil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2-inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips or other undesirable or harmful material to plant growth. Topsoil shall be reasonably free from perennial weeds and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life.

- B. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classified as a loam, silt loam, clay loam or a combination thereof. The pH shall range from 5.5 to 6.0. Topsoil shall contain not less than two percent by weight, of organic matter as determined by the Wakley-Black Method as described in Soil Chemical Analysis, 1958, Prentice-Hall, Inc.

- C. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed in commercial quantities, the product will be homogeneous in nature and will conform to the requirements of these Specifications, and as required by the Project Landscape Architect.

- D. Topsoil may not be secured from areas which are, or have been, in cultivation within the past five years.

PART 3 - EXECUTION

3.01 EQUIPMENT

- A. All equipment necessary for the proper removal, transportation, protection and maintenance of topsoil must be available, when required, in first class working condition and shall have been approved by the Project Landscape Architect before construction will be permitted to begin.

3.02 MAINTENANCE

- A. The Contractor shall maintain all topsoil areas, at Contractor's own expense, in connection with any seeding or planting, or otherwise, until Final Acceptance of the Project. Maintenance shall consist of preserving, protecting, replacing and such other work as may be necessary to keep the Project in a satisfactory condition.

3.03 CLEANING

- A. Final cleaning shall consist of completely removing all equipment, rubbish, excess material and unused materials from the project site.

- B. All pavements and structures shall be swept clean of all dirt or rubbish which may have become deposited upon them during construction.

- C. All pavements and structures shall be cleared of any stains that may have become deposited upon them during construction.

- D. Final Cleaning shall be performed in accordance with the requirements of Section 01710 of these Specifications.

END OF SECTION 02921

SECTION 02930

LAWNS AND GRASSES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work described in this section consists of the establishment of grassing of 100% of all areas indicated to receive seeding and of all of the area on the Project site disturbed by cut or fill, except the area covered by paving or those areas designated for other plant materials. Consult with the Owner to coordinate placement of landscaping materials. Provide clean pine straw instead of grass in areas determined by Owner.

1.2 SOIL SAMPLES

- A. The Contractor shall take soil samples from several areas of the site to be grassed and have them analyzed by the Agricultural Extension Service. The results of the analysis shall determine the fertilizer to be used on the site. Copies of the soil analysis shall be submitted to the Engineer and the Owner no later than ten (10) days prior to anticipated date of fertilization of grassed areas.

PART 2 – PRODUCT

2.1 FERTILIZER

- A. Commercial Fertilizer: For lawns, the fertilizer shall be a complete, slow-release type. The nitrogen content shall be derived from either organic or inorganic sources and meeting the following minimum requirements of plant food by weight, unless the soil analysis and report indicates a need for a different fertilizer mixture in which case the recommended mixture shall be furnished and applied. Compliance with all State and Federal laws relative to fertilizer is required.
 - 1. Minimum requirements: 19% Phosphoric Acid – 19% Potash
- B. Ammonium Nitrate: Ammonium nitrate shall be a commercial product in dry granular form of recent manufacture and shall be delivered in the original, unopened containers each bearing the manufacturer's guaranteed statement of analysis, it shall contain not less than 33.5% Nitrogen.
- C. Ground Limestone: Lime shall be ground dolomitic limestone containing not less than 85% of total carbonates and shall be ground to such a fineness that 50% will pass through a 100-mesh sieve and 90% will pass through a 20-mesh sieve. Coarser material will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve.

2.2 GRASS SEED

- A. Shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of Invitation of Bids. Seed shall be furnished in sealed standard containers, unless exception is granted in writing by

the Engineer. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. Seed shall be guaranteed 92% germination.

1. Kentucky 31 Fescue (*Festuca Elatior*) Seed: Fresh, clean, new seed testing 98% for purity and 85% for germination. September 15 – May 15.
2. Common Bermuda (*Cynodon Dactylon*) Seed: Fresh, hulled, clean, new seed testing 98% for purity and 85% for germination. May 15 – September 15.
3. Winter Rye (*Lolium multiflorum*) Seed: 90% minimum purity and 85% germination. Seed ten (10) pounds per 1,000 sq. ft.

2.3 WATER

- A. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life. Furnish hose and other watering equipment required for the work.

2.4 HYDROMULCH

- A. Wood cellulose fiber containing no germination inhibiting or growth inhibiting agents. Characteristics shall be as follows:
 1. Percent moisture content: 9.0% (± 3 , 0%).
 2. Percent organic mater: 99.2% (± 0.8 %).
 3. Percent ash content: 0.8% (± 0.2 %).
 4. pH: 4.8 (± 0.5).
 5. Water holding capacity: 150 grams water/100 grams fiber, minimum.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Before any seeding is attempted, the seed bed must be in a well pulverized, smooth, friable condition of uniformly fine texture.

3.2 FERTILIZER

- A. Fertilizer shall be distributed uniformly at a rate of 800 pounds per acre, plus 1-ton agricultural lime per acre two (2) days prior to seeding, over the areas to be grassed, and shall be incorporated into the soil to a depth of at least 3 inches by discing or harrowing. The incorporation of fertilizer may be part of the tillage operation specified above. Undulations in the surface as a result of tillage or fertilizing shall be smoothed.

3.3 AMMONIUM NITRATE

- A. Approximately 4 weeks after seeding and when grass coverage has been established, apply 3 pounds of ammonium nitrate per 1,000 square feet to all seeded areas and immediately water using a fine spray. At the end of the maintenance period and prior to final inspection, apply 10 pounds of specified fertilizer per 1,000 sq. ft. and water immediately.

3.4 SEED

- A. Seed shall be Fescue or Bermuda. Method of seeding shall be hydroseeding or broadcast at the Contractor's option; however, the method selected shall be a part of his erosion control plan.

3.5 BROADCAST SEEDING

- A. If conditions are such, by reason of drought, high winds, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the Contractor shall stop the work, and work shall be resumed only when conditions are favorable again or when approved alternate or corrective measures and procedures have been put into effect. If inspection during seeding operations or after there is a show of green indicates that strips have been left, or skipped, the Contractor shall sow additional seed on these areas.
- B. Seeding shall be at the rate of 10 pounds per 1,000 sq. ft. for Fescue or 5 pounds per 1,000 sq. ft. for Bermuda.
- C. Seed shall be broadcast either by hand or approved sowing equipment. The seed shall be uniformly distributed with the sower moving in one direction, and the remainder shall be sown with the sower moving at right angles to the first sowing. The seed shall be covered to an average depth of ¼ inch by means of a brush harrow, spike-tooth harrow, chain harrow, cultipacker, or another approved device.

3.6 HYDROSEEDING

- A. Apply seed/fertilizer/hydromulch mixture in water slurry. Dispense using hydraulic mulching equipment in the following minimum quantities.
 - 1. Fertilizer: 130 lbs./acre.
 - 2. Fescue Seed: 300 lbs./acre/Bermuda seed 150 pound/acre.
 - 3. Hydromulch: 1500 lbs./acre.

3.7 COMPACTION

- A. Immediately after the seeding operations specified above have been completed, the entire area shall be compacted by means of a cultipacker, roller, or other approved equipment weighing 60 to 90 pounds per linear foot of roller. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic roller shall have tires of sufficient size so that complete coverage of the soil surface is obtained. When a cultipacker or similar equipment is used, the final rolling shall be at right angles to the prevailing winds to prevent dust.

3.8 WATERING

- A. Soak soil immediately after seeding to a minimum depth of 1" to 2", and to a minimum depth of 2" after sodding. Do not water to the point of creating wash out areas.
- B. Keep all surfaces continuously moist thereafter until 30 calendar days after the lawn has been established. Use fine spray nozzles only.

3.9 CLEAN-UP

- A. Remove from the site and dispose of all debris and foreign material. During the grassing operations, debris shall not be dumped on any part of the property or on any unauthorized area.

3.10 MAINTENANCE

- A. The Contractor shall be responsible for establishment and proper care of the grassed areas during the period when the grass is becoming established and until final acceptance by the Owner.
- B. Maintenance shall consist of watering, weeding, repair of any erosion and reseeding as necessary to establish a 100% uniform stand of grass, and shall continue until acceptance.
- C. All seeded areas that do not show satisfactory growth within 18 days after seeding shall be re-seeded and re-fertilized as directed until a satisfactory lawn is established. Full coverage is required in 60 days.
- D. All lawn areas shall be protected until acceptance. All eroded and damaged areas, regardless of cause, shall be immediately repaired and reseeded. Protect all lawn areas from pedestrian or vehicular traffic.

3.11 GUARANTEE AND ACCEPTANCE

- A. Guarantee all lawns and grassing from the date of written acceptance for a period of not less than one year.

END OF SECTION 02930

SECTION 02933

TEMPORARY SEEDING

PART 1 – GENERAL

1.1 SCOPE

- A. The work covered by this section consists of the establishment of a temporary vegetative cover on disturbed areas by seeding with appropriate rapidly growing grass seed. Temporary seeding shall be provided for all exposed soil surfaces that are not to be fine graded or landscaped within 30 days after fine grading.

1.2 PROJECT CONDITIONS

- A. Protect all adjacent public and private property from siltation and other damage due to construction activities with silt dams or fences as indicated on the Drawings.
- B. Temporary seeding shall be applied to any and all disturbed areas left idle for two weeks and shall be applied no later than the 15th calendar day from last land disturbance activity (i.e. clearing, grubbing, or grading).

1.3 QUALITY CRITERIA

- A. Installation shall be in strict compliance with the rules and regulations of the local seed laws.
- B. Installation shall comply with all applicable codes, rules, regulations and ordinances related to erosion control and temporary seeding.

PART 2 – PRODUCTS

2.1 TEMPORARY SEED

- A. Select temporary grass seed appropriate to the season and site conditions. Temporary grass shall be a quick growing species such as millet, rye grass, Italian rye grass or cereal grasses suitable to the area providing a temporary cover which will not later compete with grasses sown for permanent cover. Seed shall meet the requirements of the rules and regulations of the Georgia Seed Law.

2.2 LIME

- A. Provide agricultural grade ground or pulverized limestone. Lime shall contain not less than 85% carbonates with 50% passing a 100-mesh sieve. Lime shall have tested values of 90% minimum germination and 1% maximum weed content.

2.3 FERTILIZER

- A. Provide standard commercial grade fertilizer, either 4-12-12, 6-12-12 or 5-10-15 as required for conditions.

PART 3 – EXECUTION

3.1 SEED-BED PREPARATION

- A. Where soils are known to be highly acid (pH 5.5 and lower), apply lime at the rate of two tons per acre (1 #/10 s.f.).
- B. Apply fertilizer at a rate of 450 lbs./acre (10 #/1,000 s.f.). Lime and fertilizer shall be incorporated into the top 2 to 4 inches of the soil by tilling.
- C. Loosen ground surface by discing, raking or harrowing. If the area has been recently loosened or disturbed, no further roughening shall be required. Remove all large clods, boulders and debris which will interfere with the work. Remove all stones 2" and larger in any given dimension.

3.2 SEEDING

- A. Apply seed evenly with a cyclone seeder, drill, culti-packer seeder or hydro-seeder. Small grains shall be planted no more than one inch deep. Grasses and legumes shall be planted no more than ¼ inch deep. Distribution by hand shall not be permitted.

3.3 ROLLING

- A. Roll all seeded areas before applying mulch. On steep slopes cover seeds by dragging spiked chains or similar methods.

3.4 MULCHING

- A. All seeding in fall for winter cover shall be mulched. Seedings on slopes 4:1 or greater, on adverse soil conditions and in excessively hot or dry weather shall also be mulched.
- B. Mulch shall be straw, or hay spread at the rate of approximately two tons/acre, wood cellulose fiber applied at the rate of approximately 1500 lbs./acre. Bituminous treated mulch shall be used on all slopes steeper than 2:1.
- C. Seedings made during optimum spring and summer seeding dates, with favorable soil and site conditions shall not require mulch if written permission is received by the Engineer.

3.5 WATERING

- A. Provide watering as required to establish and maintain healthy vegetative cover.

3.6 RESEEDING

- A. Reseed and provide straw cover for bare areas 1 s.f. and larger to establish and maintain vegetative cover and to prevent sheet and rill erosion. Repair erosion damage as required and reseed.

END OF SECTION 02933

SECTION 02934

SODDING

PART 1 GENERAL

1.01 SCOPE

Sodding shall consist of establishing certain critical areas with sod as designated on the Drawings.

PART 2 PRODUCTS

2.01 SOD

- A. Sod shall consist of a live, dense, well-rooted growth of turf grass species as noted on the Drawings. The sod shall be free from Johnson grass, nut grass and other obnoxious grasses and shall be of suitable character for the purpose intended and for the soil in which it is to be planted. It shall be un-injured at the time of planting.
- B. Sod shall be uniform in thickness, having not over 2-inches or less than 1-inch of soil.
- C. Sod strips shall have a consistent width of 12 or 18-inches.

2.02 FERTILIZER

- A. Fertilizer (10-10-10) used in connection with sodding, shall contain 10 percent nitrogen, 10 percent phosphoric acid and 10 percent potash. The fertilizer shall be furnished in standard containers with the name, weight and guaranteed analysis of the contents clearly marked. The containers shall ensure proper protection in handling and transporting the fertilizer. All commercial fertilizer shall comply with local, state and federal fertilizer laws.
- B. Ammonium nitrate shall be a standard commercial product, shall conform to the requirements for other commercial fertilizers as specified above, and shall have a minimum of 32-1/2 percent nitrogen.

2.03 LIME

Agricultural limestone shall be dolomitic and contain not less than 85 percent of calcium carbonate and magnesium carbonate combined, and shall be crushed so that at least 85 percent will pass the No. 10 mesh sieve and 50 percent will pass a No. 40 mesh screen.

2.04 WEATHER LIMITATIONS

Sod shall be planted only when the soil is moist and favorable to growth. No planting shall be done between October 1 and April 1 unless weather and soil conditions are considered favorable and permission is granted by the Engineer.

PART 3 EXECUTION

3.01 SODDING

- A. The area to be sodded shall be constructed to the lines and grades indicated on the Drawings or as directed by the Engineer, and the surface loosened to a depth of not less than 3-inches with a rake or other device. If necessary, it shall be sprinkled until saturated at least 1-inch in depth and kept moist until the sod is place thereon. Immediately before placing the sod, the fertilizer shall be uniformly applied at the rate of 12 pounds of Grade 10-10-10, or equivalent, per 1,000 square feet. Agricultural limestone shall be applied at the rate of 50 pounds per 1,000 square feet.
- B. The entire area shall be thoroughly covered with sod. The sod shall be placed on the prepared surface with the edges in close contact and, as far as possible, with staggered joints.
- C. The sod shall be maintained moist from time of removal until reset but shall be placed as soon as practicable after removal from place where growing. Immediately after placing it shall be rolled with a light- weight roller or hand tamped to the satisfaction of the Engineer.
- D. Sod on slopes steeper than 3 to 1 shall be held in place by wooden pins about 1-inch square and 6-inches long, driven through the sod into the soil until they are flush with the top of the sod.

3.02 WATERING AND MAINTENANCE

- A. The sod shall be watered as directed by the Engineer for a period of two weeks after which ammonium nitrate shall be applied at the rate of three pounds per 1,000 square feet and the sod given a final watering.
- B. The Contractor shall not allow any equipment or material to be placed on any planted area and shall erect suitable barricades and guards to prevent Contractor's equipment, labor or the public from traveling on or over any area planted with sod.
- C. It shall be the obligation of the Contractor to secure a satisfactory growth of grass before final acceptance of the Project.

END OF SECTION 02934

SECTION 02950

REINFORCED TURF

PART 1 – GENERAL

RELATED DOCUMENTS

The Drawings and general provisions of the Contract, including General and Special Conditions, apply to work of this section. Contractor shall refer to the following sections:

Section 02200 Earthwork
Section 02810 Underground Sprinkler
Section 02900 Landscape Work

DESCRIPTION OF WORK

Furnish all materials, equipment and labor as necessary for preparation of graded areas, soil preparation, fertilizer, gravel fill, turf grass, maintenance, guarantee, and related items as required to complete the work as indicated on the drawings and specified herein.

JOB CONDITIONS:

All existing buildings, walks, walls, paving, piping and other items of construction and planting already completed or established shall be protected from damage by the contractor. Any damage resulting from negligence shall be repaired or replaced to the satisfaction of the owner.

Coordination: Construction shall not begin until all exterior building construction within the contract limit boundary has been completed, except as directed otherwise by the Landscape Architect.

Percolation Test: Contractor shall insure that subsurface soils under the proposed gravel fill area will percolate as defined in Section 02900.

QUALITY ASSURANCE:

General: The contractor shall have a minimum of five years successful experience in this field of grading and turf installation. A resume shall be furnished to the Landscape Architect upon request. The selection of the contractor shall be approved by the Landscape Architect.

Work under Section 02200 shall be performed in co-ordination with this section by a contractor meeting the quality assurance requirements of both Sections.

Materials: The Contractor shall retain at the time of delivery and furnish to the Landscape Architect delivery tickets for all materials received.

Samples: Samples of materials as listed below shall be submitted for inspection on the job site, or as otherwise determined by the Landscape Architect.

<u>Materials</u>	<u>Sample</u>
57 Stone - washed	1 Pint
89 Stone - washed	1 Pint
Turf Grass	1 8" Square
Fertilizer	1 bag

Typical samples shall be furnished from each separate source of supply. Approved samples shall be retained on site until furnishing of construction is completed.

PART 2 – PRODUCTS:

GENERAL:

Water: All water necessary for sodding and maintenance shall be of satisfactory quality to sustain the growth of grass and shall not contain harmful, natural or man-made elements detrimental to the turf. Water meeting the above standards shall be furnished by the Contractor and all arrangements for securing water and any expenses of transporting to the site and dispersal on the site shall be the responsibility of the Contractor.

Commercial Fertilizer: Provide a complete fertilizer, uniform in composition, dry and free flowing, delivered to the site in the original unopened containers, each bearing the manufacturer's statement of analysis, meeting the following requirements: Type of fertilizer may need to be modified based on the turf grass type selected for the project. See the plant schedule to determine variety of grass specified.

Soil Test: The contractor shall make soil tests to determine the current conditions of the sub-base soils and revise fertilizer and quantities of lime as dictated by the soil tests.

Topsoil: Where required, topsoil shall be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well-drained areas, free from substances harmful to plant growth, and free from clay lumps, stones, stumps, roots, or similar substances two inches or more in diameter. The source and material shall be approved by the Landscape Architect before placing on site. Topsoil shall be free from noxious grass and weeds.

Lime shall be applied at the rate necessary to obtain 6.0 PH soil measurement.

Fertilizer shall be 50% nitrogen, slow release, 16-8-8 or 16-16-16 applied at rate of 400 pounds/acre on the sub-base soil before placing the gravel fill.

PLANT MATERIALS:

GENERAL:

See Planting Plan and Construction (BID) Schedule, Sodding Work for area required. Quantities necessary to complete the work shown on the drawings shall be furnished.

Although quantity estimates have been carefully made, the Landscape Architect assumes no liability for omissions or errors. Contractor shall verify necessary quantities to finish the work.

Sod shall be Certified Sod of the species or mixture called for on the plans, grown in a nursery equipped for the production of such sod and capable of meeting the published State Standards for Certification. It shall have been mowed regularly, fertilized and fumigated and shall be free of diseases and harmful insects at the time of delivery. Sod shall be delivered in strips one foot wide and two feet or longer as soil and species permit or in rolls not over six feet long. Sod shall have a minimum of one-inch thickness including roots and soil.

Note: Only sod that has a proven track record are varieties of Bermuda.

PART 3 – EXECUTION

GENERAL:

Sodding operations shall be conducted under favorable weather conditions preferable for the type turf specified. The Contractor has the option and assumes full responsibility for sodding in unseasonable conditions.

Protect roots of turf at all times from sun and drying winds, water and freezing, as necessary until placing.

Stored sod must be kept damp and protected.

SOIL PREPARATION AND PLANTING EXECUTION PROCEDURE:

Cleaning up before commencing work: The Contractor shall clean up work and surrounding areas of all rubbish or objectionable matter. All mortar, cement, and toxic material shall be removed from the sub-base surface of all sod areas. They must not be stirred with the soil. Should the Contractor find such conditions beneath the soil which shall in any way adversely affect the turf growth, he shall immediately call it to the attention of the Landscape Architect. Failure to do so before beginning shall make the responsibility of corrective measures the responsibility of the Contractor. Use approved herbicide to eliminate temporary plant material as directed.

Rough Grading: Contractor shall proceed to bring the subsoil-base level to within 7-8” of the proposed finished grade for the proposed turf area. If existing soil is too low, contractor shall bring in adequate topsoil to meet finish the grade.

Subsoil Base level shall be scarified a minimum of 6” deep and raked smooth to grade before placing the topsoil layer.

Topsoil: Lay 2 – 3” of topsoil over the subsoil base as needed to reach sub-base grade. Topsoil fill shall be a sandy clay loam at proper Ph for selected turf variety.

Lime and Fertilizer Application: Spread lime and fertilizer uniformly over the topsoil areas to be mix thoroughly into the topsoil to depth of four inches during the tilling operation. Spreading shall be done with approved mechanical spreaders or seed drills, and blended into the soil. Contractor shall retain and count empty bags for verification of fertilizer rate.

Topsoil Preparation: After the topsoil placement in area to be graveled has been brought to finished sub-base grade, prepare the soil by thoroughly tilling the surface until these areas are friable, well pulverized and acceptable to the Landscape Architect. Soil shall be scarified a minimum of 6" deep and tilled a minimum of 4" deep. This is considered a sub-grade level; therefore, it does not have to be completely smoothed out, only rough raked and lightly compacted to the prescribed grade. All foreign material detrimental to grading shall be removed.

Irrigation Lines: Irrigation lines shall be installed after soil preparation with the stubs for irrigation heads extended up above the proposed gravel layer to the sod level.

Drainage: In low areas or along the edges of pavement on the down slope side where water may get trapped, install 4" perforated drain pipes and connect to closest storm inlet or daylight out to low grades.

Gravel Base Course: Place a 4" layer of washed #57 stone over the prepared sub-grade, irrigation lines, and drain pipe installations. Gravel shall be washed free of fines and other small particles before spreading. Spread the gravel to a uniform depth to within 1 1/2" of finished turf level. Gravel shall be spread with small rubber tire tractor and a box blade. **Do not** use heavy track equipment or bobcats.

Gravel Leveling Course: Spread a 1" layer of washed #89 stone over the surface of the base #57 stone as a leveling course. The #89 stone shall be washed free of all fines and small particles before installation. Hand rake the gravel to a uniform smooth surface suitable for laying sod. Finish grade level shall be within a 1" to 1.5" tolerance of the finished turf grade. Take care to be sure there are not dips, sinks, holes, or high spots that will be reflected on the surface of the finish lawn.

Watering: Spray the surface of the stone until thoroughly wet before placing the sod.

Sodding: Finished gravel bed as described for turf areas shall be no greater the 1 1/2 inches below proposed finished grade established by the grading plan. Low areas to be filled with #89 stone to meet grade.

Stored sod of the species required in the schedule shall be kept moist prior to laying. Dampen all gravel areas immediately prior to placing the sod. Cover sod to prevent drying by the sun.

Unroll the sod on top of the prepared gravel beds. Lay the strips parallel with the strip ends staggered in a brick layers' running bond pattern. Select the running direction to be perpendicular to the most significant direction of flow for runoff of the lawn. Press each successively laid strip of sod snugly up against the adjacent one. Reject all sod that does not

have a root layer profile on the bottom. If sod has been scalped of the root layer, it will not survive and shall not be installed. Insure that strips of sod are snugly butted up to each other.

Roll the placed sod with a 100 lb. roller. Lightly fertilize immediately after installation. Spread at a rate of 3 pounds per 1,000 S.F. Determine if the sod has been fertilized by the supplier immediately before delivery and adjust application accordingly.

Sand Fill: Do **not** fill cracks with top dressing sand, at time of installation. Sand fill may occur three (3) months after turf has taken root in the gravel. It is important that the voids in the gravel not be filled with fine sand particles until the roots have had adequate opportunity to grow down through the voids in the gravel and attach to the sub-base topsoil.

Complete Irrigation: Extend irrigation stubs and install heads as indicated to finish the system.

Turf must be kept heavily watered for the first 6 weeks, and lightly watered for the next 6 weeks. Contractor shall check the progress of the roots by pulling up a test plot of the turf to determine the root penetration through the gravel. Turf and rock must never be allowed to become dry during the first 12 weeks.

Foot traffic must be kept at a minimum the first two weeks, with no mowing. After two weeks, the turf shall be kept mowed at a 2" height until the roots have thoroughly tacked down into the gravel. Use a mower with sharp blades and thatch catcher.

When turf has tacked down to the gravel, maintenance may begin to mow the turf at the prescribed height suitable for the species of grass installed.

Heavy foot traffic may begin at 12 weeks or when the turf has sufficiently attached its roots into the gravel so as not to move, sink or pull free. This can be monitored by pulling at plots of turf to determine how well it is attached.

Lawn area shall be given a top dressing of fertilizer to provide 100 pounds available nitrogen per acre when the grass has attained a satisfactory growth and the first mowing has been performed. Nitrogen shall be derived from Ammonium Nitrate or Nitrate of Soda.

Do not allow any vehicular traffic other than small push mowers on the turf for 6 months. Once the grass has firmly established itself into the sub-base soil, the lawn can absorb significant foot and vehicular use without damaging the grass. Riding mowers can be used at this time. However, the turf will need continuous maintenance care to maintain its health.

MAINTENANCE:

Surface Repair: Any areas that settle or show dips, sinks, or other uneven levels of surface must be repaired in the first two weeks. This is accomplished by lifting the sod and adding #89 stone to the low spot to reach grade and replace the sod. High spots can be corrected by lifting the sod and removing gravel.

All sodding shall be protected and maintained by the Contractor until time of final acceptance. Maintenance shall include but is not limited to watering, weeding, top dressing, replacement of dead material, mowing, fertilizing, and other necessary operations.

The Owner will be responsible for maintenance after final acceptance. The Contractor shall submit, in writing, maintenance instructions for use by the Owner in caring for the turf during warranty period.

Sand fill: When the sod has tacked down into the gravel to the point where it can not be pulled free by hand, contractor may top dress the turf to fill cracks, voids, and minor dips in the surface of the lawn. This should not occur before three (3) months.

General Maintenance: When the lawn is turned over to the Owner for regular maintenance, it is important that the turf be monitored to maintain good health. Because the turf is designed for heavy use, it must have the following routine attention.

- A. Do not allow grass clippings to settle into the turf. Always use a thatch catcher
- B. Fertilize on a regular schedule
- C. Mow slightly higher than normal for the species selected
- D. Do not allow sod to dry out during periods of extreme heat or drought
- E. Replace dead spots by removing sod and enough gravel to re-level the surface

WARRENTY:

All grass shall be guaranteed to be alive and health 90 days after the date of final acceptance, or to remain alive and healthy through one full growing season following planting, which ever occurs first. Contractor shall be responsible for maintaining the plant installations for 90-days after final acceptance. Any grass that is dead or not showing satisfactory growth after 90-day period shall be replaced, or conditions contributing to unsatisfactory growth corrected. All replacements shall be of the original quality and shall be of equal quality to that installed. Replacement turf shall be guaranteed to be alive at the beginning of the following growing season. Only one replacement will be required for each plot of dead grass.

The guarantee may become void if it is determined that turf kill or unsatisfactory growth results from Owner negligence or abuse. The decision for determination of responsibility for damage shall rest solely with the Landscape Architect.

FINAL CLEAN UP:

After all work has been completed and all surfaces settled, clean-up and adjustments must be made to insure proper depth of base gravel, proper drainage, proper grades adjacent to walks and curbs, proper slope of plant beds, etc. Remove all soil, gravel, or grass from walks and paving, leaving the areas broom clean.

REINFORCED TURF

ABBREVIATED INSTALLATION PROCESS

1. Bring the rough sub-grade to within $\pm 8''$ of the finished grade
2. Be sure the surface of the final sub-grade, fill or cut, is scarified to break hard pan or compacted subsoils.
3. Add 2-3'' of sandy clay loam topsoil.
4. Lightly spread slow release 16-16-16 fertilizer over the topsoil surface at ± 400 lbs./acre. and rototill 6'' deep. Hand rake smooth the surface and lightly compact.
5. Spread washed #57 Stone 3 -4'' deep to within 2'' of the proposed finished grade. It is critical that the fines be washed out of the #57 stone to avoid filling the air voids in the gravel layer. Choke the top the #57 stone with $\frac{1}{2}''$ layer of #89 Stone carefully spread to within 1'' of finished grade. Be sure the finished surface is relatively smooth and even.
6. Spray the gravel to dampen the surface of the gravel immediately before laying the sod.
7. Lay 1'' thick layer of sod directly on top of the gravel bed. Butt fit the strips tightly together to prevent open voids or gaps. Do not top dress or fill voids with sand.
8. Irrigate heavily so that the gravel does not dry out or draw moisture out of the sod. Irrigation is required daily until the white root hairs tack down the sod into the gravel so that you cannot lift the sod layer.
9. Keep all traffic off the grass a minimum of 6 weeks until it completely tacks down. No vehicles or riding mowers on the grass for 8-10 weeks.
10. Check regularly for root penetration by lifting the corner of a sod palette to observe the root hairs as they penetrate the gravel down to the soil layer and tack down too tight to lift up.
11. After the sod tacks down and has had several months to grow in, top dress with sand to fill any joints. Go lightly with sand so that it does not infiltrate the gravel and fill the voids.
12. Do not mow the lawn until the sod is tacked down too tight to move.
13. Always use a thatch catcher on the mowers used for the turf. Spray wash any mower to be used on the turf before mowing to remove invasive turf or weed seeds off the mower.

The roots will eventually penetrate through the gravel until they reach the topsoil and spread through the soil layer. The roots in the gravel will gradually expand to become woody stems connecting the leaf structure to the root mass in the topsoil.

This profile prevents the roots from being crushed under compaction and provides greater air access to the root system. It can also serve as a storm water storage layer under the lawn to

reduce runoff. In some cases, the subgrade can be graded so as to become a subsurface drainage system.

The grass will not need as much irrigation once it is established, it will dry quickly during periods of draught. The profile allows the grass to stay healthy even under heavy foot traffic use. This application is especially good for a park or amphitheater setting.

Do not recommend this profile for an athletic field in that certain areas on fields get intense use that will wear through the turf layer into the gravel and expose the base to the surface. The gravel will then give way to traffic and begin to spread on the surface.

This profile is best used for periodic parking areas, event lawns or festival areas that get periodic heavy use.

Care for the lawn includes appropriate watering and fertilizer. Never needs aeration. The gravel will damage the aeration spikes. Grass must be mowed with a thatch catcher otherwise the fines will work their way down into the gravel and begin to fill the voids. Turf should not be mowed less than 1" height.

During heavy use, the leaf layer will be smashed or damaged, but the root zone will stay safe. Within a few days the grass will recover and sprout out new leaves.

The only grass used successfully to date with this profile are varieties of Bermuda.

We recognize that many designers will be skeptical of this approach and process. Therefore, we recommend that you select a smaller area to install this profile as a test zone to see how well it works before committing to an entire event lawn area.

END OF SECTION 02950

SECTION 02975

CLEANUP AND FINISH

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish labor, materials, and equipment required to complete cleanup of all paving, building, grounds, and all other areas outlined on the drawing.
- B. Chemicals, paints, cleaning products, concrete or other waste materials shall not be discarded in the planting beds. If such materials are discharged in the plant beds, the contractor shall remove the contaminated soils and replace with viable topsoil.
- C. Debris shall not be dumped on any part of the property or any unauthorized place. All debris, construction material, Contractor's buildings or equipment, stumps, roots, boulders or any other extraneous material deposited during construction shall be removed from the site.

END OF SECTION 02975

SECTION 03200

CONCRETE REINFORCEMENT

0BPART 1 – GENERAL

1.1 WORK OF THIS SECTION

- A. Work covered by this Section includes the furnishing and installation of concrete and masonry reinforcement as specified in the Contract Documents.
- B. Work includes slab for Splash Pad. See drawing by WaterSplash Inc.
- C. In cases where specs in Section 03200 conflict with the specifications and details in the Splash Pad equipment manual by WaterSplash, Manual shall rule.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to Work of this Section.
- B. Cast-in-Place Concrete 03300

1.3 SUBMITTALS

- A. Submit under provisions of Division One.
- B. Manufacturer's certification that reinforcement meets Specification requirements, and/or certified mill test reports
- C. Shop Drawings shall show dimensions, spacing, bar and mesh schedule, bending details, stirrup and support details, and other pertinent data and in accordance with ACI 315.
- D. Submit manufacturer's printed product data, clearly marked, indicating proposed fibrous concrete reinforcement materials. Submit manufacturer's printed batching and mixing instructions.
- E. See WaterSplash Equipment manual in the Appendix.

1.4 QUALITY ASSURANCE

- A. Provide at least one person who will be present during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed, the referenced standards and the requirements of this work, and who shall direct all work performed under this section.

- B. Work shall comply with requirements and recommendations of the following:
1. American Concrete Institute, ACI 315, "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
 2. American Concrete Institute, ACI 318, "Building Code Requirements for Reinforced Concrete Structures."
 3. American Concrete Institute, ACI-ASCE 530 and 530.1, "Building Code Requirements for Masonry Structures."
 4. American Welding Society, AWS D1.4, "Structural Welding Code for Reinforcing Steel".
 5. American Welding Society AWS D12.1. "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connection in Reinforced Concrete Construction."
 6. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
 7. American Concrete Institute, ACI SP-66 "Detailing Manual."
 8. American Concrete Institute, ACI 544, "Report on Fiber Reinforced Concrete."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. All deliveries shall be accompanied by detailed bills of material which shall include information pertaining to bar size, bar mark, length of bends, total length of bar, weight of individual sets of bars and total weight delivered for each structure. Bundles shall be color coded.
- B. Store reinforcement off the ground, under suitable cover or in a suitable enclosure. Maintain easy access for inspection and identification of materials.
- C. Maintain reinforcement free from dirt, grease, scale, loose rust, oil, paint, other foreign matter, and all deleterious materials. Clean all reinforcement as required to meet these conditions, and maintain such clean condition until such time as concrete is placed.

1.6 JOB CONDITIONS

- A. All reinforcing steel within the limits of a day's pour shall be in place and firmly wired prior to commencement of concrete placing operations.
- B. Installation or wiring of steel less than six hours before commencing placement of concrete shall not be permitted, except by special written authorization of the Architect/Engineer. At least six hours of review time for each pour location shall be provided to the Architect/Engineer by the Contractor after the last reinforcement is placed and prior to placement of concrete.
- C. The reinforcing steel, in place, shall be subject to review and approval by the Architect/Engineer prior to placing of any concrete.
- D. The Contractor shall notify the Architect/Engineer a minimum of at least 24 hours

prior to readiness for each reinforcing review.

PART 2 - PRODUCTS AND MATERIALS

2.1 MATERIALS

- A. Reinforcing Bars: Deformed bars conforming to ASTM A615, Grade 60, including Supplementary Requirement S1.
- B. Wire Fabric Plain Type: ASTM A185. Flat sheets only.
- C. Wire Fabric Deformed Type: ASTM A497.
- D. Tie Wire: 16-gauge annealed type.
- E. Supporting Devices: Size and shape appropriate to conditions. Where concrete is exposed to view, chairs shall have plastic coated feet.
- F. Supporting devices for slabs on grade shall have sand plates.
- G. Dowels: plain round bars conforming to ASTM A675 Grade 80.
- H. Fiber Reinforcing (Alternate temperature reinforcing for slabs on grade)
 - 1. Fibermesh 300 (or engineer approved equal) 100 percent virgin polypropylene, fibrillated fibers containing no reprocessed olefin materials and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. Volume per cubic yard shall equal a minimum of 0.1% (1.5 pounds).
 - 2. Fibrous concrete reinforcement shall be as manufactured by Fibermesh Company, 4019 Industry Drive, Chattanooga, TN 37416, or an engineer approved equal.
 - 3. Physical Characteristics:
 - a. Specific gravity: 0.91.
 - b. Tensile strength: 50 to 110 ksi.
 - c. Fiber length: graded per manufacturer.
- I. Adhesive and grouted anchors shall be KELIBOND and KELIGROUT as manufactured by KELKEN GOLD of South Plainfield, New Jersey (201-753-0088), or an approved equal.
- J. Mechanical Rebar Splices: CADWELD T Series and B Series as manufactured by Erico Products, Inc., or an approved equal.
- K. Pipe Sleeves: Standard weight pipe conforming to ASTM A120.

2.2 FABRICATION

- A. Fabricate reinforcement in accordance with CRSI Manual of Standard Practice, ACI SP-66 and ACI 318.
- B. Accurately fabricate to the details and dimensions shown on the Drawings.
- C. All bars shall be bent cold and shall not be bent or straightened in a manner that will injure the material (i.e. torched).
- D. Bend all reinforcement in accordance with ACI 318.
- E. No bars that are partially embedded in concrete shall be field bent except as shown on the Drawings or as permitted by Architect/Engineer.

1BPART 3 - EXECUTION

3.1 INSTALLATION

- A. Accurately position reinforcement and firmly support in place. The system of holding reinforcement in place shall insure that steel will not be able to move during concrete placement. If necessary, top reinforcing shall be adequately held in position to support the weight of the workmen without displacement. All reinforcement shall be rigidly wired in place with adequate spacers and tie chairs. Bar supports shall be 3'-0" on center maximum, and in accordance with ACI 315.
- B. For concrete slabs on ground or fill, support reinforcement on approved chairs. "Hooking-up" or "Walking-in" of any reinforcement including mesh, will not be permitted.
- C. Protective concrete cover shown on the Contract Documents, or required by ACI Code, shall be rigidly adhered to. Coordinate conduit and insert placement so as to avoid decreasing or increasing protective cover on reinforcement.
- D. In the event conduits, piping, inserts, sleeves, or any other items interfere with the placing of reinforcement, as indicated on the Contract Documents, consult Architect/Engineer for required changes.
- E. Protect installed reinforcing from damage and displacement before, during, and after placement of concrete. Exposed reinforcing intended for bonding with future extensions shall be protected from corrosion.
- F. At the time concrete is placed, all reinforcement shall be free from dirt, mud, ice, rust, scale, loose mill scale, oil, paint, and other coatings which may destroy or reduce bond between steel and concrete.
- G. The Contractor shall repair or replace damaged, distorted or displaced reinforcement.

- H. Fiber Reinforcing
1. Add fibrous concrete reinforcement to concrete materials at the time concrete is batched in amounts in accordance with approved submittals for each type of concrete required.
 2. Mix concrete in strict accordance with fiber reinforcement manufacturer's instructions and recommendations for uniform and complete distribution.
 3. Manufacturer shall provide a qualified technical representative to instruct the concrete supplier in proper batching and mixing of materials to be provided.

3.2 SPLICES IN REINFORCEMENT

- A. Lap splices (wired together) and embedment lengths shall conform to:
Concrete - ACI 318 - Chapter 12
Masonry - ACI 530 - Chapter 8
- B. No splices of reinforcement shall be made except as shown on the plans or as specified/authorized by the Architect/Engineer.
- C. Mechanical splices shall be installed in strict accordance with manufacturer's instructions.
- D. Welding of reinforcing is not permitted unless specified or authorized by the Architect/Engineer.

END OF SECTION 03200

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. Formwork for cast-in-place concrete.
- B. Cast-in-place concrete, including concrete for the following, and other items as indicated on the Drawings.
 - 1. Foundation walls, footings, sidewalks.
 - 2. Floors, and slabs on grade.
 - 3. Grout for reinforced masonry.
 - 4. Equipment for splash pads and bases.
- C. Concrete curing and finishing.
- D. Control joints, expansion, and contraction joints.

1.2 NOT USED

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to Work of this Section.
- B. Concrete Reinforcement 03200
- C. WaterSplash equipment manual in the Appendix of this Project Manual.

1.4 SUBMITTALS

- A. Submit under provisions of Division One.
- B. Submit manufacturer's catalog cuts, technical data, and recommendations on quantities, installation, and application for the following:
 - 1. Formwork accessories.
 - 2. Concrete admixtures.
 - 3. Waterstops.
 - 4. Grout and patching materials.
 - 5. Bonding agents.
 - 6. Anchor bolts and inserts.
 - 7. Joint fillers.
 - 8. Vapor barrier.
 - 9. Curing and sealing compounds
 - 10. Surface coating for the Splash pad by WaterSplash

- C. Submit proposed mix designs and test data. Identify for each mix submitted the method by which proportions have been selected.
1. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength $f'(cr)$ calculations.
 2. For mix designs based on trial mixtures, include trial mix proportions, test results, and graphical analysis and show required average compressive strength $f'(cr)$.
 3. Indicate quantity of each ingredient per cubic yard of concrete.
 4. Indicate type and quantity of admixtures proposed or required.
 5. Submit current test reports for aggregates showing compliance with specified quality and gradation.
- D. Submit affidavits from an independent testing agency certifying that materials furnished under this section conform to Specifications.
- E. Provide documentation from manufacturers assuring compatibility of admixtures with other ingredients. Provide documentation from manufacturers assuring compatibility of all surface applied products.
- F. Submit concrete placement schedule prior to start of any concrete placement operations. Include location of all joints indicated on drawings, plus anticipated construction joints.
- G. Submit copies of delivery tickets complying with ASTM C 94 for each load of concrete delivered to site. Include on the tickets the additional information specified in the ASTM document.
- H. Submit description of planned protective measures for cold weather or hot weather concreting.

1.5 QUALITY ASSURANCE

- A. The American Concrete Institute (ACI), ACI 318 "Building Code Requirements for Reinforced Concrete" and ACI 301 "Specifications for Structural Concrete for Buildings" shall be part of these Specifications as though written and attached hereto.
- B. Work shall comply with recommendations and requirements of the following, except as specifically superseded by these Specifications:
1. ACI 211 "Selecting Proportions for Concrete";
 2. ACI 226 "Silica Fume in Concrete";
 3. ACI 308 "Curing Concrete";
 4. ACI 304 "Measuring, Mixing, Transporting and Placing Concrete";
 5. ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures";
 6. ACI 302 "Floor and Slab Construction";
 7. ACI 305 "Hot Weather Concreting";
 8. ACI 306 "Cold Weather Concreting";
 9. ACI 347 "Formwork for Concrete"; and
 10. ACI 330
- C. Provide at least one person who shall be present during the execution of this portion of the Work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct work performed under this Section.
- D. Concrete Quality Control
1. Procure concrete from a single Architect/Engineer-approved source. Source shall be a

- central commercial batching plant conforming to "Concrete Plant Standards" of the Concrete Manufacturer's Association automatic proportioning type.
2. Conform to ASTM C94, paragraphs 1 through 15 and paragraph 18.
 3. Obtain materials of each type from same source for the entire project.
 4. The Contractor shall engage testing agency to conduct tests and perform other services specified for quality control during construction.
- E. Project Conditions
1. Notify Architect/Engineer at least 48 hours in advance of intent to place concrete.
 2. Do not place concrete when the ambient temperature is below 40^oF nor when the concrete temperature or ambient temperature exceeds 85^oF. The Architect/Engineer may approve the placement of concrete under the above conditions, provided the recommendations of ACI 305 or ACI 306 are strictly adhered to.
 3. Do not place concrete when environmental conditions may adversely affect the placing, finishing, or curing of concrete, or its strength.
 4. Sub terrain pipe installations for the SplashPad must be inspected by the Dekalb County prior to allowing the pipes under the slab to be covered. Contactor shall coordinate the inspection between the cotracto
- F. The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes. The Contractor shall correct deficient concrete as directed by the Architect/Engineer.

PART 2 - PRODUCTS AND MATERIALS

2.1 FORMWORK

- A. Form Materials:
1. Concrete not exposed to view: Any standard form materials that shall produce structurally sound concrete.
 2. Exposed finish concrete: Materials selected to offer optimum smooth, stain-free final appearance and minimum number of joints. Material shall resist hydrostatic head without bowing or deflection.
 3. Plywood: PS-1, B-B high density concrete form overlay, Class I.
- B. Formwork Accessories:
1. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
 2. Form ties: Commercially manufactured types; cone snap-ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a one-inch diameter hole in concrete surface.

2.2 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II for normal weight concrete; Type II for lightweight concrete. Use only one brand of cement for each structure.
- B. Fly Ash: ASTM C618, Type F, Tables 1, 2, 3, and 4.
- C. Microsilica (silica fume): "Force 10,000" as manufactured by W.R. Grace & Company.

- D. Water: Fresh, clean, and potable.
- E. Aggregates:
1. Normal weight concrete: ASTM C 33.
 2. Light weight concrete: ASTM C330, expanded shale.
 3. Aggregate for normal weight concrete for interior slabs on grade shall conform to Georgia State DOT specification 603-0202 for Crushed Gravel.
 4. Fine aggregate: percentage passing No. 200 sieve shall be less than 2%.
 5. Coarse aggregate: Percentage passing No. 200 sieve shall be less than 0.7%.
 - a. Nominal size 1": ASTM Size No. 57
 - b. Nominal size 3/4": ASTM Size No. 67
 - c. Nominal size 1/2": ASTM Size No. 7
 6. Aggregates shall have been tested within the past six months from the date of the contract for the following:
 - a. Gradation: ASTM C136
 - b. Material finer than 200 sieve: ASTM C117
 - c. Organic impurities: ASTM C40
 - d. Soundness: ASTM C88
 - e. Clay lumps: ASTM C142
 - f. Light weight constituents: ASTM C123
 - g. Abrasive of coarse materials: ASTM C131
 - h. Soft particles: ASTM C235
 - i. Resistance to freeze-thaw: ASTM C66, ASTM C682.
- F. Admixtures
1. Admixtures that produce more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.
 2. Admixtures shall be certified by their manufacturer for compatibility with other mix components.
- G. Air-Entraining Admixture: ASTM C 260. The following products or approved equivalents will be among those considered acceptable:
1. "Air Mix"; The Euclid Chemical Company.
 2. "Micro-Air"; Master Builders, Inc.
 3. "Daravair"; W. R. Grace & Co.
- H. Water-Reducing Admixture: ASTM C 494, Type A. The following products or approved equivalents will be among those considered acceptable:
1. WRDA with HYCOL; W.R. Grace & Co.
- I. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or G. The following products or approved equivalents will be among those considered acceptable:
1. "WRDA 19"; W.R. Grace & Co.
 2. "Daracem-100"; W. R. Grace & Co.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Nonshrink Grout: CRD-C 621, Grade B.
1. Provide nonmetallic type only.
 2. The following products or approved equivalents will be among those considered

- acceptable:
- a. "Masterflow 713 or 928"; Master Builders, Inc.
 - b. "Euco N-S Grout"; The Euclid Chemical Company.
 - c. "Axpandcrete"; Anti-Hydro Waterproofing Co.
 - d. "Embeco 636"; Master Builders for equipment bases.
- B. Burlap: AASHTO M 182, Class 2 jute or kenaf cloth.
- C. Moisture-Retaining Cover: ASTM C 171, and as follows:
1. Fiber-reinforced waterproof paper.
 2. Polyethylene film.
 3. White burlap-polyethylene sheeting.
- D. Bonding Systems: ASTM C881; Type, grade, and class as required for project conditions. The following products or approved equivalents will be among those considered acceptable:
1. "Concresive LPL", Master Builders, Inc.
 2. "Sikadur 32 Hi-Mod", Sika Corporation.
 3. "Euco #452 Epoxy System"; Euclid Chemical Company.
- E. Adhesive anchor system:
1. Reinforcing bars:
 - a. "HIT C-100 System", HILTI.
 - b. "Keligrout"; KELKEN GOLD, INC., Princeton, NJ (phone 800-342-5154)
 2. Anchor bolts:
 - a. "HVA System", HILTI.
 - b. "Kelibond Anchors", KELKEN GOLD, INC., Princeton, NY (phone 800-342-5154)
- F. Expansion Joint Filler for pavements and sidewalks: Nonextruding bituminous type conforming to ASTM D1751.
- G. Isolation joint filler for slabs on grade: Preformed cork, 1/2" thick, conforming to ASTM D1752, Type II.
- H. Preformed Control Joint: "Screed Cap" for joints to receive sealant; "Zip Cap-Control Joint" for sawcut type joints; as manufactured by Greenstreak, Inc.
- I. Waterstop: Polyvinyl chloride (PVC), ribbed type with center bulb. Size appropriate to application. Supply prefabricated corner shapes.
- J. Waterstop: Bentonite type, "Volclay Waterstop-Rx", as manufactured by American Colloid Company.
- K. Vapor Barrier: Polyethylene sheets 10 mils thick. Top with 2-inch clean sand fill.
- L. Vapor Barrier: Moistop as manufactured by Fortifiber Corporation.
- M. Dovetail Anchor Slot: Galvanized steel, 22 gauge, felt filled.
- N. Wedge anchors: Hohman & Barnard, size as noted on Drawings.

2.4 SURFACE APPLIED CURING AND SEALING COMPOUNDS

- A. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
1. Master Builders, Inc.
 2. Anti Hydro Company, Inc.
 3. The Euclid Chemical Company.
 4. W. R. Meadows, Inc.
 5. Sonneborn Building Products Division/ChemRex, Inc.
 6. L & M Construction Chemicals, Inc.
- B. Curing and Sealing Compounds: For interior or exterior applications.
1. Products shall comply with ASTM C 309, Type 1, clear styrene acrylate type, 30% minimum solids content.
 2. Maximum allowable moisture loss of 0.3 grams per square centimeter.
 3. Do not apply to surfaces scheduled to receive other finishes, coatings or coverings unless specifically approved by the Architect/Engineer.
 4. "SuperRez-Seal"; The Euclid Chemical Company or approved equivalent.
- C. Sealing and Hardening Compounds: Generally, for use at exterior slabs and walks subject to deicing products.
1. Concrete shall receive initial water cure as described elsewhere in this section.
 2. Product shall be siloxane based, 20% minimum solids content.
 3. "Euco-Guard 200"; The Euclid Chemical Company or approved equivalent.
- D. Chemical Hardening Compounds: For interior applications where a denser and more durable surface is required.
1. Concrete shall receive initial water cure as described elsewhere in this section.
 2. Product shall be magnesium silicofluoride that reacts chemically with the free lime and calcium salts in the hardened concrete.
- E. Concrete Curing Compounds: Generally, for interior curing applications.
1. Product shall comply with ASTM C309, Type 1, Class B, wax free, resin based.
 2. Maximum allowable moisture loss of 0.3 grams per square centimeter.
 3. "KUREZ", The Euclid Chemical Company or approved equivalent. Do not apply to surfaces scheduled to receive other finishes, coatings, or coverings unless specifically approved by the Architect/Engineer.
 4. For surfaces that are scheduled to receive other finishes, coatings, or coverings, use dissipating resin-type compound, "KUREZ-DR", The Euclid Chemical Company or approved equivalent.
- F. Evaporation retarder: "Confilm"; Master Builders Company.

2.5 CONCRETE MIX DESIGN

- A. Do not begin concrete operations until proposed mixes have been reviewed and approved by the Architect/Engineer.
- B. Comply with recommendations of ACI 211.1 for normal weight concrete.
- C. For each type and strength of concrete, establish the required average strength $f'(cr)$ of the design

mix on the basis of either field experience or trial mixtures as specified in ACI 301, and proportion mixes accordingly. If trial mixtures method is used, employ an independent testing agency acceptable to the Architect/Engineer for preparing and reporting proposed mix designs.

D. Admixtures:

1. Air-entraining admixture: Add at rate to achieve specified air content.
2. High-range water-reducing admixture (superplasticizer): Add as required for placement and workability.
3. Do not use admixtures not specified or approved.

E. Design mixes to meet or exceed each requirement specified. Where more than one criterion is specified, the most stringent shall apply. For example, a minimum cement content or maximum water-cement ratio might result in strengths greater than the minimum specified; likewise, a greater cement content or lower water-cement ratio may be required in order to achieve the required strength.

F. Normal Weight Concrete - Type A

1. Minimum compressive strength f_c : 3,000 psi @ 28 days.
2. Maximum water-cement ratio by weight: 0.50.
3. Minimum cement content: 475 lbs. per cubic yard.
4. Coarse aggregate size: 1".
5. Maximum slump: 3-1/2 inches \pm 1 inch.
6. Air Content: 4-6%.
7. Schedule: Foundation work.

G. Normal Weight Concrete - Type B

1. Minimum compressive strength f_c : 4,000 psi @ 28 days.
2. Maximum water-cements ratio by weight: 0.45.
3. Minimum cement content: 540 lbs. per cubic yard.
4. Coarse aggregate size: 3/4"-1".
5. Maximum slump: 3-1/2 inches \pm 1 inch.
6. Schedule: interior slabs on grade.

H. Normal Weight Concrete - Type C

1. Minimum compressive strength f_c : 4,000 psi @ 28 days.
2. Maximum water-cement ratio by weight: 0.45.
3. Minimum cement content: 590 lbs. per cubic yard.
4. Coarse aggregate size: 1/2".
5. Maximum slump: 3-1/2 inches \pm 1 inch.
6. Air Content: 4-6%.
7. Schedule: exterior walks or paving, structural piers & walls

I. Light Weight Concrete - Type D

1. Minimum compressive strength f_c : 4,000 psi @ 28 days.
2. Minimum cement content: 660 lbs. per cubic yard.
3. Coarse aggregate size: 3/4".
4. Maximum slump: 2-1/2 inches \pm 1 inch.
5. Air Content: 4-8%.
6. Schedule: Supported floors on composite steel deck.

J. Light Weight Insulating Concrete - Type-E

1. Comply with requirements for U.L. Design number P907.
 2. Six c.f. Perlite aggregate per bag of Portland cement.
 3. One and one half pint 12.5 % solution neutralized vinsol resin, air-entrainment agent.
 4. Average dry density: 27 pcf.
 5. Minimum compressive strength: 150 psi.
 6. Schedule: Fire rated roof assembly.
- K. Provided that no additional expense to owner is involved, contractor may submit for Architect's/Engineer's approval requests for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

2.6 CONTROL OF MIX IN THE FIELD

- A. A tolerance of up to 1 inch above specified slump will be permitted for 1 batch in 5 consecutive batches tested. Concrete of lower slump than that specified may be used, provided proper placing and consolidation is obtained.
- B. If slump upon arrival at the site is lower than 1 inch below the value specified, one addition of water in accordance with ASTM C 94 will be permitted to bring slump within tolerance, provided that:
1. A positive means is available to measure the amount of water added at the site.
 2. The specified (or approved) maximum water-cementitious ratio is not exceeded.
 3. Not more than 45 minutes have elapsed since batching.
- C. Total Air Content: A tolerance of plus or minus 1-1/2 percent of that specified will be allowed for field measurements.
- D. Do not use batches that exceed tolerances.

2.7 CONCRETE MIXING

- A. Mix concrete materials in transit mixers, complying with requirements of ASTM C94, paragraphs 1 to 15 and 18 only.
- B. Elapsed time between initial contact of the cement with water and the completed discharge of the batch at the project site shall not exceed 90 minutes or 300 revolutions of the drum, whichever comes first. These limits shall be reduced at the direction of the Architect/Engineer.
- C. Concrete batch plant shall conform to requirements of the "Concrete Plant Standards" of the "Concrete Manufacturer's Association".

PART 3 – EXECUTION

3.1 HOT AND COLD WEATHER CONCRETING

- A. Do not proceed with work of this section for hot or cold weather placement without approval of the Architect/Engineer.
- B. Comply with recommendations of ACI 306 when air temperatures are expected to drop below 40 degrees F either during concrete placement operations or before concrete has cured.
1. Do not use frozen or ice-laden materials.
 2. Do not place concrete on frozen substrates.

3. Do not add salt, calcium chloride, anti-freeze compounds.
- C. Comply with recommendations of ACI 305 when ambient temperature before, during, or after concrete placement is expected to exceed 85 degrees F.
1. Do not use retarding admixtures.
 2. Make special provisions for curing and finishing.

3.2 CONCRETE FORM PREPARATION

- A. Comply with requirements of ACI 301 and ACI 347 for formwork, and as herein specified. The contractor is responsible for design, engineering, and construction of formwork, and for its timely removal.
- B. Earth forms are not permitted.
- C. Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work.
- D. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.
- E. Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.
1. Minimize form joints and make watertight to prevent leakage of concrete.
 2. Provide chamfered edges and corners at exposed locations, unless specifically indicated otherwise on the drawings.
 3. Provide openings to accommodate work of other trades, sized and located accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
 4. Provide temporary openings for cleaning and inspection in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete work.
 5. Build into concrete work all required ties, anchors, anchor bolts, sleeves, and other inserts. Accurately set items, by using templates, in their final position at the time concrete is placed.
- F. Comply with minimum tolerances established in ACI 117, unless more stringent requirements are indicated on the drawings.
- G. Provide either form materials with factory applied non-absorptive liner or field applied form coating. If field applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is unacceptable.

3.3 JOINT CONSTRUCTION

- A. Construction Joints: Locate and install construction joints as indicated on Drawings. If construction joints are not indicated, or if contractor opts to add additional joints, locate in manner which will least impair strength and stability of the structure.
1. Contractor shall submit location diagrams to Architect/Engineer for approval if locations are not shown on the Contract Documents.

2. Provide keyways not less than 1-1/2 inches deep.
 3. Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.
 4. Provide adequate shear reinforcement as shown on the Drawings or as directed by the Architect/Engineer.
 5. Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned. Joints shall be wetted and slushed with a coat of neat cement grout immediately before placement of new concrete. The grout shall be a neat cement and sand grout (1:3 mix) placed to a 1/2" minimum thickness. An approved bonding compound may be used in lieu of the cement grout with approval of the Architect/Engineer.
 6. Provide waterstops as indicated, and on all construction joints below grade adjacent to usable spaces. Install to form continuous, water-tight dam, with field joints fabricated in strict accordance with manufacturer's instructions.
- B. Movement Joints: Construct isolation joints in slabs poured on grade at points of contact with vertical components, such as foundation walls and column pedestals.
1. Install joint filler to full concrete depth. Recess top edge of filler 1/8 inch where joints are unsealed.
 2. Slabs on grade shall be tied to foundation walls with #3 reinforcing bars at 4'-0" unless specifically shown otherwise on the drawings.
 3. Smooth dowels, greased or treated one end to prevent bond shall be installed at columns and as shown on the Drawings. Refer to "Installing Dowels", this section.
- C. Expansion Joints: Construct expansion joints where indicated. Install expansion joint filler to full depth of concrete. Recess edge of filler to depth indicated to receive joint sealant (and backer rod where necessary) specified in Division 7.
- D. Control Joints - Slabs on grade: Spacing of joints in slabs shall not exceed three times the thickness of the slab on center in feet nor 15 feet. Joints shall typically isolate columns and shall run between columns.
1. If locations of joints are not specifically shown on the Drawings, the Contractor shall submit location diagram to the Architect/Engineer for approval.
 2. Form control joints by means of saw cuts one-fourth the depth of the slab (1-1/4" minimum), performed as soon as possible after slab finishing without possibility of dislodging aggregate.
 3. Form control joints with preformed plastic accessories as directed by manufacturers.
- E. Control Joints - Walls: Construct control joints in walls within 5'-0" of corners/intersections and then at 25'-0" on center.
1. Contractor shall submit location diagram to Architect/Engineer for approval if locations are not shown on the Drawings.
 2. Construct weakened plane vertical control joints as shown on the drawings. Provide adequate shear reinforcement as directed by the Architect/Engineer.
 3. Joints above grade shall be constructed to provide for the installation of water tight joint and sealant. Joints shall be filled with appropriate backer rod and sealant.
 4. Provide waterstops where indicated on the Drawings and on all joints below grade adjacent to usable spaces. Install to form continuous watertight dam, with field joints fabricated in strict accordance with manufacturer's instructions.

3.4 INSTALLATION OF SMOOTH DOWELS

- A. Install dowels as noted on the Drawings.
- B. One end of dowel on one side of joint shall be non-bonded, allowed to slip.
- C. Methods:
 - 1. Coat the non-bonded end with grease and wrap snugly with polyethylene tape. Work shall be neat and snug without excess material.
 - 2. Use pre-molded dowel caps over non-bonded end.

3.5 INSTALLATION OF BUILT-IN ITEMS

- A. Set anchorage devices and other items required for other work connected to or supported by cast-in-place concrete, using templates, setting drawings, and instructions from suppliers of items to be embedded.
- B. Set edge forms and intermediate screeds as necessary to achieve final elevations indicated for finished slab surfaces.
- C. Set anchor bolts furnished under Division 5, using templates and in coordination with steel shop drawings.
- D. Comply with requirements of Paragraph 6.3 of ACI 318.

3.6 CONCRETE PLACEMENT

- A. Provide materials necessary to ensure adequate protection of concrete during inclement weather before beginning installation of concrete.
- B. Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.
- C. Moisten wood forms immediately before placing concrete in locations where form coatings are not used.
- D. Provide runways for wheeled equipment to convey concrete. Do not support runways on reinforcing or wheel equipment directly over reinforcing.
- E. Schedule continuous placement of concrete to prevent the formation of cold joints.
- F. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
- G. Deposit concrete as close as possible to its final location, to avoid segregation.
- H. Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
- I. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.

- J. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
- K. Do not use vibrators to move concrete laterally.
- L. Strike off and level concrete slab surfaces, using highway straight edges, darbies, or bull floats before bleed water can collect on surface. Do not work concrete further until finishing operations are commenced.

3.7 FINISHING FORMED SURFACES

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting. Dampen patch location and area immediately surrounding it prior to applying bonding compound or patching mortar.
- C. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white and normal portland cement as necessary to achieve color match. Consolidate thoroughly and strike off slightly higher than surrounding surface.
- D. Unexposed Form Finish: Repair tie holes and patch defective areas. Rub down or chip off fins or other raised areas exceeding 1/4 inch height.
- E. Exposed Form Finish:
 - 1. Repair and patch defective areas with fins or other projection completely removed and smoothed.
 - 2. Smooth Rubbed Finish: Apply to surfaces indicated no later than 24 hours after form removal. Wet concrete surfaces to be finished and rubbed with Carborundum brick or other abrasive until uniform color and texture are achieved. Do not apply separate grout mixture.

3.8 FINISHING SLABS

- A. Finishing Operations
 - 1. Do not directly apply water to slab surface or dust with cement.
 - 2. Screeding: Strikeoff to required grade and within surface tolerances indicated. Verify conformance to surface tolerances. Correct deficiencies while concrete is still plastic.
 - 3. Bull Floating: Immediately following screeding, bull float or darby before bleed water appears to eliminate ridges, fill in voids, and embed coarse aggregate. Recheck and correct surface tolerances.
 - 4. Do not perform subsequent finishing until excess moisture or bleed water has disappeared and concrete will support either foot pressure with less than 1/4 inch indentation or weight of power floats without damaging flatness.
 - 5. Final floating: Float to embed coarse aggregate, to eliminate ridges, to compact concrete, to consolidate mortar at surface, and to achieve uniform, sandy texture. Recheck and correct surface tolerances.
 - 6. Troweling: Trowel immediately following final floating. Apply first troweling with power trowel except in confined areas, and apply subsequent trowelings with hand trowels. Wait between trowelings to allow concrete to harden. Do not overtrowel. Begin final troweling when surface produces a ringing sound as trowel is moved over it. Consolidate concrete

- surface by final troweling operation. Completed surface shall be free of trowel marks, uniform in texture and appearance, and within surface tolerance specified.
7. Grind smooth surface defects which would telegraph through final floor covering system.
- B. Finishes: Coordinate appearance and texture of required final finishes with the Architect/Engineer before application.
1. Broomed Float Finish: After floating and when water sheen has practically disappeared, apply uniform transverse corrugations approximately 1/16 inch deep, without tearing surface.
 2. Trowel Finish: As specified above.
- C. Slab Surface Tolerances:
1. Achieve flat, level planes except where grades are indicated. Slope uniformly to drains.
 2. Floated finishes: Depressions between high spots shall not exceed 5/16 inch under a 10-foot straight edge.
 3. Troweled finishes: Achieve level surface plane so that depressions between high spots shall not exceed 1/8 inch under a 10-foot straight edge.
- D. Slab Finish Schedule: Apply finishes in the following typical locations and as otherwise shown on the drawings:
1. Broomed float finish:
 - a. Sidewalks, exterior ramps and slabs.
 2. Trowel finish:
 - a. Exposed interior floors.

3.9 CONCRETE CURING AND PROTECTION

- A. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.
- B. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case. Curing period shall be not less than 7 days for standard cements and mixes.
- C. Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed.
1. Keep wet wooden or metal forms exposed to heat of the sun.
 2. If forms are removed prior to completion of curing process, continue curing by one of the applicable methods specified.
- D. Water Cure: The surface of finished concrete shall be kept continuously wet for a minimum of seven days.
1. Concrete surfaces shall be kept continuously wet by sprinkling or fogging with water and by a covering material thoroughly saturated with water and kept wet by intermittent hosing. Concrete shall be protected against freezing during the curing.
 2. Covering material shall be kept continuously moist so that a film of water remains on the concrete surface throughout the curing period. Alternate cycles of wetting and drying shall not be permitted during the curing period.
 3. The use of a moisture retaining cover over burlap or a manufactured type of moisture retaining cover shall be permitted. Lap not less than 3 inches at edges and ends, and seal with waterproof tape or adhesive. Repair holes or tears during curing period with same

- tape or adhesive. Maintain covering in intimate contact with concrete surface. Secure to avoid displacement.
4. Do not use plastic sheeting directly on surfaces that will be exposed to view when in service.
- C. Compound Cure: Curing compounds shall be applied immediately following last finishing operations.
1. Apply curing compound at rate stated by manufacturer to conform with moisture-retention requirements specified, using second, immediate application at right angles to first. Reapply if damaged by rain.
 2. Apply additional coat near substantial completion to act as sealer.
 3. Use curing compounds only in locations permitted or required. Do not apply to surfaces to receive other finishes, coatings, or coverings.
- D. Hardening Compound: Apply to concrete after initial water cure and seasoning of the concrete as recommended by manufacturer. Apply two or more applications as recommended by manufacturer to achieve maximum hardness.
- E. Avoid rapid drying at end of curing period.
- F. During and following curing period, protect concrete from temperature changes of adjacent air in excess of 5 degrees F per hour and 50 degrees F per 24 hours. Progressively adjust protective measures to provide uniform temperature changes over entire concrete surface.

3.11 JOINT FILLER

- A. Concrete surfaces shall be fully cured (minimum 120 days).
- B. Fill full depth of crack for proper load transfer.
- C. Install in strict accordance with manufacturer's instructions.

3.12 REMOVAL OF FORMS AND SUPPORTS

- A. Non-Load-Bearing Formwork: Provided that concrete has hardened sufficiently that it will not be damaged, forms not actually supporting weight of concrete or weight of soffit may be removed after concrete has cured at not less than 50 degrees F for 24 hours. Maintain curing and protection operations after form removal.

3.13 MISCELLANEOUS CONCRETE ITEMS

- A. Fill in holes and openings left in concrete structures for passage of work by other trades after such work is in place. Place such fill-in concrete to blend with existing construction, using same mix and curing methods.
- B. Provide machine and equipment bases and foundations, as indicated on drawings. Set anchor bolts at correct elevations, complying with diagrams or templates of equipment manufacturer.
- C. Provide concrete grout for reinforced masonry where indicated on drawings and as scheduled.

3.14 CONCRETE REPAIRS

- A. Patch tie holes, honeycomb, and other surface imperfections in accordance with ACI 301 and as directed by the Architect/Engineer.
- B. Defective concrete is defined as concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete or surface imperfections shall be as determined by the Architect/Engineer.
- D. Do not patch, fill, touch-up, repair, or replace any concrete except upon specific approval of methods and materials by the Architect/Engineer for each individual area.

3.15 REMOVAL OF EXISTING CONCRETE

- A. Saw cut surfaces or drill holes at regular intervals sufficient to establish a fracture plane for removal by power tools.
- B. Salvage all existing reinforcing; do not cut away until specifically directed by the Architect/Engineer, or as shown on the Drawings.
- C. New work bonded to existing work:
 - 1. Clean and roughen existing surface by sandblasting, water-blasting, scabber, or other approved method.
 - 2. Embed dowels and reinforcing as detailed on the Drawings.
 - 3. Coat surface with bonding agent applied in strict accordance with manufacturer's instructions.
- D. Existing work cut away for new work.
 - 1. Saw cutting and removal shall continue to within 1/4" of the finished surface. The final 1/4" removal shall be completed by grinding to the final surface.
 - 2. Cut existing reinforcing bars 1/2" below the surface. Coat with anti-corrosion protective coating. Grout holes.
 - 3. Provide bond breaker where new concrete work is adjacent to existing work but structurally separate.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Composite Sampling, and Making and Curing of Specimens: ASTM C 172 and ASTM C 31.
 - 1. Take samples at point of discharge.
 - 2. For pumped concrete, perform sampling and testing at the frequencies specified herein at point of delivery to pump, and perform additional sampling and testing at the same frequency at discharge from line. Results obtained at discharge from line shall be used for acceptance of concrete.
- B. Slump: ASTM C 143. One test per batch. Modify sampling to comply with ASTM C 94.
- C. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air-entrained concrete.
- D. Concrete Temperature: One test per strength test.

- E. Compressive Strength Tests: ASTM C 39.
1. Mold and cure one set of 4 standard cylinders for each compressive strength test required.
 2. Obtain samples on a statistically sound, random basis, minimum frequency as follows:
 - a. One set per 100 cubic yards or fraction thereof for each day's pour of each concrete class.
 - b. One set per 3500 square feet of slab or wall area or fraction thereof for each day's pour of each concrete class.
 - c. When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing from not less than 5 randomly selected batches, or from each batch if fewer than 5.
 3. Test Schedule:
 - a. Test one specimen per set at 7 days for information unless an earlier age is required.
 - b. Test two specimens per set for acceptance of strength potential; test at 28 days unless other age is specified. The test result shall be the average of the two specimens. If one specimen shows evidence of improper sampling, molding, or testing, the test result shall be the result of the remaining specimen.
 - c. Retain one specimen from each set for later testing, if required.
 4. Strength potential of as-delivered concrete will be considered acceptable if all of the following criteria are met:
 - a. No individual test result falls below specified compressive strength by more than 500 psi.
 - b. Not more than 10 percent of individual test results fall below specified compressive strength $f'(c)$.
 - c. Average of any 3 consecutive strength test results equals or exceeds specified compressive strength $f'(c)$.
 5. Testing for evaluation of field curing:
 - a. Frequency: One field set of specimens per strength acceptance test.
 - b. Mold specimens from same sample used for strength acceptance tests. Field-cure, and test at same age as for strength acceptance tests.
 - c. Evaluate construction and curing procedures and implement corrective action when strength results for field-cured specimens are less than 85 percent of test values for companion laboratory-cured specimens.
- F. Test Results: Testing agency shall report test results in writing to Architect/Engineer and contractor within 24 hours of test.
1. Test reports shall contain the following data:
 - d. Project name, number, and other identification.
 - e. Name of concrete testing agency.
 - f. Date and time of sampling.
 - g. Concrete type and class.
 - h. Location of concrete batch in the completed work.
 - i. All information required by respective ASTM test methods.
 2. Nondestructive testing devices such as impact hammer or sonoscope may be used at Architect's/Engineer's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.
 3. The testing agency shall make additional tests of in-place concrete as directed by the Architect/Engineer when test results indicate that specified strength and other concrete characteristics have not been attained.

- a. Testing agency may conduct tests of cored cylinders complying with ASTM C 42, or tests as directed.
- b. Cost of additional testing shall be borne by the Contractor when unacceptable concrete has been verified.

END OF SECTION 03300

SECTION 03310
CONCRETE WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

The provisions of Division 1 shall govern this section

1.2 DESCRIPTION OF WORK:

Extent of concrete work is shown on the drawings, and includes, but is not necessarily limited to the following:

Wall footings, sidewalks, crosswalks, and pavement slabs

1.3 RELATED WORK SPECIFIED ELSEWHERE:

Section 02200:	Earthwork
Section 03100:	Concrete Form Work
Section 03200:	Concrete Reinforcement
Section 03521	Concrete Curbs
Section 3523:	Concrete Sidewalks

1.4 QUALITY ASSURANCE:

Sample Pours: Prior to commencing overall construction of concrete surfaces, Contractor shall coordinate with Owner/Landscape Architect to construct a minimum of three sample pours of the finished concrete product. Sample shall include color additives, finish and adjacent brick border. Concrete paving may not begin until a sample pond is approved.

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified:

ASTM C 33	Concrete Aggregates
ACI 301	"Specifications for Structural Concrete for Buildings"
ASTM C 150	Portland Cement
ACI 311	"Recommended Practice for Concrete Inspection"
ASTM C 94	Ready-Mixed Concrete
ACI 318	"Building Code Requirements for Reinforced Concrete"
ACI 347	"Recommended Practice for Concrete Form Work"

ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"

Concrete Testing Service: Employ at Contractor's expense a testing laboratory acceptable to the Owner to perform material evaluation tests and to design concrete mixes.

Materials and Installed Work may require testing and re-testing, as directed by the Landscape Architect, at any time during the progress of the work. Always allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at the Owner's expense, including the re-testing of rejected materials and installed work, shall be done at the Contractor's expense.

Tests for Concrete Materials: Test aggregates by method of sampling and testing of ASTM C 33. For Portland Cement, sample the cement and determine the properties by the methods of test of ASTM C 150.

Submit written reports to the Landscape Architect for each material sampled and tested, prior to the start of the work. Provide the project identification name and number, date of report, name of contractor, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, and values specified in the referenced specification for each material as acceptable for intended use.

Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing. Certificates of compliance must be signed by the materials producer and the Contractor.

1.5 SUBMITTALS:

Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, and others as requested by the Landscape Architect.

Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified.

Material Certificates provide materials certificates in lieu of materials laboratory test reports when permitted by Landscape Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

Color: Submit product data and sample to Landscape Architect for approval.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS:

Portland Cement: ASTM C 150, Type I, unless otherwise acceptable to Landscape Architect.

Use one brand of cement throughout project, unless otherwise acceptable to Landscape Architect.

Normal Weight Aggregates: ASTM C 33 and as herein specified. Provide aggregates from a single source for exposed concrete. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Landscape Architect.

Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank-run sand and manufactured sand are not acceptable.

Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter, as follows:

Crushed stone processed from natural rock or stone.

Washed gravel, either natural or crushed. Use of pit or bankrun gravel is not permitted.

Maximum Aggregate Size: Not larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear spacing between individual reinforcing bars.

Water: Potable

Air Entraining Admixture: ASTM C 260.

Water-Reducing Admixture: ASTM C 494, Type A.

Calcium Chloride: will not be permitted in concrete.

Color: Schofield (Submit samples for selection) Price Sombrero Buff.

2.2 PROPORTIONING AND DESIGN OF MIXES:

Prepare design mixes for each type and strength of concrete in accordance with applicable provisions of ASTM C 94. Use an independent testing facility acceptable to Landscape 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 Landscape Architect.

Submit written reports to Landscape Architect for each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Landscape Architect.

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 Landscape Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Landscape Architect before using in work.

2.3 ADMIXTURES:

Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits.

Pressure:

4% for maximum 2" aggregate

6% for maximum 3/4" aggregate, 7% for maximum 1/2" aggregate

Other concrete: 2% to 4% air

Use admixtures in strict compliance with manufacturer's directions.

2.4 CONCRETE STRENGTHS AND SLUMPS:

All concrete, except where shown or specified otherwise, shall have the following minimum compressive strengths at 28 days, and slump at time of placement:

LOCATION	STRENGTH	MAX. AGG. SIZE	SLUMP
Footings, Bases	3000 psi	1 1/2"	1 - 3"
Sidewalks & Paving	3000 psi	3/4"	1 - 4"

2.5 CONCRETE MIXING:

Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.

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.

When air temperature is between 85 F (30 C) and 90 F (32 C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90F (32 C), reduce mixing and delivery time to 60 minutes.

Color: Follow manufacturer instructions.

PART 3 - EXECUTION

3.1 JOINTS:

Construction Joints: All construction joints shall be saw cut. No trowl or tooled joints are acceptable. Locate and install construction joints not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Landscape Architect.

Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs on ground at points of contact between slabs and vertical surfaces, such as pedestals, walls, steps, and elsewhere as indicated.

3.2 INSTALLATION OF EMBEDDED ITEMS:

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.

Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds. Coordinate location of pipe conduits and other required penetrations of the surface.

3.3 CONCRETE PLACEMENT:

Pre-placement Inspection: Before placing concrete, inspect and complete form work installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where coatings are not used.

Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

General: Comply with ACI 304, and as herein specified.

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 in its final location to avoid segregation.

Placing Concrete Slabs, Beams, Columns: Deposit and consolidate concrete slabs, beams and columns in a continuous operation within limits of construction joints, until the placing of a panel or section is completed.

Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps and hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on the plastic surface.

Maintain reinforcing in proper position during concrete placement operations.

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.

When air temperature has fallen to or is expected to fall below 40 F, uniformly heat water and aggregate before mixing to obtain a concrete mixture temperature of not less than 50 F, and not more than 80 F at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

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.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 F (32 C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Do not use retarding admixtures unless otherwise accepted in mix designs.

3.4 FINISH OF FORMED SURFACES:

Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.

Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to view.

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 1/8" in 10' when tested with a 10' straightedge.

3.5 CONCRETE CURING AND PROTECTION

General: Protect freshly placed concrete from premature drying and excessive hot or cold temperatures.

Method: Apply approved liquid type curing material to exposed concrete slabs.

3.6 CONCRETE SURFACE REPAIR

Patching Defective Formed Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Landscape Architect.

Cut out honeycomb, rock pockets, voids over 1/4" 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". Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar or proprietary patching compound, thoroughly clean, dampen with water and brush-coat the area to be patched with neat cement grout, or proprietary bonding agent.

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 surfaces.

Repair defective slab surfaces by removing and replacing entire slab with fresh concrete.

3.7 QUALITY CONTROL TESTING DURING CONSTRUCTION:

The Owner shall employ a testing laboratory to perform tests and to submit test report.

Sampling and testing for quality control during placement of concrete shall include the following, as directed by Landscape Architect.

Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

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.

Compression Test Specimen: ASTM C 31: One set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

Compressive Strength Tests: ASTM C 39: One set for each 100 cy. yds. or fraction thereof of each concrete class placed in any one day or for each 5,000 sq. foot of surface area placed. 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

When frequency of testing will provide less than 3 strength tests for a given class of concrete, conduct testing from at least 3 randomly selected batches or from each batch if fewer than 3 are used.

When total quantity of a given class of concrete is less than 50 cy. yards strength test may be waived by Landscape Architect if, in his judgement, adequate evidence of satisfactory strength is provided.

When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

Test results will be reported in writing to Landscape Architect, Owner and Contractor on same day that 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 placement, 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.

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 as directed by Landscape 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.

Final Clean Up: Finished surface shall be left free and clean of tire marks, construction stains, residue, slug, grit, dirt, paint and other elements that mar the final appearance.

All excess concrete and debris shall be removed from the site. Plant beds shall be left clear of construction debris

END OF SECTION 03310

SECTION 03523

CONCRETE SIDEWALKS

PART 1 - GENERAL

1.01 SCOPE:

- A. Concrete sidewalks shall be constructed of Portland cement concrete, at the locations and to the dimensions, lines, grades and cross section indicated on the Drawings or as directed by the Owner and in conformity with the provisions and requirements set out in these Specifications.
- B. Concrete sidewalks shall include all the necessary excavation, unless otherwise indicated, subgrade and subbase preparation, backfilling, final clearing up and completing all incidentals thereto, as indicated on the Drawings or as directed by the Project Landscape Architect.
- C. All materials and methods of construction for concrete sidewalks and pavement shall conform to the requirements of the Georgia Department of Transportation Standard Specifications and ASTM C 94 "Standard Specification for Ready Mixed Concrete".
- D. Gravel parking areas and driveways shall conform to aggregate base requirements outlined in this Section of the specifications.

1.02 CONDITIONS

- A. Weather Limitations:
 - 1. Do not conduct concrete paving operations when surface is saturated, or contains excess of moisture, which would prevent uniform distribution and required penetration.
 - 2. Construct concrete sidewalk sections only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
 - 3. Place base course when air temperature is above 35 degrees F and rising. No base course shall be placed on a frozen, saturated, or otherwise unsuitable subgrade material.
- B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

1.03 INSPECTION AND TESTING:

- A. Pavement and base testing will be performed by an independent testing laboratory paid by the Owner.

- B. The testing agency shall test in-place courses for compliance with specified density, thickness and surface smoothness requirements.
- C. Earthwork and compaction operations shall conform to the requirements of Section 02200 of these specifications.
- D. Concrete Strength: One set of acceptance and field cylinders (a total of four) from the same batch of concrete will be made for each 50 cubic yards or fraction thereof, not less than once for each 5,000 square feet of pavement in each day's placing for each class and mix design.
1. Each batch of concrete shall be tested for slump prior to placement. Slump shall be between 1/2 and 1 1/2 inches as determined by AASHTO Test Method T119.
 2. Acceptance cylinders are compression test cylinders molded in the field, stored and cured in the field for the first 24 hours after molding and thereafter in the laboratory of the testing agency until time of testing. Average breaking strength at 28 days of a set of two acceptance cylinders will comprise test.
 3. Field cylinders are compression test cylinders molded in the field, stored and cured on the work site in the same location and subject to the same exposure as job concrete of which it is a representative. Each set of two acceptance cylinders will have two matching field cylinders.
 4. One field cylinder will be broken at seven days and the remaining will be held in reserve.
- E. Allowable Variation in Thickness:
1. Aggregate Base Course: $\pm 1/2$ -inch.
 2. Surface Course: $\pm 1/4$ -inch.
- F. Surface Smoothness: Test finished surface of each course for smoothness using a 16-foot straightedge. Intervals of tests shall be as directed by the Landscape Architect. Surfaces will not be acceptable if exceeding the following:
1. Base Course: 1/4-inch in 16 feet.
 2. Surface Course: 1/8-inch in 10 feet.
- G. Contractor's Duties Relative to Testing:
1. Notifying laboratory of conditions requiring testing.
 2. Coordinating with laboratory for field-testing.
 3. Paying costs for additional testing performed beyond the scope of that required and for retesting where initial tests reveal non-conformance with specified requirements.
 4. Paying the cost of overlays or pavement removal and replacement which does not comply with the specified testing limits.
- H. Samples:

Contractor shall pour at least 3 samples of colored concrete complete with finish and an adjacent integral curb for approval prior to committing to the entire concrete pour.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Materials used in the construction of sidewalks, in addition to Section 03300 and other general requirements of these Specifications, shall conform, unless otherwise stipulated, to the following:
1. Portland cement shall conform to ASTM C 150, Type 1.
 2. Graded aggregate base shall be uniform throughout and conform to requirements of Section 815.01 of the Georgia Department of Transportation Specifications.
 3. Sand: Dune sand, bank-run sand and manufactured sand are not acceptable. Only builders sand shall be used.
 4. Fiber Reinforcement: Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs.
 5. Color: Schofield (Samples to be selected).
 6. Premolded joint filler for expansion joints shall conform to the requirements of ASTM D 1751 or ASTM D 1752. The joint sealer for the joints in the concrete pavement shall meet the requirements of Federal Specification SS-S-164 and shall be hot poured type.
 7. Concrete Color: Concrete shall include integrated colors in the concrete mix and shall be from same supplier and same batch mixture. Finished concrete shall have a light broom finish parallel to traffic flow on all sidewalk sections.
 8. All concrete, except where shown or specified otherwise, shall have the following minimum compressive strengths at 28 days, and slump at time of placement:

Location	Strength	Maximum Aggregate Size	Slump
Footings, Bases	3000 psi	1-1/2"	1"
Walls	3000 psi	3/4"	1"
Pavement, Sidewalks	4000 psi	1-1/2"	1"

2.02 FORM MATERIAL:

- A. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, natal-farmed 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 the joint system specified. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

- B. Lumber used in construction of wood forms shall be free of bulge or warp, of uniform width, not less than 2-inches in thickness, except that 1-inch thickness may be used on curves, and shall be sound and free from loose knots. Stakes shall be not less than 2" x 4" lumber of sufficient length that, when driven, they will hold the forms rigidly in place.
- C. Metal forms shall be of approved sections and shall have a flat surface on top. They shall present a smooth surface of the desired contour, sufficiently thick and braced to withstand the weight of the concrete without bulging or becoming displaced.

PART 3 - EXECUTION

3.01 LABOR:

- A. For finishing, competent and skilled finishers shall be provided.

3.02 EQUIPMENT:

- A. All equipment necessary and required for the construction of concrete sidewalks must be on the Project, proven to be in first class working condition and approved by the Owner, before construction will be permitted to begin.
- B. A one bag mixer will be permitted when the total output of concrete, per 10-hour day, does not exceed 25 cubic yards.
- C. Satisfactory floats, edgers, spades and tamps shall be furnished. Tamps of not over 8-inch diameter and weighing not less than 25 pounds shall be provided for tamping subgrade. A 10-foot longitudinal float of the inverted T-type with plough handles attached for manipulation, and a rigid float not less than 18-inches longer than the width of the walk being constructed, shall be provided.

3.03 REMOVAL OF STRUCTURES AND OBSTRUCTIONS:

- A. Unless otherwise indicated or stipulated, the removal of structures, obstructions, etc., will be performed in accordance with the requirements of Section 02060 of these Specifications.

3.04 EARTHWORK AND COMPACTION

- A. Earthwork and compaction operations shall be performed in accordance with requirements of Section 02200 of these specifications.

3.05 SUBGRADE PREPARATION:

- A. The subgrade for the sidewalk shall be formed by excavation to a depth equal to the thickness of the concrete plus the base course.
- B. All subgrade shall be of such width as to permit the proper installation and bracing of the forms.
- C. Yielding, or unsuitable material shall be removed and backfilled with satisfactory material in accordance with recommendations and approval of geo-technical consultant. Place 6-inches of graded aggregate base, as determined by the geotechnical sub-consultant, under concrete sidewalks as necessary for subgrade stabilization, compacted thoroughly and finished to a smooth, unyielding surface and proper line, grade and cross section of the proposed construction.
- C. Additional stabilization of poor subgrade areas may be necessary to achieve compaction criteria for aggregate base. These additional subgrade stabilization measures shall be performed under the direct supervision of the geo-technical consultant. These measures may include, but are not limited to, placement of

geogrid reinforcement materials, aggregate bridge lifts, undercutting of unsuitable soils and soil cement admixtures.

3.06 FORMS:

- A. All forms shall be set upon the prepared subgrade, true to lines and grade, and held rigidly in place so as not to be disturbed or displaced during the placing of the concrete. The top of the form shall be set to exact grade and the height shall be equal to not less than the thickness of the proposed concrete.
- B. Design form work to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades level and plumb work in finished structures. Provide for opening, offsets, sinkages, keyways, recesses, moldings, rustifications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.

- E. Immediately before placing the concrete, the forms shall be given a coat of light oil and where being removed and used again, the forms shall be thoroughly cleaned and oiled each time.
- F. Forms shall be removed within 24 hours after placing concrete and no pressure shall be exerted upon the concrete in removing forms.
- G. When the concrete sidewalk is to be joined to an existing sidewalk, the existing sidewalk, if not in proper condition for the junction, shall be cut to a neat line perpendicular to both the centerline and the surface, or as indicated by the Owner.

3.07 JOINTS:

- A. Control joints shall be saw scores. No trowel joint shall be permitted or accepted.
- B. Unless otherwise indicated on the Drawings or as directed by the Landscape Architect, premoulded expansion joint filler, 3/4-inch in thickness, shall be placed at the locations and in line with expansion joints in the adjoining pavement, gutter or curb. Transverse expansion joints for concrete sidewalks shall be 3/4-inch thick. When expansion joints are not required in the adjoining pavement or gutter, and not otherwise indicated on the Drawings, a 3/4-inch premoulded expansion joint filler shall be placed at intervals of not over 30 feet apart. All premoulded expansion joint filler must be cut to full width or length of the proposed construction and shall extend to within 1/2-inch of the top or finished surface. All longitudinal expansion joints shall be placed as indicated on the Drawings or as directed by the Project Landscape Architect.
- C. All expansion joints shall be true, even and present a satisfactory appearance.
- D. All expansion joint material protruding after the concrete has been finished shall be trimmed flush as directed by the Landscape Architect.
- E. Construction Joints: Locate and install construction joints not shown on the Drawings, so as not to impair strength and appearance of the structure, as acceptable to the Landscape Architect. Review need for additional joints or scores with the Landscape Architect prior to construction.
- F. Control Joints in Slabs-on-Ground: Construct control joints in slabs-on-ground to form panels of patterns as shown. Locate expansion type joint at spacing recommended by Portland Cement Association.
- G. Control Joints in Sidewalks: Provide joints in pattern as indicated on the Drawings. Locate expansion type joints at spacing as indicated.

- H. Saw joints shall be cut no sooner than 7 hours or less than 24 hours from initial pour.

3.08 MANUFACTURING AND PLACING CONCRETE:

- A. Immediately before placing concrete, the depth of the proposed concrete shall be checked by means of a template cut true to the cross section of the proposed construction and any irregularities shall be corrected.
- B. Immediately before placing concrete, all subgrade shall be thoroughly sprinkled or wetted.
- C. Concrete shall not be placed upon a frozen subgrade or subbase.
- D. Construction joints will be permitted only at grooves or at expansion joints, unless otherwise approved by the Owner.
- E. The concrete shall be manufactured and placed in accordance with the requirements of Section 03300 of these Specifications.
- F. The concrete shall be placed immediately after mixing; the edges, sides, etc. shall be thoroughly spaded and the surfaces tamped sufficiently to thoroughly compact the concrete and bring the mortar to the surface. The concrete shall be deposited and compacted in a single layer.

3.09 FINISHING:

- A. The concrete shall be stuck-off with a transverse template resting upon the side forms and then shall be floated with a 10-foot longitudinal float working the float transversely across the concrete with a sawing motion, always maintaining it parallel to the edges of the sidewalk, or driveway, where practicable, and in such a manner that all surplus water, laitance and inert material shall be removed from the surface. This operation shall be continued until the surface of the concrete shows no variation from a 10-foot straightedge. If necessary, additional concrete shall be added to fill depressions, and the longitudinal float used again. The longitudinal float shall not be moved ahead more than one-half its length at any time.
- B. When the surface of the concrete is free from water and just before the concrete obtains its initial set, it shall be gone over and finished with a wooden float so as to produce a sandy texture. The longitudinal surface variations shall be not more than 1/4-inch under a 12-foot straightedge, nor more than 1/8-inch on a five-foot transverse section. The surface of the concrete must be finished so as to drain completely at all times.

- D. The edges of the sidewalks or driveways shall be carefully finished and rounded with an edging tool having a radius of 1/2-inch.
- E. Finish: The finished surface of the concrete shall be a light broom finish perpendicular to the flow of traffic.
- F. The edges of the concrete at contraction joints shall be rounded with an edging tool having a radius of 1/4-inch. The top and ends, where practicable, of expansion joint material shall be cleaned of all concrete and the expansion joint material shall be trimmed so as to be slightly below the surface of the concrete. All marks caused by edging shall be removed with a wetted brush or wooden float.
- G. The surface of sidewalks shall be divided into blocks by use of a grooving tool. Grooves shall be placed so as to cause contraction joints to be placed at a groove line, where practical. The grooves shall be spaced equal to the sidewalk width, but not to exceed 10' spacing between joints. The grooves shall be cut to a depth of not less than 1-inch. The edges of the grooves shall be edged with an edging tool having a radius of 1/4-inch, and any marks caused by edging or otherwise shall be removed with a wetted brush or wooden float so as to give the surface an uniform texture and finish

3.10 PROTECTION AND CURING:

- A. Immediately after finishing the concrete, it shall be covered and cured in accordance with the requirements of Section 03300 of these Specifications. Curing materials shall conform to the requirements of ASTM C 309 (liquid membrane compound) or ASTM C 171. If the temperature falls to below freezing, satisfactory heating devices shall be placed under suitable covers to keep the temperature around the concrete at above 45 degrees F.
- B. Pedestrians will not be allowed upon concrete sidewalks until 12 hours after finishing concrete, and no vehicles or loads shall be permitted upon any sidewalk or driveway until the concrete has attained sufficient strength for such traffic.
- C. The Contractor shall construct such barricades and protection devices as are necessary to keep pedestrians and traffic off the sidewalks.
- H. If any sidewalk is damaged at any time previous to final acceptance of the project, it shall be repaired by removing all concrete within the limits of the grooves, and be replaced, at the Contractor's expense, with concrete of the type, kind and finish in the original construction.

3.11 BACKFILLING:

- A. Immediately after the concrete has set sufficiently, the spaces along the sides or edges of the sidewalk shall be refilled with suitable material, this material shall be compacted in layers of not over 4-inches each, until firm and solid.

3.12 CLEANING:

- A. All excess or unsuitable material shall be removed and disposed of in accordance with requirements of Section 02200 of these Specifications.
- B. Final clean up shall be performed in accordance with the requirements of these Specifications.
- C. All material becoming the property of the Owner shall be stored in a manner and at locations near or on the Project as directed by the Owner.

END OF SECTION 02523

SECTION 04100

MASONRY MORTAR

Part 1 GENERAL

1.01 Scope

The work covered by this Section consists of furnishing all labor, equipment and material required to ensure the proper proportioning of materials for masonry mortar and related work as described herein and or shown on the Drawings.

1.02 Storage and Protection

- A. Cementitious materials shall be delivered to the site in unbroken bags or other approved containers, plainly marked and labeled with the manufacturer's name and brand.
- B. Cementitious materials shall be handled in a manner which will prevent the inclusion of foreign materials and damage by water or dampness.

1.03 Quality Assurance

- A. Materials shall conform to the current editions of the following standards:
 - 1. Masonry Cement: ASTM C91.
 - 2. Aggregate for Masonry Mortar: ASTM C 144.
 - 3. Portland Cement: ASTM C 150, Type I.
 - 4. Hydrated Lime for Masonry Purposes: ASTM C 207, Type S.
 - 5. Mortar for Unit Masonry: ASTM C 270.
 - 6. Latex Portland Cement Mortar: ANSI A118.4
- B. The Contractor shall submit to the Engineer written evidence that the cement, lime and aggregate is in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the cement, lime and/or aggregate supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on samples of cement, lime and/or aggregate.
- C. In addition to these submittals, the Contractor shall submit to the Engineer test results in compliance with ASTM C 270, Section 9 for each type of mortar to be used in the work. The test report shall also include the average compressive strength of three 2-inch cubes of laboratory prepared mortar. Mortar mix ingredients and proportions shall not be changed during the course of the work without the Engineer's approval. Extreme care shall be taken to assure that the same proportion of each ingredient is

used in each batch. Mortar color shall be proportioned by weight in individual containers prior to mixing. Measuring mortar color by volume during mixing shall not be allowed.

Part 2 PRODUCTS

2.01 Materials

A. Masonry Cement

1. Masonry cement shall be a mixture of Portland cement and Type S hydrated lime. The mix shall not contain inert or noncementitious mineral fillers. If package mix is used, other hydraulic cements may be substituted for a part of the Portland cement. However, the Portland cement shall not be less than 30 percent of the total. Packaged mixes shall conform to the requirements of ASTM C 91.
2. The composition of the masonry cement shall be printed on each bag in terms that show compliance with these requirements.
3. If a packaged mix is not used, the Portland cement shall conform to ASTM C 150, Portland Cement, Type I and hydrated lime shall conform to ASTM C 207, Type S. The hydrated lime may be used in dry or paste form.

B. Sand: Aggregate for use in masonry mortar shall be clean, free from salt or other deleterious materials and conform to ASTM C 144, Aggregate for Masonry Mortar.

C. Water: Water for mixing shall be potable, clean and free from oil, acids, salts and other deleterious matter.

D. Color

1. Masonry cement used in load bearing and non-load bearing CMU wall construction shall be grey.
2. Masonry cement used in the granite stone shall be colored. Colors shall be approved by the Engineer in conjunction with the selection of the granite stone and CMU veneers.

Part 3 EXECUTION

3.01 Installation

A. Mixing and Placing

1. All mortar materials shall be accurately measured by volume and thoroughly mixed until they are evenly distributed throughout the batch. Mix mortar as follows: first, add approximately 3/4 of required water, 1/2 the sand and all the cement and lime; mix and add remainder of sand. Mix briefly; then add remainder of water in small quantities until workability of batch is satisfactory to masons. Mortar color when used shall be added to the 3/4 of required water prior

to adding sand. After all materials have been added, mix for a minimum of five minutes. Completely empty drum before recharging for next batch.

2. All mortar shall be mixed in a powered, batch-type mechanical mixer. This requirement will not be waived except for minor jobs and only upon the approval of the Engineer.
3. Mortars mixed for more than one hour shall not be used. A mortar which shows a tendency to become dry before this time shall have water added to it and shall be re-mixed. The use of a continuous mixer or retempered mortar shall not be permitted.
4. Mortar for pointing shall have integral waterproofing added in accordance with the manufacturer's instructions.
5. Mortar for exterior brick paving shall have a bond coat between the concrete slab and mortar setting bed. Bond coats consist of Portland cement mixed to a creamy consistency with latex additive. The bond coat is used to create improved bond between the concrete slab and the mortar setting bed. It is installed as the setting bed and pavers are laid and should not exceed 1/16 in. (2mm).

B. Mix Proportions: All mortar shall conform to the requirements of ASTM C 270. Mix proportions by volume. Allowable error is two percent.

1. Mortar Mixes

Types	Mix by Parts Description	A	B
M	Portland Cement	1	1
M	Masonry Cement	0	1
M	Hydrate Lime	1/4	0
M	Damp Loose Aggregate	3 - 3-1/2	4-1/2 - 6
N	Portland Cement	1	0
N	Masonry Cement	0	1
N	Hydrate Lime	1	0
N	Damp Loose Aggregate	4-1/2 - 6	2-1/4 - 3
S	Portland Cement	1	1/2
S	Masonry Cement	0	1
S	Hydrate Lime	1/2	0
S	Damp Loose Aggregate	4-1/2	4-1/2

2. Mortar Uses
 - a. Use Type M for all load bearing masonry and in foundation walls where masonry materials occur.
 - b. Use Type N for all interior non-load bearing masonry.
 - c. Use Type S for all face stone work, backup and parging.
 - d. Type M may be used in lieu of Type N or S.
 - e. Type S may be used in lieu of Type N.
 - f. Use Type M for exterior mortared masonry unit paving
 - g. Use Latex-Portland Cement Mortar in applications such as heavy vehicular traffic pavements or pavements where proper drainage is not possible.

END OF SECTION 04100

SECTION 04200

UNIT MASONRY WORK

PART 1 - GENERAL

RELATED DOCUMENTS

Section 04150 - Masonry Accessories

Section 04400 - Stone

DESCRIPTION OF WORK:

Extent of each type of masonry work is indicated on drawings. In general, the work includes:

Stone masonry, mortar, and accessories.

QUALITY ASSURANCES:

Use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

Sub-Contractor or Mason:

Shall have a minimum of three years experience in the installation of flat work paving and walls respectively.

Construction Tolerances:

Variation from Plumb:

For vertical lines - walls and arises do not exceed 1/8" in 3'.

Variation from Level:

For top of walls and masonry courses do not exceed 1/8" in 10'. Tops of all borders, steps and paving shall be flush to adjacent bricks unless specified.

Variation in Cross-Sectional Dimensions:

For thickness of walls do not exceed minus 1/4" or plus 1/2".

SUBMITTALS:

Product Data:

Submit manufacturer's specifications and other data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements. Include instructions for handling, storage, installations and protections. Submit samples of each color and shape for approval prior to purchase. Color range sample for a **variations of grey granite** shall be submitted for approval.

SAMPLE PANELS:

No work shall proceed until sample panels are completed and approved by the Landscape Architect.

Construct sample flat work panel 4'x4' using specified stone and mortar, bond and joint tooling required for final work, indicating the proposed range of color, texture and workmanship to be expected in the completed work. Obtain Landscape Architect's acceptance of visual qualities of the sample before start of masonry work. Protect panels during construction as a standard for judging completed masonry work. Use sample panels to test proposed cleaning procedures.

Construct sample panels to show finished condition of each pattern of stone and brick paving and walk including all borders and edges. Sample may be built in place and become part of finish work upon approval by Landscape Architect. Use sample panels to test jointing, pointing and cleaning procedures.

Samples shall be maintained throughout the project as a standard. Samples shall be removed as part of final cleanup.

Borders shall be installed with clean joints, even and uniformly spaced. Corners shall be neatly butted or mitered.

JOB CONDITIONS:

Protection of Work:

During construction cover work with heavy waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 12" beyond work completed.

Do not apply uniform loading for a least 12 hours after building masonry walls, columns or paving.

Do not apply concentrated loads for at least 3 days after building masonry walls, columns or paving.

Staining:

Prevent grout or mortar from staining the face of masonry to be left exposed. Remove immediately grout or mortar in contact with such masonry.

COLD WEATHER PROTECTION:

Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.

Remove all masonry determined to be frozen or damaged by freezing conditions.

Perform the following construction procedures while the work is progressing:

When air temperature is from 40 degrees F to 35 degrees F, heat sand or mixing water to produce mortar temperatures between 40 degrees F and 120 degrees F.

Do not proceed with masonry work until temperatures are 35 degrees F and rising.

Perform the following protections for completed masonry not being worked on:

When the mean daily air temperature is from 40 degrees F and below, protect masonry from rain or snow for at least 24 hours by covering with weather resistive membrane.

PART 2 - PRODUCTS

MASONRY UNITS – GENERAL:

Common Brick:

ASTM C 62 Quality Standard, Grade SW, select from manufacturer's standard colors and textures. For use where concealed from view in completed work at option of Contractor. Submit samples of red brick and brown brick for approval.

Standard Brick:

Required sizes – 3 ¾" x 8" x 2 ¼" complying with ASTM C-216 Grade SW Type FBS

Facebrick:

Shall be as brand name "Regent Collection" as manufactured by General Shale Brick of Atlanta, Georgia.

Provide solid brick (without holes) with exposed faces finished the same for any brick with exposed ends or tops except for utility brick, which are acceptable with holes. Submit samples of red brick only.

Brick Pavers:

Highway approved brick. Required sized 3 ¾" x 8 x 2 ¼".

Brick Pavers shall be as brand name "Regent Collection" as manufactured by General Shale Brick of Atlanta, Georgia.

Provide solid brick (without holes) with exposed faces finished the same for any brick with exposed ends or tops except for utility brick, which are acceptable with holes. Submit samples of red brick and brown brick for approval.

Brick for stair nosing shall have ¼" rounded corner on nose edge.

For use on stairs and landings and for patio and walk borders where set in mortar.

Brick Pavers on Granite Screenings:

Required sizes 3 3/4" x 8" x 2 1/4" for borders and curbs where set in mortar, 3 3/4" x 7 1/2" x 2 1/4" (twice as long as wide) for brick pavers on granite screenings.

Brick Pavers shall be as brand name "Regent Collection" as manufactured by General Shale Brick of Atlanta, Georgia.

Provide solid brick (without holes) with exposed faces finished the same for any brick with exposed ends or tops except for utility brick, which are acceptable with holes.

Install brick curbs and border as detailed, set in specified mortar.

Spread granite screenings, screed and compact to proper grade.

Establish compacted subgrade to allow for 2" thick granite screenings setting bed.

Lay brick flat with hand tight joints. Spread granite screenings on finished work and broom sweep into joints.

Utility Brick Pavers:

Lay out work carefully to avoid unnecessary cutting of brick.

Required sizes, 3 1/2" x 12" x 3 1/2"

Brick Pavers shall be as brand name "Regent Collection" as manufactured by General Shale Brick of Atlanta, Georgia.

Utility with holes are acceptable. Holes shall not be exposed of finished faces.

Provide brick with exposed faces finished the same for any brick with exposed ends or tops.

Color shall conform to the selected red brick chosen for walks and walls.

Allowance: The Contractor shall include in his bid an allowance for Utility Brick Allowance \$XXX.00/per thousand, Highway approved Brick Allowance \$XXX.00/per thousand, Standard Brick Allowance \$XXX.00/per thousand, including sales tax.

The Contractor shall be responsible for estimating and furnishing sufficient quantities required to complete the project. The quantities estimated shall be stated in the bid proposal for the purpose of establishing credits for differences in cost of brick selected and allowance stated above.

Concrete Masonry Units (Concrete Block):

Size: Manufacturer's standard units with nominal dimensions of 16" long, 8" wide and 8" high (15 5/8" x 7 5/8" x 7 5/8" actual) and other sizes indicated.

Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, Grade N. Normal weight units using concrete aggregates complying with ASTM C 33 producing dry net unit weight of not less than 125 pounds per cubic foot.

Provide manufacturer's standard color and texture, unless otherwise indicated.

Mortar Materials:

Masonry Cement for Exposed Work: Brixment-in-color. Color shall be as required to closely match brick.

Portland Cement: ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color.

Masonry Cement: ASTM C 91, non-staining, except with 12% maximum air content by volume.

Hydrated Lime: ASTM C 207, Type S.

Aggregates: ASTM C 144.

Masonry Accessories:

Continuous Wire Reinforcing and Ties for Masonry:

Provide welded wire units prefabricated in straight lengths of not less than 10' with matching corner units. Fabricate from cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross-rods, and a unit width of 1-1/2" less than thickness of wall.

Provide units fabricated as follows:

Truss type fabricated with single pair of 9 ga. Side rods and 9 ga. continuous diagonal cross-rods spaced not more than 16" o.c. Hot-dip galvanize after fabrication with 1.5 oz. Zinc coating, ASTM A 153, Class B2.

Wall Ties:

Provide Z-Bar type, 3/16" diameter hot dipped galvanized steel wire, 2" legs x 10" length, as Dur-O-Wall D/A 500 for reinforced brick walls.

Provide Z-Type, 3/16" diameter mill galvanized steel wire, as Dur-O-Wal D/A 512, No.7 for brick veneered walls.

Anchors and Ties:

Provide straps, bars, bolts and rods as indicated.

Reinforcing Bars: Deformed steel ASTM A 615, Grade 60 of the sizes shown.

Mortar Mix:

Mortar shall consist of (by volume) one-part Portland cement, two parts masonry cement and six parts sand, with sufficient water for workable plastic mix.

Mortar For Reinforced Brick Masonry:

Mortar shall consist of (by volume) one-part Portland cement, ½ part hydrated lime or lime putty, not more than 4 ½ parts clean mortar sand, with sufficient water for workable plastic mix. Prepared masonry cements shall not be used. No mortar additives of any kind shall be used.

Portland Cement Grout:

Grout shall consist of (by volume) one-part Portland cement, two parts sand, and two parts coarse aggregate, maximum size 3/8". Add sufficient water to provide a fluid mix, with 8 ½" to 10" slump.

Manufacturer:

Obtain masonry units from one manufacturer of uniform texture and color for each kind required, for each continuous area and visually related areas.

PART 3 - EXECUTION

Layout work carefully to avoid unnecessary cutting of brick. Contractor is expected to adjust layouts to fit common brickwork dimensions.

STAKING:

See paragraph 1.8 of Special Conditions for process.

SAMPLE:

Contractor shall install and clean to finished condition enough work to include each element pattern, bond and jointing of the masonry to serve as a sample. No work shall commence until the sample is approved by the Landscape Architect. Approved sample shall be maintained in finished condition through the construction process.

INSTALLATION, GENERAL:

Thickness:

Build masonry construction to the full thickness shown, except build single-width walls (if any) to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

Cut masonry units with motor-driven saw designed to cut masonry with clean sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.

Frozen Materials and Work:

Do not use frozen materials or materials mixed or coated with ice or frost. For masonry which is specified to be wetted, comply with the BIA recommendations. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.

Pattern Bond:

Lay exposed masonry in the pattern shown. Do not use units with less than 4" horizontal face dimensions at corners.

Lay concealed masonry with all units in a wythe bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners, unless otherwise shown. Do not use units with less than 4" horizontal face dimensions at corners

If drawings do not clearly indicate the pattern or detail of the brick or bond, the contractor shall immediately contact the Landscape Architect for clarification.

Stopping and Resuming Work:

Rack back 1/2 masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.

Wherever contractor determines there is not adequate information to construct an element, bond, or pattern of the design, the contractor shall not proceed with the work until the Landscape Architect is notified.

Batch Control, Mortar:

Measure and batch materials by volume such that the required proportions for mortar can be accurately controlled and maintained. Measurement of sand exclusively by shovel will not be permitted.

Mix mortar ingredients for a minimum of 5 minutes in a mechanical batch mixer. Use water clean and free of deleterious materials which would impair the work. Do not use mortar which has begun to set, or if more than 2-1/2 hours has elapsed since initial mixing. Re-temper mortar during 2/1/2-hour period as required to restore workability.

Mixer shall not be located in proximity of plants or plant beds.

Bedding and Jointing:

Lay stone or brick with completely filled bed, head and collar joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also bed webs in mortar in starting course on footings, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

All joints butting against concrete or other masonry installations shall be a silicon flexible joint material or expansion material.

Joints:

Maintain joint widths shown, except for minor variations required to maintain bond alignment.

If not otherwise indicated, lay walls with 3/8" minimum and 1/2" maximum joints. Lay all flat work with 1/2" minimum and 5/8" maximum joints.

Joint Treatment:

For concealed work, struck flush.

Wall caps and exposed joints of all brick work shall have joints tooled slightly concave.

Brick walls exposed to view shall have vertical and horizontal joints raked 1/2" deep.

Any joints falling out shall be replaced by contractor for up to one year after final acceptance.

All flat work and border work shall have recessed joints.

Brick Paving on Dry Mix:

Lay out work carefully to avoid unnecessary cutting of brick. Establish compacted subgrade to allow for 2" thick dry mix setting bed.

Install brick curbs and border as detailed, set in specified mortar. Tops shall be flush and joints consistent at corners.

All curbs and borders shall be installed with smooth consistent curves with no kinks or flat spots.

Spread dry mix consisting of one part Portland cement and six parts sand between borders, dampen slightly, screed and compact to proper grade.

Lay brick flat, tightly butted at sides and ends for minimum space between brick or with minimum 1/2" mortar joints as detailed.

Dampen entire area. Do not flood but fog until dry mix is thoroughly wet.

After mix has set, sweep sand into joints to fill completely.

Brick on Sand:

Lay out work to fit space provided with minimum cutting of brick.

Install properly graded sand base, using sand as specified for mortar.

Set brick on sand base in indicated pattern with approximately ½” wide-open joints at sides and ends. Top surface of brick to be on line with adjacent brick.

Fill spaces between brick with sand.

Horizontal Joint Reinforcing

Provide continuous horizontal joint reinforcing as shown and specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8” on exterior side of walls and ½” at other locations. Lap reinforcement a minimum of 6” at ends of units. Provide continuity at corners by using prefabricated “L” sections.

Space continuous horizontal reinforcing as shown on drawings.

REINFORCING BARS:

Install reinforcing bars as specified in cells of concrete masonry units where shown on drawing. Fill cells solid with mortar around reinforcing.

REPAIR, POINTING AND CLEANING:

Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

Pointing:

During the tooling of joints, enlarge any voids or holes, except weep-holes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance.

Clean exposed brick masonry surfaces by the bucket and brush hand cleaning method or by high pressure water method.

Use commercial cleaning agents only with approval of owner and landscape architect and in accordance with manufacturer's instructions.

Do not allow chemical cleaning agents to damage adjacent plant materials, contaminate soil in plant beds, or damage surface of other materials.

Workmen shall not track across lawns when using chemical cleaning agents.

Slug, dust and debris left from the operation of mixer and brick saw shall be removed from the site and cleaned from all finished surfaces.

FINAL CLEAN UP:

All finished masonry shall be left in cleaned condition free of mortar, stains, slug or other debris.

All adjacent plant beds shall be left clear of mortar, refuse, bricks, and other contaminants. Any soil contaminated by masonry work shall be removed and replaced with suitable topsoil. Any plant material damaged by masonry or cleanup work shall be replaced by the contractor.

END OF SECTION 04200

SECTION 04400

STONE MASONRY

PART 1 - GENERAL

RELATED DOCUMENTS

General and Specials Conditions shall apply to this section.

DESCRIPTION OF WORK:

Extent of each type of masonry work is indicated on drawings. In general, the work includes: Stone masonry, mortar, and accessories needed to complete the work.

QUALITY ASSURANCES:

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

Sub-contractor or mason: Shall have a minimum of three years experience in the installation of flat work paving and stone walls respectively.

Construction Tolerances:

Variation from Plumb: For vertical lines, walls and arises do not exceed 1/8" in 3'.

Variation from Level: For top of walls and masonry courses do not exceed 1/8" in 10'. Tops of all borders, steps and paving shall be flush to adjacent bricks unless specified.

Variation in Cross-Sectional Dimensions: For thickness of walls do not exceed minus 1/4" or plus 1/2".

SUBMITTALS:

Product Data: Submit manufacturer's specifications and other data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements. Include instructions for handling, storage, installations and protections.

SAMPLE PANELS:

No work shall proceed until sample panels are completed and approved by the Landscape Architect and or Owner's Representative.

Construct sample flat work panel 4'x4' using specified stone and mortar, bond and joint tooling required for final work, indicating the proposed range of color, texture and workmanship to be expected in the completed work. Obtain Landscape Architect or Owners Representatives acceptance of visual qualities of the sample before start of masonry work. Protect sample panels during construction as a standard for judging completed masonry work. Use sample panels to test proposed cleaning procedures.

Construct sample panels to show finished condition of each pattern of stone paving and wall including all borders and edges. Sample may be built in place and become part of finish

work upon approval by Landscape Architect or Owner's Representative. Use sample panels to test jointing, pointing and cleaning procedures.

Samples shall be maintained throughout the project as a standard. Samples shall be removed as part of final cleanup.

Borders shall be installed with clean joints, even and uniformly spaced. Corners shall be neatly butted or mitered.

JOB CONDITIONS:

Protection of Work: During construction, cover work with heavy waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

Do not apply uniform loading for a least 12 hours after building masonry walls, columns or paving.

Do not apply concentrated loads for at least 3 days after building masonry walls, columns or paving.

Staining: Prevent grout or mortar from staining the face of masonry to be left exposed. Remove immediately grout or mortar in contact with such masonry.

COLD WEATHER PROTECTION:

Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.

Remove all masonry determined to be frozen or damaged by freezing conditions.

Perform the following construction procedures while the work is progressing:

When air temperature is from 40 degrees F to 35 degrees F, heat sand

or mixing water to produce mortar temperatures between 40 degrees F and 120 degrees F.

Do not proceed with masonry work until temperatures are 35 degrees F and rising.

Perform the following protections for completed masonry not being worked on:

When the mean daily air temperature is from 40 degrees F and below, protect masonry from rain or snow for at least 24 hours by covering with weather resistive membrane.

PART 2 - PRODUCTS

MASONRY UNITS, GENERAL:

Granite for the seatwalls and the splash pad columns:

Stones: 4" depth grey Elberton Granite Rubble as a 4" veneer.
Supplier: Aztec Stone Empire 5055 Buford Hwy, Atlanta, Ga 30071
Ph. 770 368-9337 website: aztecstoneempire.com.

Colors:

Grey
Dark Grey

Finish: Rubble

Pattern: Solder Course 3" height x 4" depth, length varies.

Manufacturer: Obtain masonry products from one supplier, of uniform texture and color for each kind required, for each continuous area and visually related areas.

Concrete Blocks: Standard 8 x 8 x 16 CMU grey blocks

Cap: Precast concrete capstone 3.5" thick x 13" wide x 24" long @ 4000 PSI

MORTAR MATERIALS:

Masonry Cement for Exposed Work: ASTM C 270 Type S (1800-PSI) Color to be approved by landscape architect.

MASONRY ACCESSORIES:

Continuous Wire Reinforcing and Ties for Masonry: Provide welded wire units prefabricated in straight lengths of not less than 10' with matching corner units. Fabricate from cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross-rods, and a unit width of 1-1/2" less than thickness of wall.

Anchors and Ties: Provide straps, bars, bolts and rods as indicated.

Reinforcing Bars: Deformed steel ASTM A 615, Grade 60 of the sizes shown.

PART 3 - EXECUTION

LAYOUT:

See Special Conditions for process.

SAMPLE: Contractor shall install and clean to finished condition enough work to include each element pattern, bond and jointing of the masonry to serve as a sample. No work shall commence until the sample is approved by the Landscape Architect or Owner's Representative. Approved sample shall be maintained in finished condition through the construction process.

INSTALLATION, GENERAL:

Thickness: Build masonry construction to the full thickness shown, except build single-width walls (if any) to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

Break masonry units with stone hammer designed to chip and break field stones with controlled similar irregular edges. Stone units as required to provide pattern shown and to fit adjoining work neatly. Use full units without breaking or chipping wherever possible.

Frozen Materials and Work: Do not use frozen materials or materials mixed or coated with ice or frost. For masonry, which is specified to be wetted, comply with the BIA recommendations. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.

Pattern Bond: Lay exposed masonry in the pattern shown on the details. Do not use units with less than 4" horizontal face dimensions at corners.

If drawings do not clearly indicate the pattern or bond, the contractor shall immediately contact the Landscape Architect for clarification.

Stopping and Resuming Work:

Rack back 1/2 masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.

Wherever contractor determines there is not adequate information to construct an element, bond, or pattern of the design, the contractor shall not proceed with the work until the Landscape Architect is notified.

Batch Control Mortar:

Measure and batch materials by volume such that the required proportions for mortar can be accurately controlled and maintained. Measurement of sand exclusively by shovel will not be permitted.

Mix mortar ingredients for a minimum of 5 minutes in a mechanical batch mixer. Use water clean and free of deleterious materials which would impair the work. Do not use mortar which has begun to set, or if more than 2-1/2 hours has elapsed since initial mixing. Re-temper mortar during 2/1/2-hr. period as required to restore workability.

Mixer shall not be located in proximity of plants or plant beds.

Bedding and Jointing:

Lay stone with partially filled bed, head and collar joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not flush head joints. Rake all joints to minimum 1/2" depth on the face of the stone.

All joints butting against concrete or other masonry installations shall be a silicon flexible joint material or expansion material.

Joints: maintain joint widths shown, except for minor variations required to maintain bond alignment.

Joint Treatment: For concealed work, struck flush.

Exposed joints of all work shall have raked joints to a minimum of ½ inch from the face of the stone.

Any joints falling out shall be replaced by contractor for up to one year after final acceptance.

All flat work and border work shall have concave recessed joints.

REINFORCING BARS:

Install reinforcing bars as specified in cells of concrete masonry units where shown on drawing. Fill cells solid with mortar around reinforcing.

REPAIR, POINTING AND CLEANING:

Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

Pointing: During the tooling of joints, enlarge any voids or holes, except weep-holes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance.

Clean exposed masonry surfaces by the bucket and brush hand cleaning method or by high pressure water method.

Use commercial cleaning agents only with approval of owner and landscape architect and in accordance with suppliers' instructions.

Do not allow chemical cleaning agents to damage adjacent plant materials, contaminate soil in plant beds, or damage surface of other materials.

Workmen shall not track across lawns or plant beds when using chemical cleaning agents.

Slug, dust and debris left from the operation of mixer and masonry saw shall be removed from the site and cleaned from all finished surfaces.

STONE BASES AT SHELTER;

The bases around the posts of the Polygon shelter shall be built in accordance with this spec. The edges shall have a slight taper up to the level when the base is capped. See Details.

The space between the top stones and the wooden post shall be caulked with waterproof Caulk.

FINAL CLEAN UP:

All finished masonry shall be left in cleaned condition free of mortar, stains, slug or other debris.

All adjacent plant beds shall be left clear of mortar, refuse, bricks and other contaminates. Any soil contaminated by masonry work shall be removed and replaced with suitable topsoil. Any plant material damaged by masonry or cleanup work shall be replaced by the contractor.

END OF SECTION 04400

SECTION 05513

PREFABRICATED SHELTER

PART 1 - GENERAL

Shelter Model: Low-Pitched Gable Wood Shelter in a rectangle 20 x 28.
WLG-20X28 as manufactured by Poligon or equal.

Supplier: Contact person is:
Allison Hasley
Hasley Recreation, Inv.
PO Box 480
Flowery Branch, Ga 30542
770 965-4042 off,
706 338-6004 cell

Shop Drawings: Contractor shall collaborate with Polygon to secure a set of approved shop drawings of the shelter stamped by a licensed Georgia Engineer. Shelter shall be installed per the manufacturer's recommendations.

Substitute: Contractor may provide or substitute an as equal structure that conforms to the same size, shape, and structure of the specified Poligon Shelter. Contractor shall submit shop drawings or conform to Poligon plans and specifications.

Stone Bases: The bases of the post shall have granite stone wrapping the base of the wooden post to be built after the posts are erected. See section 04400 Stone Masonry.

PART 2 - PRODUCTS

2.1 SHELTER

- A. Shelter shall be a Poligon standard WLG-20-28 Job number 500-2-19 Which includes the following modifications.
- Kynar multi-rib metal roof with 6-12 pitch.
 - Color to be selected by the owner before ordering.
 - Stained tongue and groove roof/ceiling. Stain color to be selected by the owner before ordering
 - Stained wood columns and trusses. Staining to be selected by owner before ordering.
 - Structural connection plates and hardware to be factory finished black by Poligon.

Shelter shall consist of an eight (8) wooden frame posts supporting four (4) laminated wood truss under a sloped metal roof. Posts may be set in a direct bury embedment under the surface level of concrete pad attached to the pad with anchor bolt connection.

- A. Posts: The wooden frame shall have eight (8) vertical posts extending from the concrete foundation pad to the sloped roof approximately 10' 8" above the slab. The eight (8) posts shall be located at the elevation of the slab, which shall be installed as detailed on the grading and layout plans.
- B. Roof: Roof shall consist of multi ribbed metal members attached to a rectangular frame, 20' x 28' of SYP 2x6 tongue and groove decking. The decking shall be fastened to the four (4) laminated trusts by galvanized roofing screws.

All roofing screws shall be #14 x 1" self-tapping gasket head screws.

- C. Lights: Shelter shall be lighted by 3 vapor tight incandescent fixtures, minimum 150 watts with safety cage, mounted on an 11-gauge x 18" deep x 6'- 6" long plate permanently positioned directly along the center beam of the roof structure at the top of the 2 support posts. Light shall be located so that the roof shields the light's glare from players on the field. Wiring to the light shall be encased in metal conduit. A 120 V waterproof duplex receptacle shall be mounted on the conduit at the base of each post 5' height. Waterproof light switch shall be located on the post at 3' height. Junction box shall be located below grating level.

- D. Approximate dimensions of the slab to be:
1. Concrete Slab: 20' x 28' x 4" thick, reinforced with 8" turndown
 2. Roof Frame: 20' x 28'
 3. Height of outside posts shall set at 8' 0" above the slab at the truss.
 4. Overall height at highest point of roof is 10' 9".

- E. Codes: Construction of shelter shall meet all applicable codes and regulations. All federal, state and local safety standards shall be applied.

- F. Fasteners: All bolts shall be ASTM A325. Do not substitute with a lesser grade.

- F. Finish:
1. All hardware shall be shot dip galvanized.
 2. Color stains shall be selected by the Owner before ordering
 3. All materials and applications to be in accordance with Poligon manufacturer's specifications.
 4. Standard frame shall be primed only. Frame shall be finished in the field.
 5. Stone veneer at the base of each post shall match the granite stone used for the seatwalls and splash pad columns.

G. Electrical: Conduit shall be inside the nearest post and brought up to the underside framing beam and connected to the light fixtures.

H. Stone color and details shall be consistent with the existing stone seat walls on the site.

PART 3 – EXECUTION

3.1 WORKMANSHIP:

For final tightening, use turn of nut method: using a spud wrench, tighten as much as possible with a normal man's strength. Then using an extension, tighten an additional ½ turn.

Rest of frame must be plumb, square, and tightened before installing purlins. Purlins must be parallel to the eave beams and tension members.

3.2 WELDING:

All welds shall be completed in accordance with good practices of the trade.

3.3 CONCRETE PAD:

Shall be constructed in accordance with Section 02523 cast in place concrete.

3.4 ELECTRICAL:

Shall be installed in accordance with Section 16000 Electrical Power and Systems.

3.5 FOOTING:

Do not pour footing or install anchor bolts without job specific anchor and footing design details.:

3.6 STONE BASE:

The stone bases around each pole should be built in accordance with the conditions stated in Section 04400 Stone Masonry.

3.7 WARRANTY:

Poligon Shelter: Contractor shall warranty the shelter to the Client as stated by Poligon and shall hold Poligon responsible as a subcontractor or manufacturer to the General Contractor. As equal, Contractor shall provide copies of all warranties as provided by Poligon to the Contractor.

If Contractor opts to provide a different "as equal" shelter to the Client, he shall provide a warranty equal to the one specified by Poligon.

END OF SECTION 05513

SECTION 06100

ROUGH CARPENTRY

1.1 GENERAL

- A. Submittals: Submit the following:
1. Contractor shall remove a treatment tag from each lumber delivery and provide the Landscape Architect and Owner with a copy of the tag, manifest and delivery date. Include in daily reports and provide at regular on-site project meetings.
 2. Contractor shall provide material certificates for dimension lumber specified to comply with minimum allowable unit stresses.
 3. Wood treatment data, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials.
 4. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence code compliance of engineered wood products, foam-plastic sheathing, air-infiltration barriers, metal framing anchors, power-driven fasteners, and fire-retardant-treated wood.
 5. See Prefabricated Shelter Section 05513 and manufacturers specifications for lumber to be used in construction of the shelter.

1.2 PRODUCTS

- A. Lumber, General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee's (ALSC) Board of Review. Provide dressed lumber, S4S, with each piece factory marked with grade stamp of inspection agency.
1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
 3. Provide lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
- B. Wood-Preservative-Treated Materials: Comply with applicable requirements of AWWA C2 (lumber) and AWWA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
1. Above Ground Lumber: Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

- a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - c. Wood framing members less than 18 inches (460 mm) above grade.
 - d. Wood floor plates installed over concrete slabs directly in contact with earth.
2. Ground Contact Lumber: Pressure treat ground contact wood members or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m) or approved equal.
 3. Water Contact: Lumber or posts in constant contact with fresh or saltwater shall be Marine Grade treatment.
 4. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWWA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
 5. Exterior Type: Use for exterior locations and where indicated.
 6. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
- C. Dimension Lumber: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
1. Non-Load-Bearing Interior Partitions: Provide Standard, Stud, or No. 3 grade and any of the following species:
 - a. Species: Mixed southern pine; SPIB.
 2. Framing Other than Non-Load-Bearing Partitions: Provide Construction or No. 2 grade and any of the following species:
 - a. Species: Southern pine; SPIB.
 3. Exposed Framing: Provide material hand-selected from lumber of species and grade indicated below for uniformity of appearance and freedom from characteristics and would impair finish appearance.
 - a. Species and Grade: Southern pine, Select Structural; SPIB.
- D. Concealed Boards: Provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Species and Grade: Eastern softwoods, No. 3 Common per NELMA rules.
 2. Species and Grade: Northern species, No. 3 Common or Standard per NLGA rules.

3. Species and Grade: Mixed southern pine, No. 2 per SPIB rules.
 4. Species and Grade: Western woods, Standard per WCLIB rules or No. 3 Common per WWPAA rules.
- E. Miscellaneous Lumber: Provide No. 3 or Standard grade lumber of any species for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, and similar members.
- F. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project. Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
1. Laminated-Veneer Lumber: Lumber manufactured by laminating wood veneers in a continuous press using an exterior-type adhesive complying with ASTM D 2559 to produce members with grain of veneers parallel to their lengths and complying with the following requirements
 - a. Extreme Fiber Stress in Bending: 2500 psi (17 MPa) for 12-inch nominal- (286-mm actual-) depth members.
 - b. Modulus of Elasticity: 2,000,000 psi (13 800 MPa).
 2. Parallel-Strand Lumber: Lumber manufactured by laying up wood strands using an exterior-type adhesive complying with ASTM D 2559, and cured under pressure to produce members with grain of strands parallel to their lengths and complying with the following requirements:
 - a. Extreme Fiber Stress in Bending: 2900 psi (20 MPa) for 12-inch nominal- (286-mm actual-) depth members.
 - b. Modulus of Elasticity: 2,000,000 psi (13 800 MPa).
 3. Prefabricated Wood I-Joists: Units manufactured by bonding stress-graded lumber flanges to wood-based structural-use panel webs with exterior-type adhesives complying with ASTM D 2559, to produce I-shaped joists complying with the following requirements:
 - a. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.
- L. Extruded Cellular Polystyrene Sheathing: ASTM C 578, Type IV, in manufacturer's standard lengths and widths with T & G or shiplap long edges as standard with manufacturer.
- M. Polyisocyanurate Foam Sheathing: Rigid, closed-cell foam board; formed by expanding polyisocyanurate resin using hydrochlorofluorocarbons (HCFCs); with

aluminum foil facings laminated to both sides; complying with FS HH-I-1972/1, Class 1 or 2; with a thermal resistance (R-value) for 1-inch (25-mm) thickness of 7.2 ° F x h x sq. ft./Btu at 75 ° F (1.27 K x sq. m/W at 24 ° C); in thicknesses indicated. Foam-plastic core, 4-1/4 inches (108 mm) thick or less, and facings shall have flame spread of 25 or less, when tested individually.

- P. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
1. Power-Driven Fasteners: CABO NER-272.
 2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

1.3 EXECUTION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- B. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

END OF SECTION 06100

SECTION 06200

FINISH CARPENTRY

1.1 GENERAL

- A. Submittals: In addition to Product Data, submit Samples for each finish and type of siding and paneling.
- B. See Section 06100 Rough Carpentry for additional submittal requirements.
- C. See Section 05513 Prefabricated Shelter and manufactures requirements for wood construction on the Poligon shelter.

.2 PRODUCTS

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
- B. Softwood Plywood: Comply with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."
- C. Hardwood Plywood: Comply with HPVA HP-1, "Interim Voluntary Standard for Hardwood and Decorative Plywood."
- D. Preservative Treatment: Comply with NWWDA I.S. 4 for exterior finish carpentry to receive water-repellent preservative treatment or equal.
- E. Fire-Retardant Treatment: Where indicated, use materials impregnated with fire-retardant chemicals per AWPA C20; exterior type or interior Type A as required.
- F. Exterior Standing and Running Trim: Provide finished lumber and moldings complying with the following requirements:
 - 1. Species and Grade: Smooth-textured, Clear All Heart redwood; RIS.
 - 2. Species and Grade: Saw-textured, Clear Heart, western red cedar; NLGA, WCLIB, or WWPA.
 - 3. Species and Grade: Smooth-textured, B & B, southern yellow pine; SPIB.
- G. Primed Hardboard Trim: Provide trim made from high-temperature cured, high-resin, wood fiber composite; factory primed on face and 2 edges; and recommended by manufacturer for exterior use.
- H. Interior Standing and Running Trim: Provide finished lumber and moldings complying with the following requirements:

1. Species and Grade: C Select, eastern white pine; NELMA or B & Btr. Select or Supreme, Idaho white, lodgepole, ponderosa, or sugar pine; WWPA.
- I. Wood Molding Patterns: Provide stock moldings made to patterns included in WMMPA WM 7 and graded under WMMPA WM 4.
 1. Base: WM 623 (ogee base).
 2. Base: WM 713 (ranch base).
 3. Base: WM 753 (beaded-edge base).
 4. Casing: WM 327 (clamshell casing).
 5. Casing: WM 366 (featheredge casing).
 6. Casing: WM 376 (beaded-edge casing).
 8. Moldings for Painted Finish: P-Grade.
- J. Shelving: **3/4-inch (19-mm)** particleboard shelving with radiused and filled front edge.
 1. Surface-Burning Characteristics: Flame spread of 25 or less and smoke developed of 450 or less, per ASTM E 84.
- N. Lumber Siding: Kiln-dried lumber siding complying with DOC PS 20, in size and pattern indicated.
 1. Species and Grade: Clear All Heart redwood; RIS.
 2. Species and Grade: Clear Heart, western red cedar; NLGA, WCLIB, or WWPA.
 3. Species and Grade: B & B, southern pine; SPIB.
- O. Plywood Siding: Exterior-type, APA 303 series siding, **1/2 inch (12.7 mm)** thick, cedar faced, rough sawn, Texture 1-11; grooves **4 inches (101.6 mm)** o.c.
- P. Fasteners for all Exterior Finish Carpentry: Provide ring shank nails of stainless steel, hot-dip galvanized steel or non-corroding aluminum.

1.3 EXECUTION

- A. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours.
- B. Prime and back prime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Division 9 Section "Painting."

- C. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
- D. Standing and Running Trim: Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.
- E. Paneling: Install according to manufacturer's recommendations. Select and arrange units on each wall for best match of adjacent units where grain character or color variations are noticeable. Install with uniform tight joints between units.
- F. Siding: Install siding and flashing according to manufacturer's recommendations. Do not allow nails to penetrate more than one thickness of siding, unless otherwise recommended by siding manufacturer. Seal joints at inside and outside corners and at trim locations.
- G. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

END OF SECTION 06200

SECTION 16010

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Contractor shall install all electrical work covered by the below specifications and approved drawings. Provide all material, labor transportation, tools, supervision, etc., necessary to complete the total electrical job. All items not specifically mentioned herein which are obviously necessary to make a complete working installation shall be provided by the contractor, including any necessary field engineering and/or detail drawings required. Drawings shall be submitted for approval as provided for in 01340-1.4 Shop Drawings.
- B. The work shall consist of, but shall not be limited to, the installation of the following systems:
 - 1. Exterior electrical systems for power, power distribution and incoming electrical service as indicated on the Drawings.
 - 2. Power connections to equipment specified in Specifications and Approved Drawings.
 - 3. Temporary Power as required for the project.

1.2 CODES AND FEES:

- A. All work shall be done in accordance with the requirements of the National Electrical Code, NFPA #70, 2017 Edition, all local and state codes and the regulations of utility company providing service.
- B. The contractor shall obtain and pay for all permits and inspections required by the building and safety codes and ordinances and the rules and regulations of any legal body having jurisdiction.
- C. All electrical items covered by this specification shall be U.L. labeled and listed for the purpose.

1.3 DRAWINGS:

- A. The drawings indicate the general arrangement of electrical equipment.

- B. Do not scale drawings. Dimensions for layout of equipment shall be obtained from the electrical drawings.
- C. Discrepancies shown on different drawings, between Drawings and Specifications or between documents and field conditions shall be promptly brought to the attention of the Engineer.

1.4 SHOP DRAWINGS:

- A. The contractor shall submit for review by the Engineer, eight sets of complete schedules and data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive materials, such as catalog sheets, product data sheets, diagrams, performance curves, and charts published by the manufacturer, to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. Data submitted for review shall contain all information required to indicate compliance with equipment specified. Complete electrical characteristics shall be provided for all equipment. Submittals for lighting fixtures shall include photometric data. The Engineer reserves the right to require sample of any equipment to be submitted for approval.
- B. Each individual submittal item for materials and equipment shall be marked to show specification section and paragraph number which pertains to the item.
- C. Prior to submitting shop drawings, the contractor shall review the submittal for compliance with the contract documents and place a stamp or other confirmation thereon which states that the submittal complies with contract requirements. Submittals without such verification will be returned without review.
- D. Eight complete sets of Submittals shall be made for each of the following items:
 - Panelboard and Circuit Breakers
 - Inground Junction Boxes
 - Wiring Devices

1.5 RECORD DRAWINGS:

- A. At the time of final inspection, provide three (3) sets of complete data on electrical equipment used in the project and Reproducible As-Built drawings reflecting all field changes. This data shall be in bound form and shall include the following items:
 - 1. Test results required by these specifications.
 - 2. Panelboard shop drawings and copies of the final circuit directories reflecting all field changes.

3. Data sheets indicating electrical characteristics of all devices and equipment.
4. All conduits that are buried less than 36” below grade shall be identified on the As-Built Drawings. Indicate the entire length of the conduit run that is less than 36” below grade on the “As-Built Drawings”.
5. All "As-Built" Drawings shall have the Contractor's name, address, telephone number, date and indication that the drawings are "As-Built".

1.6 UTILITY SERVICE:

- A. Electrical power service shall be as indicated on the drawings. Contractor shall coordinate with the local Utility Company for the new electrical service requirements and date needed for power to the project.

1.7 SITE INVESTIGATION:

- A. Prior to submitting bids of the project, the contractor shall visit the site of the work to become aware of **ALL EXISTING** conditions which may affect the cost of the project.

1.8 EQUIPMENT CONNECTIONS:

- A. All equipment requiring electrical connections shall be connected under this section of these specifications. Where electrical connections to equipment require specific locations, such location shall be obtained from shop drawings.

1.9 COOPERATION:

- A. The contractor shall coordinate his electrical activities with other trades so as to avoid delays, interference's, and any unnecessary work.

1.10 GUARANTEE:

- A. For guarantee of work under Division 26, refer to the general and special conditions.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Materials or equipment specified by manufacturer's name shall be used.

- B. All material shall be new and shall conform to the applicable standard or standards where such have been established for the particular material in question. Publications and standards of the organization listed below are applicable to materials specified herein.
1. American Society for Testing and Materials (ASTM).
 2. Underwriters' Lab (UL).
 3. National Electrical Manufacturer Association (NEMA).
 4. Insulated Cable Engineers Association (ICEA).
 5. Institute of Electrical and Electronic Engineers (IEEE).
 6. Edison Electric Institute (EEI).
 7. National Fire Protection Association (NFPA).
 8. American Wood Preservers Association (AWPA).
 9. American National Standards Institute (ANSI).
- C. Material of the same type shall be the product of a single manufacturer.

PART 3 - EXECUTION

3.1 WORKMANSHIP:

- A. All work shall be neatly, orderly, and securely installed with conduits, panels, boxes, switches, etc., perpendicular and/or parallel with the principle structural members. Exposed raceways shall be offset where they enter surface mounted equipment. Wiring installed in panels and other enclosures shall be looped and laced and not wadded or bundled.

3.2 TESTS:

- A. At final inspection, a test will be made, and the entire system shall be shown to be in proper working order as per these specifications and the approved drawings.
- B. Contractor shall provide all instruments, labor and materials for any essential intermediate and final testing.
- C. Equipment covers (i.e., panelboard trims, motor controls, device plates, and

junction box covers) shall be removed, as directed, for inspection of internal wiring. All circuits throughout project shall be energized and shall be tested for operation and equipment connections in compliance with contract requirements.

D. Perform the following test after the installation but prior to energizing equipment:

1. Megger test all feeders and branch circuits 50 Amps or greater. Allowances for leakages shall be within the manufacturers recommend tolerances. Testing methods shall be per the cable manufacturer's recommendations. Certified test results and the manufacturers data/recommendations shall be provided to the Owners Representative as indicated below.
2. The Contractor shall perform any other test which may be required by any legal authority having jurisdiction to verify this installation meets that requirement or requirements.

3.3 IDENTIFICATION:

- A. Contractor shall identify each device such as circuit breakers, panelboards, contactor, timeclock, controllers, etc. with Black on White Phenolic Tags using machine cut letters, 1/4" minimum height, unless otherwise noted. Permanently attach to each device as required. For all panelboards, switchboards, transformers, fusible disconnecting motor starters, fusible disconnect switches and remote ballast enclosures include name, voltage, phase, number of wires, ampacity rating, short circuit rating and name/location of feed to the device.
- B. Contractor shall provide and install a Black on White Phenolic Tag using machine cut letters, 3/8" minimum height, unless otherwise noted. Permanently attach to Panelboard A as required. This tag will indicate the maximum available fault current at Panelboard A and the date calculated as required by NEC Paragraph 110.24 (A).

3.4 CLEANING AND PAINTING:

- A. Oil, dirt, grease, and other foreign materials shall be removed from all raceways, fittings, boxes, panelboard trims, and cabinets to provide a clean surface for painting. Scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, switchboard, or other equipment enclosures shall be touched up with paint furnished by the equipment manufacturers specifically for that purpose. Painting in general is specified under other sections of the specifications.

3.5 EXCAVATION, TRENCHING AND BACKFILLING:

- A. All conduits shall be buried a minimum of 36" below finished grade. Provide

and install magnetic warning tape 12" below finished grade over the entire length of all buried conduits.

- B. The contractor shall perform all excavation to install the electrical work herein specified. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the contractor. Grading shall be done to prevent surface water from flowing into trenches and other excavation and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. No tunneling shall be done. Any area disturbed during excavation shall be repaired back to its original condition, i.e.: paving, concrete, grassing, sod, gravel, sidewalks, etc.
- C. The bottom of the trenches shall be graded to provide uniform bearing and support for conduits, cables, or duct bank on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth, tamped. Remove unstable soil that is not capable of supporting equipment or installation and replace with specified material for a minimum of 12" below invert of equipment or installation.
- D. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and rammed until the installation has a cover of not less than the adjacent ground but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to 95% of the maximum density as determined by the Standard Proctor Test. Settling the backfill with water will not be permitted. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore the surface to the grade and compaction indicated, mounded over and smoothed off.
- E. Contractor shall repair all surfaces disturbed by the installation of all underground conduit systems back to their original condition with the same type of material and construction and/or up-grade as approved by the Owners Representative and Engineer. Any paved area or hard surface disturbed (asphalt or concrete paving) shall be saw cut to have clean and straight edges for the required trenching and repaired back to its original condition as indicated above.
- F. The Contractor shall provide **ALL REQUIRED** erosion control for this project as required by the County / City / State Officials.

3.6 DIRECT BORING:

- A. The contractor shall direct bore conduit runs in this project where indicated on the Drawings or as an alternate to trenching, at the Contractor's option.

Minimum depth of all conduits shall be 36" below finished grade. All excavated materials shall be removed and disposed of by the contractor. Any area disturbed during boring shall be repaired back to its original condition, i.e.: paving, grassing, sod, gravel, etc.

- B. Contractor shall repair all surfaces disturbed by the installation of all underground conduit systems back to their original condition with the same type of material and construction and/or up-grade as approved by the Architect and Owner. No holes or trenches shall be left open after the end of each workday. See Paragraph 3.5 - F above for instructions and procedures.
- C. All direct bore conduits shall be accurately located on the Contractor's "As-Built" Documents that are to be provided to the Owner at the completion of the project.
- D. The Contractor shall provide **ALL REQUIRED** erosion control for this project as required by the County / City / State Officials.

END OF SECTION 16010

SECTION 16100

BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.1 GENERAL:

- A. Provide complete conduit system including boxes, fittings and supports. All empty conduits shall be left with fiber polyline pull cord

1.2 RACEWAYS:

- A. Contractor shall install all conduits as per the below requirements.
 - 1. Intermediate Metal Conduit (IMC) shall be ferrous galvanized conduit and shall comply with Article 342 of the National Electrical Code.
 - 2. Rigid steel conduit shall be ferrous galvanized conduit and shall comply with Article 344 of the National Electrical Code.
 - 3. Rigid nonmetallic conduit shall be polyvinyl chloride Schedule 40 (PVC) and comply with Article 352 of the National Electrical Code. No exposed PVC Conduit will be accepted, transition from PVC to metal at the last 90-degree bend and up to above grade.

PART 2 – PRODUCTS

2.1 CONDUCTORS:

- A. All conductors shall be copper and have 600 Volt type THHN/THWN insulation except where noted on drawings. Conductors installed where fixtures are used as raceway shall be 90°C Type THHN or XHHN.
- B. All branch circuits shall be a minimum of #12 AWG solid or stranded copper except for motor leads, which shall be a minimum #12 AWG, stranded copper, unless otherwise noted on drawings.
- C. All branch circuit and feeder conductors, No. 6 AWG and smaller shall be color coded as follows: 208Y/120 Volt, three phase system, Phase A--Black, Phase B--Red, Phase C--Blue, Neutral--White, Ground--Green.
120/240 Volt, single phase system, Phase A--Black, Phase B--Red, Neutral--White, Ground--Green.

2.2 INGROUND JUNCTION BOXES:

- A. All inground junction boxes shall be as noted on the Drawings.

2.3 OUTLET BOXES:

- A. Outlet boxes shall be provided for each device. Boxes shall not be smaller than specifically indicated herein and shall be larger if required by Article 314 of the National Electrical Code for the number and size of conductors installed.

2.4 RECEPTACLES:

- A. Receptacles shall be of the type and size indicated on the drawings. Equal quality devices manufactured by Bryant, Hubbell or P & S may be used.
 - 1. GFCI duplex outlets shall be 20-amp 125-volt A.C. 3 wire Specification grade straight blade with gray face and green identification dot unless otherwise noted on drawings.
- B. All devices shall be provided with a weatherproof in-use extra duty metal cover plate.

PART 3 – EXECUTION

3.1 RACEWAYS:

- A. Rigid or IMC conduit shall be attached to sheet metal enclosures with two bonding type lock nuts and insulated bushing. All connectors shall be of the insulated throat type. Rigid conduit stub ups not attached to enclosure shall be terminated with steel insulated throat, grounding type bushing. All connectors and couplings shall be approved for the purpose.
- B. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until all masonry work is complete.
- C. All conduits entering buildings from below grade shall be sealed with fiber and insulating electrical putty to prevent entrance of moisture.

3.2 CONDUCTORS:

- A. All feeder and branch circuit conductors No. 4 AWG and larger shall be phase identified in each accessible enclosure by 1" wide plastic tape attached to conductors in a readily visible location. Tape colors shall match color requirements specified herein.
- B. All branch circuit conductors shall be connected as indicated on the drawings. Common neutrals and ground wires may be pulled in conduits where only opposite phase conductors are run. All conduits shall have a ground wire pulled

and shall comply with Article 250 of the National Electrical Code.

- C. Conductors within enclosures, i.e., panels, terminal cabinets, control cabinets shall be grouped and laced with nylon tie straps. Conductors within pull boxes shall be grouped and identified with nylon tie straps with circuit identification tag.
- D. Splices in conductors shall be made only within junction boxes, wiring troughs and other enclosures as permitted by the National Electrical Code, 2017 Edition. All splices and terminations shall be made with watertight connectors as per the Documents.
- E. Phase rotation established at service equipment shall be maintained throughout entire project.
- F. Pull wires shall be 500# minimum test continuous fiber polyline.

END OF SECTION 16100

SECTION 16400

ELECTRICAL SERVICE AND DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL:

- A. Provide and install all electrical distribution equipment as specified, scheduled or indicated on the approved drawing and these specifications.

PART 2 - PRODUCTS

2.1 PANELBOARDS:

- A. Shall be bolt-in circuit breaker type with a rated main breaker or rated main lugs only as noted on drawings. All shall have UL approved interrupting capacity of equal to or greater than the Fault Currents indicated on the Power Riser Diagram. All multiple breakers shall be common trip type only. GFCI (Ground Fault Circuit Interrupter) breakers shall be provided where specifically indicated. All panels shall be fully rated. All circuit breakers shall have 75 degree C rated lugs.
- B. End and side gutter shall have minimum clearance as required by the NEC. Depth shall be 5 3/4" minimum.
- C. Approved manufacturers are: Square D, GE/ABB, Siemens, Eaton or prior approved equal.
- D. Circuit breakers shall be numbered and connected to panel bus in the following sequence: Circuit 1, Phase A; Circuit 3, Phase B; Circuit 5, Phase C. Where bus diagrams are indicated on the drawings, breakers shall be positioned in panel to conform to diagrams; otherwise, single pole breakers shall occupy top positions in panel with blank spaces in lower positions and two and three pole breakers in between.
- E. Main lugs of panels or main circuit breaker shall be UL listed for copper or aluminum conductors. Lugs shall be of the proper range for feeder conductors indicated on the drawings. Each circuit protective device shall be identified with numeral designation, cross referenced with typewritten circuit directory on interior of panel door. All panel directories shall include the load served by the individual circuit. A copy of each panel directory, reflecting all field changes shall be included in the bound data to be provided by the contractor at the time of final inspection.
- F. Conductors within panels shall be grouped and laced with nylon tie straps. Splicing of conductors within panels is not acceptable. Only one conductor shall be installed under terminal of individual circuit breaker.

- G. All panels throughout project shall be keyed alike.
- H. Circuit breakers shall be provided with trip rating class and poles as indicated on the drawings. Class indicated is designation according to Federal Specification W-C-375C/GEN-2000 and indicates the frame size and interrupting rating required. Operation of multiple breakers shall be by single handle; tie handles are not acceptable.
- I. Circuit breakers used for the control of discharge or fluorescent lighting shall be designated for the purpose and bear the marking "HID" or "SWD".
- J. All panelboard shall be marked with Arc Flash Warning Labels as required by Article 110.16 of the NEC.

PART 3 - EXECUTION

3.1 MANUFACTURERS' RECOMMENDATIONS:

- A. The contractor shall install all electrical distribution equipment in accordance with the manufacturer's recommendations and these specifications.

END OF SECTION 16400

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.1 GROUNDING:

- A. Shall comply with Article 250 of the National Electrical Code and all state and local codes and the requirements of the utility company serving the site.
- B. Grounding shall be provided as per these specifications and the approved drawings.
- C. The electrical system shall be a grounded wye supplemented with equipment grounding systems. All non-current carrying parts of the electrical system i.e., raceways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, shall be grounded to provide a low impedance path for potential ground faults.
- D. The neutral conductor of the 209Y/120 Volt, Three Phase, 4 Wire system shall be grounded to the ground system as indicated on the drawings. Grounding conductor shall be copper sized in accordance with Table 250.66 of the National Electrical Code and as indicated on the drawings. Conductor shall be installed in PVC Conduit to the ground point connection.

PART 2 - PRODUCTS

2.1 PRODUCTS:

- A. Ground rods shall be 3/4" copperweld sectional rods 10'-0" in length. Top of the ground rod shall be twelve (12) inches below finished grade. Connection to the ground rod shall be made by chemical weld process. Resistance to ground shall not exceed twenty-five (25) ohms.

PART 3 - EXECUTION

3.1 GROUND TEST:

- A. Upon completion of the ground rod installation the contractor shall test the system by the "fall of potential" measuring method using a ground resistance test meter and two auxiliary electrodes driven into the earth, interconnected through the meter with the ground rod installation being tested. Placement of the auxiliary electrodes shall be in accordance with operating instructions of the test meter, but in no case, shall be placed within the effective resistance area of the

system being tested. The effective resistance area shall be considered twice the ground rod length of the ground rod(s) driven. The test shall not be taken within forty-eight (48) hours of rainfall and shall include the data tested and the lowest reading recorded. Test results shall be forwarded, in writing, immediately to the engineer.

3.2 GROUNDING:

- A. Each panelboard shall be provided with a copper or aluminum equipment grounding bar brazed or riveted to the associated enclosures or cabinet and an insulated neutral bar. The related feeder and branch circuit grounding conductors shall be brazed to the grounding bar or connected with pressure connector.
- B. A grounding conductor shall be installed in all power and lighting conduit installations. All circuit grounding conductors shall be sized as per Table 250.122 of the National Electrical Code.

END OF SECTION 16450

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 02060 "Demolition" for disposition of waste resulting from partial demolition of structures, and site improvements, and for disposition of hazardous waste.
 - 2. Section 02100 "Site Preparation" for disposition of waste resulting from site clearing and removal of above and below grade improvements.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including but not limited to the following:
 - 1. Demolition Waste:
 - a. Metal roof.
 - b. Concrete paving.
 - c. Concrete reinforcing steel..
 - d. Concrete masonry units.
 - e. Chain link fence.
 - f. Wood joists.

- g. Rough hardware.
- h. Supports and hangers.
- i. Valves.
- j. Sprinklers.
- k. Electrical conduit.
- l. Copper wiring.
- m. Lighting fixtures.
- n. Lamps.
- o. Ballasts.
- p. Electrical devices.
- q. Switchgear and panelboards.
- r. Transformers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Metals.
- e. Piping.
- f. Electrical conduit.
- g. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.4 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:

- 1. Material category.
- 2. Generation point of waste.
- 3. Total quantity of waste in tons.
- 4. Quantity of waste salvaged, both estimated and actual in tons.
- 5. Quantity of waste recycled, both estimated and actual in tons.
- 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
- 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings in hauling and tipping fees by donating materials.
 7. Savings in hauling and tipping fees that are avoided.
 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches or more.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.

- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 4-inch size.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

- H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- J. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- K. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- L. Carpet Tile: Remove debris, trash, and adhesive.
 - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- N. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- D. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

*Ashford
Splash Pad
2019-3820*



WATER SPLASH

102 West service Rd,
Suite 412
Champlain, NY 12919

2200 46th Avenue
Lachine Quebec H8T 2P3



Water Splash, Inc.
is an innovative water playground
equipment manufacturer founded in 2003 by a
team of engineers who put their skills at the heart of their
enterprise, with an emphasis on continuous product improvement
through research and development. Our team has a total of 15 years
experience in the design and manufacture of splash park equipment.
We provide products for splash pads, spray parks/spray grounds and
swimming pools. We have a strong engineering and customer care
group that will provide the technical support you need at every stage of
your project. Our durable and reliable products come with timely and
personalized customer service, and they're factory-assembled and -tested
to reduce your installation costs.

Backed by some of the strongest product warranties in the industry and
an unparalleled safety record, Water Splash is rapidly becoming the
benchmark for top-quality splash pad products.



PROJECT SCOPE

Water Splash offers its expertise in splash park design, manufacturing and installation for your project. Our approach is to work with customer directly and get customer's input for each stage of the project. Therefore, within the first week of project approval, we schedule an online meeting with customer's representatives and our project manager. The goal of this meeting is:

- *Identify if there is any changes on proposed splash park layout,
- *Finalize product list and colors for splash park, List each departments and contacts for
- *Construction Permit / If Required *Plumbing /Water Permit –Approval / If Required
- *Electrical connection details / Permit if needed

Our design includes products below:

- 1 x Above ground spray element
- 16 x In ground spray elements
- 2 x Drain boxes
- Water recirculation system
- Water wise controller
- WDS manifold -
- Water storage tank
- Vault

Second stage is our production stage which is around 6-7 weeks. Between production completion and construction start, we will setup an onsite meeting with customer's representative to review final construction plans along with permit application status.

After production is completed, our project manager will be onsite to receive all parts and start excavation, setting up anchor bases, placing and leveling products, grounding each product to mechanical room, plumbing each product to manifold lines, backfilling and surface concrete pouring. We will have pressure testing of plumbing connections before concrete is poured in order to make sure pipes withstand working pressure of Splash Park.

Last item is to commission Splash Park to owner by training customer's representative for daily day usage, and maintenance procedures.

Wishing to be a solution partner for your project.

KEY

PERSONNEL

Thank you in advance for the opportunity to provide your community with an Innovative Water Park Design. We have put together a team of some of the strongest, most experienced and reputable companies in the Water Park Industry. The key personnel is as listed below:

WATER PLAY FEATURE MANUFACTURER/DESIGNER/ENGINEER/PROJECT MANAGER- Gokhan CELIK, CEO & Engineer

founded Water Splash with the sole aim of bringing cutting-edge innovation, while utilizing the highest possible safety standards to the industry, the company has rapidly expanded and has set new standards in virtually every area of the industry. Over 15 years of experience in splash park industry.

AQUATIC ENGINEER- Ali Zeddou, has an extensive portfolio in all aspects of Aquatic Designs and Engineering. He focuses on achieving the goals of every client's dream. Ali has aggressively pursued and completed engineering opportunities throughout the country. With each client, he has dedicated himself delivering the highest level of service while meeting and surpassing their expectations..

CONSTRUCTIONMANAGER/- Milan Petrov has vast expertise in the implementation and construction of major splash park projects in USA and Canada. He has vast knowledge on construction management. Locating in our Lachine, Quebec.

Our project team has decades of experience in designing, manufacturing, and building spray parks and aquatic facilities, moreover we will continue to design and construct with a Safety First emphasis for this project. Information on our teams experience with Safety and management is included in the appendix. A preliminary safety plan can be submitted upon request.

Should you have any questions, please contact me directly.

We look forward to working with you,

Gokhan Celik President,
Water Splash,
(800) 936-3430
gcelik@watersplashnet.com

WATER

SPLASH

To: Splash Park Evaluation Committee,

Thank you for the opportunity given to submit Water Splash, Inc.'s unique splash park layout proposal for your community. Water Splash has over 15 years of experience in designing, building and installing splash parks throughout the US, Canada, Europe and many other countries.

We create your unique splash park design by considering: safety, play value, budget and aesthetics.

Our products are made of durable stainless steel material, which meet or exceed all requirements.

ASTM F-1487, ASTM F2461 (USA)

CSA Z-614-07 (CANADA)

EN 1176 (EU)



AS685 (AU)

Electrical Components

European Union directives and standards

We look forward to discussing our proposal with you, ensuring all the special requirements within your community are met beyond satisfaction.

We appreciate your consideration and will always go that extra mile to earn your business.

Kind Regards,

Gokhan Celik

Water Splash

gcelik@watersplashnet.com

(800) 936-3430



Water Splash products are designed and manufactured to meet two basic criteria; fun and safety. Only the finest materials are used in the construction process, to ensure that maximum safeguards are incorporated into every design. To this end, all manufacturing and tooling takes place in-house, and all products conform to or exceed ASTM F1487, ASTM F2461, SS 457 and CSA Z614-07 standards. Our in-house engineering and manufacturing expertise also provide our customers with another advantage: complete customization, to suit any and all of their needs.





- **All metal products are made of 304/304L stainless steel material.**
- **Nozzles, water openings and sprayers are made of C360 brass material.**
- **Water Splash provides special tamper-resistant tools. All products are offered with winter caps.**
- **The painted finish of all equipment is a high-quality, UV-resistant powder coating of oven-cured glossy polyester, with stabilizers and chlorinated water resistance.**
- **Spray nozzles are recessed, welding marks are invisible (buffed and polished) and equipment is pressure tested for leakage.**
- **Products comply with the ADA (Americans with Disabilities Act) and CDA (Canadians with Disabilities Act).**



DESIGN CONCEPT



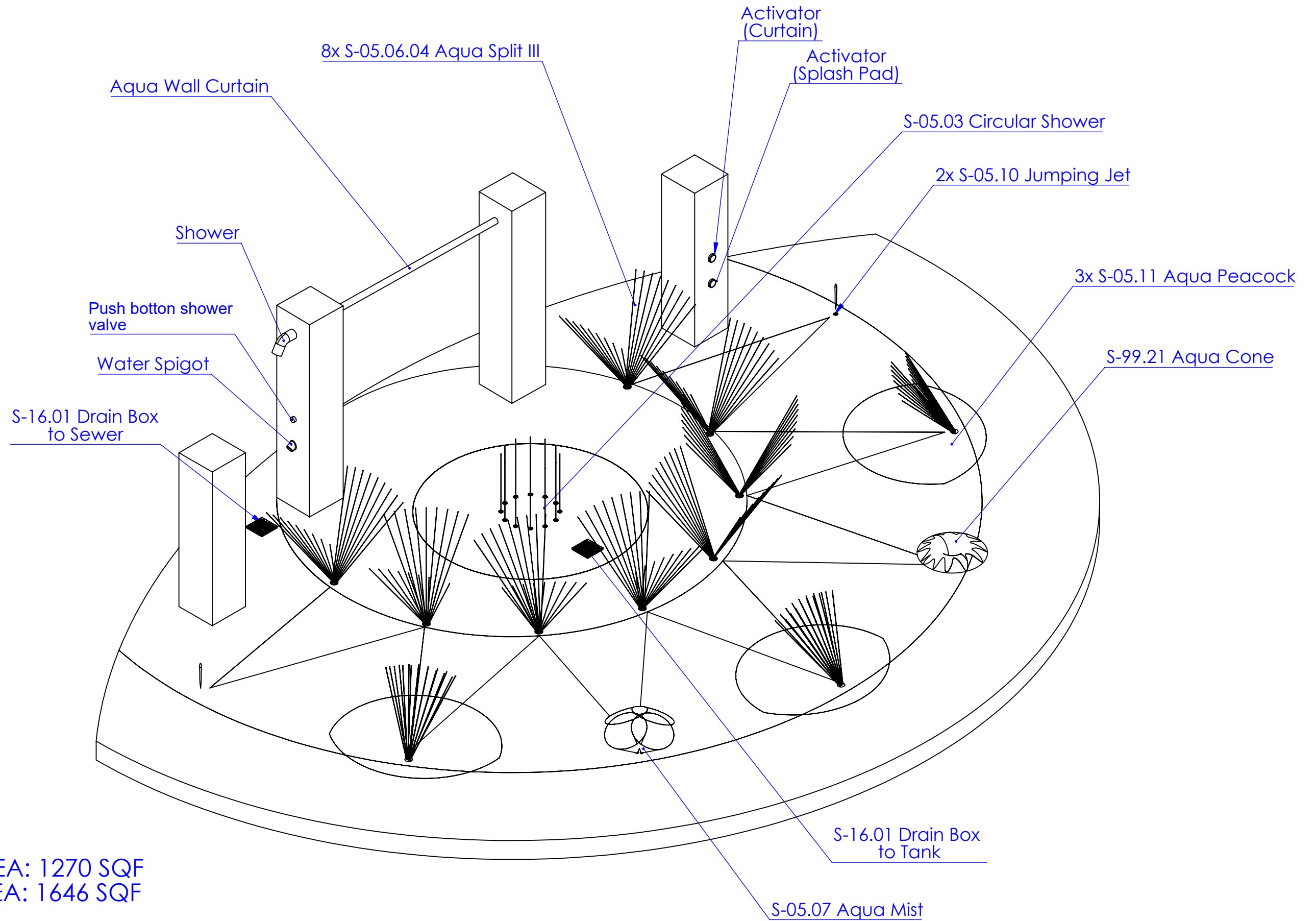


Ashford Splash Pad - Brookhaven





Ashford Splash Pad - Brookhaven



Drawn By
G.YAYMAN

DESCRIPTION:
2019-3820 Ashford Splash Pad

Rev

DATE
17.06.2019

SCALE
1:50

Edited By

DRAWING NO:

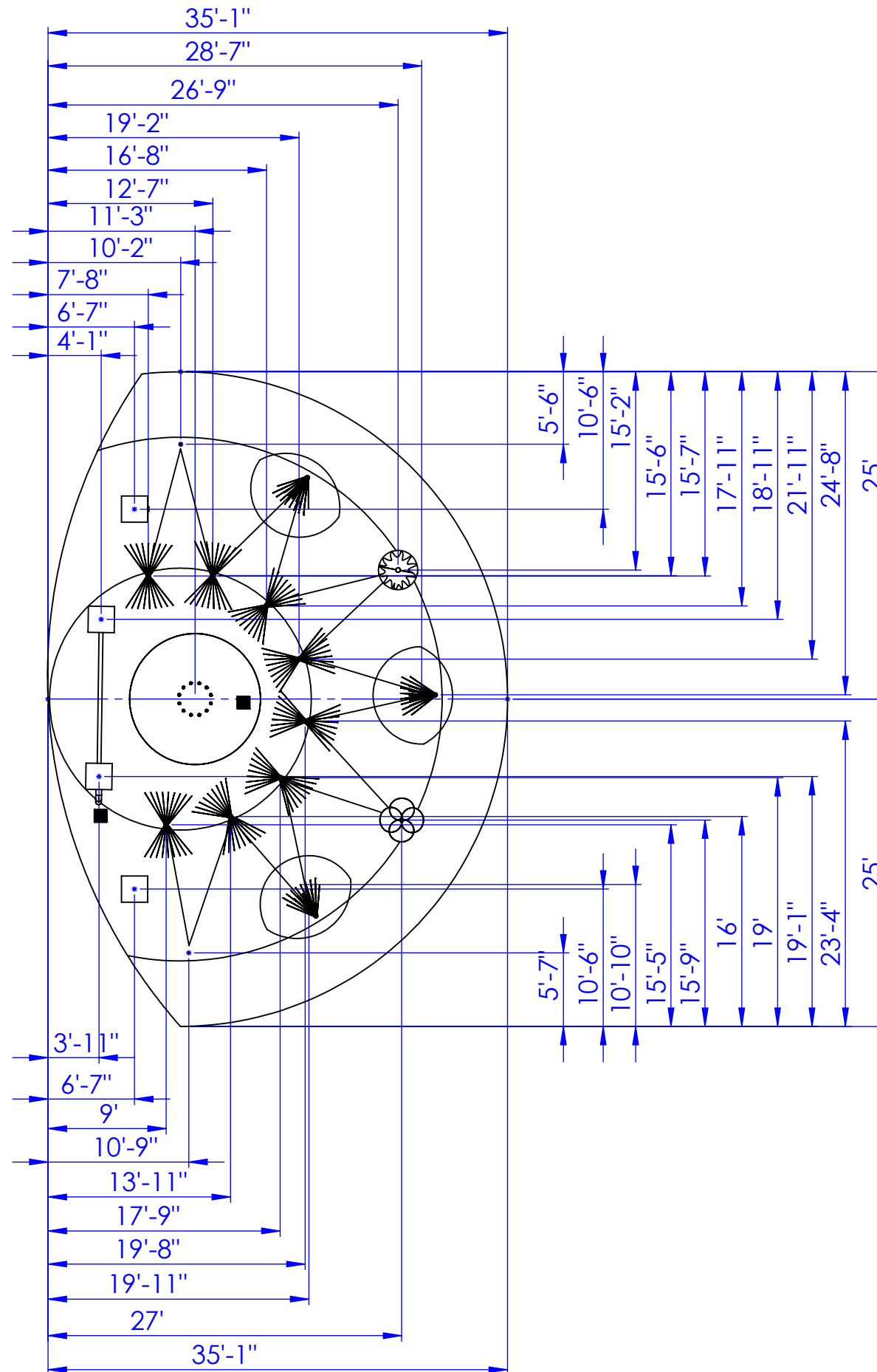
UNITE
FT-INCH

SHEET
1/3



WATER SPLASH

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G.YAYMAN

DESCRIPTION:
2019-3820 Ashford Splash Pad

Rev

DATE

17.06.2019

SCALE

1:130

Edited By

DRAWING NO:

UNITE

FT-INCH

SHEET

2/3



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PIPING CONNECTIONS

LINE NO	PRODUCT NO	LINE SIZE	GPM
1	2X Jumping Jet	3/4"	4x2=8
2	3X Aqua Split III	1 1/2"	15x3=45
3	2X Aqua Split III	1 1/2"	15x2=30
4	Aqua Cone	1 1/2"	6
5	3X Aqua Peacock	1 1/2"	15x3=45
6	Aqua Mist	1 1/2"	9
7	Circular Shower	1 1/2"	12
8	3X Aqua Split III	1 1/2"	15x3=45
9	Aqua Wall Curtain	1 1/2"	52
10	Shower and Water Spigot	1 1/2"	20

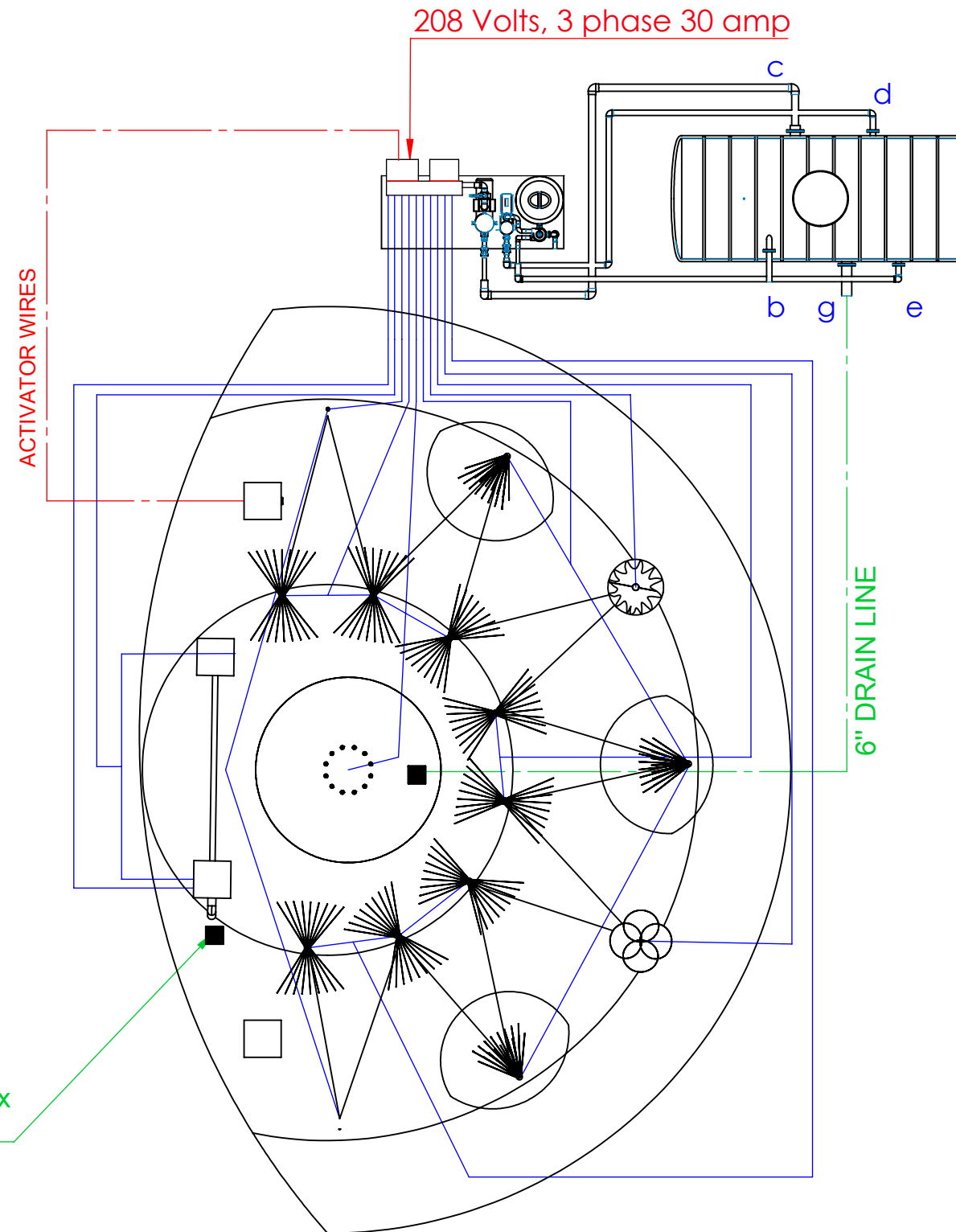
TOTAL GPM : 272

Water Connections:

- a: 1" fresh water line (pressure regulator and backflow required)
- b: 3" tank overflow line
- c: 4" line to features pump suction (Check valve required inside the tank)
- d: 3" line to recirculation pump suction (Check valve required inside the tank)
- e: 3" line return to tank from filter
- f: 3" waste water line form filter blackwash (use backflow presenter or proper air gap)
- g: 6" line from drain boxes to tank (with rain 2% slope)

S-16.01 Drain Box to Sewer

PIPING LAYOUT



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G.YAYMAN

DESCRIPTION:
2019-3820 Ashford Splash Pad

Rev DATE
17.06.2019

SCALE
1:100

Edited By

DRAWING NO:

UNITE
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3/3



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TECHNICAL PRODUCT SPECIFICATION



WATER SPLASH



S-05.03 CIRCULAR SHOWER

WATER SPLASH

STRUCTURE

The structure is constructed with 304L/316 grade stainless steel tubing without any pinch point and sharp edges. Tubing is to include stainless steel housing for spray nozzles.

SPRAY DESIGN

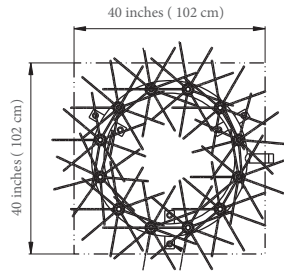
Nozzles are CNC machined from non-corrosive brass material and are recessed to eliminate any possible pinch points.

HARDWARE

Assembly process to use non corrosive stainless hardware exclusively to avoid corrosion related problems.

ANCHORING SYSTEM

Water Splash shall supply easy installation templates and anchor bolts/hardware set. Please see attached technical diagrams for more details.



Spray zone : 120 inches(305 cm)

Specifications Material: Stainless Steel

Water Pressure : 4-8 psi /0,4 bar Water

Consumption: 10-12 gpm/37-45 lpm



WATER SPLASH



S-99.21 AQUA CONE

WATER SPLASH

STRUCTURE

The structure is constructed with 304L/316 grade stainless steel tubing without any pinch point and sharp edges. Tubing is to include stainless steel housing for spray nozzles.

NOZZLES

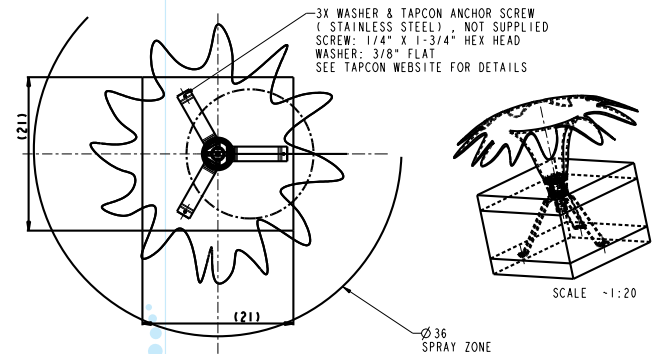
All nozzles are CNC machined from high quality brass and sit recessed in the stainless steel housings to avoid any pinch points.

HARDWARE

Assembly process to use non corrosive stainless hardware exclusively to avoid corrosion related problems.

COATING / GRAPHIC DESIGN

NA



Water consumption: 6-10 gpm /23-37 lpm

Water pressure: 4-8 psi / 0.5 bar



WATER SPLASH



S-05.11 AQUA PEACOCK

WATER SPLASH

STRUCTURE

The structure is constructed with 304L/316 grade stainless steel tubing without any pinch point and sharp edges. Tubing is to include stainless steel housing for spray nozzles.

NOZZLES

All nozzles are CNC machined from high quality brass and sit recessed in the stainless steel housings to avoid any pinch points.

HARDWARE

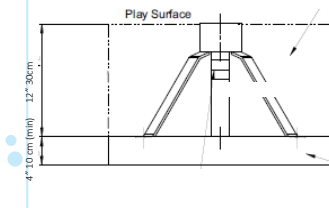
Assembly process to use non corrosive stainless hardware exclusively to avoid corrosion related problems.

COATING / GRAPHIC DESIGN

NA

ANCHORING SYSTEM

Water Splash shall supply easy installation templates and anchor bolts/hardware set. Please see attached technical diagrams for more details.



Water consumption: 15-48 gpm /40-180 lpm
Water pressure: 4-8 psi / 0.5 bar

WATER SPLASH



S-05.10 JUMPING JET

WATER SPLASH

STRUCTURE

The structure is constructed with 304L/316 grade stainless steel tubing without any pinch point and sharp edges. Tubing is to include stainless steel housing for spray nozzles.

NOZZLES

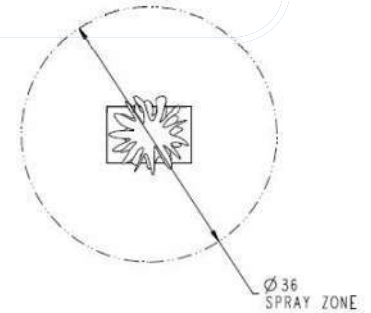
All nozzles are CNC machined from high quality brass and sit recessed in the stainless steel housings to avoid any pinch points.

HARDWARE

Assembly process to use non corrosive stainless hardware exclusively to avoid corrosion related problems.

COATING / GRAPHIC DESIGN

NA



Water consumption: 5-7 gpm
Water pressure: 4-8 psi / 0.5 bar



S-16.01 Drain Box

STRUCTURE

The outer casing is constructed with non corrosive, commercial durable fiberglass

TOUCH PAD

NA

HARDWARE

Assembly process to use non corrosive stainless steel hardware exclusively to avoid corrosion related problems.

COATING / GRAPHIC DESIGN

The structure is to be supplied finished with weather resistant, UV protective fiberglass coating.

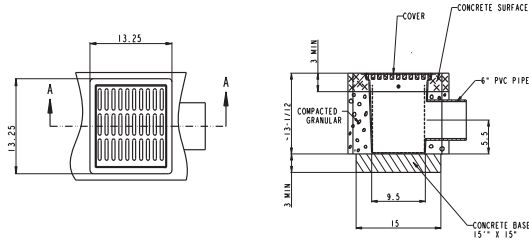
ANCHORING SYSTEM

Secured to base concrete using stainless steel screw set.

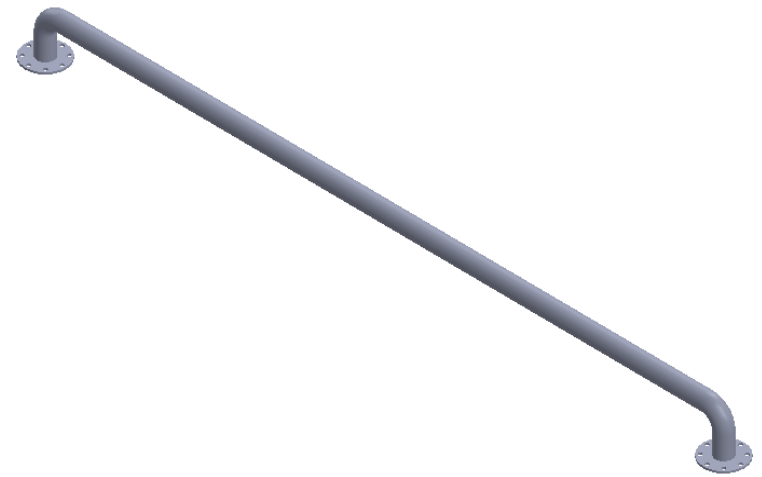
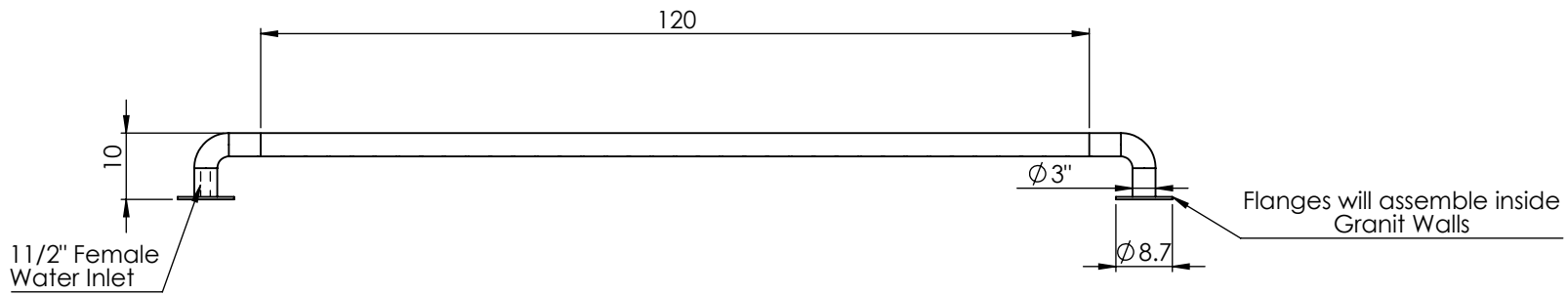
MECHANISM

NA COATING COLOR

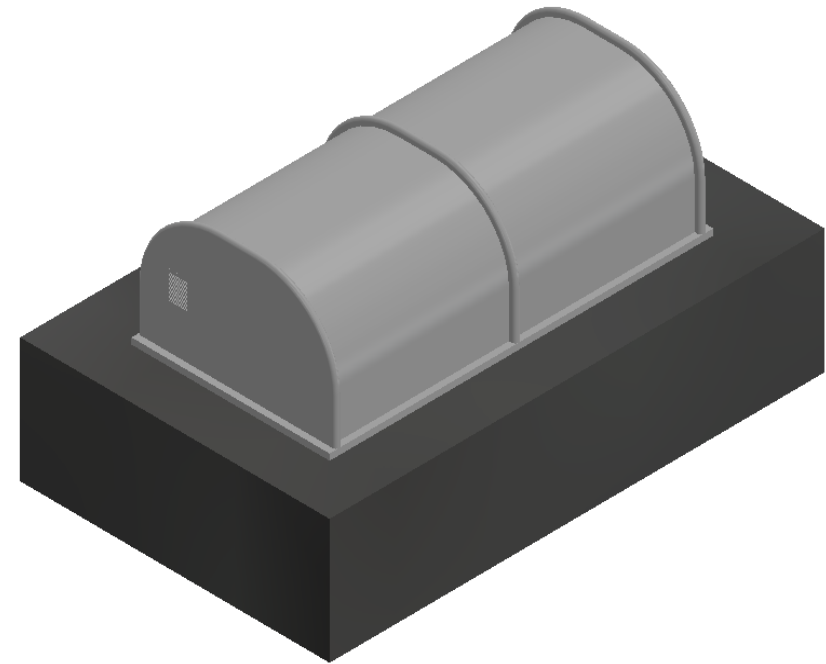
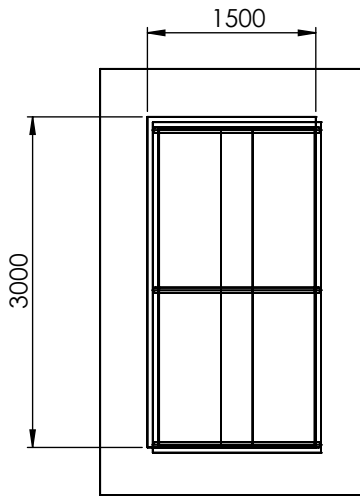
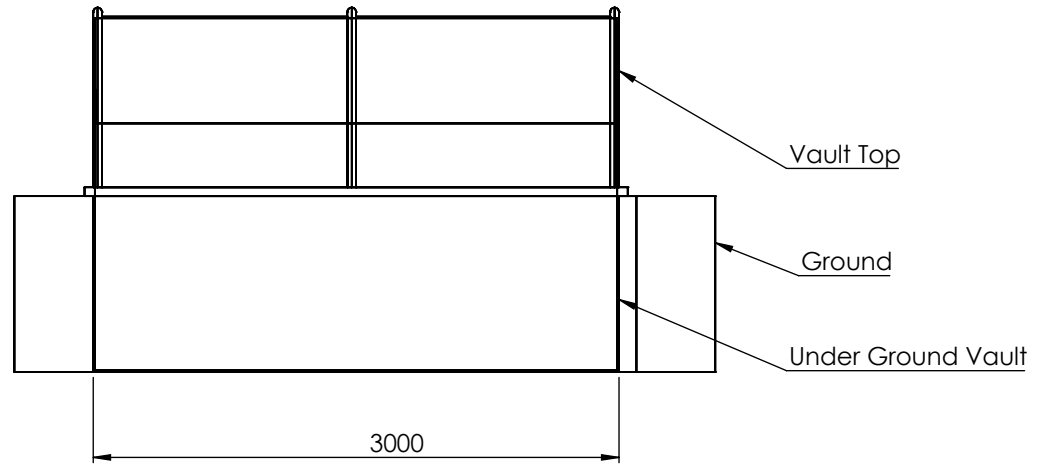
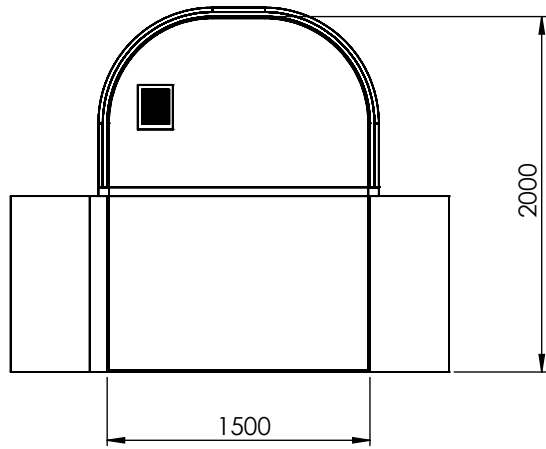
CHART:



● Yellow	● Pink	● Blue
● Melon	● Lilac	● Night blue
● Orange	● Green	● Light brown
● Red	● Ocean green	● Brown
● Raspberry	● Dark green	● White



Drawn By A.Jamil	DESCRIPTION: Aqua Wall Curtain	Rev	DATE 05.05.2019	SCALE 1:20	 WATER SPLASH <small>THIS DRAWING IS A PROPERTY OF WATER SPLASH INC. AND IS NOT TO BE REPRODUCED BY ANY MEANS OR USED TO FURNISH INFORMATION TO OTHERS WITHOUT THE EXPLICIT CONSET OF WATER SPLASH</small>
Edited By	DRAWING NO:		UNITE Inch	SHEET	



Drawn By
A.Jamil

DESCRIPTION:
Vault

Rev DATE
06.09.2018

SCALE

Edited By

DRAWING NO:

UNITE
mm

SHEET



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Splash Parks & Water Management System



01

Inground Features

02

Above Ground Features

03

Activator

Activator is a sensor unit; kids interact to activate play function of Splash Park. Activator sends a signal to Water Wise controller and play features starts functioning.

04

Drain

Drain is located in several location of splash park in order to collect all water in play area to storage tank.

05

Storage Tank

Storage tank is a container where drain from Splash Park connects to. Water stored in constantly filtered by Water Management System.

06

Water Wise Controller&Manifold

Water Wise Controller is brain of Splash Park, and controls Water Management System components and manifold valves. Manifold is the connection to each play equipment, and operates on/off linked to Water Wise controller.

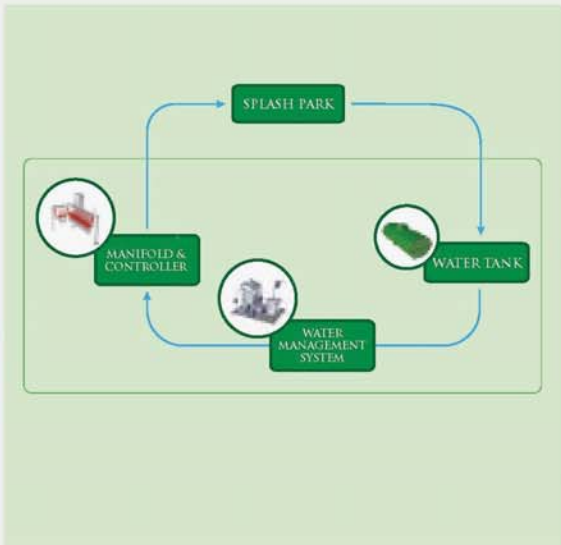
07

Water Management System (WMS)

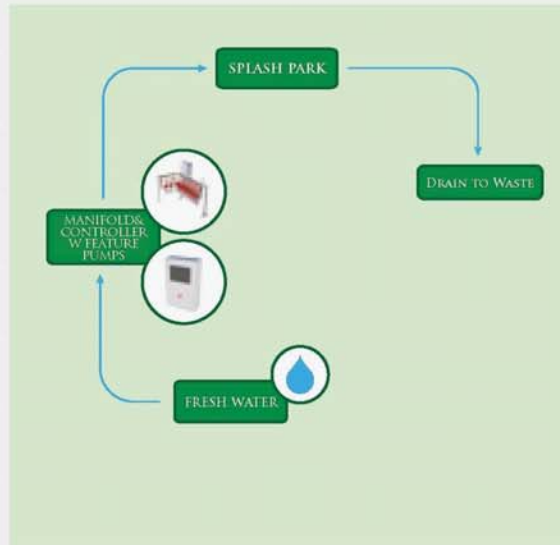
Factory assembled and tested, skid mounted Water Management System (WMS) is an engineered system for Splash and Aqua Parks. Each system is unique and meets local health code of project location. Water stored in holding tank is constantly filtered by WMS.

Recirculation Systems/Options

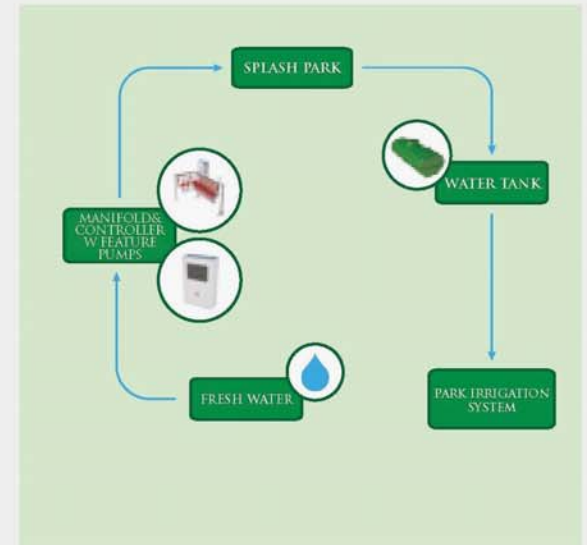
WATER RECIRCULATION SYSTEM



DRAIN AWAY



GREY WATER SYSTEM



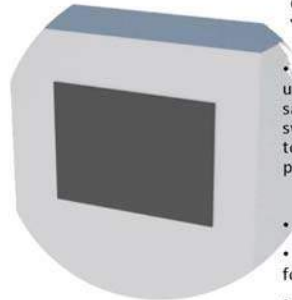
SYSTEM (RE-USE/RECIRCULATION) SPECIFICATION



WATER RE-CAPTURE/RE-USE SYSTEM

• Splash park with Water Re-Capture system, re-uses water utilized at splash park by filtration and sanitizing constantly. This system is similar to swimming pool water sanitization system. Engineered to meet state / provincial health codes for swimming pool/splash parks.

- PARTS INCLUDED
- Tank Size: 2500-4000 Gallons with 1" float valve for Fresh water intake.
- WATER SPLASH Controller
- Water Splash Stainless Steel Manifold
- Factory assembled and tested pump/sand filter/chemical controller kit
- UV System



WATER SPLASH



SPLASH PARK MANIFOLD
- STAINLESS STEEL -

••• WATER SPLASH

STRUCTURE

Manifold housing is consist of commercial grade, non corrosive, 304/304L grade 3-1/2" OD stainless steel tubing. Housing shall have a 3" FNPT tread.

MANIFOLD LINE

Manifold lines are assembled using commercial grade, SCH 80 PVC piping and pipe fittings. Each manifold line consist of :

- One double union ball valve
- One solenoid valve / Rain Bird
- Winterization Valve Connection

(3/4" double union ball valve)

W.H. ARRESTER /Pressure Gauge

Housing shall have a 1" FNPT connection for water hammer arrester ((potable water installation) and 3/4" MNPT for pressure gauge.

ANCHORING SYSTEM

Manifold shall be installed inground or above ground housing in Water Splash facility after functionality test at 100 PSI.

INSTALLATION:

- Inground Vault
 - Above Ground Vault
 - Install by others in pump room
- Product Video File, Scan or Click: NA

Water consumption: NA

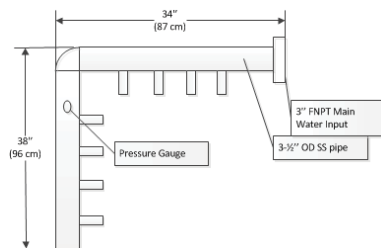
Water pressure: NA



Manifold Housing and Water Hammer Arrester



Pressure Gauge



WATER SPLASH



WATER WISE CONTROLLER

••• WATER SPLASH

ENCLOSURE

Commercial, industrial non metallic NEMA 4X enclosure houses components for splash park water wise controller.

CONTROL UNIT

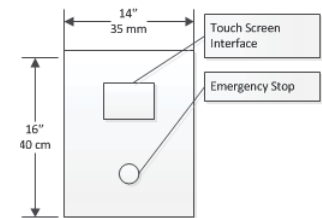
Water Wise controller has a center PLC unit controlling each manifold line. Large touch industrial touch screen interface allows users to set desired programming settings for splash park.

Controller is user programmable and following functions can be programmed:

- Current day and time
- Working hours / or always on
- Activate products via activator or always on
- Spray time
- Up to five spray play sequence
- Product selection per each sequence.
- Wind Speed effect (optional)
- Low water temperature on/off (optional)
- Battery back up



WS-120 VAC, 50HZ 10A
240 VAC, 60HZ 5A
Hardwired to main power source.
UL



**RECIRCULATION SYSTEM
BY
WATER SPLASH
(Automated)**

Water Recirculation System by Water Splash is pre-assembled and factory tested system, mounted on aluminum skid.

System components include:

- Sand Filter / Hayward HCF Series
- Hayward high performance pump HCP55 (features) (5.5 HP 230VAC 3 phase),
- Tristar high performance pump (recirculation) (1.5 HP 230VAC 1 phase),
- Water Splash Controller,
- Water Splash motor starter box,
- Aluminum skid
- Chemical Controller, Hayward CAT-2000
- Chemical tanks (chlorine tank / pool chlorine, acid tank /exp: muriadic acid)
- Peristaltic pump (2 each) for automated chemical feeding,
- Flow meter, 0-200 gpm, clear PVC
- Piping : PVC, Sch 80 fittings and SCH 40 piping is used for connections.

Chemical System Details:

CAT-2000 chemical controller is base for our recirculation side of our system. There are two sensors verifying free chlorine level and ph level of stored water. Chemical controller releases power to two standard feed pumps to inject chemical to return line to the tank.

Controller has pre-set levels for PH and free chlorine levels for verification. However, these levels can be override by users. Pre-set levels for control references are:

Ph: 7.2-7.8

Free Chlorine: 2 and 4 parts per million (ppm)

Chemical system has a safe guard by flow sensor. Chemicals are not depleted unless there is no flow alarm by flow sensor. If chemical controller detects low level or high level of chemicals, it turns to alarm mode. This alarm mode forces Water Splash controller to shut play products pump so that kids do not expose to undesired water quality. Products pump starts working when quality level is maintained.

Water Play Products Controller and Manifold

Water Play operation is controlled via programmable control unit attached to Water Splash controller. Each product is plumbed to a solenoid valve assemble. Each solenoid valve assemble has a ball valve to control and limit water flow for products. Products shut down off times (timer controlled) and when water quality alarm signals.

Holding Tank

2500 Gallons – FIBERGLASS with ¾" float valve water inlet.

RECIRCULATION SYSTEM by WATER SPLASH

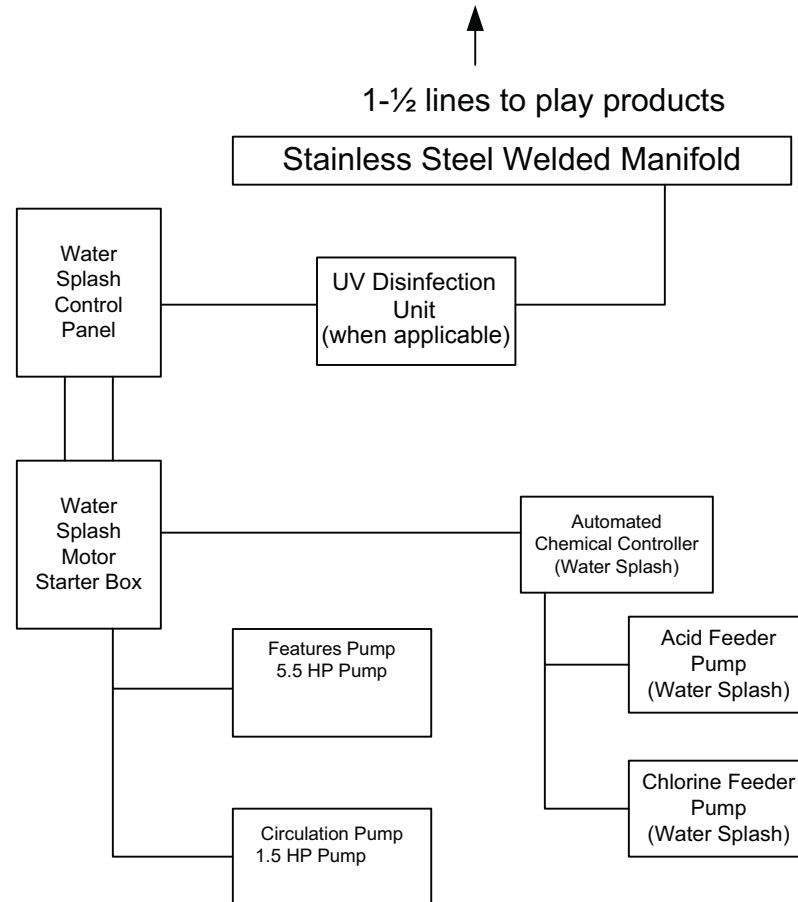


Sample installation picture /
products might varies)



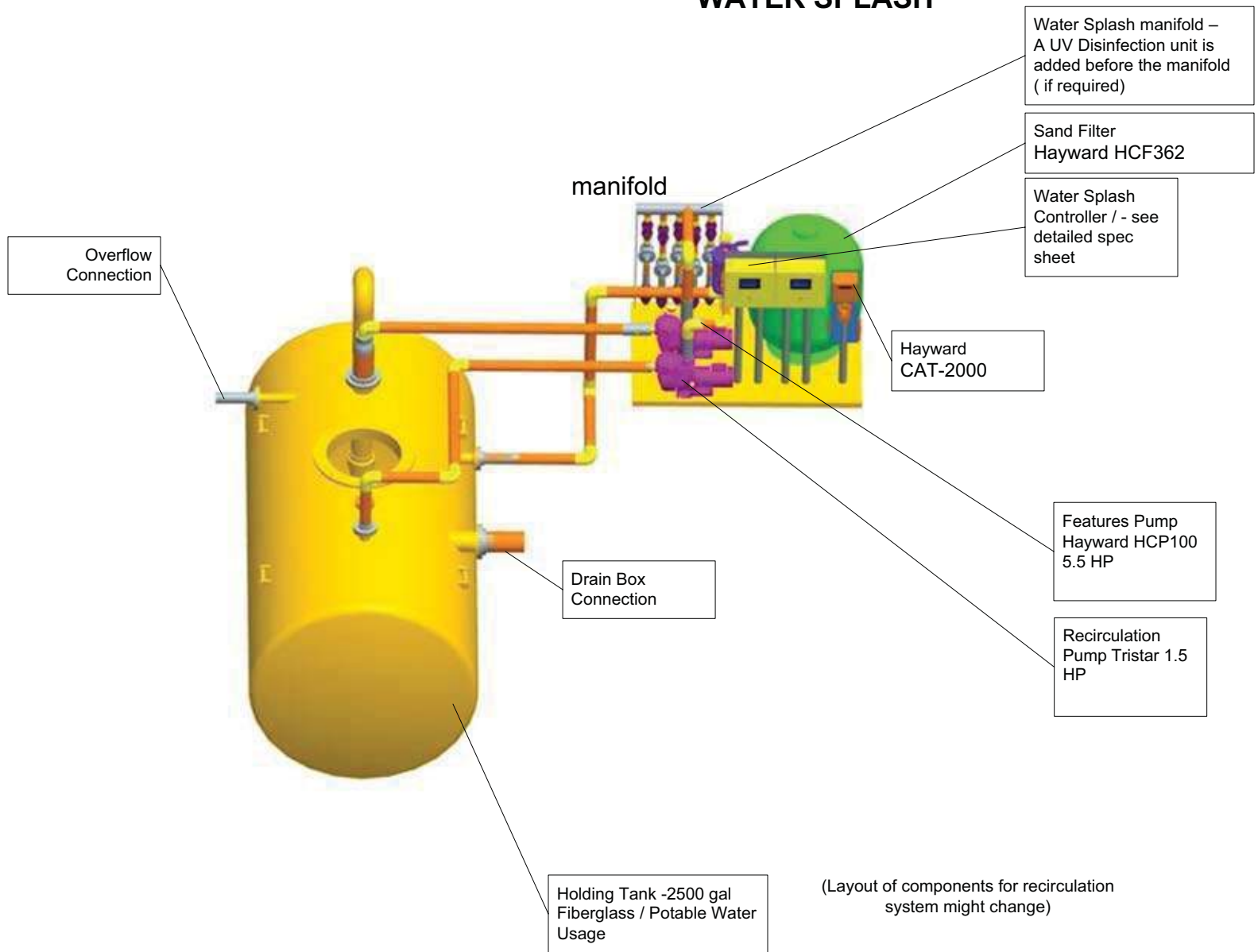
System Specifications:

- Fully factory assembled.
- Mounted on aluminum skid.
- Chemical controller is an automated ORP and PH controller. Controller frequently monitors water quality and injects necessary amounts of acid and chlorine.
- System includes two pumps: Circulation and features pumps.
- Chemical control panel is fully integrated with Water Splash Park control panel. If there is an alarm caused by low water quality, chemical controller will force the system to be shut down. System will be able to resume after restoring water quality level.
- Flow meter : 0-100 GPM scale, plastic cover
- Sand filter : Hayward HCF 362
- Pre-assembled Manifold (stainless steel manifold / 3" pipe and 1" or 1-1/2" solenoid valves for each water outlet).
- UV Disinfection unit



WATER SPLASH INC
(800) 936-3430

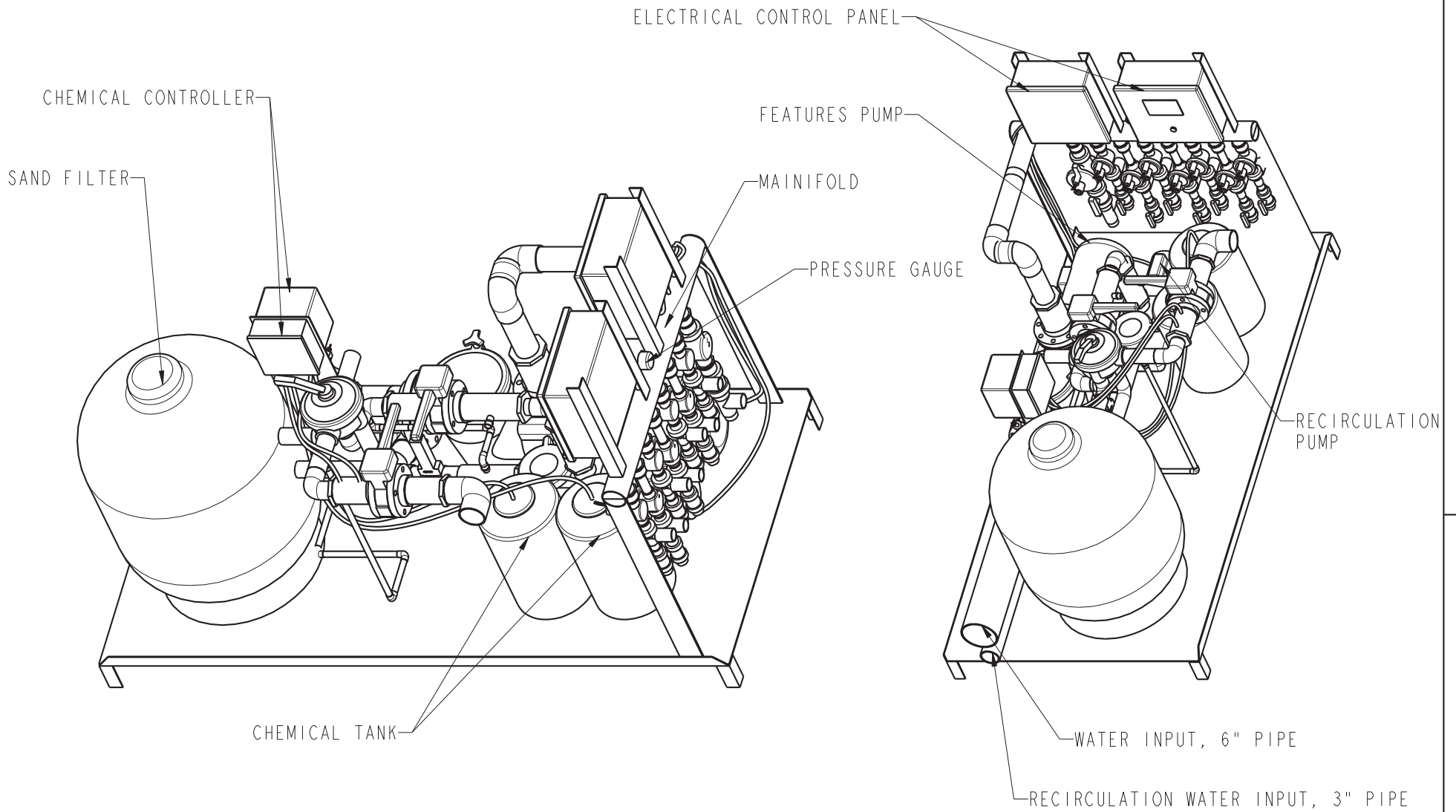
RECIRCULATION SYSTEM by WATER SPLASH





2

1

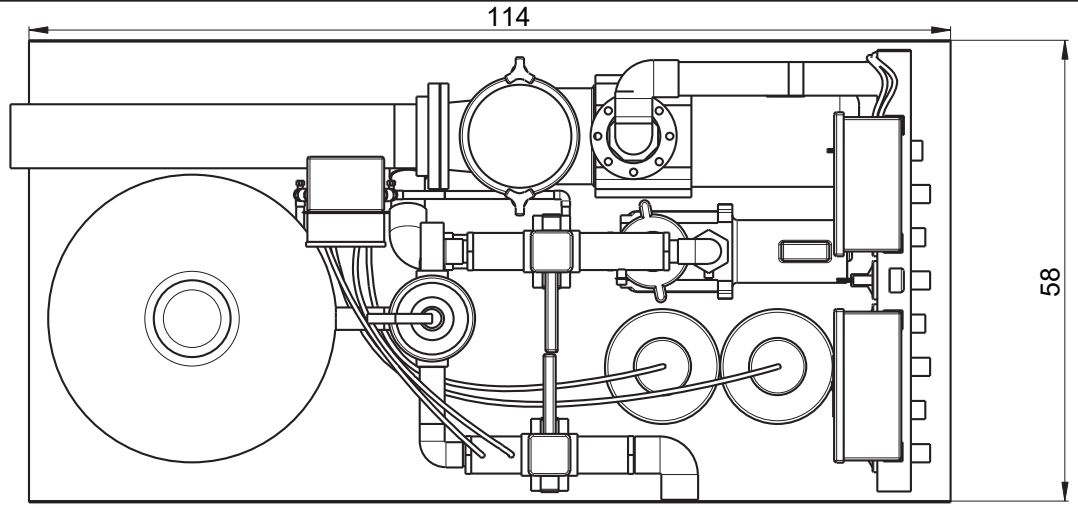


SCALE 1:20

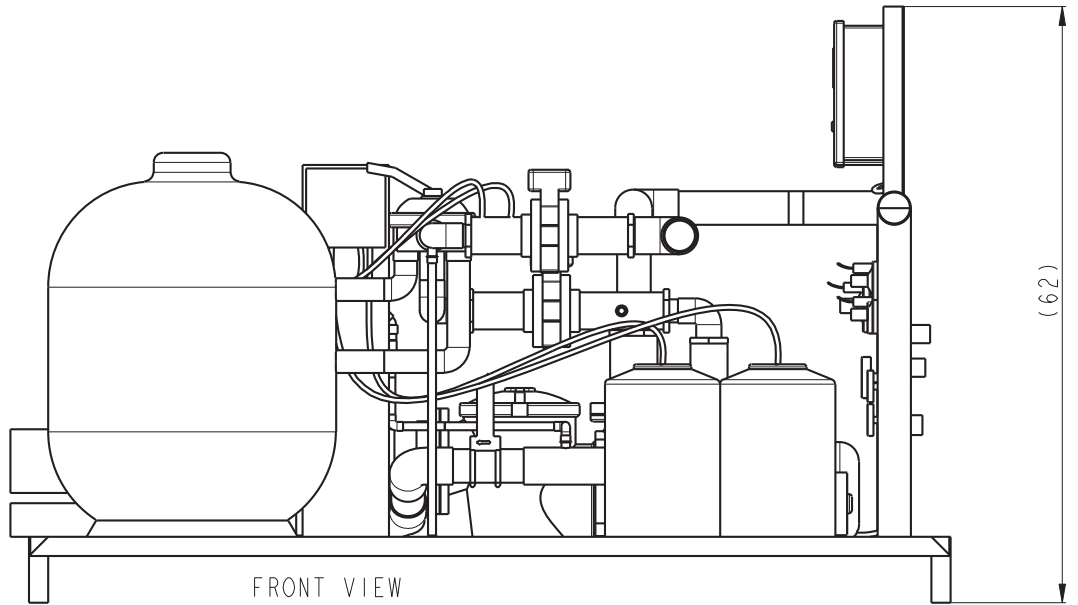
DRAWN BY D.G HE EDITED BY D.G HE APPROVALS ENG PROD QS	THIS DRAWING IS THE PROPERTY OF WATER SPLASH INC. AND IS NOT TO BE REPRODUCED BY ANY MEANS OR USED TO FURNISH INFORMATION TO OTHERS WITHOUT THE EXPLICIT CONSENT OF WATER SPLASH INC.		CR NO	MATERIAL	WATER SPLASH						
			XXXXXX	XXXXXXXXX XXX							
		UNIT	DATE	DESCRIPTION							
		INCH	2009.02.04	RECIRCULATION SYSTEM PROJECT NO. :							
		ENVIRONMENT PRO E WILDFIRE 2.0	SURFACE FINISH μ in	SHEET	SCALE	DOCUMENT	SIZE	DRAWING NO	REV		
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2

1

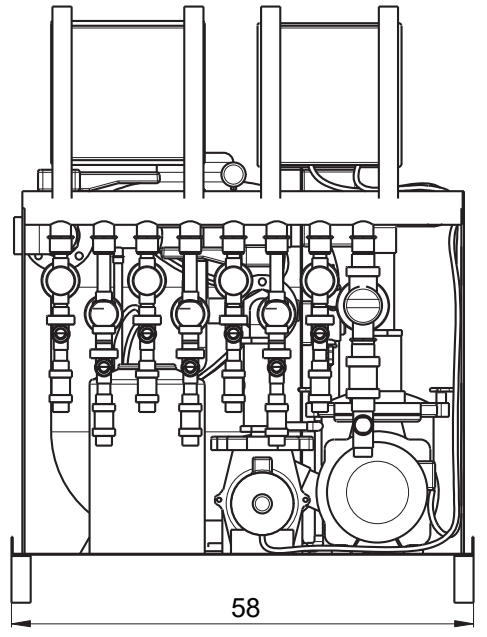


TOP VIEW



FRONT VIEW

SCALE 1:20



RIGHT VIEW

DRAWN BY	D.G HE
EDITED BY	D.G HE
APPROVALS	
ENG	
PROD	
QS	

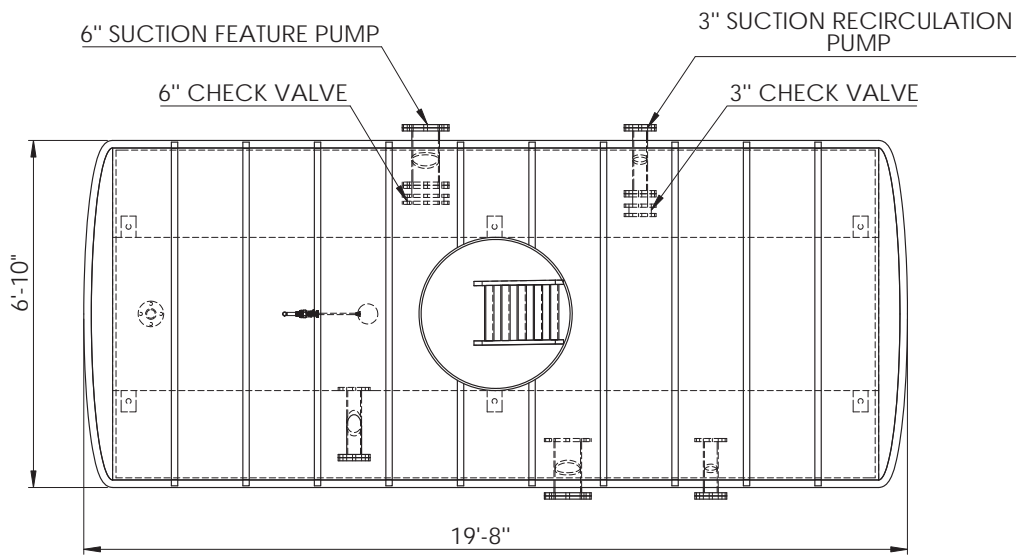
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	UNIT
INCH	
PRO E WILDFIRE 2.0	ENVIRONMENT

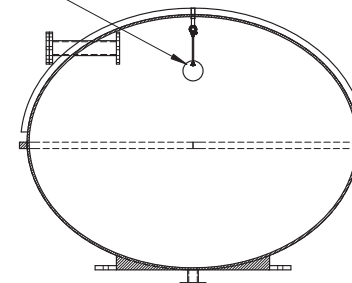
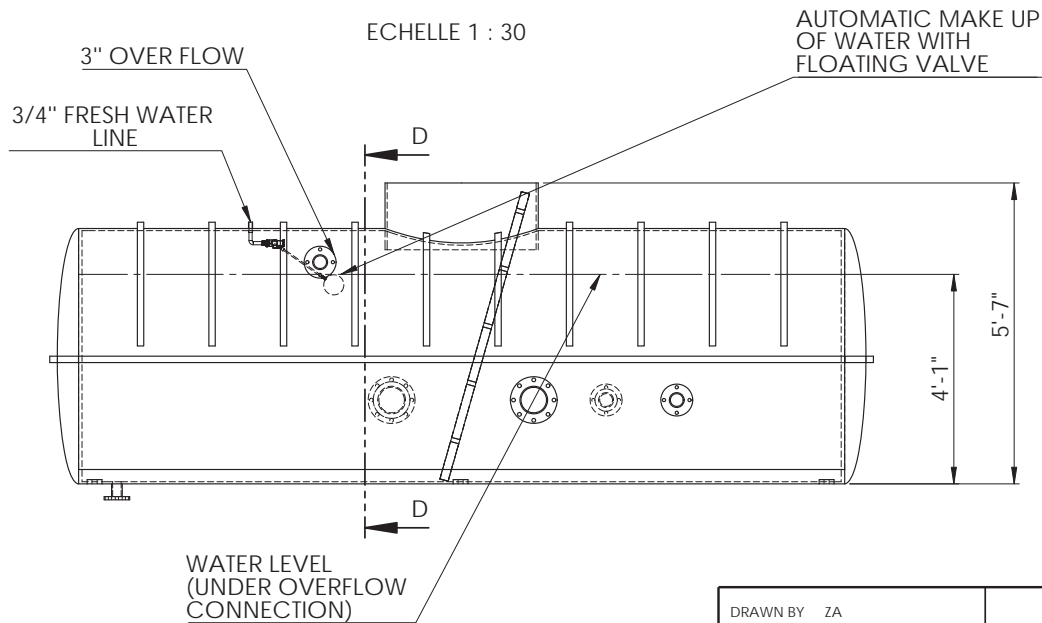
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SURFACE FINISH	μin

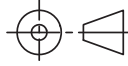
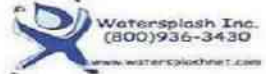
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DESCRIPTION	RECIRCULATION SYSTEM PROJECT NO. :
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DOCUMENT	D10
SIZE	A

WATER SPLASH	
DRAWING NO	W060271-00-01
REV	A

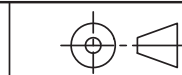


SCALE
1 : 30



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EDITED BY ZA			XXXXX	XXXXX		
APPROVALS		DATE	DESCRIPTION			
ENG		30.01.2017	DETAIL TANK 2500 GALLONS			
PROD		ENVIRONMENT SOLIDWORKS 2013	SURFACE FINISH	SHEET 1/3	SCALE 1:30	DOCUMENT SIZE B
QS				DRAWING NO W061071-00	REV A	

ENVIRONMENT
SOLIDWORKS
2013



CR NO

XXXXX

DATE
30.01.2017

SURFACE
FINISH

MATERIAL

XXXXX

DESCRIPTION
DETAIL TANK 2500 GALLONS

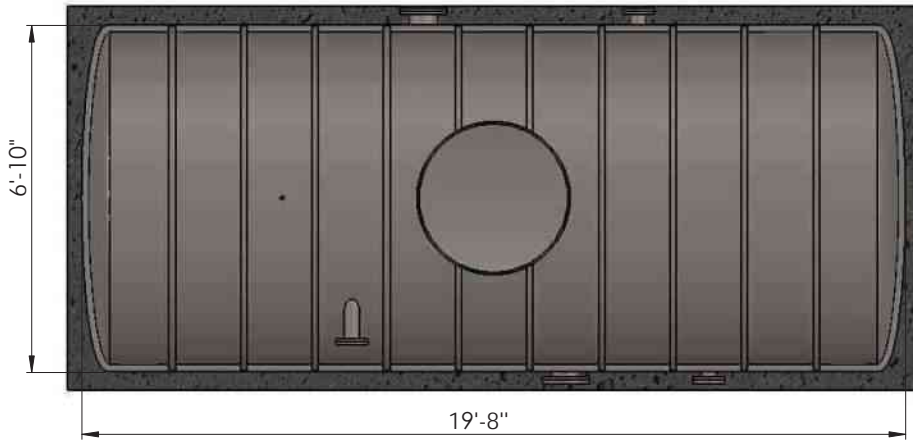
SHEET
1/3

SCALE
1:30

DOCUMENT
SIZE
B

DRAWING NO
W061071-00

REV
A

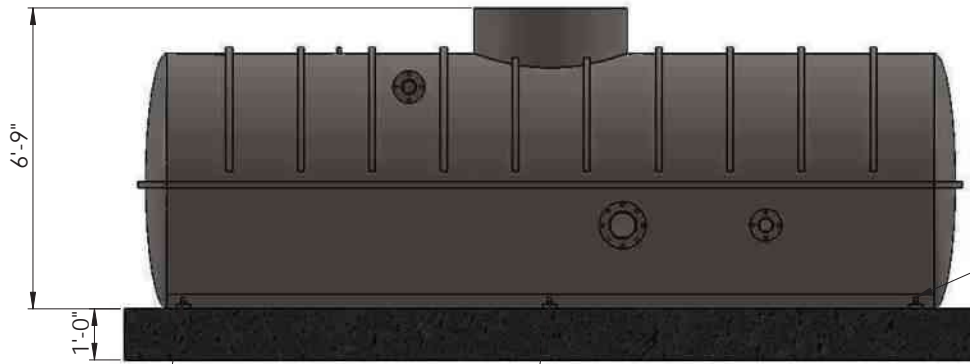


ECHELLE 1 : 30



HOLDING TANK
2500 GALLONS

SCALE
1 : 30



6 X 1/2" ANCHOR ROD
(USE CONCRETE ADHESIVE
NOT SUPPLIED)

CONCRETE BASE

6 X 1/2" NUT

6 X 1/2" LOCK WASHER

ECHELLE 1 : 30

DRAWN BY ZA	THIS DRAWING IS A PROPERTY OF WATER SPLASH INC. AND IS NOT TO BE REPRODUCED BY ANY MEANS OR USED TO FURNISH INFORMATION TO OTHERS WITHOUT THE EXPLICIT CONSET OF WATER SPLASH		CR NO	MATERIAL	 Water Splash Inc. (800)936-3430 www.watersplashnet.com		
EDITED BY ZA			XXXXX	XXXXX			
APPROVALS		UNTIL FEET	DATE	DESCRIPTION			
ENG		ENVIRONMENT SOLIDWORKS 2013	30.01.2017	INSTALLATION TANK 2500 GALLONS			
PROD		QS	SURFACE FINISH	SHEET 1/3	SCALE 1:30	DOCUMENT SIZE B	DRAWING NO W061072-00

PRODUCT

WARRANTY

Water Splash Inc. guarantees that all its products meet the specifications provided in the installation drawings and offers:

25 YEAR WARRANTY on stainless steel structures and workmanship, stainless steel anchoring systems and aluminum spheres.

5 YEAR WARRANTY on brass parts, spray nozzles and spray openings, high density polyethylene components, polyurethane components, stainless steel automated water distribution manifold, drain boxes, and electrical enclosures.

2 YEAR WARRANTY on coatings, stainless steel hardware and moving parts, fiberglass components, Seeflow polymers, Toe guards, piping, fittings, ball valves, pressure gauges, terminal blocks, PLC controller, time switches, manual switches, transformers, breakers, electrical wiring, connections and on recirculation system workmanship, Recirculation system pumps and filters are covered by their Manufacturer. Please refer to their warranty documentation.

1 YEAR WARRANTY on all products and parts not listed above.

Warranty above is valid only if structures are installed or assembled as per Water Splash's installation instructions/drawings maintained according to maintenance manual and procedures, not subject to misuse, vandalism, operated under normal use as per designed purpose or have not modified / repaired by unauthorized personnel.





CHLOIE CREEK SPLASH PAD- ASBURY IA
 EQUIPMENT SUPPLY JULY 2017
 2500 SQ FT
 Recirculation System w/ UV
 23 Features
 Rod Schumacher, Project Manager
rschumacher@conlonco.com
 563.583.1724



ROSA JACKSONCC- MACON,GA
 DESIGN/SUPPLY/BUILD- JANUARY 2017
 2500 sq ft
 26 Features
 Recirculation System \$150k Budget
 Safety Surfacing
 Reggie Moore- Parks & Recreation Director
 (478) 621-6280
rmoore@maconbibb.us



SOUTH RIVERVIEW PARK - ROSEAU, MN
 DESIGN/SUPPLY/INSTALL JULY 2017
 Fresh Water System
 Slide Structure, 26 features
 2500 Sq Ft
 \$170K Budget



OLYMPIA MASTER ASSOCIATION- WELLINGTON, FL
 DESIGN/SUPPLY/INSTALL
 SEPTEMBER 2016
 ROBYN MARONEY - LCAM, PROPERTY MANAGER
rmaroney@seacrestservices.com 561-333-3636



SCOTT TOWNSHIP POOL- CARNEGIE PA
SPRING 2016
SUPPLY WATER FEATURES
SANDY NOVELLI - FINANCE DIRECTOR
snovelli@scotttownship.com 412-276-5300 x228



FILMORE THOMAS PARK - SPLASH PAD
Macon, Georgia

Client:
City of Macon

Role:
Design
Supply
Build

Park Budget:
\$1.7 million

Splash Pad Budget:
\$175,000

Date:
August 2016

Park Opening:
Spring 2017

Reference:
Mr. Reggie Moore, Director
Parks & Recreation Department
RMoore@maconbibb.us
P: 478-731-0764
F: 478-751-9290

Macon/Bibb County Parks Department received a \$21 million SPLOST program to upgrade their old parks and develop new parks in under-served areas of the city. As part of these funds, \$1.7 million was allocated to renovate Filmore Thomas Park. Water Splash, Inc. was commissioned to design, supply, and construct the splash pad for the project. It is scheduled to open by October of this year.



FRISCO PARK- AMORY, MS
DESIGN/SUPPLY/INSTALL JULY 2015
JAMIE MORGAN - CITY CLERK
jamiemorgan@cityofamoryms.com (662) 256-5721





CURRENT CLIENT REFERENCES - WATER SPLASH, INC.

Patti Pettit, Parks & Recreation Director
City of Cleveland, Tennessee
1334 Church Street
Cleveland, Tennessee
ppetitt@clevelandtn.gov
423-472-4551, Ext. #5324

Jay Williams, Mayor
City of Texas City, Texas
1004 4th Avenue South
Texas City, Texas 77024
sjwilliams@bunkerhilltx.gov
409-643-5987

Mac Alford, Architect
Alford & Associates, Inc.
1507 West Flowers Road
Terry, Mississippi 39170
601-213-4570

Wayne Clark, Supply Manager
Campbell Crossing, LLC
Building 844, Georgia Avenue
Fort Campbell, Kentucky 42223
931-431-2318

Tom Henry, Director of Parks & Recreation
Haltom City, Texas
5024 Broadway Avenue
Haltom City, Texas 76117
Ethenry@haltomcitytx.com
817-831-6710

Robert Woods, Public Works Director
City of Anna, Texas
111 North Powell Parkway
City of Anna, Texas 75409
rwoods@annatexas.gov
972-924-3325

Eddie Pugh, Park Supervisor
City of Greensboro, NC
Splash Pad Area: 3,763 sf
7 Above Gound, 6 In-Ground
Product Cost: \$60,000
336-373-5892



Patrick O'Hara, Executive Director
YMCA - Asheboro, NC
Splash Pad Area: 3,750 sf
10 Above Gound, 6 In-Ground
Product Cost: \$61,000
336-625-1977



Dale Goodreau, Business Director
City of Bridgeton, NJ
Splash Pad Area: 5,000 sf
14 Above Gound, 16 In-Ground
Splash Pad Cost: \$175,000
856-455-3230, Ext. #225



City Of Clarence - Rockland, ON Canada Summer 2012



Playground area: 1600 Sq. ft.
Products cost: 53 000 CAD Total
Cost of the project: 111 500 CAD

Contact Information:
Parks & Rec
Pierre Boucher
Phone: 613-446-6022 ext. 2263

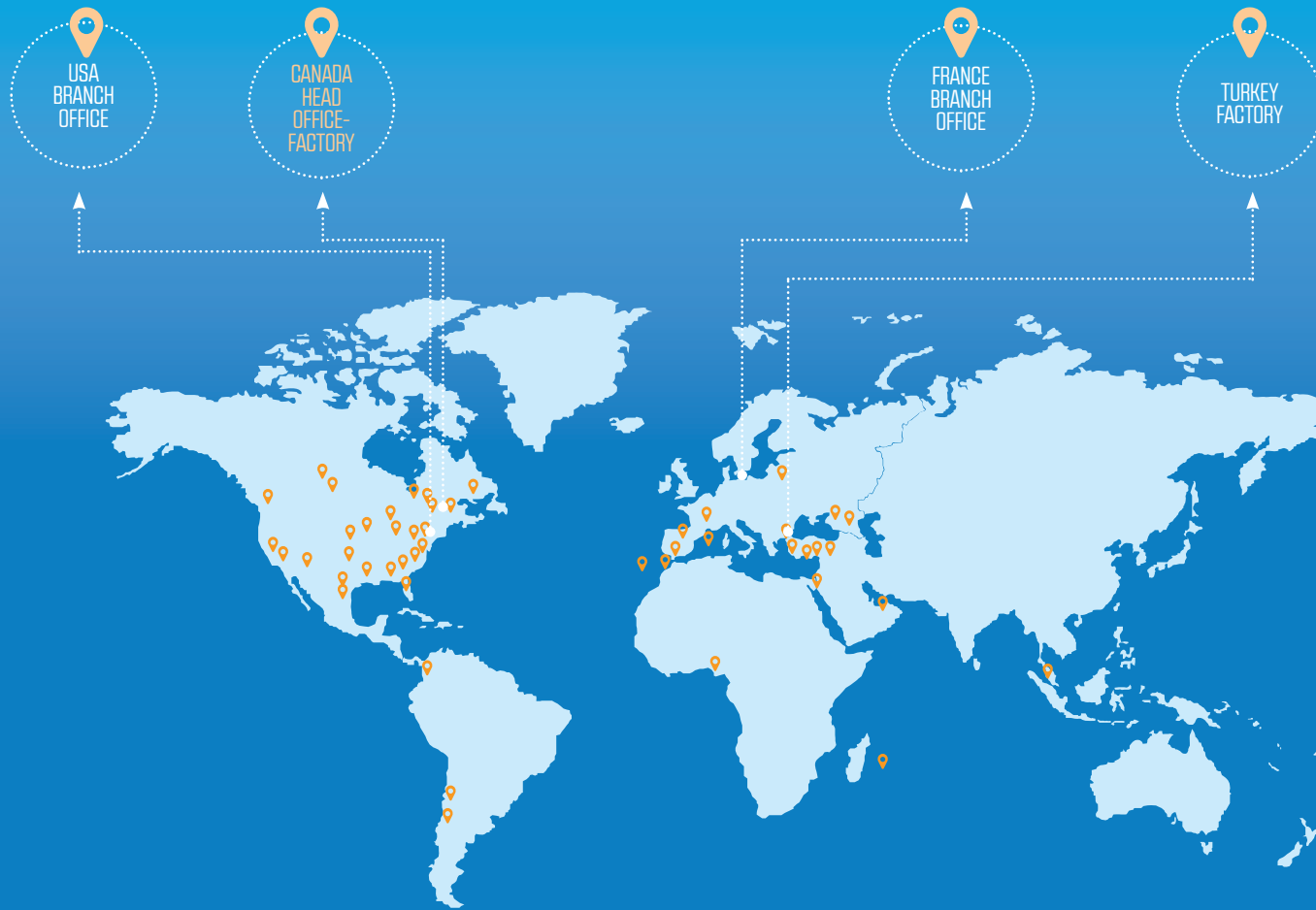
Town Of Smiths Falls, ON Canada Summer 2011



Playground area: 5000 Sq. ft.
Products cost: 55 000 CAD
Total cost of the project: 110 000 CAD

Contact Information:
City Planner
Nicole McKernan
Phone: 613-283-4124





WATERSPLASH INSTALLATIONS OVER WORLD

Singapore • Chile • Turkey • Nigeria • Russia • Canarias • United Arab Emirates
 Usa • Poland • Colombia • Spain • Reunion • Jordan • Canada



USA/Canada (800) 936-3430

France + 33 172 77 4328

www.watersplashnet.com

info@watersplashnet.com





 watersplashinc

⁺⁻
Request for Qualifications
SPECIFICATIONS

APPENDIX

FOR

ASHFORD PARK SPLASH PAD

PROJECT MANUAL:

CITY OF BROOKHAVEN, GEORGIA

PROJECT #15089.00
BID # 20-108

PREPARED BY:

CPL Inc.
Land Planning & Landscape Architecture
3011 Sutton Gate Dr. Suite 130
Suwanee, Georgia 30024

Ph. 678 318-1241

April 2020

PROJECT MANUAL

APPENDIX 'A'

1. Application for New Swimming Pool Permit
2. Requirements for New Swimming Pool Checklist
3. Dekalb County Hydraulic Analysis 2019
4. Ashford Geotechnical Report
5. Poligon Estimated Foundation Sizes
6. Splash Pad Specifications
7. Splash Hydraulics Form

END OF SECTION TOC



Division of Environmental Health
445 Winn Way, Suite 320
Decatur, GA, 30030
Phone: 404-508-7900
Fax: 404-508-7979
www.dekalbhealth.net

APPLICATION FOR A NEW SWIMMING POOL CONSTRUCTION PERMIT

1. Name of Facility: _____

2. Check Appropriate Block(s):

- Swimming Pool, Whirlpool/Spa, Recreational Water Park, Interactive Play Device, Spray Pool, Water Course Pool, Wave Pool, Multi-purpose Pool, Wading Pool, Waterslide/Splash Pool, Zero-Depth Entry Pool, Indoor-Outdoor Pool, Special Purpose Pool, Hydraulic Analysis Worksheet Completed, Equipment Specifications Included

3. Address of Facility: _____
Street City Zip Code

4. Mailing Address of Facility: _____
Street City Zip Code

5. Facility Owner's Name: _____ Phone Number: _____

6. Facility Owner's Address: _____
Street City State Zip Code

7. Type of Facility (Apartments, Condos, Motel, etc.): _____ Number of Units: _____

8. Certified Pool Contractor: _____ Certification #: _____
(Please submit a copy of your most recent certification certificate with application)

9. Contractor's Address: _____

10. Contractor's Email: _____ Phone Number: _____

Pursuant the DeKalb County Board Health Swimming Pool Ordinance Chapter 1, Article VIII, the undersigned hereby applies for a permit to construct a public swimming pool. I understand that no construction may begin until a construction permit has been issued by the DeKalb County Board of Health.

Applicant's Signature Date

FOR INTERNAL USE ONLY

Method of Payment: Check #, Credit Card Receipt #, Date Paid



Division of Environmental Health
445 Winn Way, Suite 320
Decatur, GA, 30030
Phone: 404-508-7900
Fax: 404-508-7979
www.dekalbhealth.net

REQUIREMENTS FOR NEW SWIMMING POOL CONSTRUCTION

The Code of DeKalb County, Georgia, Chapter 13, Article VIII, Section 13-185, **Construction approval**, requires that all plans for public swimming pools, whirlpools, spas, waterslides and other bathing places, except those serving two or less private residences, must be reviewed and approved by this department **prior to the issuance of the Department Swimming Pool Construction Permit and prior to construction**.. This code is available on our website: www.dekalbhealth.net under the Environmental Health tab.

Submit Plans to: Division of Environmental Health
445 Winn Way, Suite 320, Decatur, GA 30030

Plan Submittal Checklist:

- Completed DeKalb County Board Health (DCBOH) application for new swimming pool construction
- Plan review fee
- Most recent copy of the certified pool contractor's certification (*unless otherwise directed*)
- At least two (2) sets of plans submitted by an approved DCBOH certified pool contractor:
 - Complying with standard architectural/engineering practices;
 - Drawn to a minimum 1/8" per foot scale or one inch per ten feet (1"/10') scale with the identification of the certified pool contractor;
 - Stating maximum bathing load and maximum number of living/dwelling units;
 - Showing the project location and number of dwelling units outside a three hundred foot (300') radius measured horizontally from the pool's edge;
- Additional plans from the General Contractor may be required for other areas such as a bathhouse, etc.
- Manufacturer's cut sheets and/or specifications on all equipment
- Completed hydraulic analysis of all pool piping and circulation equipment
- Fence/barrier detail with dimensions and material specifications
- Approved water source and method of sewage disposal is provided/indicated on plans
- Indication of whether or not food service area will be provided

Please ensure that all items on this checklist have been completed and turned in to our office. Incomplete plan submittals will result in a delayed review time.



POOL HYDRAULIC ANALYSIS

DeKalb County Board of Health

POOL INFORMATION

Name: _____

Address: _____ GA _____
 # Street Suite/Bldg.# City Zip Code

Pool Type: Swimming Pool Whirlpool Wading Multi-Purpose Wave Lazy River
Waterslide Special Purpose Spray Pool Zero-depth

Location: Indoor Pool Outdoor Pool **Operation:** Seasonal Year-round **Government-owned** Yes No

CERTIFIED CONTRACTOR INFORMATION

Name: _____ Cert.#: _____

Company Name : _____

Address: _____
 # Street Suite/Bldg.# City State Zip Code

Contact: _____
 Phone# Fax# E-mail

Shape: _____ Perimeter(ft.): _____ Width(ft.): _____

Length(ft.): _____ Min. Depth(ft.): _____ Break Depth(ft.): _____ Max. Depth(ft.): _____

Slope (< 5') = 1 ft. in _____ ft. Area: _____ Sq. Ft. Volume: _____ gallons

Pool Base Material: Gunite Poured Other: _____ Type of Piping: _____

Design Flow Rate = $\frac{\text{pool volume}}{\text{turnover time}^*}$ = _____ gallons = _____ gpm**
 minutes

*For pool use minimum 6 hr. turnover (360 min.) **Check minimum skimmer flow rate. If turnover rate is inadequate for wading pool use minimum 2 hr. turnover (120 min.) minimum skimmer operation (as per manufacturer or 25 gpm) then design whirlpool use minimum 1/2 hour turnover (30 min.) flow rate must be increased to provide minimum skimmer flow rate.

I. Number of Skimmers Required:

A. Swimming pools (see Appendix A, Fig. 4): minimum two skimmers, then one skimmer per 500 sq. ft pool surface area. Wading pools: minimum one skimmer per 200 sq. ft pool surface area. Whirlpool: minimum one skimmer per 100 sq. ft pool surface area.

Pool Surface Area: _____ sq. ft.; # of skimmers required: _____; # of skimmers provided: _____

II. Skimmer / Gutter Flow Rate:

A. If wall returns are utilized: total skimmer/gutter flow rate = design flow rate x 0.8 = _____ gpm

B. If floor returns are utilized: total skimmer/gutter flow rate = design flow rate = _____ gpm

C. Flow through each skimmer/gutter = skimmer/gutter flow rate = _____ gpm = _____ gpm *
 # of skimmers provided

* Must be > 25 gpm and < 55 gpm

III. Number of Inlets Required:

A. Minimum # of inlets required = $\frac{\text{perimeter (ft)}}{x^*}$ = _____ ft = _____ (use next whole number)

*For pools, x = 20 feet For wading pools or whirlpools, x = 10 feet

IV. Pipe Size Selection

A. Skimmer / Gutter Line Size: select pipe size which gives max. 5 fps velocity at skimmer / gutter flow rate*:

	<u>Branch 1</u>	<u>Branch 2</u>	<u>Branch 3</u>	<u>Branch 4</u>	<u>Branch 5</u>	<u>Branch 6</u>	<u>Branch 7</u>	<u>Branch 8</u>
# of Skimmers Served by Pipe	_____	_____	_____	_____	_____	_____	_____	_____
Pipe Size (inches)	_____	_____	_____	_____	_____	_____	_____	_____
Flow in Pipe (gpm)	_____	_____	_____	_____	_____	_____	_____	_____
Velocity (fps)	_____	_____	_____	_____	_____	_____	_____	_____

*Indicate which chart used for velocity numbers: _____

For additional branches, use the reverse side of this sheet

B. Return Line Size: select pipe sizes and branches which give max. 10 fps velocity at design flow rate*:

	<u>Branch 1</u>	<u>Branch 2</u>	<u>Branch 3</u>	<u>Branch 4</u>	<u>Branch 5</u>	<u>Branch 6</u>	<u>Branch 7</u>	<u>Branch 8</u>
# of Inlets Served by Pipe	_____	_____	_____	_____	_____	_____	_____	_____
Pipe Size (inches)	_____	_____	_____	_____	_____	_____	_____	_____
Flow in pipe (gpm)	_____	_____	_____	_____	_____	_____	_____	_____
Velocity (fps)	_____	_____	_____	_____	_____	_____	_____	_____

*Indicate which chart used for velocity numbers: _____

For additional branches, use the reverse side of this sheet

V. Main Drain: select pipe sizes which give maximum 5 fps velocity at the design flow rate:

A. Pipe size (inches): _____ Design flow rate (gpm): _____ Velocity (fps) _____

B. Main Drain Grate Selection: Main drain outlet 4 to 1 open area ratio each drain; minimum 2 main drains required; 1½ fps max. velocity through each grate; each main drain must accommodate 100% of the design flow rate; 5 fps max. flow rate*:

<u>Pipe Size (in.)</u>	<u>Grate Size (each, sq. in.)</u>	<u>Flow Area (each, sq. in.)</u>	<u>Velocity (fps)</u>	<u>(Total Flow, Both Drains gpm)</u>
_____	_____	_____	_____	_____

C. Open pipe area = _____ (sq. in.) X 4 = _____ (sq. in.) [must be < _____ open grate area(sq. in.)]

Frame & Grate Catalog Number: _____ Quantity: _____

*If booster or additional pump flow is through the main drain grates, this flow must also be figured into all calculations

Maximum velocity through each grate 1 1/2 fps.

(.321 x Design Flow Rate _____ gpm)/Grate Open Area _____ sq. in.= Velocity _____ fps

Velocity _____ fps. < 1.5 fps.

Is velocity through each drain grate approved? Yes/No

D. Main Drain Line Head Loss

If wall returns are utilized, head loss calculation must be based on:

Main drain flow rate = 0.20 x design flow rate = 0.20 x _____ gpm = _____ gpm

Straight pipe size = _____(in.) Straight pipe length = _____(ft.)

_____ # elbows x equiv. length _____ = _____(ft.)

_____ # tees x equiv. length _____ = _____(ft.)

_____ # valves x equiv. length _____ = _____(ft.)

Total equiv. length = _____(ft.)

Friction loss per 100' based on above flow rate = _____ x total equiv. length _____ ÷ 100 = _____(ft.)
(enter on page 6)

Indicate which chart used for equivalent lengths: _____

If floor returns are utilized, head loss calculations are based on 100% flow through skimmers:

Skimmer flow rate = design flow rate

Main drain flow rate = 0

Main drain head loss = 0 (enter 0 on page 6)

E. Interactive Play Features Utilizing Separate Drains as a Water Source

Drain Grate Selection: Drain outlet 4 to 1 open area ratio each drain; minimum 2 drains required; 1 1/2 fps max. velocity through each grate; each drain must accommodate 100% of the design flow rate; 5 fps max. flow rate*:

Pipe Size (in.) Grate Size (each, sq. in.) Flow Area (each, sq. in.) Velocity (fps) (Total Flow, Both Drains gpm)

Open pipe area = _____ (sq. in.) X 4 = _____ (sq. in.) [must be < _____ open grate area(sq. in.)]

Frame & Grate Catalog Number: _____ Quantity: _____

Drain Line Head Loss (not to be included into pool total head loss)

Main drain flow rate = _____ gpm

Straight pipe size = _____(in.) Straight pipe length = _____(ft.)

_____ # elbows x equiv. length _____ = _____(ft.)

_____ # tees x equiv. length _____ = _____(ft.)

_____ # valves x equiv. length _____ = _____(ft.)

Total equiv. length = _____(ft.)

Friction loss per 100' based on above flow rate = _____ x total equiv. length _____ ÷ 100 = _____(ft.)

Indicate which chart used for equivalent lengths: _____

VI. Return Line Loss

Indicate which chart used for return line loss calculations: _____

Calculate return line loss for each branch or run of entire return line

Branch #1: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #2: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #3: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #4: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #5: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #6: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #7: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #8: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Friction loss due to inlet resistance @ _____ gpm = _____ ft.

Total return line friction loss = _____ ft.
(enter on page 6)

VII. Skimmer / Gutter Line Loss

Indicate which chart used for skimmer / gutter line loss calculations: _____

Calculate skimmer/gutter line loss for each branch or run of entire return line

Branch #1: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #2: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #3: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #4: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #5: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #6: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #7: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #8: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Friction loss over the skimmer weir @ _____ gpm = _____ ft.

Total skimmer / gutter line friction loss = _____ ft.
 (enter on page 6)

VIII. Total Dynamic Head Required:

- A. Main Drain Line Loss = _____ ft.
(from page 3)
- B. Return Line Loss = _____ ft.
(from page 4)
- C. Filter Loss When Dirty = _____ ft.
(*see below)
- D. Skimmer / Gutter Line Loss = _____ ft.
(from page 5)
- E. Heater Loss = _____ ft.
(from manufacturer)
- F. Other (multi-port valves, etc.) = _____ ft.
(from manufacturer)
- G. Total Dynamic Head Required = _____ ft.

*For C. above use the following:

- Cartridge Filter = 23.1 ft.
- Sand Filter = 34.7 ft.
- Pressure D.E. = 57.8 ft.
- Vacuum D.E. = 4.3 ft.

IX. Pump Selection:

A. Pump Manufacturer: _____ Model: _____ Horsepower: _____
Pump Rated: _____ gpm @ _____ TDH # of pumps: _____

X. Filter Selection:

Minimum Filter Area Required = $\frac{\text{Design flow rate}}{\text{Filter flow rate}^*}$ = _____ $\frac{\text{gpm}}{\text{gpm/sq.ft.}}$ = _____ sq. ft.

*Use Manufacture's Filter Flow Rate (In absence of that information use the following Filter Flow Rates: Diatomaceous= 1 gpm / sq. ft; Hi -rate Sand=15 gpm / sq. ft; Cartridge= .3 gpm / sq. ft)

Manufacturer: _____ Model: _____ Catalog # : _____

Filter Type: _____ Diameter (each filter): _____ inches

Filter Area (each): _____ sq. ft. # of Filters: _____ Total Filter Area: _____ sq. ft.

XI. Other Information:

Certified Contractor's Signature: _____ Date: _____

Plans Reviewed and Approved & by: _____ Date: _____
EHS Staff

February 19, 2020



Mr. Lee Croy, Program Manager
Jacobs Engineering Group
City of Brookhaven
Parks Bond Program Manager

**Re: *Geotechnical Exploration Report
Ashford Park – Proposed Pavilion and Splashpad
Matrix Engineering Group’s Project No. MEG 302350***

Dear Mr. Croy:

Matrix Engineering Group, Inc. has completed the authorized Subsurface Exploration for the proposed pavilion and splashpad project located in Brookhaven, GA. This work was performed in accordance with Matrix Proposal Number 012420-1, dated January 24, 2020.

The purpose of this exploration was to determine the site's subsurface conditions, to analyze and evaluate the data obtained, and to provide recommendations regarding the geotechnical aspects of the proposed development.

Project Description:

It is our understanding that the new development will consist of a pavilion, splash pad, sidewalks, and other hardscapes. The exploration performed in this study included the pavilion that is planned south of the existing soccer field and will be connected with the field area with concrete sidewalk. The location of the splash pad is proposed just north of the parking area at Caldwell Road near the intersection with Redding Road. Granite seat walls and concrete sidewalks are proposed around the splash pad and will be connected to the park with sidewalks and pedestrian bridges. The existing pavilion, concrete slab, grill and trash cans will require removal to facilitate the construction of the proposed development.

The finished floor elevations were not provided at the time of writing this report. However, we assume that minor grading will be required to achieve the finished subgrade elevations.

Testing Procedures:

The proposed pavilion and splash pad were explored by performing soil test borings. The approximate test locations are shown on the attached Figure 1. For exact location of the test borings, the client may elect to survey the boring locations. Matrix should be informed of any deviations in order to evaluate and modify our recommendations, if necessary. The soil consistency and bearing capacity were evaluated in general accordance with ASTM STP-399 using a portable hand auger and Dynamic Cone Penetrometer Device (DCP). The DCP device consists of a cone tip which drives into the soil, and a 15-lb ring-weight hammer falling freely 20 inches at the top. The number of hammer blows required to drive the sampler 1.75 inches is recorded and is designated as the Blow Count. The blow counts, when properly evaluated and correlated to the Standard Penetration Test Resistance (SPT), is an index of the soil strength, consistency and ability to support foundations. The number of blow counts per increment (bpi) was counted and recorded. The depth of the borings was augured to the proposed depth of 7 feet in order to obtain the necessary information for the bearing capacity evaluation.

The test borings were backfilled with the soil cuttings at the conclusion of DCP testing. Some consolidation of the backfilled soil column should be expected.

Findings:

The subsurface conditions were characterized by visual-manual classification of the soils obtained from the hand auger in general accordance with ASTM D2488. The soil boring logs, designated as B1 to B6, are provided in the appendix of this report. The subsurface conditions within the drilled borings are characterized as follows:

B1: The surface cover consisted of approximately 2 inches of topsoil. Below the topsoil, the soil profile consisted of Firm, Light Brown, Sandy Silt man-made Fill. Below the man-made Fill, Residual soil consisting of Loose to Medium Dense, Micaceous, Silty SAND was encountered. The soil consistency ranged from 7 to 13 blows per increment (bpi). The test borings were terminated at 7 feet Below Ground Surface (BGS). No groundwater was encountered within the boring depths.

B2: The surface cover consisted of approximately 4 inches of topsoil. Below the topsoil, the soil profile consisted of Loose to Medium Dense, Light Brown, Silty Sand man-made Fill. Below the man-made Fill, Residual soil consisting of Loose to Medium Dense, Micaceous, Silty SAND was encountered. The soil

consistency ranged from 8 to 13 blows per increment (bpi). The test borings were terminated at 7 feet BGS. No groundwater was encountered within the boring depths.

B3: The surface cover consisted of approximately 5 inches of topsoil. Below the topsoil, the soil profile consisted of Stiff, Light Brown, Sandy Silt man-made Fill with hairline roots. Below the man-made Fill, Residual soil consisting of Loose to Medium Dense, Silty SAND with Manganese Oxide staining was encountered. The soil consistency ranged from 6 to 15+ blows per increment (bpi). The test borings were terminated at 7 feet BGS. No groundwater was encountered within the boring depths.

B4: The surface cover consisted of approximately 6 inches of topsoil. Below the topsoil, the soil profile consisted of Loose, Light Brown, Silty Sand man-made Fill. Below the man-made Fill, Residual soil consisting of Loose to Medium Dense, Silty SAND with Manganese Oxide staining was encountered. The soil consistency ranged from 6 to 14 blows per increment (bpi). The test borings were terminated at 7 feet BGS. No groundwater was encountered within the boring depths.

B5: The surface cover consisted of approximately 5 inches of topsoil. Below the topsoil, the soil profile consisted of Soft, Light Brown, Sandy Silt man-made Fill. Below the man-made Fill, Residual soil consisting of Loose to Medium Dense, Silty SAND Manganese Oxide staining was noted. The soil consistency ranged from 4 to 12 blows per increment (bpi). The test borings were terminated at 7 feet BGS. No groundwater was encountered within the boring depths.

B6: The surface cover consisted of approximately 2 inches of topsoil. Below the topsoil, the soil profile consisted of Firm to Stiff, Light Brown, Sandy Silt man-made Fill. Below the man-made Fill, Residual soil consisting of Medium Dense, Silty SAND with Manganese Oxide staining was encountered. The soil consistency ranged from 5 to 14 blows per increment (bpi). The test borings were terminated at 7 feet BGS. No groundwater was encountered within the boring depths.

Recommendations:

The following recommendations are based on the information furnished to us, the data obtained from the subsurface exploration, and our past experience with similar projects. They were prepared in general accordance with established and accepted professional geotechnical engineering practice in this region. Our recommendations are based on findings from the dates referenced within this report and do not reflect any variations that would likely exist at later dates or between the pre-designated borings or unexplored areas.

If information becomes available which may impact our recommendations, Matrix Engineering Group shall be afforded the opportunity to review this information and re-evaluate the recommendations contained within this report and make any alterations deemed necessary by a Georgia Registered professional engineer. This report is intended for the use of City of Brookhaven and its current design team. No other warranty is expressed or implied. Matrix Engineering Group, Inc. is not responsible for conclusions, opinions, or recommendations made by others based on this report.

Subgrade Preparation Recommendations

Subgrade preparation for the proposed building should be the stripping of vegetation, topsoil, removal of existing structures, concrete slab, grill, trash can, and/or all other deleterious matter, if encountered. Based on the test boring records, the site has some man-made fill ranging between approximately 2 feet to 4 feet. The soils encountered at the test borings appeared to be suitable soils for use in structural fill. However, inherent in the man-made fill, unsuitable soils may be encountered between the test borings or unexplored areas such as proposed sidewalk areas as well as areas near drainage features. Therefore, any material that is excavated and planned to be used as structural fill should be inspected by a geotechnical engineer to ensure its suitability. Refer to the Structural Fill Section in this report. **Any deleterious materials or buried debris, such as underground utility lines, septic tanks, or trash pits that may be encountered during the grading operation removed and replaced with suitable materials.**

After removal of the surface materials, the suitability of the exposed subgrade should be confirmed by proofrolling (as applicable), which will discern any localized soft zones in the subgrade.

The proof rolling test should be performed by a loaded tandem-wheeled dump truck with an approximate weight of 25 tons (if possible). Any material that deflects excessively or ruts under the loaded truck should be densified or removed and replaced with well-compacted material.

Similarly, the suitability of all other areas of the exposed subgrade needs to be confirmed by proofrolling at the time of construction, after any unsuitable or softened materials are removed. The proofrolling should be observed by the geotechnical engineer.

Foundations Recommendations:

Shallow foundations may be used to support the proposed development. The foundations should be situated in the existing residual soils or well compacted and properly tested soils and be designed for a maximum net allowable soil bearing pressure not to exceed **2,500 pounds per square foot (psf)**. **A subgrade modulus of 125 pci should be used for design of the concrete slab-on-grade construction.**

Groundwater was not encountered at any of the test borings; therefore, it is not anticipated to impact the construction or the proposed structure.

Structural Fill Recommendations

Staged, methodical and well-planned grading is key to avoiding unnecessary costs and time delays. Areas should not be stripped or disturbed if the grading contractor is unable to properly seal the subgrade prior to departure each day. Exposure of soils to moisture from direct rainfall or runoff usually renders these soils unusable for several days. This usually gets mischaracterized as an unsuitable soils condition which is inaccurate. Unsuitable soils are defined as those containing deleterious matter (such as organics, alluvium, debris and/or trash). Moisture related problems should be avoided by employing best management practices that involve maintaining positive drainage, installation of berms, diversion channels, and/or sealing the subgrade to avoid water infiltration. Other measures involve covering all stockpiled soils with heavy tarps or plastic to avoid saturating the soils in the event of rainfall. Means and methods of construction are certainly the contractor's jurisdiction; however, exposing otherwise suitable soils to excessive moisture or softening of existing subgrades as a result of unscrupulous construction traffic should be avoided and planned for.

We recommend that the following criteria be used for structural fill:

1. Adequate laboratory proctor density tests should be performed on representative samples of the proposed fill materials to provide data necessary for the quality control. The moisture content at the time of compaction should be within 3 percentage points of the optimum moisture content. In addition, we

recommend that the fill soils be free of organics and rock boulder/cobbles larger than 2 inches in nominal size and relatively non-plastic with plasticity indices less than 20.

2. Suitable fill material should be placed in thin lifts (lift thickness depends on type of equipment used, but generally lifts of 8 inches loose measurements are recommended). The soils should be compacted by mechanical means such as sheepsfoot rollers.
3. When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Materials generated by the benching operation should be moved sufficiently away from the bench area to allow the geotechnical engineer (testing agency) to properly inspect the area and ascertain that the benching is performed properly.
4. We recommend that the fill be compacted to a minimum of 95% of the Standard Proctor Maximum Dry Density (ASTM Specifications D 698). The top 12 inches should be compacted to a minimum of 98% of the Standard Proctor Test.
5. An experienced soil engineering inspector should take adequate density tests throughout the fill placement operation to ensure that the specified compaction is being achieved.

Construction Inspection and Testing

During construction, it is advisable that Matrix Engineering Group inspect the site preparation and construction work in order to ensure that our recommended procedures are followed. The placement of any compacted fill should be inspected and tested. The utilization of acceptable on-site borrow materials, as well as adequate off-site selected fill must be verified.

We understand that the construction will be governed by an IBC 2018 Special Inspections Schedule. Such a schedule should include at a minimum the following earthwork related items:

- Verify materials below shallow foundations are adequate to achieve the design bearing capacity.
- Verify excavations are extended to proper depths and have reached proper material.
- Perform classification and testing of controlled fill materials.
- Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.

- Prior to placement of controlled fill, observe subgrade and verify that the site has been properly prepared.

Matrix Engineering Group, Inc. appreciates the opportunity to have worked on this project and looks forward to our continued association. If you have any questions or need further assistance, please do not hesitate to call.

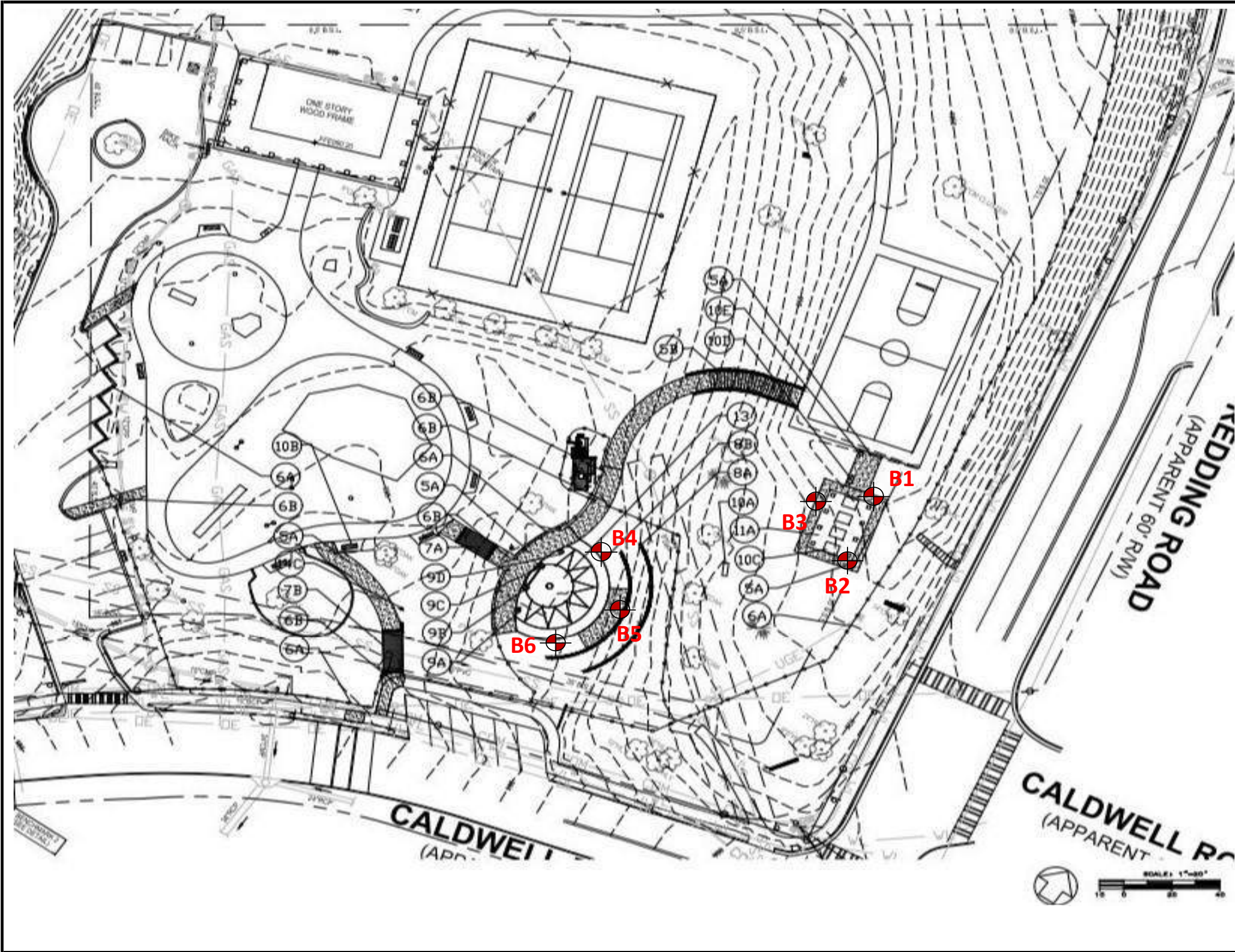
Ashraf Abukhalaf

Ashraf I. Abukhalaf, E.I.T.
Project Manager
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
Sam Alyateem

Sam Alyateem, PE
Senior Geotechnical Engineer
Principal
sam@matrixengineeringgroup.com



**Matrix
Engineering
Group, Inc.**

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TITLE	Approximate Test Boring Locations Plan
PROJECT	Ashford Park
PROJECT #	MEG 302350
CLIENT	City of Brookhaven
SCALE	Not to Scale
PREPARED BY	Ashraf Abukhalaf, EIT
REVIEWED BY	Sam Alyateem, PE
DATE	2/19/2020
FIGURE	1
LEGEND	 Approximate Boring Location

MAJOR DIVISIONS		SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS (More Than 1/2 of Soil > #200 Sieve)	GRAVELS (More Than 1/2 of Coarse Fraction > #4 Sieve)	GW	Well Graded Gravels or Gravel-Sand Mixtures; Little or no fines
		GP	Poorly Graded Gravels or Gravel-Sand Mixtures; Little or no fines
		GM	Silty Gravels, Gravel-Sand-Silt Mixtures
		GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS (MORE Than 1/2 of Coarse Fraction < #4 Sieve)	SW	Well Graded Sands or Gravelly Sands; Little or no fines
		SP	Poorly Graded Sands or Gravelly Sands; Little or no fines
		SM	Silty Sands, Sand-Silt Mixtures
FINE-GRAINED SOILS (More Than 1/2 of Soil < #200 Sieve)	SILTS & CLAYS Liquid Limit Less Than 50	SC	Clayey Sands, Sand-Clay Mixtures
		ML	Inorganic Silts and Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
		CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
	SILTS & CLAYS Liquid Limit Greater Than 50	OL	Organic Silts and Organic Silty Clays of Low Plasticity
		MH	Inorganic Silts, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silts
		CH	Inorganic Clays of High Plasticity, Fat Clays
HIGHLY ORGANIC SOILS	PT	OH	Organic Clays or Medium to High Plasticity, Organic Silty Clays, Organic Silts
		PT	Peat and Other Highly Organic Soils

CLASSIFICATION CHART

Relative Density of Cohesionless Soils from Standard Penetration Test	
Very Loose	≤ 4 bpf
Loose	5-10 bpf
Medium Dense	11-30 bpf
Dense	31-50 bpf
Very Dense	> 50 bpf
(bpf=blows per foot; ASTM D1586)	

Consistency of Cohesive Soils	
Very Soft	≤ 2 bpf
Soft	3-4 bpf
Firm	5-8 bpf
Stiff	9-15 bpf
Very Stiff	16-30 bpf
Hard	30-50 bpf
Very Hard	> 50 bpf

Relative Hardness of Rock	
Very Soft	Hard rock disintegrates or easily compresses to touch; can be hard to very hard soil
Soft	May be broken with fingers
Moderately Soft	May be scratched with a nail, corners and edges may be broken with fingers
Moderately Hard	Light Blow of hammer required to break samples
Hard	Hard blow of hammer required to break sample

Particle Size Identification	
Boulders	Larger than 12"
Cobbles	3"-12"
Gravel	
Coarse	3/4"-3"
Fine	4.76mm-3/4"
Sand	
Coarse	2.0-4.76 mm
Medium	0.42-2.00 mm
Fine	0.42-0.074 mm
Fines (Silt or Clay)	Smaller than 0.074 mm

Rock Continuity	
RECOVERY (%) = $\frac{\text{Total Length of Core}}{\text{Length of Core Run}} \times 100$	
Description	Core Recovery (%)
Incompetent	Less than 40
Competent	40-70
Fairly Continuous	71-90
Continuous	91-100

Relative Quality of Rocks	
RQD (%) = $\frac{\text{Total core, counting only pieces >4" long}}{\text{Length of Core Run}} \times 100$	
Description	RQD (%)
Very Poor	0-25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	90-100



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Correlation of Penetration Resistance with Relative Density and Consistency Sheet and Soil Classification Chart



DRILL HOLE LOG

BORING NO. B1

PROJECT: Ashford Park Pavilion and Splashpad PROJECT NO.: MEG 302350
 CLIENT: City of Brookhaven DATE: 02/12/2020
 LOCATION: Proposed Pavilion ELEVATION: 999 Feet MSL
 DRILLER: Matrix Engineering Group LOGGED BY: Ashraf Abukhalaf
 DRILLING METHOD: Hand-Auger STATION: _____
 DEPTH TO - WATER> INITIAL: ∅ After 48+ Hours: ∅ CAVING> C

File: Ashford Park Boring Logs Date Printed: 2/19/2020

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS	STP 399
	0						
	0.5	Approximately 2 inches of Topsoil. FILL - Firm, Light Brown, Sandy Silt.	FILL				7
998	1						
	1.5						
	2						
	2.5	Residual - Loose, Light Brown, Micaceous, Silty Sand.	SM				8
996	3	Becomes Medium Dense.					
	3.5						13
	4						
	4.5						
994	5						
	5.5						14
	6						
	6.5						
992	7						13
	7.5	Boring was terminated at 7 ft BGS.					
	8						
	8.5						
990	9						
	9.5						
	10						
	10.5						
988	11						
	11.5						
	12						
	12.5						
986	13						

No groundwater was encountered within the augered depth at the time of augering. Boring was backfilled with soil cuttings from the boring.



DRILL HOLE LOG

BORING NO. B2

PROJECT: Ashford Park Pavilion and Splashpad PROJECT NO.: MEG 302350
 CLIENT: City of Brookhaven DATE: 02/12/2020
 LOCATION: Proposed Pavilion ELEVATION: 997 Feet MSL
 DRILLER: Matrix Engineering Group LOGGED BY: Ashraf Abukhalaf
 DRILLING METHOD: Hand-Auger STATION: _____
 DEPTH TO - WATER> INITIAL: ∅ After 48+ Hours: ∅ CAVING> C

File: Ashford Park Boring Logs Date Printed: 2/19/2020

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS	STP 399
	0	Approximately 4 inches of Topsoil.					
	0.5	FILL - Loose, Light Brown, Silty Sand.	FILL				8
996	1						
	1.5						
	2	Becomes Medium Dense.					13
	2.5						
994	3						
	3.5	Residual - Medium Dense, Light Brown, Micaceous, Silty Sand, with trace amounts of MnO Stainings. Contained Mica rock pieces.	SM				9
	4						
	4.5						
992	5						
	5.5						
	6						11
	6.5						
990	7						10
	7.5	Boring was terminated at 7 ft BGS.					
	8						
	8.5						
988	9						
	9.5						
	10						
	10.5						
986	11						
	11.5						
	12						
	12.5						
984	13						

No groundwater was encountered within the augered depth at the time of augering. Boring was backfilled with soil cuttings from the boring.



DRILL HOLE LOG

BORING NO. B3

PROJECT: Ashford Park Pavilion and Splashpad PROJECT NO.: MEG 302350
 CLIENT: City of Brookhaven DATE: 02/12/2020
 LOCATION: Proposed Pavilion ELEVATION: 997 Feet MSL
 DRILLER: Matrix Engineering Group LOGGED BY: Ashraf Abukhalaf
 DRILLING METHOD: Hand-Auger STATION: _____
 DEPTH TO - WATER> INITIAL: ∅ After 48+ Hours: ∅ CAVING> C

File: Ashford Park Boring Logs Date Printed: 2/19/2020

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS	STP 399
	0						
	0.5	Approximately 5 inches of Topsoil.					
996	1	FILL - Stiff, Light Brown, Sandy Silt, with some hairline roots.	FILL				10
	1.5						
	2						
	2.5	Residual - Loose, Light Brown, Silty Sand.	SM				6
994	3						
	3.5	Becomes Medium Dense.					13
	4						
	4.5						
992	5						
	5.5						15+
	6						
	6.5	Contained MnO Staining.					
990	7	Boring was terminated at 7 ft BGS.					15+
	7.5						
	8						
	8.5						
988	9						
	9.5						
	10						
	10.5						
986	11						
	11.5						
	12						
	12.5						
984	13						

No groundwater was encountered within the augered depth at the time of augering. Boring was backfilled with soil cuttings from the boring.



DRILL HOLE LOG

BORING NO. B4

PROJECT: Ashford Park Pavilion and Splashpad PROJECT NO.: MEG 302350
 CLIENT: City of Brookhaven DATE: 02/12/2020
 LOCATION: Proposed Splash Pad ELEVATION: 986 Feet MSL
 DRILLER: Matrix Engineering Group LOGGED BY: Ashraf Abukhalaf
 DRILLING METHOD: Hand-Auger STATION: _____
 DEPTH TO - WATER> INITIAL: ∞ After 48+ Hours: ∞ CAVING> C

File: Ashford Park Boring Logs Date Printed: 2/19/2020

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS					STP 399
						Natural Moisture Content (%). ▲ Penetration - ●					
986	0					10	20	30	40	50	
	0.5	Approximately 6 inches of Topsoil.									
	1	FILL - Loose, Light Brown, Silty Sand, with black specs.	FILL								6
	1.5										
984	2	Loose, Light Brown, Silty Sand, with black stains.									8
	2.5	Loose, Light Brown, Silty Sand.									
	3										
	3.5	Residual - Yellowish Orange, Silty Sand.	SM								9
982	4	Changes to Yellowish Gray.									
	4.5										
	5										
	5.5										14
980	6	Contains MnO Staining.									
	6.5										
	7										9
	7.5	Becomes Loose. Boring was terminated at 7 ft BGS.									
978	8										
	8.5										
	9										
	9.5										
976	10										
	10.5										
	11										
	11.5										
974	12										
	12.5										
	13										

No groundwater was encountered within the augered depth at the time of augering. Boring was backfilled with soil cuttings from the boring.



DRILL HOLE LOG

BORING NO. B5

PROJECT: Ashford Park Pavilion and Splashpad PROJECT NO.: MEG 302350
 CLIENT: City of Brookhaven DATE: 02/12/2020
 LOCATION: Proposed Splash Pad ELEVATION: 986 Feet MSL
 DRILLER: Matrix Engineering Group LOGGED BY: Ashraf Abukhalaf
 DRILLING METHOD: Hand-Auger STATION: _____
 DEPTH TO - WATER> INITIAL: ∅ After 48+ Hours: ∅ CAVING> C

File: Ashford Park Boring Logs Date Printed: 2/19/2020

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS		STP 399
						Natural Moisture Content (%) ▲	Penetration - ●	
986	0							
	0.5	Approximately 5 inches of Topsoil.						
	1	FILL - Soft, Light Brown, Sandy Silt.	FILL					4
	1.5							
984	2							6
	2.5							
	3	Residual - Loose, Yellowish Orange, Silty Sand, with Mno Stainings.	SM					9
	3.5							
982	4							
	4.5							
	5							
	5.5							9
980	6							
	6.5							
	7							
	7.5	Becomes Medium Dense. Boring was terminated at 7 ft BGS.						12
978	8							
	8.5							
	9							
	9.5							
976	10							
	10.5							
	11							
	11.5							
974	12							
	12.5							
	13							

No groundwater was encountered within the augered depth at the time of augering. Boring was backfilled with soil cuttings from the boring.



DRILL HOLE LOG

BORING NO. B6

PROJECT: Ashford Park Pavilion and Splashpad PROJECT NO.: MEG 302350
 CLIENT: City of Brookhaven DATE: 02/12/2020
 LOCATION: Proposed Splash Pad ELEVATION: 986 Feet MSL
 DRILLER: Matrix Engineering Group LOGGED BY: Ashraf Abukhalaf
 DRILLING METHOD: Hand-Auger STATION: _____
 DEPTH TO - WATER> INITIAL: ∞ After 48+ Hours: ∞ CAVING> C

File: Ashford Park Boring Logs Date Printed: 2/19/2020

This information pertains only to this boring and should not be interpreted as being indicative of the site.

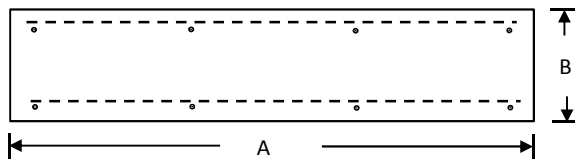
ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS		STP 399
						Natural Moisture Content (%) ▲	Penetration - ●	
986	0							
	0.5	Approximately 2 inches of Topsoil.	FILL					5
	1	FILL - Firm, Light Brown, Sandy Silt.						
	1.5							
984	2	Becomes Stiff.						
	2.5		SM					11
	3							
	3.5							
982	4	Residual - Medium Dense, Light Brown, Silty Sand, with MnO stainings.						
	4.5							
	5		Boring was terminated at 7 ft BGS.					14
	5.5							
980	6							
	6.5							
	7							11
	7.5							
978	8							
	8.5							
	9							
	9.5							
976	10							
	10.5							
	11							
	11.5							
974	12							
	12.5							
	13							

No groundwater was encountered within the augered depth at the time of augering. Boring was backfilled with soil cuttings from the boring.

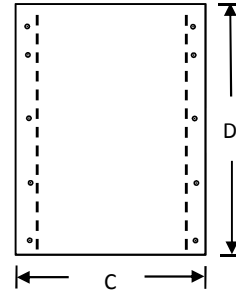
Maximum Design Loads¹

Loading	Dead Load	Snow Load	Wind Load	Seismic Design Category
Region 1	Any Roof Type	45 PSF	100 MPH	A, B, C
Region 2	Any Roof Type	20 PSF	120 MPH	A, B, C, D

Foundation Type



Square Footing



Drilled Pier

Foundation Dimensions^{2,3,4,5,6}

Foundation Type	Square Footing		Drilled Pier	
	Width 'A' (ft)	Thickness 'B' (ft)	Diameter 'C' (ft)	Depth 'D' (ft)
Building Area ^{7,8} (ft ²)	0-300	2.0	2.0	2.0
	300-600	2.5	2.0	3.0
	600-900	3.0	2.0	3.0
	900-1200	3.5	2.0	3.0
	1200+	Contact Poligon		

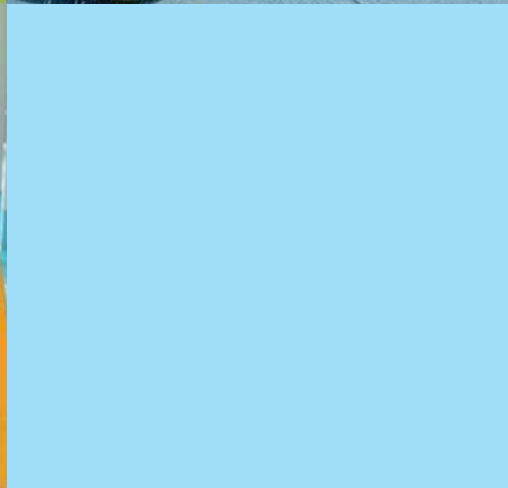
Reinforcing Requirements^{9,10,11}

Foundation Type	Square Footing		Drilled Pier	
	Width 'A' (ft)	Horz. Reinforcing	Diameter 'C' (ft)	Vert. Reinforcing
Foundation Dimensions Reinforcing	2.0	3 - #5	2.0	6 - #6
	2.5	3 - #5	2.5	8 - #6
	3.0	6 - #5	3.0	9 - #7
	3.5	6 - #5		

Notes

- Any combination of dead load, ground snow, wind loads and seismic design category up to maximum shown.
- Sizes are for estimating purposes only.**
- Contractor is to verify any frost depth requirements with a local governing body.
- All concrete is normal weight concrete with a compressive strength of 3,000 psi.
- All foundation sizes are based on an assumed 1,500 psf bearing capacity.
- Estimated foundation sizes do not apply to fixed base structures (ex. Sun Shelters, Portals, Single Trees, etc).
- Building area for 4-sided structures is calculated based on overall size (eg. REK24X34 = 24*34 = 816 ft²).
- Building area for 6- and 8-sided structures where W (ft) is the overall size (eg. HXE40 = $0.65 * 40^2 = 1,040$ ft²):
6-Sided= $0.65 * W^2$ 8-Sided= $0.70 * W^2$
- All reinforcement is ASTM A615 Grade 60.
- Reinforcement identified for the square footings is required top and bottom, each way, and equally spaced.
- Horizontal reinforcement for the drilled piers is #4 ties at 12" on center with (2) in the top 5".

*Ashford
Splash Pad
2019-3820*



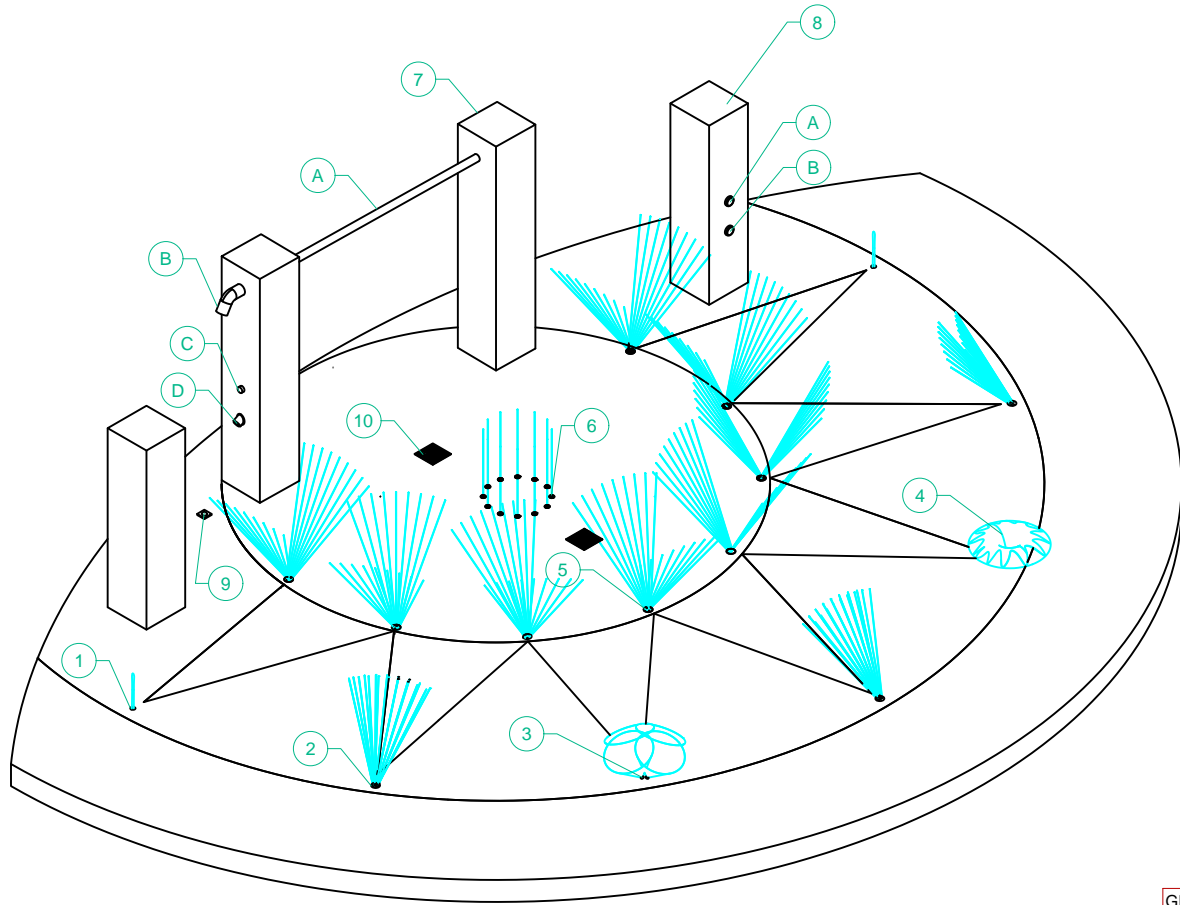
WATER SPLASH

102 West service Rd,
Suite 412
Champlain, NY 12919

2200 46th Avenue
Lachine Quebec H8T 2P3



Ashford Splash Pad - Brookhaven



SPRAY AREA: 1270 SQFT
 TOTAL AREA: 1646 SQFT

PARTS LIST

ITEM NO	ITEM CODE	DESCRIPTION	QTY
1	S-05.03	JUMPING JET	2
2	S-05.11	AQUA PEACOCK	3
3	S-05.07	AQUA MIST	1
4	S-99.21	AQUA CONE	1
5	S-05.06.04	AQUA SPLIT III	8
6	S-05.03	CIRCULAR SHOWER	1
7	A	AQUA WALL CURTAIN	1
	B	SHOWER	1
	C	PUSH BOTTON SHOWER VALVE	1
	D	WATER SPIGOT	1
8	A	ACTIVATOR CURTAIN	1
	B	ACTIVATOR SPLASH PAD	1
9	-	DRAIN TO SEWER	1
10	S-16.06	DRAIN BOX -24"X24"	2
-	VAULT	VAULT	1

GENERAL SPLASH PAD PLAN

PROJECT NAME Ashford Splash Pad	DRAWN BY/ DATE G.YAYMAN 13.04.2020	
	PROJECT NR. 2019-3820	REV B

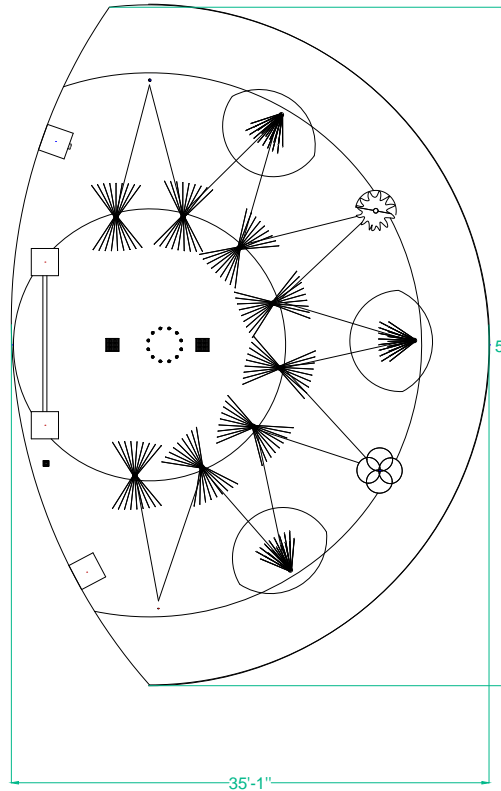
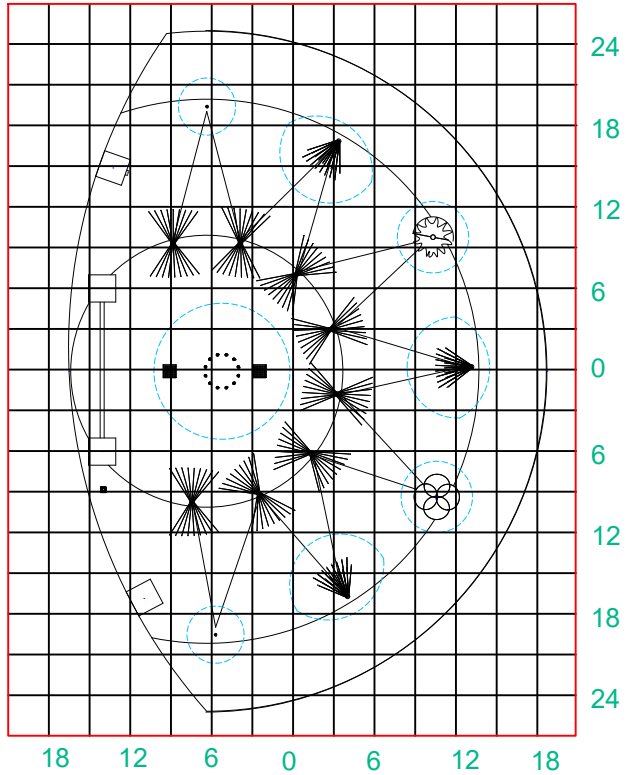


WATER SPLASH INC.

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UNIT
 FT
 SHEET
 1

GRID DIMENSION 3'X3'

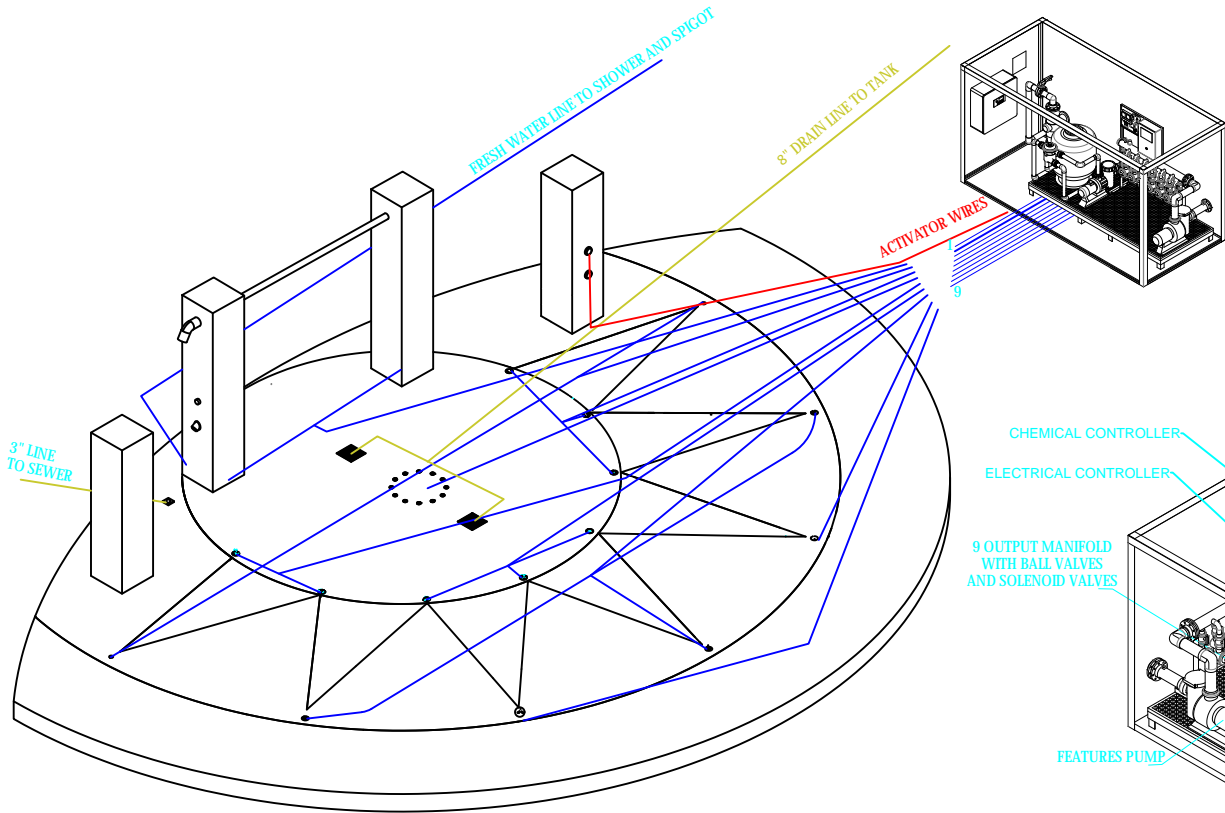


PARTS LIST					
ITEM NO	ITEM CODE	DESCRIPTION	QTY	GPM	TOTAL GPM
1	S-05.03	JUMPING JET	2	4	8
2	S-05.11	AQUA PEACOCK	3	15	45
3	S-05.07	AQUA MIST	1	9	9
4	S-99.21	AQUA CONE	1	10	10
5	S-05.06.04	AQUA SPLIT III	8	14	112
6	S-05.03	CIRCULAR SHOWER	1	12	12
7	A	AQUA WALL CURTAIN	1	48	48
	B	SHOWER	1	10	10
	C	PUSH BOTTON SHOWER VALVE	1	-	-
	D	WATER SPIGOT	1	10	10
8	A	ACTIVATOR CURTAIN	1	-	-
	B	ACTIVATOR SPLASH PAD	1	-	-
9	-	DRAIN TO SEWER	1	-	-
10	S-16.06	DRAIN BOX 24"X24"	2	-	-
-	VAULT	VAULT	1	-	-
TOTAL			26		264

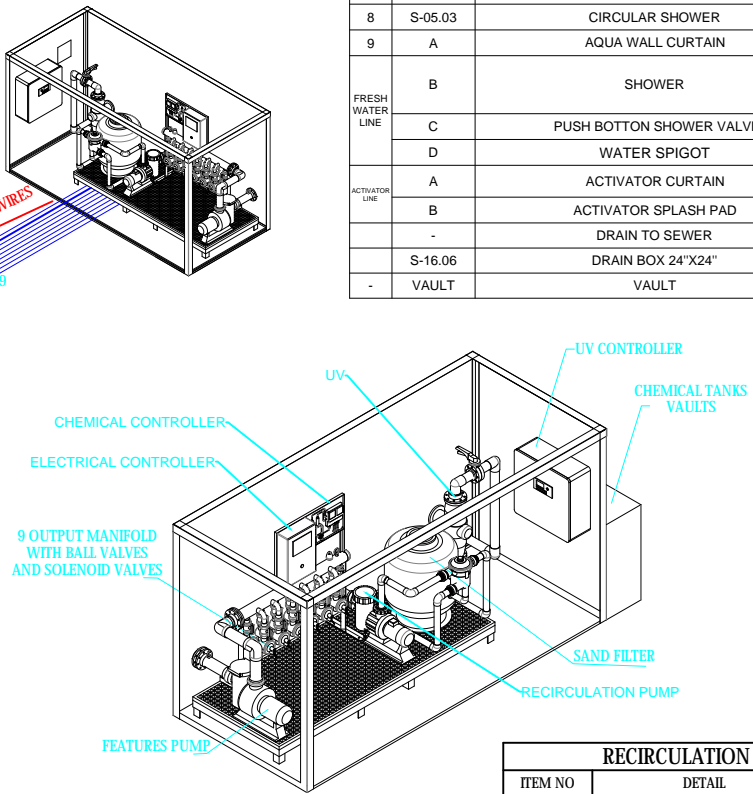
GENERAL LAYOUT

PROJECT NAME	DRAWN BY/ DATE	
	G.YAYMAN	13.04.2020
Ashford Splash Pad	PROJECT NR.	REV
	2019-3820	B

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	FT
	SHEET 2



PARTS LIST				
LINE NO	ITEM CODE	DESCRIPTION	QTY	LINE TYPE
1	S-05.03	JUMPING JET	2	1 1/2"
2	S-05.11	AQUA PEACOCK	3	1 1/2"
3	S-05.07	AQUA MIST	1	1 1/2"
4	S-99.21	AQUA CONE	1	1 1/2"
5-6-7	S-05.06.04	AQUA SPLIT III	8	1 1/2"
8	S-05.03	CIRCULAR SHOWER	1	1 1/2"
9	A	AQUA WALL CURTAIN	1	1 1/2"
FRESH WATER LINE	B	SHOWER	1	3/4"
	C	PUSH BOTTON SHOWER VALVE		
	D	WATER SPIGOT	1	3/4"
ACTIVATOR LINE	A	ACTIVATOR CURTAIN	1	3/4"
	B	ACTIVATOR SPLASH PAD	1	3/4"
	-	DRAIN TO SEWER	1	3"
	S-16.06	DRAIN BOX 24"X24"	2	8"
	-	VAULT	1	-

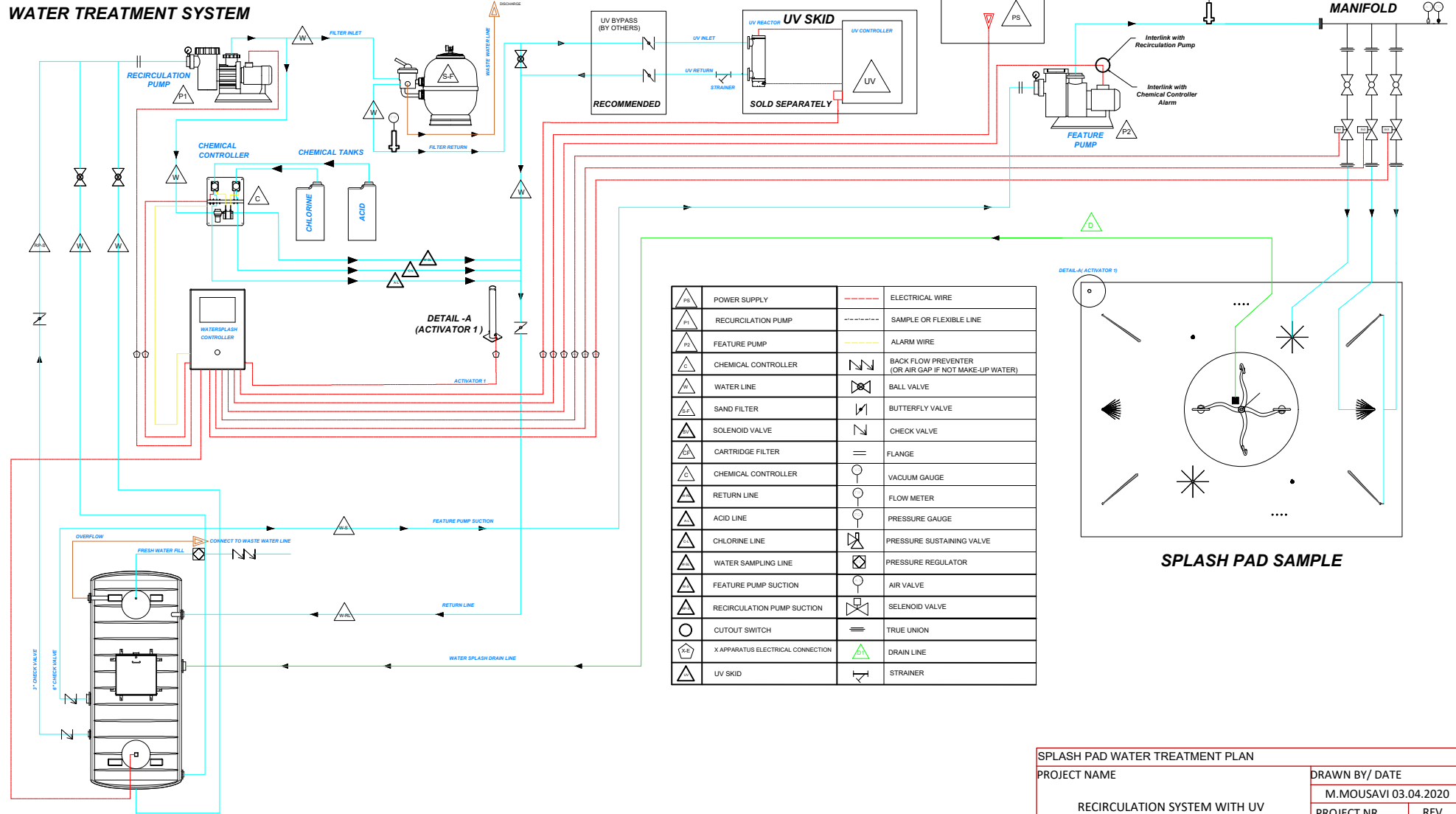


RECIRCULATION SYSTEM		
ITEM NO	DETAIL	INPUT
1	POWER SOURCE	208 V
2	FRESH WATER INLET TANK	1"
3	ELECTRIC LINE	3 PHASE
4	Amp	30

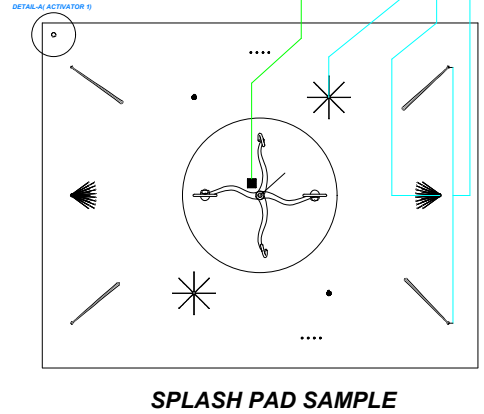
PROJECT NAME Ashford Splash Pad	DRAWN BY/ DATE G.YAYMAN 13.04.2020	
	PROJECT NR. 2019-3820	REV B
WATER SPLASH INC.	UNIT	
	FT	
	SHEET 3	

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WATER TREATMENT SYSTEM



PS	POWER SUPPLY	---	ELECTRICAL WIRE
P1	RECIRCULATION PUMP	----	SAMPLE OR FLEXIBLE LINE
P2	FEATURE PUMP	----	ALARM WIRE
C	CHEMICAL CONTROLLER	⌋	BACK FLOW PREVENTER (OR AIR GAP IF NOT MAKE-UP WATER)
△	WATER LINE	⊘	BALL VALVE
△	SAND FILTER	⌋	BUTTERFLY VALVE
△	SOLENOID VALVE	⌋	CHECK VALVE
△	CARTRIDGE FILTER	⌋	FLANGE
△	CHEMICAL CONTROLLER	⊘	VACUUM GAUGE
△	RETURN LINE	⊘	FLOW METER
△	ACID LINE	⊘	PRESSURE GAUGE
△	CHLORINE LINE	⊘	PRESSURE SUSTAINING VALVE
△	WATER SAMPLING LINE	⊘	PRESSURE REGULATOR
△	FEATURE PUMP SUCTION	⊘	AIR VALVE
△	RECIRCULATION PUMP SUCTION	⊘	SOLENOID VALVE
○	CUTOUT SWITCH	⌋	TRUE UNION
X	APPARATUS ELECTRICAL CONNECTION	△	DRAIN LINE
△	UV SKID	⌋	STRAINER



SPLASH PAD WATER TREATMENT PLAN

PROJECT NAME: RECIRCULATION SYSTEM WITH UV

DRAWN BY/ DATE: M.MOUSAVI 03.04.2020

PROJECT NR.: 0.1

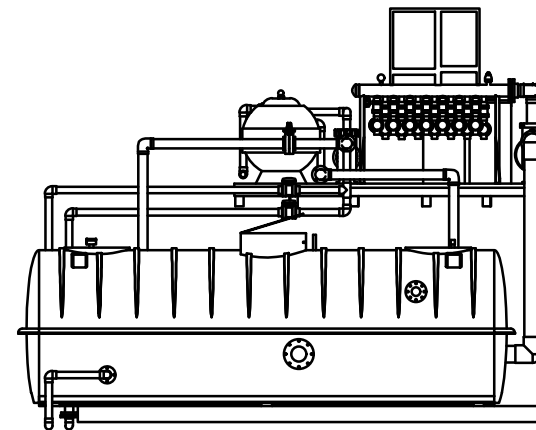
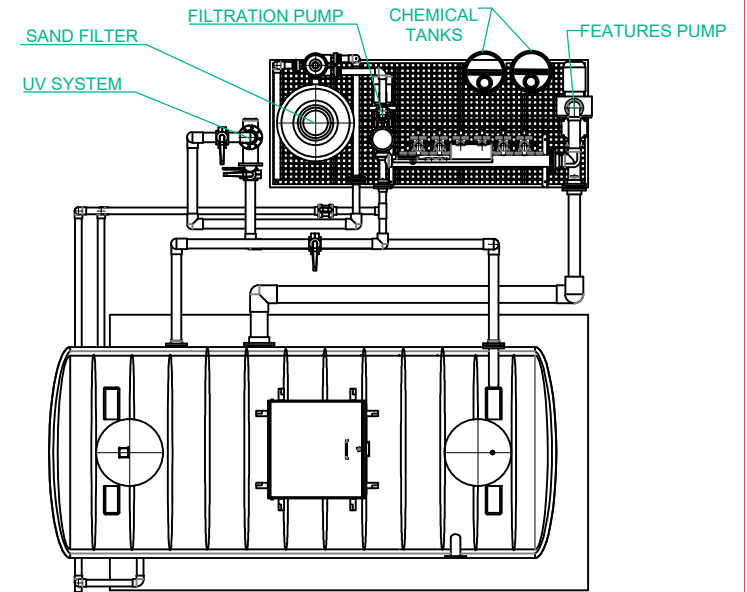
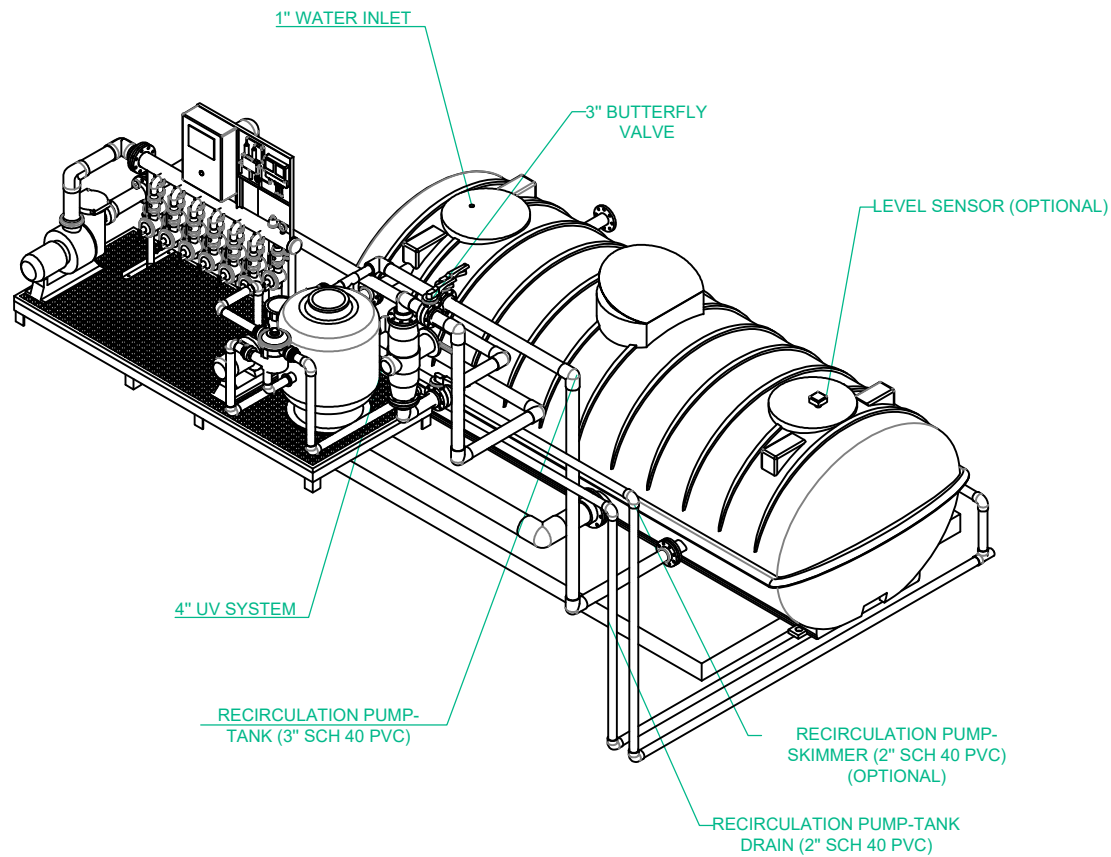
REV: 0.1

UNIT: FT

SHEET: 4

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PROJECT NAME		DRAWN BY/ DATE	
RECIRCULATION SKID WITH UV		A.JAMIL	06.04.2020
PROJECT NR.	REV		
	0.1		
	UNIT		
	FT		
	SHEET		
	5		



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WATER SPLASH



S-05.03 CIRCULAR SHOWER

WATER SPLASH

STRUCTURE

The structure is constructed with 304L/316 grade stainless steel tubing without any pinch point and sharp edges. Tubing is to include stainless steel housing for spray nozzles.

SPRAY DESIGN

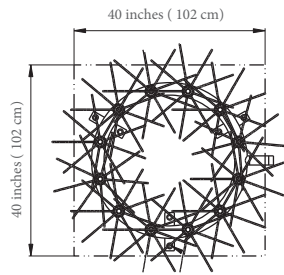
Nozzles are CNC machined from non-corrosive brass material and are recessed to eliminate any possible pinch points.

HARDWARE

Assembly process to use non corrosive stainless hardware exclusively to avoid corrosion related problems.

ANCHORING SYSTEM

Water Splash shall supply easy installation templates and anchor bolts/hardware set. Please see attached technical diagrams for more details.



Spray zone : 120 inches(305 cm)

Specifications Material: Stainless Steel

Water Pressure : 4-8 psi /0,4 bar Water

Consumption: 10-12 gpm/37-45 lpm



WATER SPLASH



S-99.21 AQUA CONE

WATER SPLASH

STRUCTURE

The structure is constructed with 304L/316 grade stainless steel tubing without any pinch point and sharp edges. Tubing is to include stainless steel housing for spray nozzles.

NOZZLES

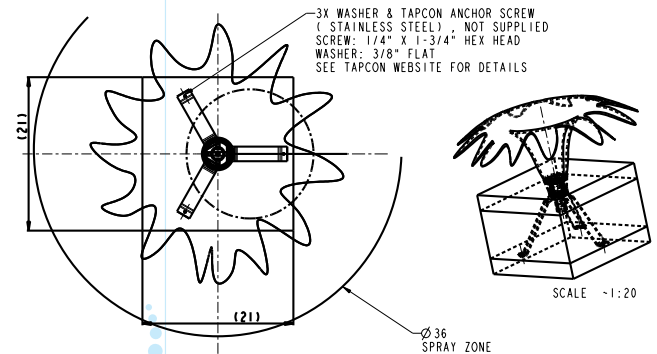
All nozzles are CNC machined from high quality brass and sit recessed in the stainless steel housings to avoid any pinch points.

HARDWARE

Assembly process to use non corrosive stainless hardware exclusively to avoid corrosion related problems.

COATING / GRAPHIC DESIGN

NA



Water consumption: 6-10 gpm /23-37 lpm

Water pressure: 4-8 psi / 0.5 bar



WATER SPLASH



S-05.11 AQUA PEACOCK

WATER SPLASH

STRUCTURE

The structure is constructed with 304L/316 grade stainless steel tubing without any pinch point and sharp edges. Tubing is to include stainless steel housing for spray nozzles.

NOZZLES

All nozzles are CNC machined from high quality brass and sit recessed in the stainless steel housings to avoid any pinch points.

HARDWARE

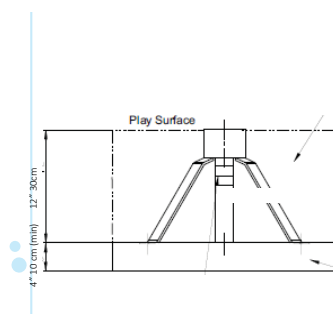
Assembly process to use non corrosive stainless hardware exclusively to avoid corrosion related problems.

COATING / GRAPHIC DESIGN

NA

ANCHORING SYSTEM

Water Splash shall supply easy installation templates and anchor bolts/hardware set. Please see attached technical diagrams for more details.



Water consumption: 15-48 gpm /40-180 lpm
Water pressure: 4-8 psi / 0.5 bar

WATER SPLASH



S-05.10 JUMPING JET

WATER SPLASH

STRUCTURE

The structure is constructed with 304L/316 grade stainless steel tubing without any pinch point and sharp edges. Tubing is to include stainless steel housing for spray nozzles.

NOZZLES

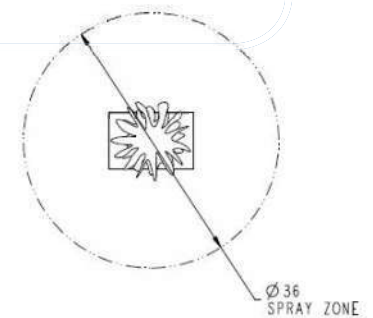
All nozzles are CNC machined from high quality brass and sit recessed in the stainless steel housings to avoid any pinch points.

HARDWARE

Assembly process to use non corrosive stainless hardware exclusively to avoid corrosion related problems.

COATING / GRAPHIC DESIGN

NA



Water consumption: 5-7 gpm
Water pressure: 4-8 psi / 0.5 bar



S-16.01 Drain Box

STRUCTURE

The outer casing is constructed with non corrosive, commercial durable fiberglass

TOUCH PAD

NA

HARDWARE

Assembly process to use non corrosive stainless steel hardware exclusively to avoid corrosion related problems.

COATING / GRAPHIC DESIGN

The structure is to be supplied finished with weather resistant, UV protective fiberglass coating.

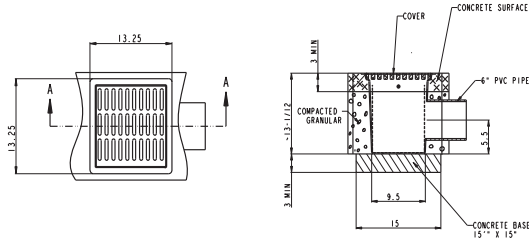
ANCHORING SYSTEM

Secured to base concrete using stainless steel screw set.

MECHANISM

NA COATING COLOR

CHART:



● Yellow	● Pink	● Blue
● Melon	● Lilac	● Night blue
● Orange	● Green	● Light brown
● Red	● Ocean green	● Brown
● Raspberry	● Dark green	● White

2

BODY: Non Corrosive, commercial Fiberglass

GRATE: (HDPE)High Density Polypropylene

Grate with UV inhibitor. Open surface area 231.69 square inches. ADA Compliant

Grate: Class B

24"

24"

A

A

COVER

CONCRETE SURFACE

3 MIN

SAND OVER PIPE

8" PVC PIPE

6.3

~13-1/12

COMPACTED GRANULAR

8 MIN

16.6

23

CONCRETE BASE
24" X 24"

SECTION A-A

GRATE COLOR SELECTION:

GREEN

BLACK

WATER SPLASH

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DATE

2010.01.21

DESCRIPTION

DRAIN BOX
INSTALLATION

UNIT

INCH

SHEET

1/1

DRAWING NO

W060404-00-XX

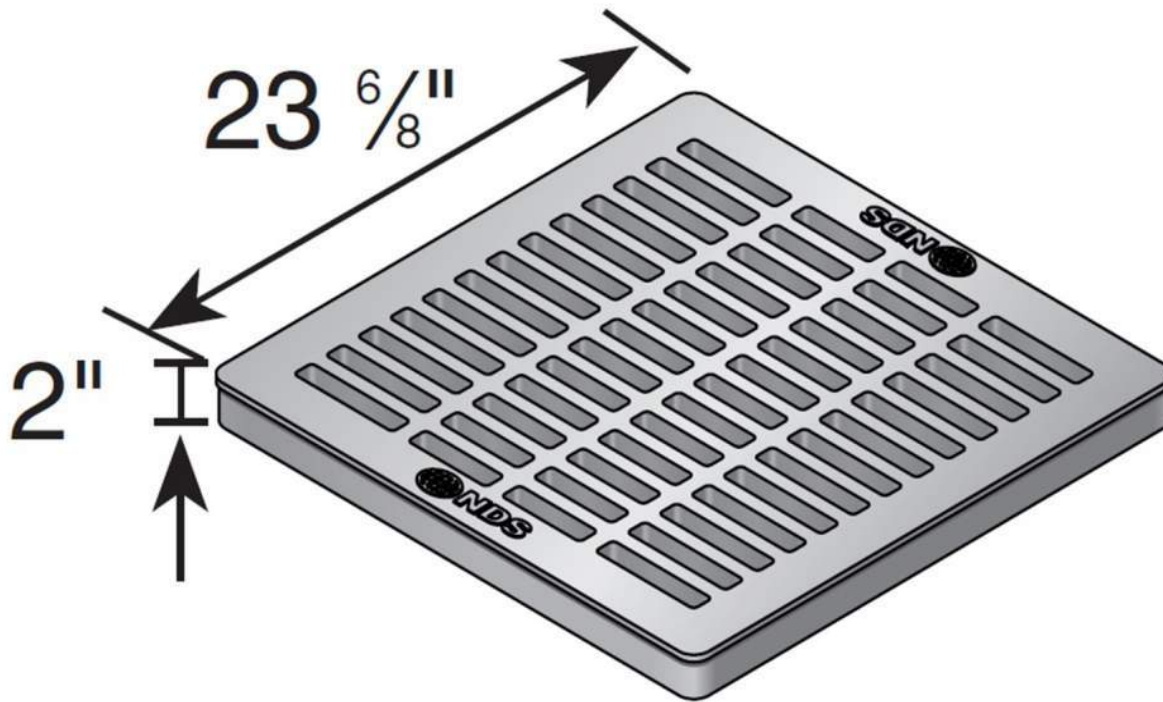
REV

A

2

1

24" x 24" Square Grate



7/8" Grate Opening

Part #: 2411, 2412
Material: (HDPE) High Density Polypropylene
Color: #2411(Black) and #2412 (Green)
Fits: Catch Basin #2400, #2404, and #2418.
Grate Opening: 7/8"
Open Surface Area: 231.69 Sq. Inches
Head Pressure / Flow Rate:
Head (inches) - Max Flow
1"= 1002.35 GPM
1/2" = 708.77 GPM
Weight Per Each: 19.81 lbs.
UV inhibitor.

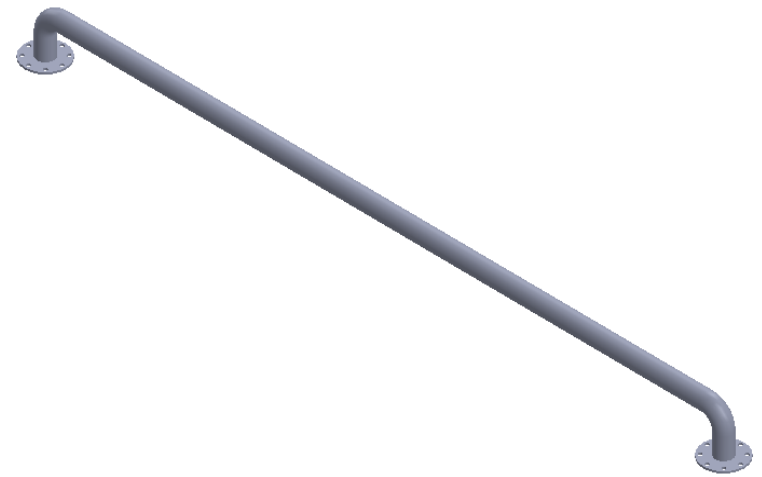
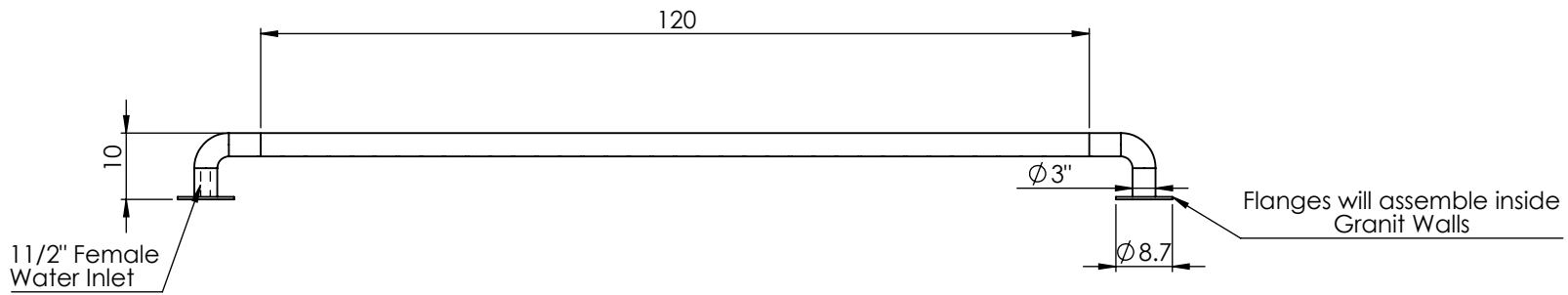
Load Recommendation Guide



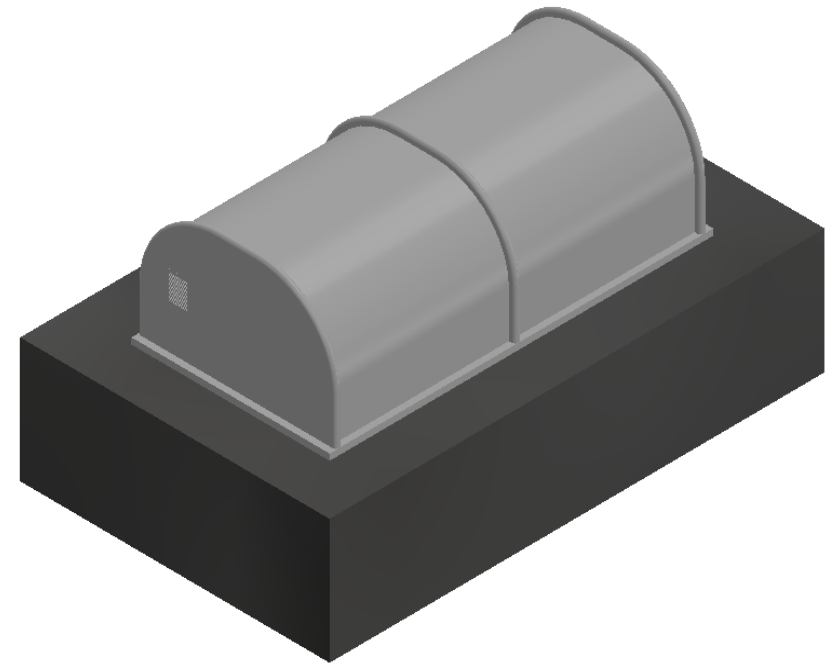
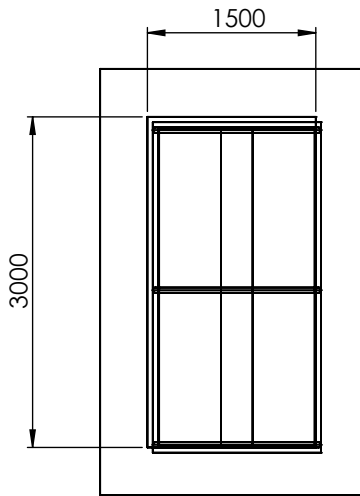
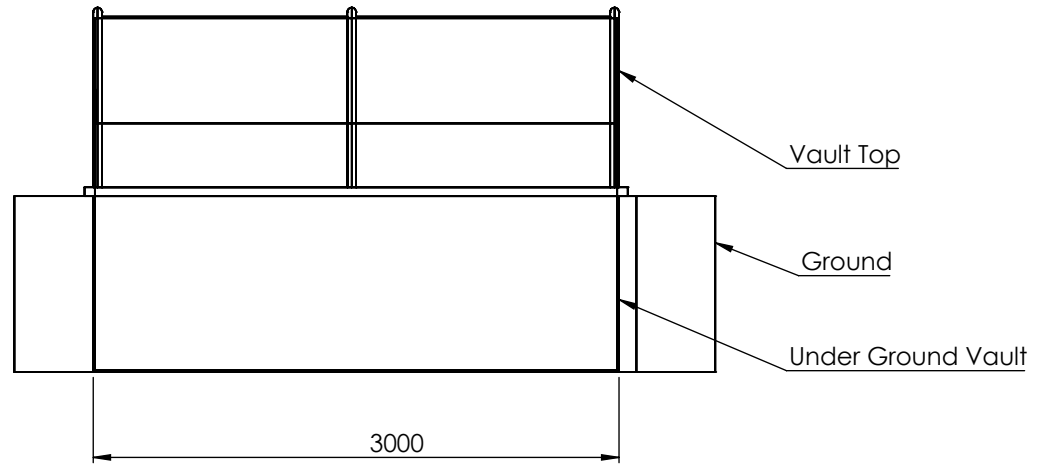
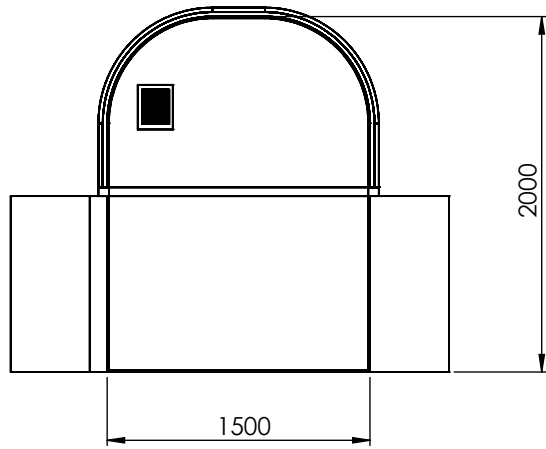
Class B

- Loads of 61-175 psi.
- Recommended for medium-duty pneumatic tire traffic, autos and light trucks at speeds less than 20 m.p.h.





Drawn By A.Jamil	DESCRIPTION: Aqua Wall Curtain	Rev	DATE 05.05.2019	SCALE 1:20	 WATER SPLASH <small>THIS DRAWING IS A PROPERTY OF WATER SPLASH INC. AND IS NOT TO BE REPRODUCED BY ANY MEANS OR USED TO FURNISH INFORMATION TO OTHERS WITHOUT THE EXPLICIT CONSET OF WATER SPLASH</small>
Edited By	DRAWING NO:		UNITE Inch	SHEET	



Drawn By
A.Jamil

DESCRIPTION:
Vault

Rev DATE
06.09.2018

SCALE

Edited By

DRAWING NO:

UNITE
mm

SHEET



WATER SPLASH

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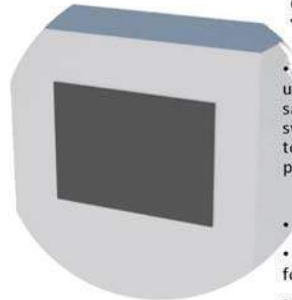
SYSTEM (RE-USE/RECIRCULATION) SPECIFICATION



WATER RE-CAPTURE/RE-USE SYSTEM

• Splash park with Water Re-Capture system, re-uses water utilized at splash park by filtration and sanitizing constantly. This system is similar to swimming pool water sanitization system. Engineered to meet state / provincial health codes for swimming pool/splash parks.

- PARTS INCLUDED
- Tank Size: 2500-4000 Gallons with 1" float valve for Fresh water intake.
- WATER SPLASH Controller
- Water Splash Stainless Steel Manifold
- Factory assembled and tested pump/sand filter/chemical controller kit
- UV System



WATER SPLASH



SPLASH PARK MANIFOLD
- STAINLESS STEEL -

••• WATER SPLASH

STRUCTURE

Manifold housing is consist of commercial grade, non corrosive, 304/304L grade 3-1/2" OD stainless steel tubing. Housing shall have a 3" FNPT tread.

MANIFOLD LINE

Manifold lines are assembled using commercial grade, SCH 80 PVC piping and pipe fittings. Each manifold line consist of :

- One double union ball valve
- One solenoid valve / Rain Bird
- Winterization Valve Connection

(3/4" double union ball valve)

W.H. ARRESTER /Pressure Gauge

Housing shall have a 1" FNPT connection for water hammer arrester ((potable water installation) and 3/4" MNPT for pressure gauge.

ANCHORING SYSTEM

Manifold shall be installed inground or above ground housing in Water Splash facility after functionality test at 100 PSI.

INSTALLATION:

- Inground Vault
 - Above Ground Vault
 - Install by others in pump room
- Product Video File, Scan or Click: NA

Water consumption: NA

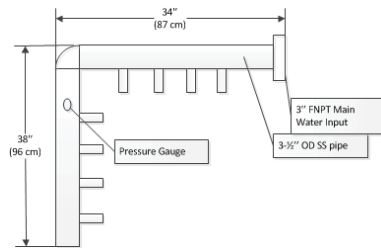
Water pressure: NA



Manifold Housing and Water Hammer Arrester



Pressure Gauge



WATER SPLASH



WATER WISE CONTROLLER

••• WATER SPLASH

ENCLOSURE

Commercial, industrial non metallic NEMA 4X enclosure houses components for splash park water wise controller.

CONTROL UNIT

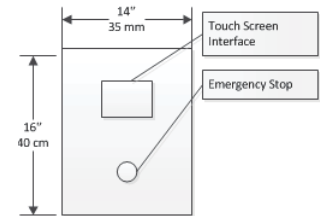
Water Wise controller has a center PLC unit controlling each manifold line. Large touch industrial touch screen interface allows users to set desired programming settings for splash park.

Controller is user programmable and following functions can be programmed:

- Current day and time
- Working hours / or always on
- Activate products via activator or always on
- Spray time
- Up to five spray play sequence
- Product selection per each sequence.
- Wind Speed effect (optional)
- Low water temperature on/off (optional)
- Battery back up



WS-120 VAC, 50HZ 10A
240 VAC, 60HZ 5A
Hardwired to main power source.
UL



**RECIRCULATION SYSTEM
BY
WATER SPLASH
(Automated)**

Water Recirculation System by Water Splash is pre-assembled and factory tested system, mounted on aluminum skid.

System components include:

- Sand Filter / Hayward HCF Series
- Hayward high performance pump HCP55 (features) (5.5 HP 230VAC 3 phase),
- Tristar high performance pump (recirculation) (1.5 HP 230VAC 1 phase),
- Water Splash Controller,
- Water Splash motor starter box,
- Aluminum skid
- Chemical Controller, Hayward CAT-2000
- Chemical tanks (chlorine tank / pool chlorine, acid tank /exp: muriadic acid)
- Peristaltic pump (2 each) for automated chemical feeding,
- Flow meter, 0-200 gpm, clear PVC
- Piping : PVC, Sch 80 fittings and SCH 40 piping is used for connections.

Chemical System Details:

CAT-2000 chemical controller is base for our recirculation side of our system. There are two sensors verifying free chlorine level and ph level of stored water. Chemical controller releases power to two standard feed pumps to inject chemical to return line to the tank.

Controller has pre-set levels for PH and free chlorine levels for verification. However, these levels can be override by users. Pre-set levels for control references are:

Ph: 7.2-7.8

Free Chlorine: 2 and 4 parts per million (ppm)

Chemical system has a safe guard by flow sensor. Chemicals are not depleted unless there is no flow alarm by flow sensor. If chemical controller detects low level or high level of chemicals, it turns to alarm mode. This alarm mode forces Water Splash controller to shut play products pump so that kids do not expose to undesired water quality. Products pump starts working when quality level is maintained.

Water Play Products Controller and Manifold

Water Play operation is controlled via programmable control unit attached to Water Splash controller. Each product is plumbed to a solenoid valve assemble. Each solenoid valve assemble has a ball valve to control and limit water flow for products. Products shut down off times (timer controlled) and when water quality alarm signals.

Holding Tank

2500 Gallons – FIBERGLASS with ¾" float valve water inlet.

RECIRCULATION SYSTEM by WATER SPLASH

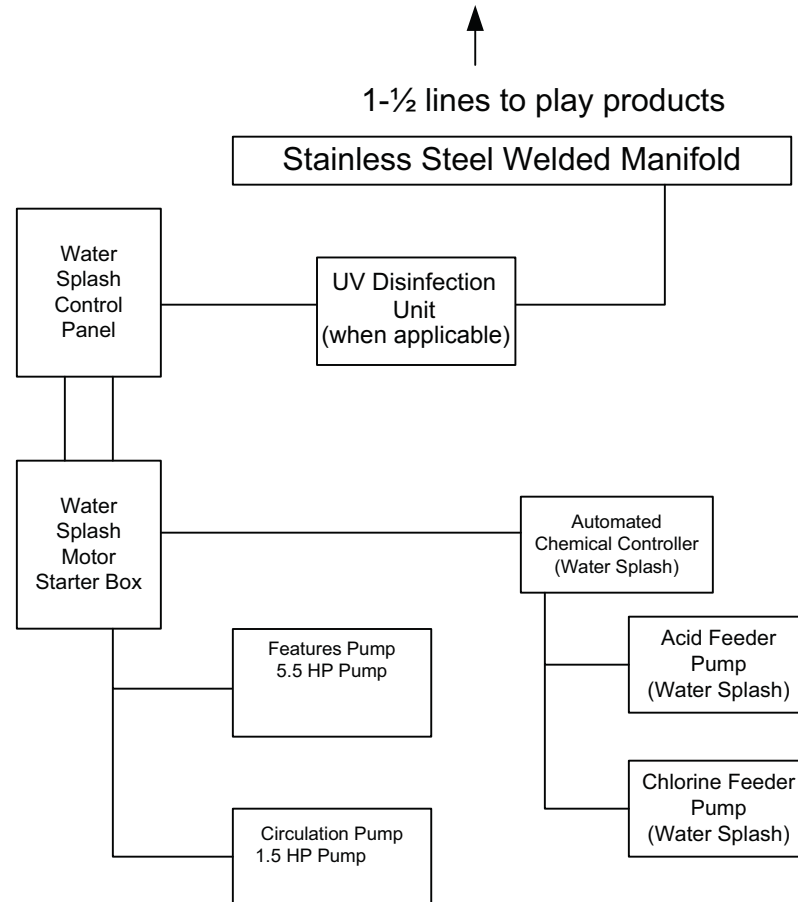


Sample installation picture / products might varies)



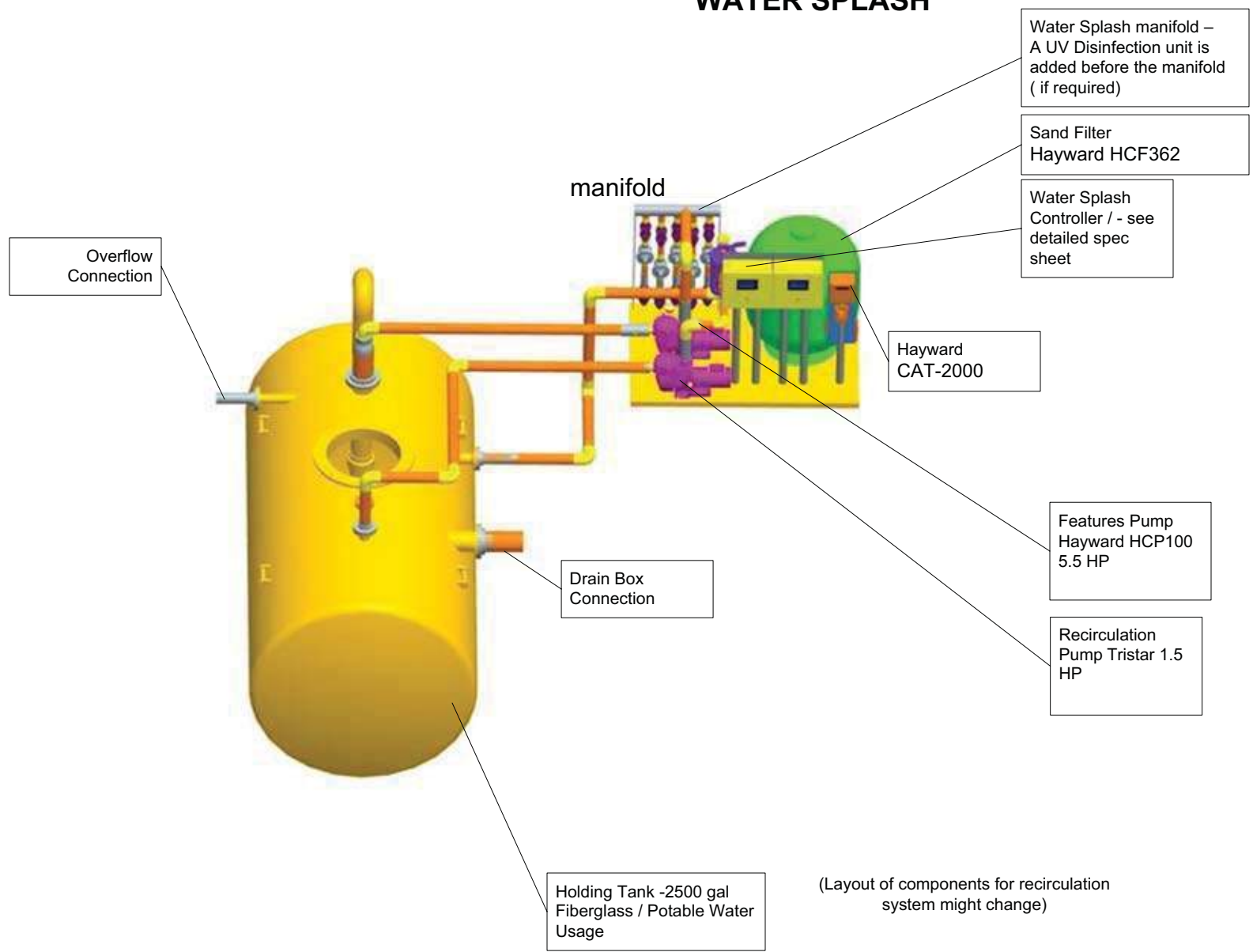
System Specifications:

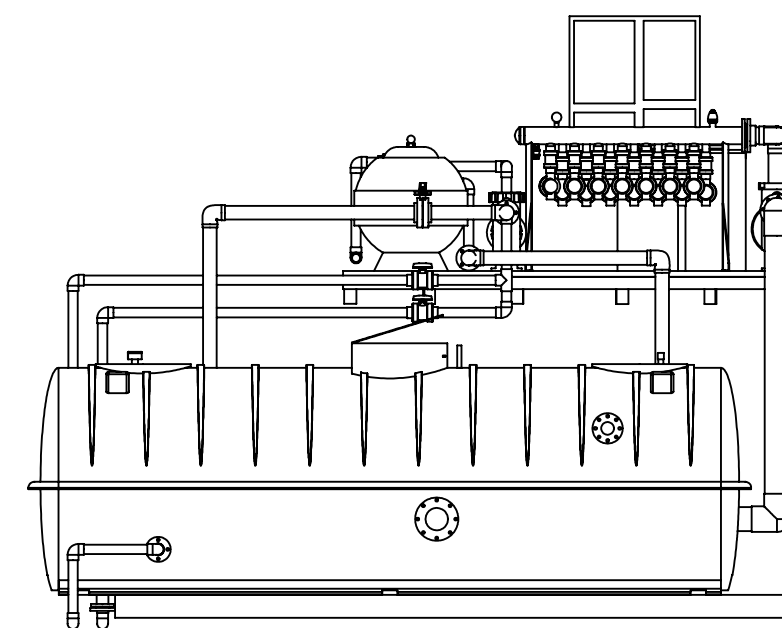
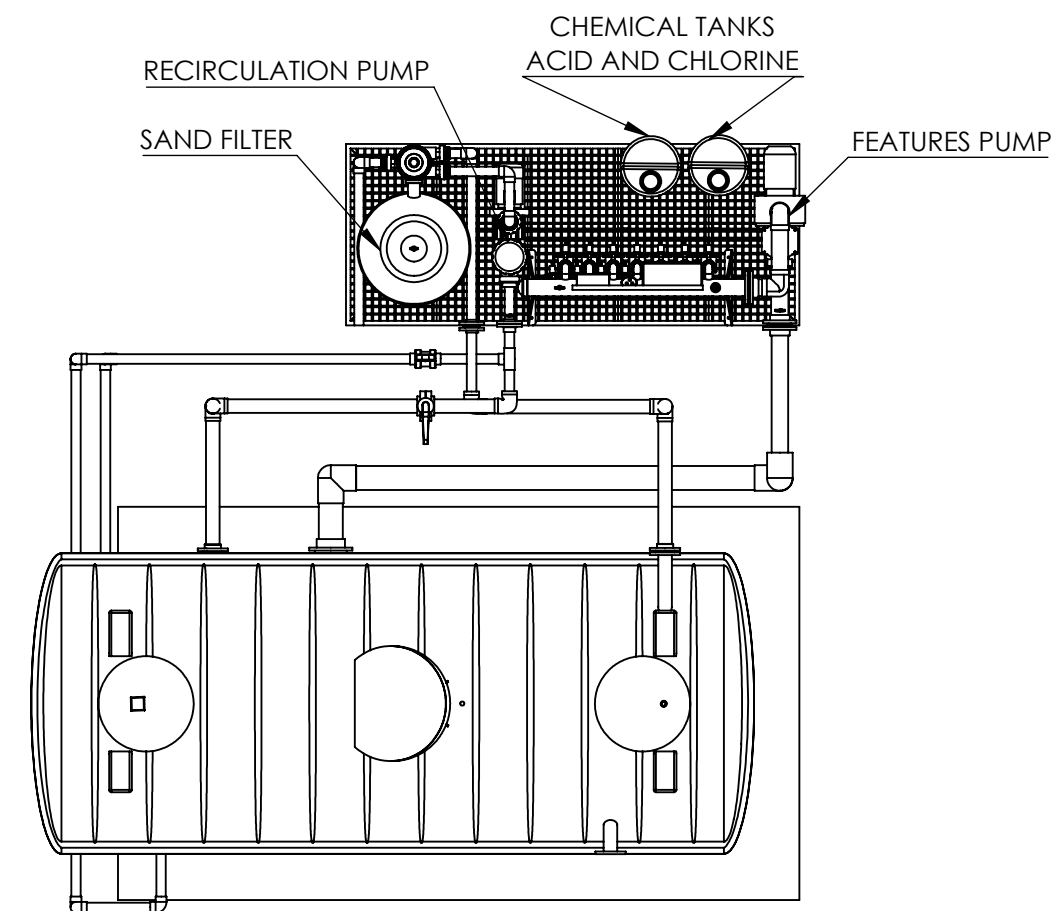
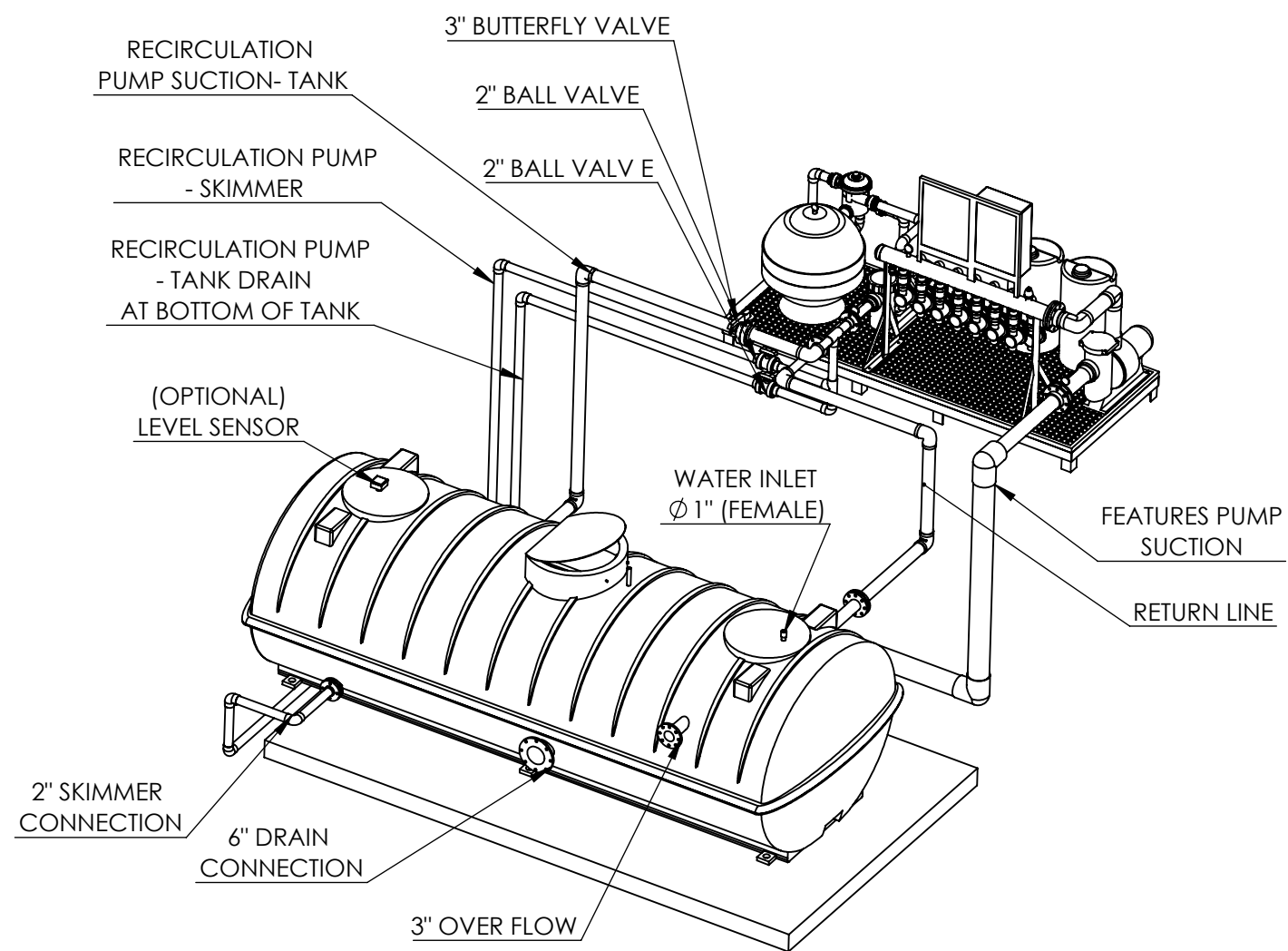
- Fully factory assembled.
- Mounted on aluminum skid.
- Chemical controller is an automated ORP and PH controller. Controller frequently monitors water quality and injects necessary amounts of acid and chlorine.
- System includes two pumps: Circulation and features pumps.
- Chemical control panel is fully integrated with Water Splash Park control panel. If there is an alarm caused by low water quality, chemical controller will force the system to be shut down. System will be able to resume after restoring water quality level.
- Flow meter : 0-100 GPM scale, plastic cover
- Sand filter : Hayward HCF 362
- Pre-assembled Manifold (stainless steel manifold / 3" pipe and 1" or 1-1/2" solenoid valves for each water outlet).
- UV Disinfection unit



WATER SPLASH INC
(800) 936-3430

RECIRCULATION SYSTEM by WATER SPLASH





Drawn By
G.YAYMAN

DESCRIPTION:
RECIRCULATION WITH TANK

Rev DATE
B 18.01.2020

SCALE
1:50

Edited By

DRAWING NO:

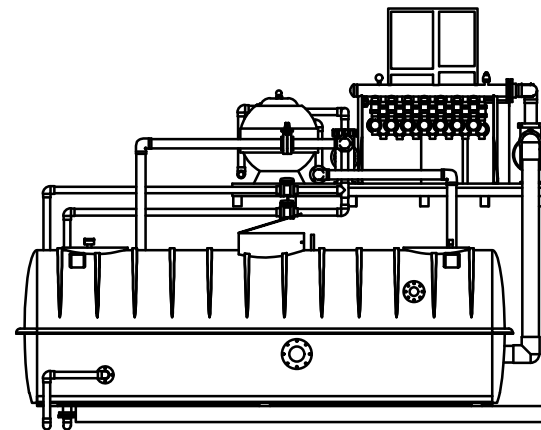
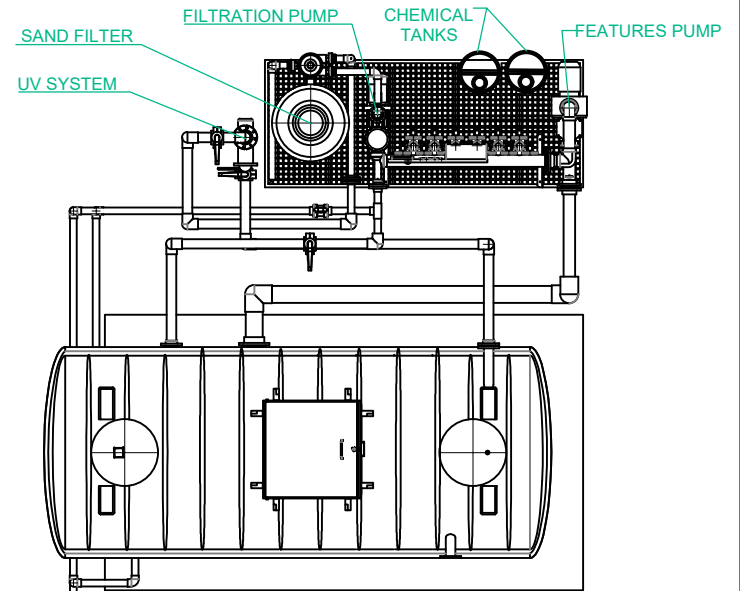
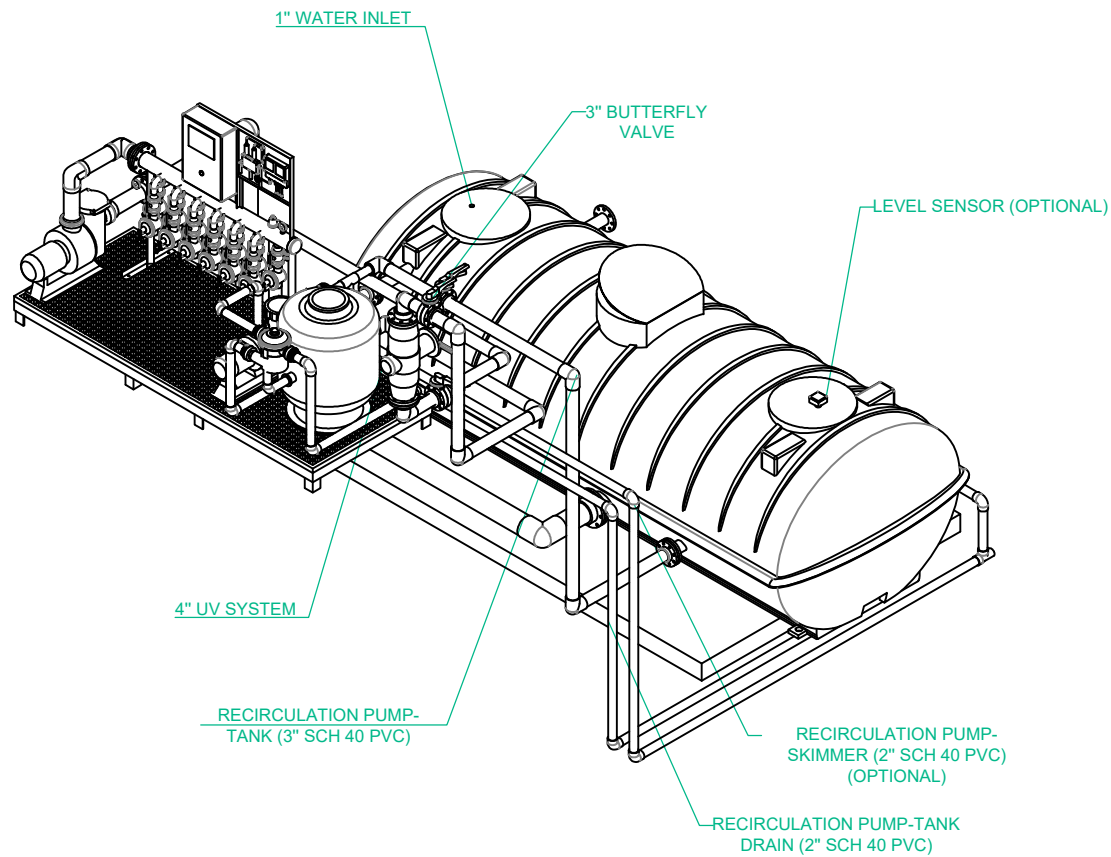
UNITE
FT-INCH

SHEET
1/1



WATER SPLASH

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PROJECT NAME		DRAWN BY/ DATE	
RECIRCULATION SKID WITH UV		A.JAMIL	06.04.2020
PROJECT NR.	REV		
	0.1		
	UNIT		
	FT		
	SHEET		
	5		



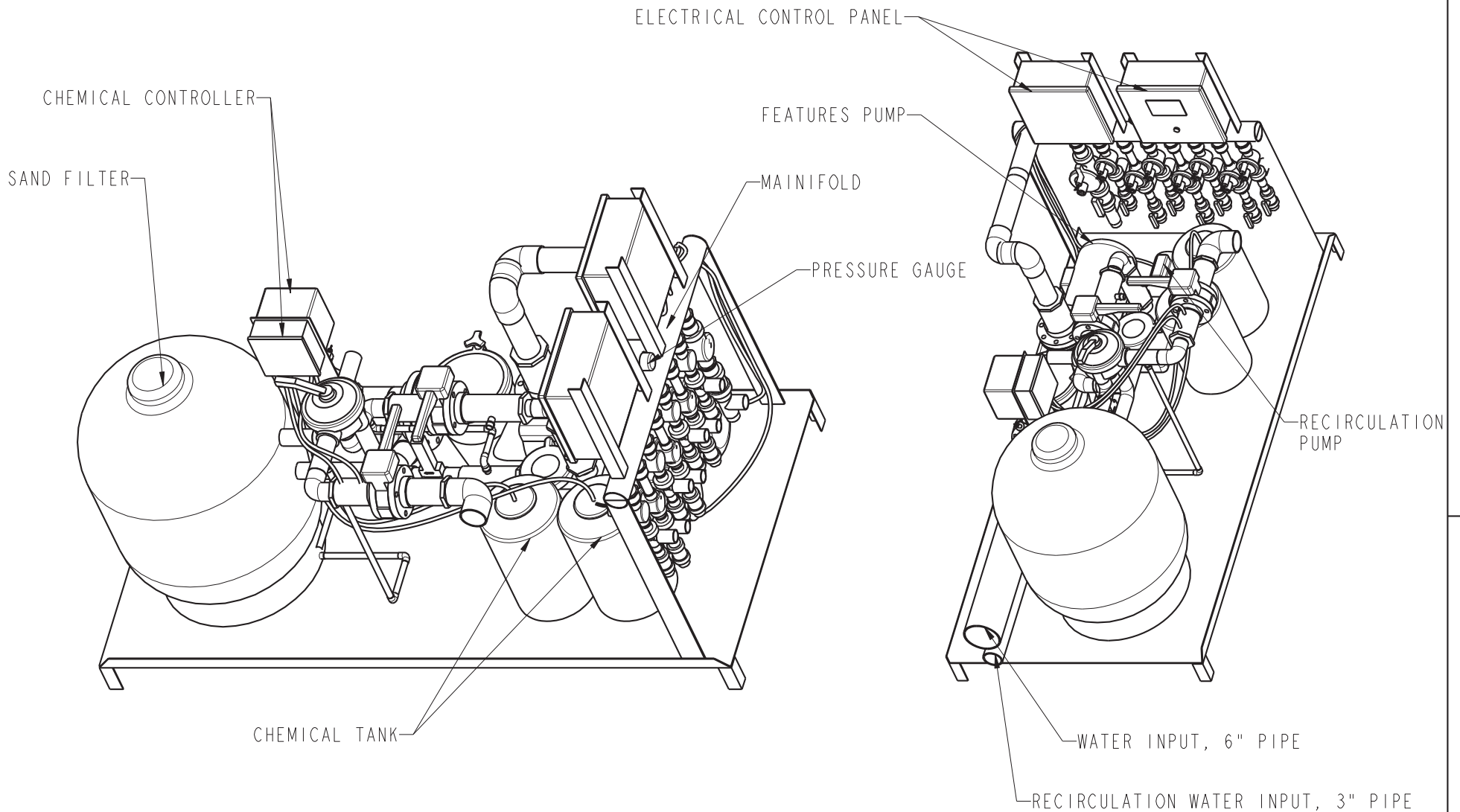
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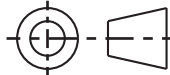


2

1

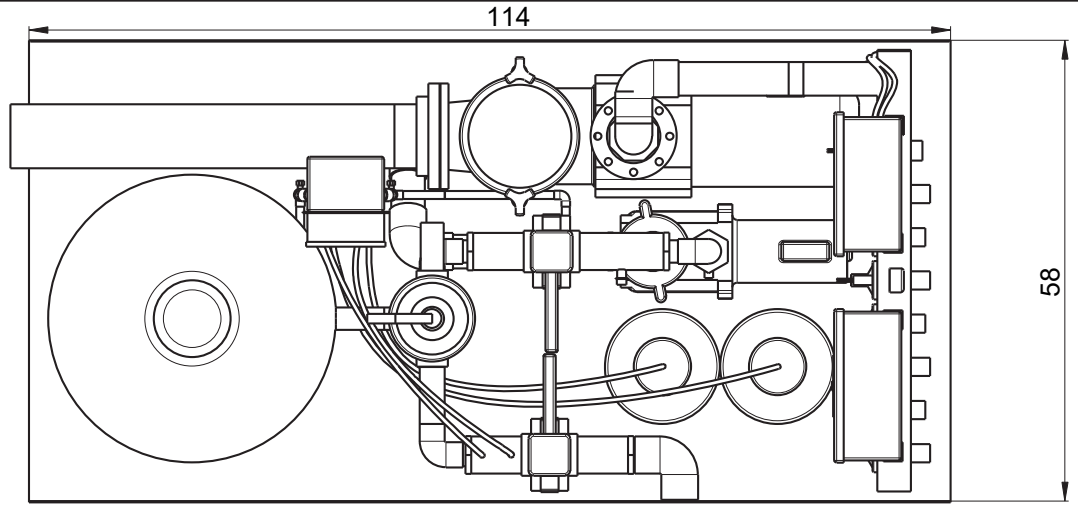


SCALE 1:20

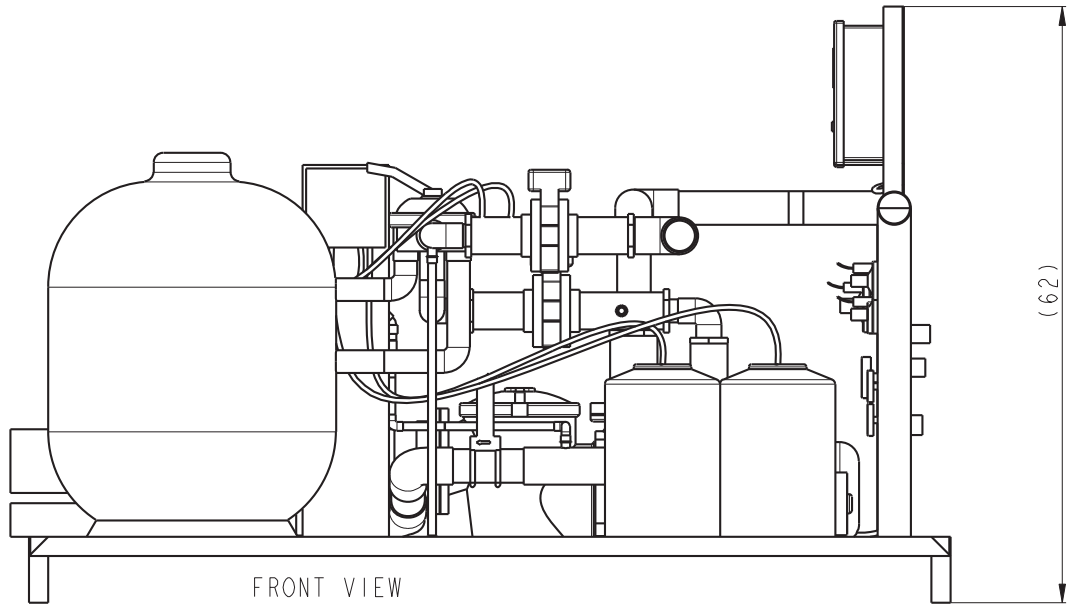
DRAWN BY D.G HE EDITED BY D.G HE APPROVALS ENG PROD QS	THIS DRAWING IS THE PROPERTY OF WATER SPLASH INC. AND IS NOT TO BE REPRODUCED BY ANY MEANS OR USED TO FURNISH INFORMATION TO OTHERS WITHOUT THE EXPLICIT CONSENT OF WATER SPLASH INC.		CR NO	MATERIAL	WATER SPLASH				
			XXXXXX	XXXXXXXXX XXX					
		UNIT	DATE	DESCRIPTION					
		INCH	2009.02.04	RECIRCULATION SYSTEM PROJECT NO. :					
		ENVIRONMENT PRO E WILDFIRE 2.0	SURFACE FINISH μ in	SHEET	SCALE	DOCUMENT	SIZE	DRAWING NO	REV
		1/3	1:50	D10	A	W060271-00-01	A		

2

1

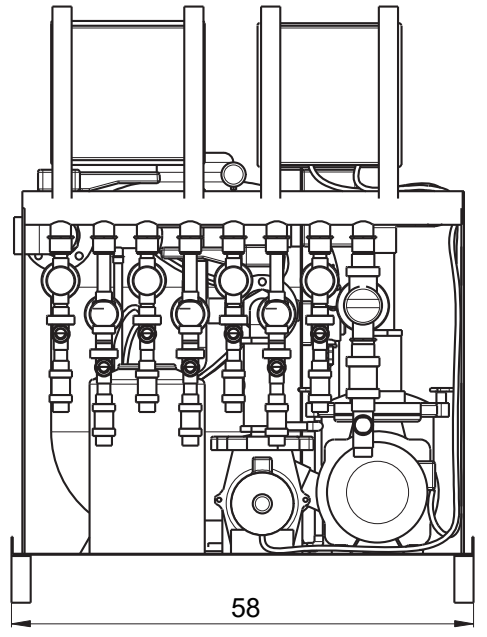


TOP VIEW



FRONT VIEW

SCALE 1:20



RIGHT VIEW

DRAWN BY	D.G HE
EDITED BY	D.G HE
APPROVALS	
ENG	
PROD	
QS	

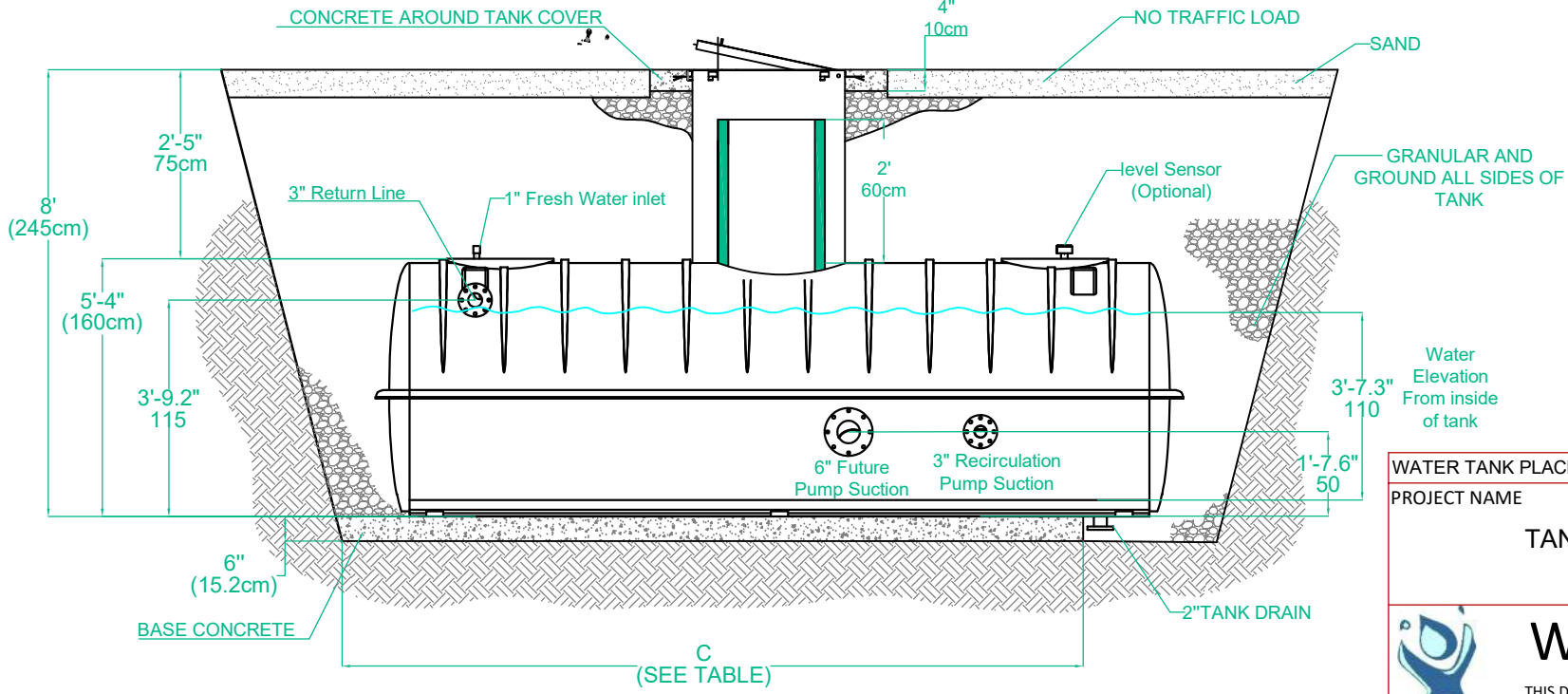
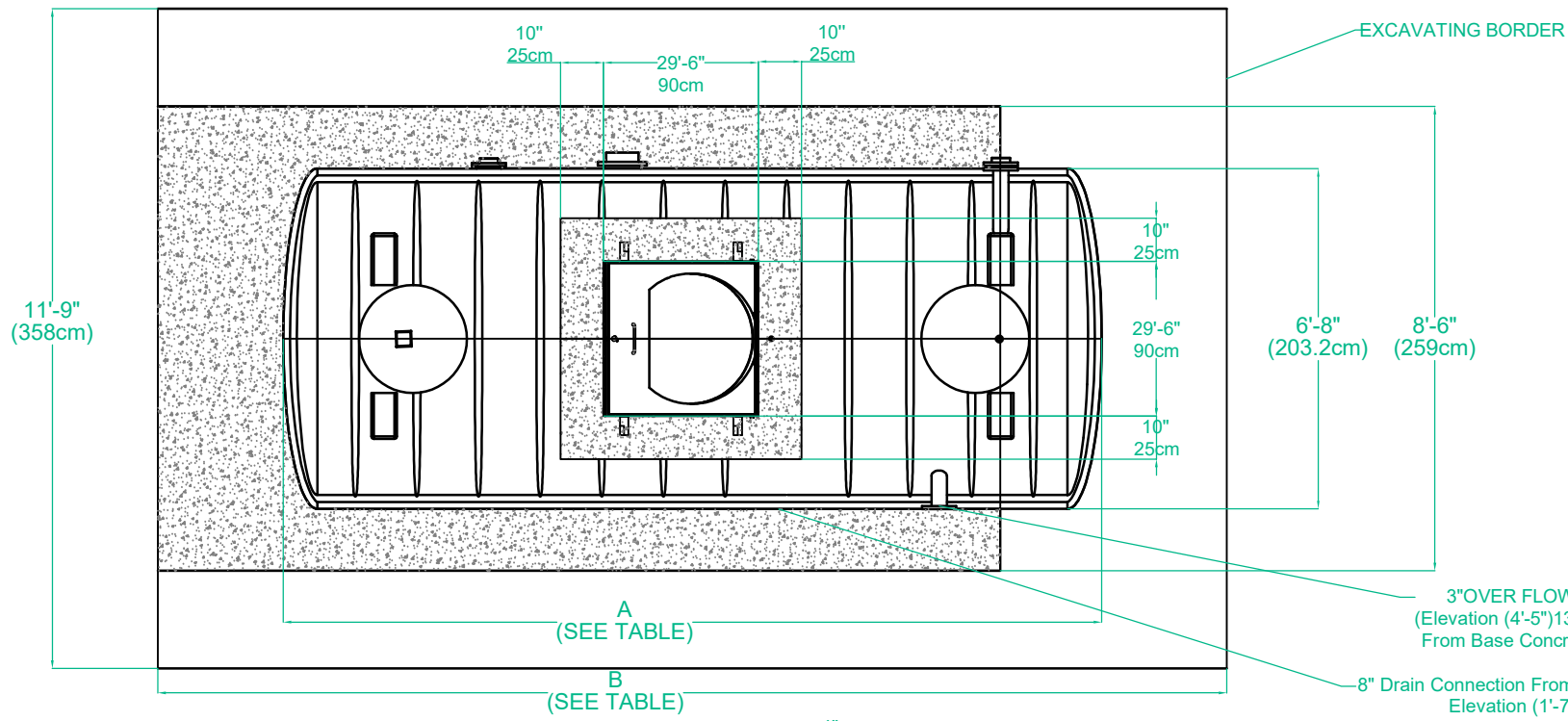
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	UNIT
INCH	
ENVIRONMENT	PRO E WILDFIRE 2.0

CR NO	XXXXXX
DATE	2009.02.04
SURFACE FINISH	μin

MATERIAL	XXXXXXXXX XXX
DESCRIPTION	RECIRCULATION SYSTEM PROJECT NO. :
SHEET	2/3
SCALE	1:50
DOCUMENT	D10
SIZE	A

WATER SPLASH	
DRAWING NO	W060271-00-01
REV	A



DIMENSION	TANK TYPE	
	2500 GALLON (10 TON)	4000 GALLON (15 TON)
A	15'-11" (485 cm)	19'-8" (600 cm)
B	19'-8" (600 cm)	22'-11" (700 cm)
C	14'-9" (450 cm)	19'-8" (600 cm)

WATER TANK PLACEMENT

PROJECT NAME: TANK DETAIL

DRAWN BY/ DATE: Murat S. 27.02.2020

PROJECT NR. / REV: / 0.1

WATER SPLASH INC.

UNIT: FT-INCH / CM

SHEET: 2-2

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PRODUCT

WARRANTY

Water Splash Inc. guarantees that all its products meet the specifications provided in the installation drawings and offers:

25 YEAR WARRANTY on stainless steel structures and workmanship, stainless steel anchoring systems and aluminum spheres.

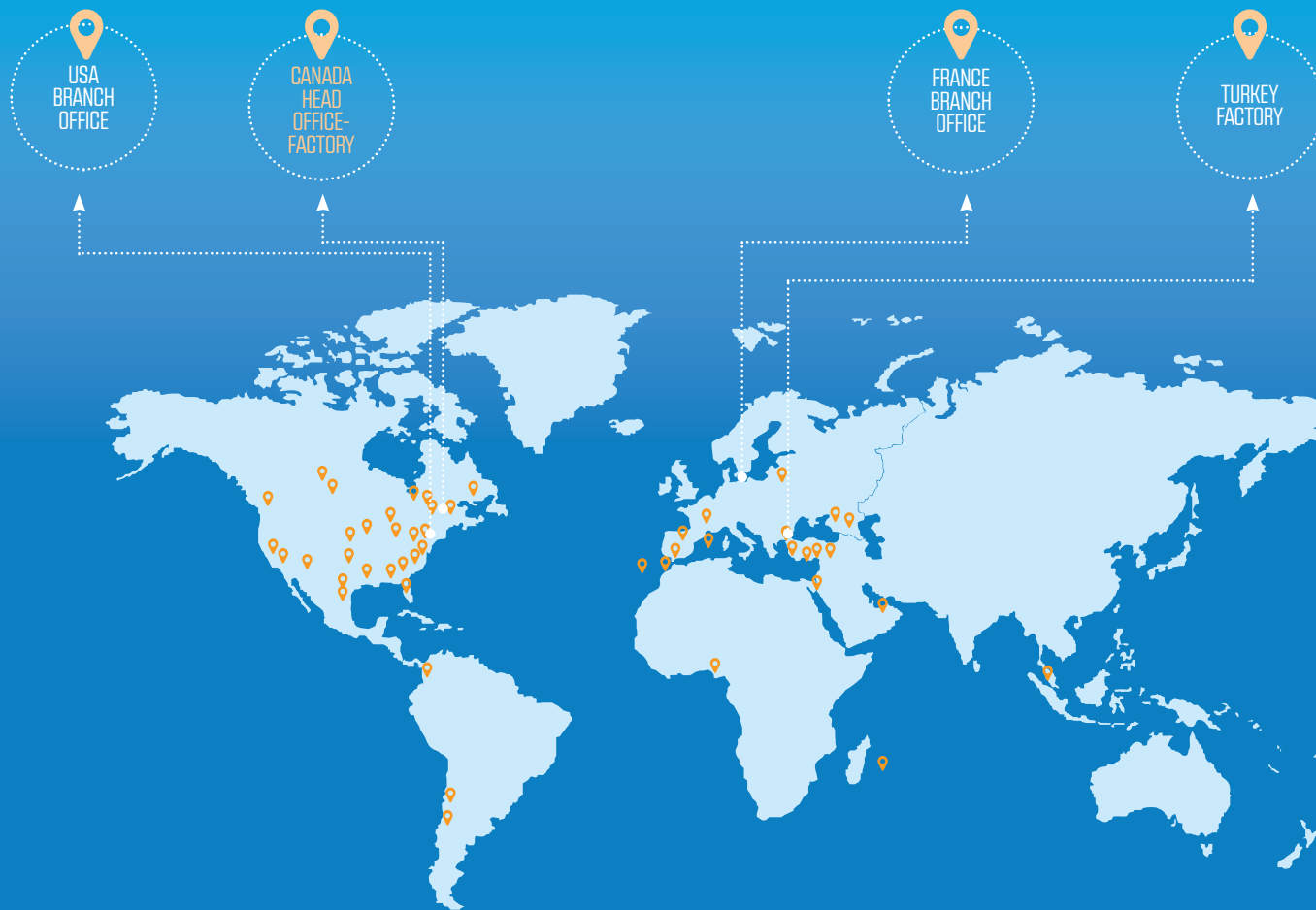
5 YEAR WARRANTY on brass parts, spray nozzles and spray openings, high density polyethylene components, polyurethane components, stainless steel automated water distribution manifold, drain boxes, and electrical enclosures.

2 YEAR WARRANTY on coatings, stainless steel hardware and moving parts, fiberglass components, Seeflow polymers, Toe guards, piping, fittings, ball valves, pressure gauges, terminal blocks, PLC controller, time switches, manual switches, transformers, breakers, electrical wiring, connections and on recirculation system workmanship, Recirculation system pumps and filters are covered by their Manufacturer. Please refer to their warranty documentation.

1 YEAR WARRANTY on all products and parts not listed above.

Warranty above is valid only if structures are installed or assembled as per Water Splash's installation instructions/drawings maintained according to maintenance manual and procedures, not subject to misuse, vandalism, operated under normal use as per designed purpose or have not modified / repaired by unauthorized personnel.





WATERSPLASH INSTALLATIONS OVER WORLD

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 Usa • Poland • Colombia • Spain • Reunion • Jordan • Canada



USA/Canada (800) 936-3430

France + 33 172 77 4328

www.watersplashnet.com

info@watersplashnet.com

[f](#) [t](#) [@](#) [in](#) watersplashinc



POOL HYDRAULIC ANALYSIS
DeKalb County Board of Health

POOL INFORMATION

Name: _____

Address: _____ GA _____
Street Suite/Bldg.# City Zip Code

Pool Type: Swimming Pool Whirlpool Wading Multi-Purpose Wave Lazy River
Waterslide Special Purpose Spray Pool Zero-depth
 Location: Indoor Pool Outdoor Pool Operation: Seasonal Year-round Government-owned Yes No

CERTIFIED CONTRACTOR INFORMATION

Name: _____ Cert.#: _____

Company Name : _____

Address: _____
Street Suite/Bldg.# City State Zip Code

Contact: _____
Phone# Fax# E-mail

Shape: Semi -Circle Perimeter(ft.): 135 Width(ft.): 35 ft

Length(ft.): 50 Min. Depth(ft.): 0 Break Depth(ft.): 0 Max. Depth(ft.): 0

Slope (< 5') = 1 ft. in 80 ft. Area: 1646 Sq. Ft. Volume: 2500 gallons
(storage tank capacity / zero depth splash pad)

Pool Base Material: Gunite Poured Other: _____ Type of Piping: _____

Design Flow Rate = $\frac{\text{pool volume}}{\text{turnover time}^*} = \frac{2500 \text{ gallons}}{30 \text{ minutes}} = 84 \text{ gpm}^{**}$

*For pool use minimum 6 hr. turnover (360 min.) **Check minimum skimmer flow rate. If turnover rate is inadequate for wading pool use minimum 2 hr. turnover (120 min.) minimum skimmer operation (as per manufacturer or 25 gpm) then design whirlpool use minimum 1/2 hour turnover (30 min.) flow rate must be increased to provide minimum skimmer flow rate.

I. Number of Skimmers Required: NA

A. Swimming pools (see Appendix A, Fig. 4): minimum two skimmers, then one skimmer per 500 sq. ft pool surface area. Wading pools: minimum one skimmer per 200 sq. ft pool surface area. Whirlpool: minimum one skimmer per 100 sq. ft pool surface area.

Pool Surface Area: _____ sq. ft.; # of skimmers required: _____; # of skimmers provided: _____

II. Skimmer / Gutter Flow Rate: NA

A. If wall returns are utilized: total skimmer/gutter flow rate = design flow rate x 0.8 = _____ gpm

B. If floor returns are utilized: total skimmer/gutter flow rate = design flow rate = _____ gpm

C. Flow through each skimmer/gutter = skimmer/gutter flow rate = _____ gpm = _____ gpm *
of skimmers provided

* Must be > 25 gpm and < 55 gpm

III. Number of Inlets Required:

A. Minimum # of inlets required = $\frac{\text{perimeter (ft)}}{x^*} = \text{_____ ft} = \text{_____}$ (use next whole number)

*For pools, x = 20 feet For wading pools or whirlpools, x = 10 feet NA

IV. Pipe Size Selection

A. Skimmer / Gutter Line Size: select pipe size which gives max. 5 fps velocity at skimmer / gutter flow rate*:

	<u>Branch 1</u>	<u>Branch 2</u>	<u>Branch 3</u>	<u>Branch 4</u>	<u>Branch 5</u>	<u>Branch 6</u>	<u>Branch 7</u>	<u>Branch 8</u>
# of Skimmers Served by Pipe	_____	_____	_____	_____	_____	_____	_____	_____
Pipe Size (inches)	_____	_____	_____	_____	_____	_____	_____	_____
Flow in Pipe (gpm)	_____	_____	_____	_____	_____	_____	_____	_____
Velocity (fps)	_____	_____	_____	_____	_____	_____	_____	_____

*Indicate which chart used for velocity numbers: _____

For additional branches, use the reverse side of this sheet

B. Return Line Size: select pipe sizes and branches which give max. 10 fps velocity at design flow rate*:

	<u>Branch 1</u>	<u>Branch 2</u>	<u>Branch 3</u>	<u>Branch 4</u>	<u>Branch 5</u>	<u>Branch 6</u>	<u>Branch 7</u>	<u>Branch 8</u>
# of Inlets Served by Pipe	1"	_____	_____	_____	_____	_____	_____	_____
Pipe Size (inches)	3"	_____	_____	_____	_____	_____	_____	_____
Flow in pipe (gpm)	100	_____	_____	_____	_____	_____	_____	_____
Velocity (fps)	4.07	_____	_____	_____	_____	_____	_____	_____

*Indicate which chart used for velocity numbers: _____

For additional branches, use the reverse side of this sheet

V. Main Drain: select pipe sizes which give maximum 5 fps velocity at the design flow rate:

A. Pipe size (inches): 6" Design flow rate (gpm): 264 Velocity (fps) gravity

B. Main Drain Grate Selection: Main drain outlet 4 to 1 open area ratio each drain; minimum 2 main drains required; 1½ fps max. velocity through each grate; each main drain must accommodate 100% of the design flow rate; 5 fps max. flow rate*:

<u>Pipe Size (in.)</u>	<u>Grate Size (each, sq. in.)</u>	<u>Flow Area (each, sq. in.)</u>	<u>Velocity (fps)</u>	<u>(Total Flow, Both Drains gpm)</u>
<u>6"</u>	<u>576</u>	<u>231.69</u>	_____	<u>1416</u>

C. Open pipe area = _____ (sq. in.) X 4 = _____ (sq. in.) [must be < _____ open grate area(sq. in.)]

Frame & Grate Catalog Number: NDS 2412 Quantity: 2

*If booster or additional pump flow is through the main drain grates, this flow must also be figured into all calculations

Maximum velocity through each grate 1 1/2 fps.
 (.321 x Design Flow Rate 264 gpm)/Grate Open Area 231.69 sq. in= Velocity 0.365 fps
 Velocity 0.365 fps. < 1.5 fps.
 Is velocity through each drain grate approved? Yes/No

D. Main Drain Line Head Loss

CALCULATION SHEET ATTACHED

If wall returns are utilized, head loss calculation must be based on:

Main drain flow rate = 0.20 x design flow rate = 0.20 x _____ gpm = _____ gpm

Straight pipe size = _____ (in.) Straight pipe length = _____ (ft.)

_____ # elbows x equiv. length _____ = _____ (ft.)

_____ # tees x equiv. length _____ = _____ (ft.)

_____ # valves x equiv. length _____ = _____ (ft.)

Total equiv. length = _____ (ft.)

Friction loss per 100' based on above flow rate = _____ x total equiv. length _____ ÷ 100 = _____ (ft.)
 (enter on page 6)

Indicate which chart used for equivalent lengths: _____

If floor returns are utilized, head loss calculations are based on 100% flow through skimmers:

Skimmer flow rate = design flow rate

Main drain flow rate = 0

Main drain head loss = 0 (enter 0 on page 6)

E. Interactive Play Features Utilizing Separate Drains as a Water Source

Drain Grate Selection: Drain outlet 4 to 1 open area ratio each drain; minimum 2 drains required; 1 1/2 fps max. velocity through each grate; each drain must accommodate 100% of the design flow rate; 5 fps max. flow rate*:

Pipe Size (in.) Grate Size (each, sq. in.) Flow Area (each, sq. in.) Velocity (fps) (Total Flow, Both Drains gpm)

Open pipe area = _____ (sq. in.) X 4 = _____ (sq. in.) [must be < _____ open grate area(sq. in.)]

Frame & Grate Catalog Number: _____ Quantity: _____

Drain Line Head Loss (not to be included into pool total head loss)

Main drain flow rate = _____ gpm

Straight pipe size = _____ (in.) Straight pipe length = _____ (ft.)

_____ # elbows x equiv. length _____ = _____ (ft.)

_____ # tees x equiv. length _____ = _____ (ft.)

_____ # valves x equiv. length _____ = _____ (ft.)

Total equiv. length = _____ (ft.)

Friction loss per 100' based on above flow rate = _____ x total equiv. length _____ ÷ 100 = _____ (ft.)

Indicate which chart used for equivalent lengths: _____

VI. Return Line Loss

Indicate which chart used for return line loss calculations: _____

Calculate return line loss for each branch or run of entire return line

Branch #1: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #2: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #3: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #4: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #5: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #6: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #7: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #8: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
of elbows _____ x equiv. length _____ = _____ ft.
of tees _____ x equiv. length _____ = _____ ft.
of valves _____ x equiv. length _____ = _____ ft.
Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Friction loss due to inlet resistance @ _____ gpm = _____ ft.

Total return line friction loss = _____ ft.
(enter on page 6)

VII. Skimmer / Gutter Line Loss

Indicate which chart used for skimmer / gutter line loss calculations: _____

Calculate skimmer/gutter line loss for each branch or run of entire return line

Branch #1: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #2: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #3: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #4: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #5: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #6: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #7: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch #8: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 # of elbows _____ x equiv. length _____ = _____ ft.
 # of tees _____ x equiv. length _____ = _____ ft.
 # of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Friction loss over the skimmer weir @ _____ gpm = _____ ft.

Total skimmer / gutter line friction loss = _____ ft.
 (enter on page 6)

VIII. Total Dynamic Head Required:

- A. Main Drain Line Loss = NA-0 ft.
(from page 3)
- B. Return Line Loss = 2.7 ft.
(from page 4)
- C. Filter Loss When Dirty = 34.7 ft.
(*see below)
- D. Skimmer / Gutter Line Loss = _____ ft.
(from page 5)
- E. Heater Loss = _____ ft.
(from manufacturer)
- F. Other (multi-port valves, etc.) = _____ ft.
(from manufacturer)
- G. Total Dynamic Head Required = 37.4 ft.

*For C. above use the following:

- Cartridge Filter = 23.1 ft.
- Sand Filter = 34.7 ft.
- Pressure D.E. = 57.8 ft.
- Vacuum D.E. = 4.3 ft.

IX. Pump Selection:

A. Pump Manufacturer: Hayward Model: Tristar Horsepower: 1.5
 Pump Rated: 100 gpm @ 65 TDH # of pumps: 1

X. Filter Selection:

Minimum Filter Area Required = $\frac{\text{Design flow rate}}{\text{Filter flow rate}^*} = \frac{84 \text{ gpm}}{100 \text{ gpm/sq.ft.}} = \text{_____ sq. ft.}$

*Filter Flow rate = as listed in ANSI/NSPI Standard 50

Manufacturer: Hayward Model: HCF362 Catalog #: _____
 Filter Type: Sand Filter Diameter (each filter): 36 inches
 Filter Area (each): 6.77 sq. ft. # of Filters: 1 Total Filter Area: 6.77 sq. ft.

XI. Other Information:

Certified Contractor's Signature: _____ Date: _____

Plans Reviewed and Approved & by: _____ Date: _____

EHS Staff

Pipe & Fitting Calculations

Project Name:		Project No.:		PIPE: PVC SCH 40		Pipe SIZES		NOTE		Pipe Type		C Range		C Average		Commonly Used	
Enter the required data in the yellow cells										Cast / Ductile Iron - New		150 - 80		130		100	
										Cast Iron 10 years old		113 - 107					
										Cast Iron 20 years old		100 - 89					
										Cast Iron 30 years old		75 - 90					
										Cast Iron 40 years old		83 - 64					
										Tar Coated Cast Iron		145 - 50		130		100	
										Steel - New		150 - 80		130		100	
										Corrugated Steel				60		60	
										Cement Lined Iron / Steel		160 - 130		148		140	
										Asphalt Lined Iron / Steel		140 - 130					
										Copper, Brass, Lead, Glass		150 - 120		140		130	
										Aluminum		150 - 130					
										Concrete		152 - 85		120		100	
										Asbestos Cement		140					
										PVC		160 - 150		155		150	
										PE		140					
										Instructions							
								NA		This spreadsheet is designed to calculate pipe and fitting friction for one to three pipe segments. The Hazen & Williams equation and C values are used for all friction calculations. This provides flexibility when working with both new and old piping systems.							
										Pipe Segment 2							
										Flow Rate (GPM)		0					
										Pipe ID (Inches)		0					
										Pipe Length (Feet)		0					
										Hazen & Williams C Value		0					
										Calculated Results							
										Velocity in Ft/sec		4.5					
										Velocity Head in Ft		0.3					
										Friction / 100 Feet of Pipe		2.4					
										Total Pipe Friction		0.9					
										Fitting Equivalent Length		75.4					
										Total Fitting Friction		1.8					
										Total Friction Losses Segment 1							



WATER SPLASH

