

CITY OF KNOXVILLE
REQUEST FOR PROPOSALS

*Landscaping Services
at Suttree Landing Park*

**Proposals to be Received by 11:00:00 a.m., Eastern Time
December 27, 2018**

Submit Proposals to:
City of Knoxville
Office of the Purchasing Division
City/County Building
Room 667-674
400 Main Street
Knoxville, Tennessee 37902

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**City of Knoxville
Request for Proposals
Landscaping Services
at Suttree Landing Park**

I. Statement of Intent

The City of Knoxville is requesting proposals from responsible, professional landscaping firms to provide landscaping and river walk maintenance at Suttree Landing Park. The City intends to award a contract for the term of one (1) year with two (2) optional one-year renewals. Contract is expected to begin the third week of March (March 2019 to March 2020).

II. RFP Time Line

Availability of RFP November 30, 2018

Pre-Proposal MeetingDecember 10, 2018

Deadline for questions to be submitted in writing to the
Purchasing DivisionDecember 17, 2018

Proposals Due DateDecember 27, 2018

This timetable is for the information of submitting entities. These dates are subject to change. **However, in no event shall the deadline for submission of the proposals be changed except by written modification from the City of Knoxville Purchasing Division.**

PRE-PROPOSAL MEETING

A pre-proposal meeting will be held at the City of Knoxville Public Works Building in the Community Room, located at **3131 Morris Avenue; Knoxville, TN 37909; on December 10, 2018 at 1:00 p.m. Eastern Time. Interested potential proposers are STRONGLY ENCOURAGED to attend.**

III. Background

The City of Knoxville Public Service Department is responsible for the overall cleanliness and beautification of the city. The City is seeking a responsible, professional landscaping firm to provide and maintain landscaping and river walk maintenance at Suttree Landing Park. The entire park measures to approximately 8-acres. There is a variety of landscaping to be maintained at the highest quality of standards (to the City’s satisfaction) year round. The areas of responsibility include all landscaping beds, shrubs, bushes, flowers, bulbs, riparian grasses, rain gardens, wildflower beds, river walk planters, upland meadow grasses, and infiltration beds. All vegetated areas within the entire park are included in this contract with the exception of the fescue lawn and trees.

IV. General Conditions

4.1 The following data is intended to form the basis for submission of proposals to provide Landscaping Services at Suttree Landing Park for the City of Knoxville.

4.2 This material contains general conditions for the procurement process, the scope of service requested, contract requirements, instructions for submissions of proposals, and submission forms that must be included in the proposal. The RFP should be read in its entirety before preparing the proposal.

4.3 All materials submitted pursuant to this RFP shall become the property of the City of Knoxville.

4.4 To the extent permitted by law, all documents pertaining to this Request for Proposals shall be kept confidential until the proposal evaluation is complete and a recommendation submitted to City Council for review. No information about any submission of proposals shall be released until the process is complete, except to the members of the Evaluation Committee and other appropriate City staff. All information provided shall be considered by the Evaluation Committee in making a recommendation to enter into an agreement with the selected consultant.

4.5 Any inquiries, suggestions or requests concerning interpretation, clarification or additional information pertaining to the RFP shall be made **in writing and be in the hands of the Procurement Specialist, Julie Smith Maxwell, by the close of the business day on December 17, 2018.** Questions can be submitted by letter, fax (865-215-2277), or email to jmaxwell@knoxvilletn.gov. The City of Knoxville is not responsible for oral interpretations given by any City employee, representative, or others. The issuance of written addenda is the only official method whereby interpretation, clarification, or additional information can be given. If any addenda are issued to this Request for Proposals, the Purchasing Division will post them to the City's website at www.knoxvilletn.gov/bids. Submitting organizations are strongly encouraged to view this website often to see if addenda are posted. Failure of any proposer to receive such addendum or interpretation shall not relieve such Proposer from any obligation under his proposal as submitted. All addenda so issued shall become part of the Contract Documents.

4.6 The City of Knoxville reserves the right to (a) accept or reject any and/or all submissions of proposals; (b) to waive irregularities, informalities, and technicalities; and (c) to accept any alternative submission of proposals presented which, in its opinion, would best serve the interests of the City. The City shall be the sole judge of the proposals, and the resulting negotiated agreement that is in its best interest, and its decision shall be final. The City also reserves the right to make such investigation as it deems necessary to determine the ability of any submitting entity to perform the work or service requested. Information the City deems necessary to make this determination shall be provided by the submitting entity. Such information may include, but is not limited to, current financial statements by an independent CPA, verification of availability of equipment and personnel, and past performance records.

4.7 Included in the Contract Documents is an affidavit that the undersigned has not entered into any collusion with any person in respect to this qualification. The qualifier is required to

submit this affidavit with the submission. Also included is the Diversity Business Program contracting packet. Submissions must indicate on the enclosed form whether or not the proposer/qualifier intends to use subcontractors and/or suppliers from one of the defined groups. Proposers/Qualifiers are advised that the City tracks use of such use, but it does not influence or affect evaluation or award.

4.8 Subsequent to the Evaluation Committee's review and the Mayor's recommendation of a firm(s), Knoxville City Council approval may be required before the final contract may be executed.

4.9 All expenses for making a submission of proposal shall be borne by the submitting entity.

4.10 Any submission of proposals may be withdrawn up until the date and time for opening of the submissions. **Any submission not so withdrawn shall, upon opening, constitute an irrevocable offer for a period of 120 days to the City of Knoxville for the services set forth in the Request for Proposals until one or more of the submissions have been duly accepted by the City.**

4.11 Prior to submitting their proposals, proposers are to be registered with the Purchasing Division through the City of Knoxville's online Vendor Registration system. Instructions for registering on-line are available at www.knoxvilletn.gov/purchasing. **Proposals from un-registered proposers may be rejected.**

4.12 **NO CONTACT POLICY:** After the posting of this solicitation to the Purchasing Division's website, any contact initiated by any proposer with any City of Knoxville representative concerning this proposal is strictly prohibited, unless such contact is made with the Purchasing Division representative listed herein or with said representative's authorization. Any unauthorized contact may cause the disqualification of the proposer from this procurement transaction. Proposals must include a notarized No Contact/No Advocacy Affidavit (to be found in the "Submission Forms" section of this document).

4.13 **INCLEMENT WEATHER:** During periods of inclement weather, the Purchasing Division will enact the following procedures with regard to solicitations and weather delays:

- If City offices are closed due to inclement weather on the date that bids/proposals/qualifications/letters of interest are due into the Purchasing Office, all solicitations due that same day will be moved to the next operational business day.
- The City of Knoxville shall not be liable for any commercial carrier's decision regarding deliveries during inclement weather.

V. Scope of Service

The City is seeking a responsible, professional landscaping firm to provide and maintain landscaping and river walk maintenance at Suttree Landing Park. The entire park measures to approximately 8-acres. There is a variety of landscaping to be maintained at the highest quality of standards (to the City's satisfaction) year round. The areas of responsibility include all landscaping beds, shrubs, bushes, flowers, bulbs, riparian grasses, rain gardens, wildflower beds, river walk planters, upland meadow grasses, and infiltration beds. All vegetated areas within the

entire park are included in this contract with the exception of the fescue lawn and trees. The contractor shall be responsible for performing all work in a professional and workmanlike manner, using quality equipment and tools. Detailed specifications for the work are listed below.

1. Prepare plants, wildflowers, meadow grasses for growing season:
 - a) Cut-back all wildflowers and grasses within the riparian grass beds, rain gardens, upland meadows and infiltration beds in mid-February and no later than February 28th of each year. These grasses, wild flowers and river-oat plants are to be trimmed, using a weed eater, to a height of 6 to 8 inches. Remove debris within the infiltration beds and other areas that have thick vegetation.
 - b) Landscaping beds currently utilizing mulch (at the time of project completion and according to the plans) will have the first application of “high quality, hardwood bark mulch” installed during the month of February. (see additional notes below on “Mulching”)
 - c) Riverwalk Planters: In the early spring, when the Daffodil and Siberian Squill Bulbs are finished blooming cut back, apply mulch and pre-emergence.
2. Landscaping and maintenance work shall consist of mulching, fertilizing, pre-emergence, and post emergence treatments, insect/disease control, pruning and general maintenance as needed and as directed by the Horticulture Manager. There are 18 plant types, approximately: 2,000 square feet of river walk planters, 1,900 linear feet of live stakes, a rain garden fringe, and a water quality swale.
 - a) Mulching: Contractors are responsible for supplying and installing all mulch necessary to maintain landscape beds weed-free year-round. Beds must be mulched at a minimum of three (3) times per year; once in February and twice during the growing season (April – September). Mulch must be approved by Horticulture Services Manager prior to usage. Mulch beds currently supplied with 4 inches of mulch do not require additional mulch application. These beds shall be turned to help air and water penetrate and to present a fresh appearance.
 - b) Fertilizing: Fertilize all plants and shrubs twice per year: March and October, Horticulture Manager must approve the materials used prior to application.
 - c) Pre-emergence/Post Emergence: Done in a seasonable manner to help keep mulch beds free of weeds and wild plant growth. Treat all beds twice per year: Spring and Fall, Horticulture Manager must approve the materials used prior to application.
 - d) Insect/disease control: As needed, report infestations and conditions to the Horticulture Manager.
 - e) Pruning: Contractor is responsible to maintain plants to the highest standards. Plant pruning will be done in a seasonable correct fashion as the plant type requires. Trim all plants and shrubs as necessary to maintain aesthetically pleasing appearance. Keep plants from becoming “overgrown” by maintaining clean curb-lines, sidewalks, walkways, etc. Also, keep plants from growing into tables, benches, signs, fencing, railings, buildings and parking lots. Cut

out dead or overgrown plant material no less than every two-weeks. Tree pruning will be conducted by Urban Forestry and Horticulture employees and are not under the responsibility of this contract.

f) Bed maintenance: Repair all damages, remove all trash, liter, debris and dead plants once per week, year round. Contractor's staff must be able to identify "desirable" plants and flowers: specialty grasses and wildflowers; see attached plant list. Remove any weeds and invasive plants that are "unwanted". Common problem weeds found in Knoxville are Thistle, Fescue, Yellow and Purple Nutsedge, Virginia creeper, Curly Dock, Aster, Johnson grass, Ivy, Dandelion, Vetch, Kudzu, Crab Grass, Mimosa, Honeysuckle, Broadleaf Plantain, Pennywort and Chickweed.

g) Additional maintenance: (1) Conduct spot spraying as necessary. The ideal timeframe runs from mid-March to early April. Use caution not to effect wildflower sprouts. (2) Crews must clean up after maintenance by blowing off roads, walkways, other areas affected by operations. (3) Report any dead or diseased plants before removing them. (4) Report any problems discovered with trees and irrigation system. (5) Monitor Horsetail plants, located within the infiltration beds, for spreading into adjacent landscape areas. Remove as necessary. (6) Inspect for over and under watering conditions. Report concerns to Horticulture Services Manager as soon as possible.

h) No type of chemicals shall be applied for weed control without prior approval from the Horticulture Services Manager. Always use these guidelines when using herbicides:

- NEVER SPRAY PLAYGROUNDS OR WHERE CHILDREN FREQUENT! THIS ALSO INCLUDES THE OUTER PERIMETER, BENCHES, TABLES AND ANY LOCATION WHERE PEOPLE EAT.
- Keep spraying to a minimum: consider cost and environmental concerns
- Spray when the weather is suitable: avoid windy and breezy conditions; high and low temperatures, avoid spraying when rain is expected or after a rain event
- Most herbicides work best when sprayed in the early morning after a few days of dry weather
- Do not spray when people are present; never inadvertently expose the public to chemical exposure
- Employees must be qualified and wear proper Personal Protective Equipment
- Dispose of waste and clean containers properly
- Do not overspray or mix too strong
- Comply with all label requirements
- Never spray near waterways; creeks, streams, rivers, lakes
- All landscaping contractors must possess "Pesticide Applicator Certification" and comply with all requirements

PROTECTIVE EQUIPMENT/ATTIRE:

Contractor shall provide and ensure the wearing of protective clothing, masks, eye protection, etc., as required by law, regulation, ordinance and/or manufacturer's instructions for material and equipment. At minimum, protective equipment shall consist of an OSHA or DOT approved safety vest.

Contractor's employees shall wear appropriate visible material while providing services under this contract. Contractors must bear in mind that the public often perceives contractor's staff as employees of the City; therefore, contractor's staff must wear, at minimum and in addition to protective equipment, a tee-shirt and shorts when providing services under this contract. No tank tops or undershirts are permitted. Clothing displaying nudity, obscene language, obscene symbols, or pro-drug slogans is strictly prohibited.

INVOICES/PAYMENT SCHEDULE:

The City of Knoxville shall be invoiced on a monthly basis for the work accomplished during that period. The City shall not be invoiced for work that has not yet been completed. Contractor must submit invoices within two (2) business days after completion of service to MWagner@KnoxvilleTN.gov. Payment will be made within 30 days of invoicing, after all locations are inspected for quality control.

ADDITIONAL INFORMATION:

Included in this document are:

1. Map for Suttree Landing Park
2. Plant List
3. Construction Landscaping plans

Firm's proposal shall address each of the following outlined items:

1. Proposed plan/ approach to accomplish the goals listed within this Request for Proposals.
2. Qualifications and experience of firm. Include proof of "Pesticide Applicator Certification"
3. Pricing for proposed plan/services

VI. Contract Requirements

Submitting entities, if selected, must be willing to sign a contract with the City which will include certain provisions, among which are the following:

6.1 Contract Documents. The contract shall consist of (1) the RFP; (2) the proposal submitted by the contractor to this RFP; and (3) the contract. In the event of a discrepancy between the contract, the RFP and the submitted proposal, the terms that provide the greater benefit to the City and/or impose the greater obligation to the contractor will prevail.

6.2 Administration. The contract will be administered by the City of Knoxville Public Service Department.

6.3 Invoices. Invoices for services will be submitted to the City in accordance with the contract terms.

6.4 Independent Contractor. The relationship of contractor to the City will be that of independent contractor. The contractor will be solely and entirely responsible for its acts and for

the acts of its agents, employees, servants and subcontractors done during the performance of the contract. All services performed by the contractor shall be provided in an independent contractor capacity and not in the capacity of officers, agents, or employees of the City.

6.5 Assignment. The contractor shall not assign or transfer any interest in this contract without prior written consent of the City of Knoxville.

6.6 Indemnification and Hold Harmless. The successful proposer will be required to sign a contract with the City which contains the following indemnification clause. This indemnification clause will not be altered in any way. Failure to agree with this indemnification clause in the contract may result in the City moving to the next responsible responsive proposer.

Contractor shall defend, indemnify and hold harmless the City, its officers, employees and agents from any and all liabilities which may accrue against the City, its officers, employees and agents or any third party for any and all lawsuits, claims, demands, losses or damages alleged to have arisen from an act or omission of Contractor in performance of this Agreement or from Contractor's failure to perform this Agreement using ordinary care and skill, except where such injury, damage, or loss was caused by the sole negligence of the City, its agents or employees.

Contractor shall save, indemnify and hold the City harmless from the cost of the defense of any claim, demand, suit or cause of action made or brought against the City alleging liability referenced above, including, but not limited to, costs, fees, attorney fees, and other expenses of any kind whatsoever arising in connection with the defense of the City; and Contractor shall assume and take over the defense of the City in any such claim, demand, suit, or cause of action upon written notice and demand for same by the City. Contractor will have the right to defend the City with counsel of its choice that is satisfactory to the City, and the City will provide reasonable cooperation in the defense as Contractor may request. Contractor will not consent to the entry of any judgment or enter into any settlement with respect to an indemnified claim without the prior written consent of the City, such consent not to be unreasonably withheld or delayed. The City shall have the right to participate in the defense against the indemnified claims with counsel of its choice at its own expense.

Contractor shall save, indemnify and hold City harmless and pay judgments that shall be rendered in any such actions, suits, claims or demands against City alleging liability referenced above.

The indemnification and hold harmless provisions of this Agreement shall survive termination of the Agreement.

6.7 Termination. The City may terminate this Agreement at any time, with or without cause, by written notice of termination to the Contractor.

If the City terminates this Agreement, and such termination is not a result of a default by the Contractor, the Contractor shall be entitled to receive as its sole and exclusive remedy the following amounts from the City, and the City shall have no further or other obligations to the Contractor: the amount due to the Contractor for work executed through the date of termination, not including any future fees, profits, or other compensation or payments which the Contractor

would have been entitled to receive if this Agreement had not been terminated.

The City may, by written notice of default to the Contractor, terminate the whole or any part of this Agreement if the Contractor fails to perform any provisions of this Agreement and does not cure such failure within a period of ten (10) days (or such longer period as the Purchasing Agent may authorize in writing) after receipt of said notice from the Purchasing Agent specifying such failure. If this Agreement is terminated in whole or in part for default, the City may procure, upon such terms and in such manner as the Purchasing Agent may deem appropriate, supplies or services similar to those terminated.

6.8 Insurance. When applicable and prior to the commencement of the contract, contractor must, at its sole expense, obtain and maintain in full force and effect for the duration of the Agreement and any extension hereof at least the following types and amounts of insurance for claims which may arise from or in connection with this Agreement. Contractor shall furnish the City of Knoxville with properly executed certificates of insurance which shall clearly evidence all insurance required by the City. All insurance must be underwritten by insurers with an A.M. Best rating of A-VIII or better. Such insurance shall be at a minimum the following:

- A. **Commercial General Liability Insurance;** occurrence version commercial general liability insurance, and if necessary umbrella liability insurance, with a limit of not less than two million dollars each occurrence for bodily injury, personal injury, property damage, and products and completed operations. If such insurance contains a general aggregate limit, it shall apply separately to the work/location in this Agreement or be no less than \$3,000,000.

Such insurance shall:

- (a.) Contain or be endorsed to contain a provision that includes the City, its officials, officers, employees, and volunteers as additional insureds with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts, or equipment furnished in connection with such work or operations. The coverage shall contain no special limitations on the scope of its protection afforded to the above-listed insureds. Proof of additional insured status up to and including copies of endorsements and/or policy wording will be required.
- (b.) For any claims related to this project, Contractor's insurance coverage shall be primary insurance as respects the City, its officers, officials, officers, employees, and volunteers. Any insurance or self-insurance programs covering the City, its officials, officers, employees, and volunteers shall be excess of Contractor's insurance and shall not contribute with it.
- (c.) At the sole discretion of the City, dedicated limits of liability for this specific project may be required.

- B. **Automobile Liability Insurance;** including vehicles owned, hired, and non-owned, with a combined single limit of not less than \$1,000,000 each accident.

Such insurance shall include coverage for loading and unloading hazards. Insurance shall contain or be endorsed to contain a provision that includes the City, its officials, officers, employees, and volunteers as additional insureds with respect to liability arising out of automobiles owned, leased, hired, or borrowed by or on behalf of Contractor.

- C. **Workers' Compensation Insurance.** Contractor shall maintain workers' compensation insurance with statutory limits as required by the State of Tennessee or other applicable laws and employers' liability insurance with limits of not less than \$500,000. Contractor shall require each of its subcontractors to provide Workers' Compensation for all of the latter's employees to be engaged in such work unless such employees are covered by Contractor's workers' compensation insurance coverage.
- D. **Other Insurance Requirements.** Contractor shall:
- Prior to commencement of services, furnish the City with original certificates and amendatory endorsements effecting coverage required by this section and provide that such insurance shall not be cancelled, allowed to expire, or be materially reduced in coverage except on 30 days' prior written notice to the City Attorney of Knoxville; P.O. Box 1631; Knoxville, Tennessee 37901. Proof of policy provisions regarding notice of cancellation will be required.
 - Upon the City's request, provide certified copies of endorsements and policies if requested by the City in lieu of or in addition to certificates of insurance. Copies of policies will only be requested when contracts are deemed to be extremely or uniquely hazardous, include a dollar amount that is significant to the overall budget of the City or a City Department, or the coverage(s) may not follow standard insurance forms. A policy will only be requested after the City's Risk Manager has reviewed the contract and proof of coverage has been provided. Should the certificate of insurance refer to specific coverage wording or endorsements(s), proof of such policy wording or endorsement(s) will be required.
 - Replace certificates, policies, and endorsements for any such insurance expiring prior to completion of services.
 - Maintain such insurance from the time services commence until services are completed. Failure to maintain or renew coverage or to provide evidence of renewal may be treated by the City as a material breach of contract.
 - If Contractor cannot procure insurance through an insurer having an A.M. Best rating of A-VIII, Contractor may, in the alternative, place such insurance with insurer licensed to do business in Tennessee and having A.M. Best Company ratings of no less than A. Modification of this standard may be considered upon appeal to the City Law Director.
 - Require all subcontractors to maintain during the term of the Agreement Commercial General Liability insurance, Business Automobile Liability insurance, and Workers'

Compensation/Employer's Liability insurance (unless subcontractor's employees are covered by Contractor's insurance) in the same manner as specified for Contractor. Contractor shall furnish subcontractors' certificates of insurance to the City without expense immediately upon request.

- Large Deductibles; Self-Insured Retentions. Any deductibles and/or self-insured retentions greater than \$50,000 must be disclosed to and approved by the City of Knoxville prior to the commencement of services. Use of large deductibles and/or self-insured retentions may require proof of financial ability as determined by the City.
- Waiver of Subrogation Required. The insurer shall agree to waive all rights of subrogation against the City, its officers, officials, and employees for losses arising from work performed by Contractor for the City. Proof of waiver of subrogation up to and including copies of endorsements and/or policy wording will be required.
- Occurrence Basis Requirement. All general liability policies must be written on an occurrence basis, unless the Risk Manager determines that a claims made basis is reasonable in the specific circumstance. Use of policies written on a claims made basis must be approved by the City. Risk Manager and retroactive dates and/or continuation dates must be provided to the City prior to commencement of any work performed. Professional Liability and Environmental Liability (Pollution Coverage) are most commonly written on a claims made basis and are generally acceptable in that form.

6.9 Ethical Standards. Attention of all firms is directed to the following provisions contained in the Code of the City of Knoxville: Chapter 24, Article II, Section 24-33 entitled "Debts owed by persons receiving payments other than Salary;" Chapter 2, Article VIII, Division 11. the Contractor hereby takes notice of and affirms that it is not in violation of, or has not participated, and will not participate, in the violation of any of the following ethical standards prescribed by the Knoxville City Code:

A. Section 2-1048. Conflict of Interest.

It shall be unlawful for any employee of the city to participate, directly or indirectly, through decision, approval, disapproval, recommendation, preparation of any part of a purchase request, influencing the content of any specification or purchase standard, rendering of advice, investigation, auditing or otherwise, in any proceeding or application, request for ruling or other determination, claim or controversy or other matter pertaining to any contract or subcontract and any solicitation or proposal therefore, where to the employee's knowledge there is a financial interest possessed by:

- (1) the employee or the employee's immediate family;
- (2) A business other than a public agency in which the employee or member of the employee's immediate family serves as an officer, director, trustee, partner or employee; or
- (3) Any person or business with whom the employee or a member of the employee's immediate family is negotiating or has an arrangement concerning prospective employment.

B. Section 2-1049. Receipt of Benefits from City Contracts by Council Members, Employees and Officers of the City.

It shall be unlawful for any member of council, member of the board of education, officer or employee of the city to have or hold any interest in the profits or emoluments of any contract, job, work or service, either by himself or by another, directly or indirectly. Any such contract for a job, work or service for the city in which any member of council, member of the board of education, officer or employee has or holds any such interest is void.

C. Section 2-1050. Gratuities and Kickbacks Prohibited.

It is unlawful for any person to offer, give or agree to give to any person, while a city employee, or for any person, while a city employee, to solicit, demand, accept or agree to accept from another person, anything of a pecuniary value for or because of:

- (1) An official action taken, or to be taken, or which could be taken;
- (2) A legal duty performed, or to be performed, or which could be performed; or
- (3) A legal duty violated, or to be violated, or which could be violated by such person while a city employee.

Anything of nominal value shall be presumed not to constitute a gratuity under this section.

Kickbacks. It is unlawful for any payment, gratuity, or benefit to be made by or on behalf of a subcontractor or any person associated therewith as an inducement for the award of a subcontract or order.

D. Section 2-1051. Covenant Relating to Contingent Fees.

(a) **Representation of Contractor.** Every person, before being awarded a contract in excess of ten thousand dollars (\$10,000.00) with the city, shall represent that no other person has been retained to solicit or secure the contract with the city upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except for bona fide employees or bona fide established commercial, selling agencies maintained by the person so representing for the purpose of securing business.

(b) **Intentional Violation Unlawful.** The intentional violation of the representation specified in subsection (a) of this section is unlawful.

E. Section 2-1052. Restrictions on Employment of Present and Former City Employees.

Contemporaneous employment prohibited. It shall be unlawful for any city employee to become or be, while such employee, an employee of any party contracting with the particular department or agency in which the person is employed.

For violations of the ethical standards outlined in the Knoxville City Code, the City has the following remedies:

- (1) Oral or written warnings or reprimands;
- (2) Cancellation of transactions; and
- (3) Suspension or debarment from being a Contractor or subcontractor under city or city-funded contracts.

The value of anything transferred in violation of these ethical standards shall be recoverable by the City from such person. All procedures under this section shall be in accord with due process requirements, included but not limited to a right to notice and hearing prior to imposition of any cancellation, suspension or debarment from being a Contractor or subcontractor under a city contract.

6.10 Firms must comply with the President's Executive Order No. 11246 and 11375 which prohibit discrimination in employment regarding race, color, religion, sex or national origin. Firms must also comply with Title VI of the Civil Rights Act of 1964, Copeland Anti-Kick Back Act, the Contract Work Hours and Safety Standards Act, Section 402 of the Vietnam Veterans Adjustment Act of 1974, Section 503 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act of 1990, all of which are herein incorporated by reference.

6.11 Firms shall give consideration to the inclusion of minority firms or individuals in this project, and shall advise the city in this proposal of their efforts to do so.

6.12 Firms shall give consideration to the use of environmentally sustainable best practices, and shall advise the city in this submittal of qualifications of their efforts to do so.

6.13 Federal, State, and Local Requirements. Each submitting entity is responsible for full compliance with all laws, rules and regulations which may be applicable.

6.14 Licenses. Before a contract is signed by the City, the submitting entity, if selected, **must** provide the City Purchasing Division with a copy of its valid business license **or** with an affidavit explaining why it is exempt from the business licensure requirements of the city or county in which it is headquartered. If a contract is signed, the contractor's business license shall be kept current throughout the duration of the contract, and the contractor shall inform the City of changes in its business name or location. The contractor must be a licensed professional as required by the state of Tennessee, see T.C.A. Sections 62-2-101 et. seq., for any services in this contract requiring such licensure.

6.15 Funding. The City's performance and obligation to pay under this contract is subject to funding contingent upon an annual appropriation.

6.16 Governing Law and Venue. This Agreement shall be governed by and construed in accordance with the substantive laws of the State of Tennessee and its conflict of laws provisions. Venue for any action arising between the City and the Contractor from the Agreement shall lie in Knox County, Tennessee.

6.17 Subcontracts to the Agreement. Contractor shall not enter into a subcontract for any of the services performed under this Agreement without obtaining the prior written approval of the City.

6.18 Amendments. This Agreement may be modified only by a written amendment or addendum that has been executed and approved by the appropriate officials shown on the signature page of the Agreement.

6.19 Captions. The captions appearing in the Agreement are for convenience only and are not a part of the Agreement; they do not in any way limit or amplify the provisions of the Agreement.

6.20 Severability. If any provision of the Agreement is determined to be unenforceable or invalid, such determination shall not affect the validity of the other provisions contained in the Agreement. Failure to enforce any provision of the Agreement does not affect the rights of the parties to enforce such provision in another circumstance, nor does it affect the rights of the parties to enforce any other provision of this Agreement at any time.

6.21 No Benefit for Third Parties. The services to be performed by the Contractor pursuant to the Agreement with the City are intended solely for the benefit of the City, and no benefit is conferred hereby, nor is any contractual relationship established herewith, upon or with any person or entity not a party to the Agreement. No such person or entity shall be entitled to rely on the Contractor's performance of its services hereunder, and no right to assert a claim against the City or the Contractor, its officers, employees, agents, or contractors shall accrue to the Contractor or to any subcontractors, independently retained professional consultant, supplier, fabricator, manufacturer, lender, tenant, insurer, surety, or any other third party as a result of this Agreement or the performance or non-performance of the Contractor's services hereunder.

6.22 Non-Reliance of Parties. Parties explicitly agree that they have not relied upon any earlier or outside representations other than what has been included in the Agreement. Furthermore, neither party has been induced to enter into this Agreement by anything other than the specific written terms set forth herein.

6.23 Force Majeure. Neither party shall be liable to the other for any delay or failure to perform any of the services or obligations set forth in this Agreement due to causes beyond its reasonable control, and performance times shall be considered extended for a period of time equivalent to the time lost because of such delay plus a reasonable period of time to allow the parties to recommence performance of their respective obligations hereunder. Should a circumstance of force majeure last more than ninety (90) days, either party may by written notice to the other terminate this Agreement. The term "force majeure" as used herein shall mean the following: acts of God; strikes, lockouts or other industrial disturbances; acts of public enemies; orders or restraints of any kind of the government of the United States or of the State or any of their departments, agencies or officials, or any civil or military authority; insurrections, riots, landslides, earthquakes, fires, storms, tornadoes, droughts, floods, explosions, breakage or accident to machinery, transmission pipes or canals; or any other cause or event not reasonably within the control of either party.

6.24 EEO/AA. The City of Knoxville is an EE/AA/Title VI/Section 504/ADA/ADEA Employer.

6.25 By submitting a proposal, the submitting entity agrees to all terms and conditions established in this RFP, including its contract requirements.

VII. Instructions to Submitting Entities

All submissions of proposals shall comply with the following instructions. These instructions ensure that (1) submissions contain the information and documents required by the City RFP and (2) the submissions have a degree of uniformity to facilitate evaluation.

7.1 General

Submission forms and RFP documentation may be obtained on or after November 30, 2018, at no charge from:

City of Knoxville Purchasing Division
City/County Building
400 Main Street, Room 667
Knoxville, Tennessee 37902

between 8:30 a.m. and 4:30 p.m. (Eastern Time), Monday through Friday or by calling 865/215-2070. Forms and RFP information are also available on the City web site at www.knoxvilletn.gov/purchasing where it can be read or printed using Adobe Acrobat Reader software.

7.2 Submission Information

Proposals shall include five (5) hard copies (one original and four duplicates—**mark the original as such**) and one electronic copy of the proposal (.pdf format on CD or USB drive only—**mark the storage device with the company name**); the electronic version shall be an exact duplicate of the original, and the electronic version will be the official document exhibited in the contract. **Electronic submissions must be included with the sealed submissions; do not email your submission.**

IMPORTANT NOTE: A minimum of one of the submitted proposals must bear an original signature, signed in ink (duplicated signatures substituted for original ink signatures may result in rejection of the proposals). This document is the official, original submission; the required copies may have copied signatures. The signature must be entered above the typed or printed name and title of the signer. All proposals must be signed by an officer of the company authorized to bind the firm to a contract.

Proposals will be received until 11:00:00 a.m. (Eastern Time) on **December 27, 2018**. Each proposal must be submitted in a sealed envelope addressed to:

City of Knoxville Purchasing Division
City/County Building
400 Main Street, Room 667
Knoxville, TN 37902

IMPORTANT NOTE: Each mailing envelope or carton containing a proposal or multiple copies of the proposal must be sealed and plainly marked on the outside “Landscaping Services at Suttree Landing Park.” Proposers are reminded that the Purchasing Division

receives many bids and proposals for any number of solicitations; **unlabeled submissions are extremely difficult to match to their appropriate solicitations and therefore may be rejected.**

Any proposals received after the time and date on the cover sheet will not be considered. It shall be the sole responsibility of the submitting entity to have the proposal delivered to the City of Knoxville Purchasing Division on or before that date.

Late proposals will not be considered. Proposals that arrive late due to the fault of United States Postal Service, United Parcel Service, DHL, FEDEX, any delivery/courier service, or any other carrier of any sort are still considered late and shall not be accepted by the City. Such proposals shall remain unopened and will be returned to the submitting entity upon request.

7.3 Format

The City is committed to reducing waste. Submissions of qualifications must be typed on 8.5 x 11 inch wide white paper, printed on both sides. **DO NOT BIND** the document; instead, staple or binder clip the submission together and place in a sealed envelope (see Paragraph 7.2). Pages must be consecutively numbered. A table of contents must be included in the proposal immediately after the title page, and each of the following numbered sections must be tabbed.

Proposals shall be structured as follows. Numbered items listed below should have a numbered tab page:

1. Title Page
2. Table of Contents
3. Submission Forms:
 - A. Form S-1
 - B. Non-Collusion Affidavit
 - C. No Contact/No Advocacy Affidavit
 - D. Child Crime Affidavit
 - E. Iran Divestment Act Certification of Noninclusion
 - F. Diversity Business Enterprise Program
4. Body of Proposal: Information which addresses the scope of service provided and the evaluation criteria listed below.

NOTE: All required submission forms may be found in this solicitation document.

7.4 Evaluation of Proposals

All qualified submissions received by the deadline will be analyzed by the Evaluation Committee according to the criteria outlined in these specifications. Failure to comply with the provisions of the RFP may cause any proposal to be ineligible for evaluation. Each submittal of proposals will be initially analyzed and judged according to the evaluation criteria below. The maximum score is 100 points.

The City reserves full discretion to determine the capability of proposing entities. Proposers, if

asked, will provide, in a timely manner, any and all information that the City deems necessary to make such a decision. In addition to materials provided in the written responses to this RFP, the Committee may request additional material, information, references, a site visit, or a live test demonstration from the submitting entity or others.

The Evaluation Committee may or may not decide to interview any or all proposing entities at a time and date determined by the City in order to address questions and more fully ascertain how the solution to this project satisfies the evaluation criteria. Firms and/or teams responding to this Request for Proposals shall be available for interviews with the Evaluation Committee. Discussions may be conducted with responsible submitting entities for purposes of clarification to assure full understanding of and conformance to the RFP requirements. Selection shall be based on the firms' qualifications applicable to the scope and nature of the services to be performed per this request for proposals. Determination of firms' qualifications shall be based on their written responses to this Request for Proposals and information presented to the Evaluation Committee during oral interviews, if any.

In addition to materials provided in the written responses to this Request for Proposals, the Committee may request additional material, information, or references from the submitting entity or others.

Provided it is in the best interest of the City of Knoxville, the firm or team determined to be the most responsive to the City of Knoxville, taking into consideration the evaluation factors set forth in this Request for Proposals, will be selected to begin contract negotiations. The firm or team selected will be notified at the earliest practical date and invited to submit more comprehensive information if necessary. If no satisfactory agreement can be reached with the "most responsive firm," the City may elect to negotiate with the next best and most responsive firm or team.

VIII. Evaluation Criteria

An evaluation team, composed of representatives of the City, will evaluate proposals on a variety of quantitative and qualitative criteria. Upon receipt of proposals, the City will review to determine whether the proposal is acceptable or non-acceptable based on the criteria outlined below.

The criteria and the associated weights upon which the evaluation of the proposals will be based include, but are not limited to, the following:

- 1. Pricing/Cost – 40 points:** Pricing shall be provided as cost per one-week cycle (7 calendar days) as well as the total cost for a one year contract.
- 2. Approach – 30 points:** Proposer shall provide details outlining the firm's approach/plan to accomplish the goals listed within this Request for Proposals.
- 3. Qualification/Experience of Firm – 30 points:** Proposal shall provide details regarding number of years in business, location of working office, and number of personnel employed available to provide service for this contract including supervisory staff. Note

if personnel is full-time, part-time, or seasonal employment. Include the use of any subcontractors. All contractor's must supply no less than three (3) references within the past three (3) years where similar work and comparable job size was performed. Include the name of the business, address, phone number, and contact person's email address for each reference. Provide any unique strengths, experiences, or qualifications of your firm. Include proof of "Pesticide Applicator Certification".

Submission Forms

**CITY OF KNOXVILLE
REQUEST FOR PROPOSALS
Landscaping Services
at Suttree Landing Park**

Submission Form S-1

**Proposals to be Received by 11:00:00 a.m., Eastern Time; December 27, 2018
in Room 667-674, City/County Building; Knoxville, Tennessee.**

IMPORTANT: Proposals shall include five (5) hard copies (one original and four duplicates—**mark the original as such**) and one electronic copy of the proposal (.pdf format on CD or USB drive only—**mark the storage device with the company name**); the electronic version shall be an exact duplicate of the original, and the electronic version will be the official document exhibited in the contract. **Electronic submissions must be included with the sealed submissions; do not email your submission.**

Please complete the following:

Legal Name of Proposer: _____

Address: _____

Telephone Number: _____

Fax Number: _____

Contact Person: _____

Email Address: _____

DUNS #: _____

Signature: _____

Name and Title of Signer: _____

Note: Failure to use these response sheets may disqualify your submission.

NON-COLLUSION AFFIDAVIT

State of _____

County of _____

_____, being first duly sworn, deposes and says that:

- (1) He/She is the _____ of _____, the firm that has submitted the attached Proposal;
- (2) He/She is fully informed respecting the preparation and contents of the attached Proposal and of all pertinent circumstances respecting such Proposal;
- (3) Such Proposal is genuine and is not a collusive or sham Proposal;
- (4) Neither the said firm nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly, with any other vendor, firm or person to submit collusive or sham proposal in connection with the contract or agreement for which the attached Proposal has been submitted or to refrain from making a proposal in connection with such contract or agreement, or collusion or communication or conference with any other firm, or, to fix any overhead, profit, or cost element of the proposal price or the proposal price of any other firm, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against the City of Knoxville or any person interested in the proposed contract or agreement; and
- (5) The proposal of service outlined in the Proposal is fair and proper and is not tainted by collusion, conspiracy, connivance, or unlawful agreement on the part of the firm or any of its agents, representatives, owners, employees, or parties including this affiant.

(Signed): _____

Title: _____

Subscribed and sworn to before me this _____ day of _____, 20__.

NOTARY PUBLIC

My Commission expires _____

No Contact/No Advocacy Affidavit

State of _____

County of _____

_____, being first duly sworn, deposes and says that:

(1) He/She is the owner, partner, officer, representative, or agent of _____
_____, the Proposer that has submitted the attached Proposal;

(2) The Proposer _____ swears or affirms that he/she will abide by the following “No Contact” and “No Advocacy” clauses:

a) **NO CONTACT POLICY:** After the posting of this solicitation to the Purchasing Division's website, any contact initiated by any proposer with any City of Knoxville representative concerning this proposal is strictly prohibited, unless such contact is made with the Assistant Purchasing Agent (Penny Owens) or the listed Point of Contact (Julie Maxwell). Any unauthorized contact may cause the disqualification of the proposer from this procurement transaction.

b) **NO ADVOCATING POLICY:** To ensure the integrity of the review and evaluation process, companies and/or individuals submitting proposals for any part of this project, as well as those persons and/or companies representing such proposers, may not lobby or advocate to the City of Knoxville staff including, but not limited to, members of City Council, Office of the Mayor, Department of Public Service, or any other City staff.

Any company and/or individual who does not comply with the above stated “No Contact” and “No Advocating” policies may be subject to having their proposal rejected from consideration.

Signed: _____

Title: _____

Subscribed and sworn to before me this _____ day of _____, 2_____.

My commission expires: _____

Child Crime Affidavit

State of _____

County of _____

_____, being first duly sworn, deposes and says that:

- (1) He/She is the owner, partner, officer, representative, or agent of _____
_____, the Bidder that has submitted the attached Bid;
- (2) The Bidder _____ will abide by the following if chosen as
the successful bidder:

The Bidder _____ agrees not to allow any employee or
volunteer who is awaiting trial or has been convicted of a felony crime involving the sexual
exploitation of children, sexual offenses involving children or violent crimes to participate in this
Agreement at sites where children may be present. Failure by the Bidder to comply with this
requirement is grounds for immediate termination of the Agreement.

Signed: _____

Title: _____

Subscribed and sworn to before me this _____ day of _____, 2_____.

My commission expires: _____

IRAN DIVESTMENT ACT

Certification of Noninclusion

NOTICE: Pursuant to the Iran Divestment Act, Tenn. Code Ann. § 12-12-106 requires the State of Tennessee Chief Procurement Officer to publish, using creditable information freely available to the public, a list of persons it determines engage in investment activities in Iran, as described in § 12-12-105. Inclusion on this list makes a person ineligible to contract with the state of Tennessee; if a person ceases its engagement in investment activities in Iran, it may be removed from the list. A list of entities ineligible to contract in the State of Tennessee Department of General Services or any political subdivision of the State may be found here:

https://www.tn.gov/content/dam/tn/generalservices/documents/cpo/cpo-library/public-information-library/List_of_persons_pursuant_to_Tenn._Code_Ann._12-12-106_Iran_Divestment_Act_updated_7.7.17.pdf

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to T.C.A. § 12-12-106.

Vendor Name (Printed)	Address
By (Authorized Signature)	Date Executed
Printed Name and Title of Person Signing	

NOTARY PUBLIC:

Subscribed and sworn to before me this _____ day of _____, 2_____.

My commission expires: _____

DIVERSITY BUSINESS ENTERPRISE (DBE) PROGRAM

The City of Knoxville strongly encourages prime contractors to employ diverse businesses in the fulfillment of contracts/projects for the City of Knoxville.

The City of Knoxville's Fiscal Year 2018 goal is to conduct 3.06% of its business with minority-owned businesses, 10.03% of its business with woman-owned businesses, and 38.71% with small businesses.

While the City cannot engage (pursuant to state law) in preferential bidding practices, the City does **strongly encourage** prime contractors to seek out and hire diverse businesses in order to help the City meet its goals as stated above. As such, the City encourages prime contractors to seek out and consider competitive sub-bids and quotations from diverse businesses.

For DBE tracking purposes, the City requests that prime contractors who are bidding, proposing, or submitting statements of qualifications record whether or not they plan to employ DBE's as sub-contractors or consultants. With that in mind, please fill out, sign and submit (with your bid/proposal) the following sub-contractor/ consultant statement.

CITY OF KNOXVILLE DIVERSITY BUSINESS DEFINITIONS

Diversity Business Enterprise (DBE's) are minority-owned (MOB), women-owned (WOB), service-disabled veteran-owned (SDVO), and small businesses (SB), who are impeded from normal entry into the economic mainstream because of past practices of discrimination based on race or ethnic background. These persons must own at least 51% of the entity and operate or control the business on a daily basis.

Minority: A person who is a citizen or lawful admitted permanent resident of the United States and who is a member of one (1) of the following groups:

- a. African American, persons having origins in any of the Black racial groups of Africa;
- b. Hispanic American, persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race;
- c. Native American, persons who have origin in any of the original peoples of North America ;
- d. Asian American, person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands.

Minority-owned business (MOB) is a continuing, independent, for profit business that performs a commercially useful function, and is at least fifty-one percent (51%) owned and controlled by one (1) or more minority individuals.

Woman-owned business (WOB) is a continuing, independent, for profit business that performs a commercially useful function, and is at least fifty-one percent (51%) owned and controlled by one (1) or more women.

Service Disabled Veteran-owned business (SDOV) is a continuing, independent, for profit business that performs a commercially useful function, owned by any person who served honorably on active duty in the armed forces of the United States with at least a twenty percent (20%) disability that is service connected. Meaning such disability was incurred or aggravated in the line of duty in the active military, naval or air service, and is at least fifty-one percent (51%) owned and controlled by one (1) or more service disabled veteran.

Small Business (SB) is a continuing, independent, for profit business which performs a commercially useful function and has total gross receipts of not more than ten million dollars (\$10,000,000) average over a three-year period or employs no more than ninety-nine (99) persons on a full-time basis.

Subcontractor/Consultant Statement
(TO BE SUBMITTED IN THE BID/PROPOSAL ENVELOPE)

We _____ do certify that on the
(Bidder/Proposer Company Name)

(Project Name)
\$ _____
(Amount of Bid)

Please select one:

Option A: Intent to subcontract using Diverse Businesses

A Diversity business will be employed as subcontractor(s), vendor(s), supplier(s), or professional service(s). The estimated **dollar value** of the amount that we plan to pay is:

\$ _____.
Estimated Amount of Subcontracted Service

Diversity Business Enterprise Utilization			
Description of Work/Project	Amount	Diverse Classification (MOB, WOB, SB, SDOV)	Name of Diverse Business

Option B: Intent to perform work “without” using Diverse Businesses

We hereby certify that it is our intent to perform 100 % of the work required for the contract, work will be completed without subcontracting, or we plan to subcontract with non-Diverse companies.

DATE: _____ COMPANY NAME: _____

SUBMITTED BY: _____ TITLE: _____
(Authorized Representative)

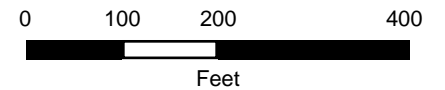
ADDRESS: _____

CITY/STATE/ZIP CODE: _____

TELEPHONE NO: _____



Suttree Landing Park
Landscaping
8 acre park



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Suttree Landing Park Landscaping

Screening Shrubs	Botanical Name	Symbol	Quantity
Button Bush, 5-gal	Cephalanthus occidentails	Co	13
Summersweet, 3-gal	Clethra alnifolic	Ca	23
Winter Red Winterberry, 4'-5' ht.	Ilex verticulata winter red	IvW	25
Jim Dandy Winterberry (male Pollenizer), 4'-5' ht	Ilex verticulata Southern Gentleman	IvS	4
Leatherleaf Viburnun, 48" ht'	Viburnum rhytidophyllum	Vr	57
Water Quality Feature Floor/Mounts	Botanical Name	Symbol	Quantity
Southern Blue Flag Iris, 4" pot	Iris virginica	Iv	3,485
Soft Rush, 4" pot	Juncus effusus	Je	3,485
Dwarf Virginia Sweetspire, 3-gal	Itea virginica Merlot	IvM	216
Water Quality Feature Fringe	Botanical Name	Symbol	Quantity
Button Bush, 5-gal	Cephalanthus occidentalis	Co	68
Summersweet, 3-gal	Clethra alnifolic	Ca	139
Redosier Dogwood, 5-gal	Coronus sericea	Cs	63
Winter Red Winterberry, 4'-5' ht.	Ilex verticulata winter red	IvW	62
Jim Dandy Winterberry (male Pollenizer), 4'-5' ht	Ilex verticulata Southern Gentleman	IvS	8
Rain Garden	Botanical Name	Symbol	Quantity
Horsetail Rush/Scouring Rush	Equisetum hymale	a	214
Blunt Spike Rush	Eleocharis ovata	b	214
Soft Rush	Junus effusas	c	214
Crested Oval Sedge	Carex cristatella	d	214
Tussock Sedge	Carex stricata	e	214
Grey's Sedge	Carex grayi	f	214
Shallow Sedge	Carex lurida	g	214
Pennsylvania Sedge	Carex pennsylvanica	h	214
River Oats/Inland Sea Oats	Chasmanthium latifolium	i	214
Swamp Milkweed	Asclepias incarata	j	214
Fritart's Aster	Asclepias x frikartii Monch	k	214
New England Aster var Purple Dome	Aster novae angliae Purple	l	214
Rattlesnake Aster	Eryngium vuccifolium	m	214
Blue Flag Iris	Iris versicolor	n	214
Dense Blasing Star	Liatris spicata	n	214
Great Blue lobelic	Lobelia silphilitica	o	214
Penstemon var Husker Road	Penstemon digitalis Husker Red	p	214
Virginia Mountain Mint	Pycnanthemum virginianum	q	214

Rain Garden Fringe	Botanical Name	Symbol	Quantity
Red Switchgrass var. Shenandoah, 1-gal	Panicum virigatum	Pv	1,564
Live Stakes ½”-2”, 2’-3’ lg	Botanical Name	Symbol	Quantity
Live Stakes – Silky Dogwood,	Cornus amonum	Cam	347
Live Stakes – Black Willow	Salix nigra	Sna	347
Live Stakes – Silky Willow	Salix sericea	Ssa	347
Riverwalk Planters	Botanical Name	Symbol	Quantity
Little Bluestream, 1-gal	Andropogon scoparias	a	769
Daffodils, bulbs	Narcissus spp.	b	4,014
Siberian Squil, bulbs	Scilla siberica Spring Beauty	c	14,184
Wild Columbine, plugs	Aquilegia canadensis	d	507
Aromatic Aster, 1-qt	Aster oblongifolius	e	499
Upland Planters (Shrubs)	Botanical Name	Symbol	Quantity
Duke Grdens Yew	Cephalotaxus Harrintonia	CH	71
Mount Airy Fothergilla	Fothergilla Gardeni Mount Airy	FG	10
Little Henry Virginia Sweetspire	Itea Virginica Little Henry	IV	7
Upland Planters (Ground Cover)	Botanical Name	Symbol	Quantity
White Lace Carnations	Diantus Plumarias White Lace	DP	234
Kim’s Knee High Coneflower	Enchinacea Purpurea Kim’s	EP	268
Dwarf St. John’s Wart	Hypericum Calycinum	HC	391
Nick’s Compact Pfitzer Juniper	Juniperus Chinensis Nick’s	JC	88
Big Blue Liriope	Liriope Muscari Big Blue	LM	309
Treatment Planters (Shrubs)	Botanical Name	Symbol	Quantity
Shamrock Compact Inkberry	Ilex Glabra Shamrock	IG	47
Hummingbird Summersweet	Clethra Alnifolia Hummingbird	CA	118
Treatment Planters (Ground Cover)	Botanical Name	Symbol	Quantity
Willowleaf Bluestar	Amsonia Hubrechtl	AH	144
Swamp Milkweed	Asclepias Incarnta	AL	96
River Oats	Chasmanthium Latifolia	CL	1298
Tussock Sedge	Carex Stricta	CS	954
The Blues Little Bluestem	Schyzachyrium Scoparium	SS	1159

1. GENERAL

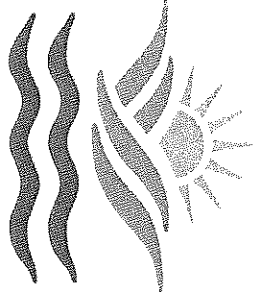
CANNON & CANNON, INC.
 6901-41 COVER SHEET

2. LANDSCAPE

- BERNEFELD RICHTERS AND CANNON & CANNON, INC.
- L002-41 PLANT SCHEDULE & LANDSCAPE NOTES
 - L101-41 PRESENT LAYOUT
 - L102-41 PRESENT LAYOUT
 - L103-41 PRESENT LAYOUT
 - L101-2-41 PROPOSED LAYOUT PLAN
 - L102-2-41 PROPOSED LAYOUT PLAN
 - L103-2-41 PROPOSED GRADING AND DRAINAGE PLAN
 - L102-3-41 PROPOSED GRADING AND DRAINAGE PLAN
 - L103-3-41 PAVEMENTS/LIGHTING/FURNITURE SITE PLAN - WEST END
 - L111-41 PAVEMENTS/LIGHTING/FURNITURE SITE PLAN - MIDDLE
 - L112-41 PAVEMENTS/LIGHTING/FURNITURE SITE PLAN - EAST END
 - L113-41 OVERALL LANDSCAPE PLAN
 - L121-41 LANDSCAPE PLAN - SECTION 1
 - L122-41 LANDSCAPE PLAN - SECTION 2
 - L123-41 LANDSCAPE PLAN - SECTION 3
 - L131-41 ENLARGED AREA - WEST END
 - L132-41 ENLARGED AREA - MIDDLE SECTION
 - L133-41 ENLARGED AREA - EAST END
 - L134-41 PUMP DETAILS
 - L135-41 PUMP DETAILS
 - L301-41 STAIR RAMP ENLARGEMENTS
 - L302-41 PLAYGROUND LAYOUT ENLARGEMENT
 - L303-41 BIKEWALK/FURNITURE LAYOUTS
 - L403-41 SITE IMPROVEMENT DETAILS
 - L404-41 SITE IMPROVEMENT DETAILS
 - L405-41 SEATWALL & RETAINING WALL DETAILS
 - L406-41 PLANTING DETAILS
 - L408-41 PLANTING DETAILS

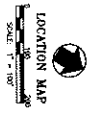
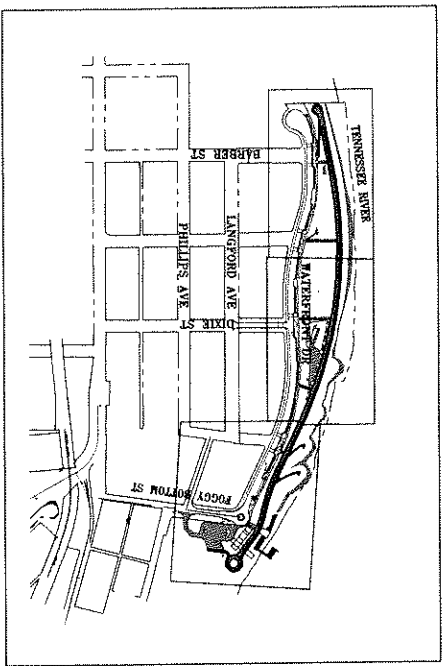
3. ARCHITECTURAL

- STUDIO 1
- A2.1A-1 PLAN
 - A4.1A-1 ELEVATIONS AND DETAILS



CITY OF KNOXVILLE
 MADELINE ROGERO, MAYOR

SUTTREE LANDING PARK: PHASE 1B
 PROPOSED PARK IMPROVEMENTS
 ADDENDUM #1



4. STRUCTURAL & MARINE

- CSA, INC.
- S1.0A-1 GENERAL NOTES
 - S1.1A-1 TYPICAL DETAILS
 - S2.1-41 FOUNDATION PLAN
 - S2.2-41 ENLARGED FOUNDATION PLAN
 - S2.3-41 ENLARGED FLOATING DOCK PLAN
 - S3.1-41 SECTIONS & DETAILS
 - S3.2-41 SECTIONS & DETAILS

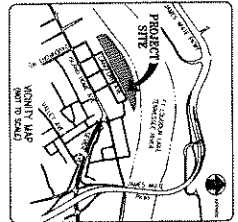
5. MEP

- FACILITY SYSTEM CONSULTANTS LLC
- E100-41 LEGEND, SCHEDULE & DETAILS
 - E101-41 SITE ELECTRICAL PLAN - SECTION A
 - E102-41 SITE ELECTRICAL PLAN - SECTION B
 - E103-41 SITE ELECTRICAL PLAN - SECTION C
 - E104-41 PAVILION LIGHTING PLAN

6. CIVIL

- CANNON & CANNON, INC.
- C101-1-41 INITIAL EROSION CONTROL PLAN
 - C102-1-41 INITIAL EROSION CONTROL PLAN
 - C103-1-41 INITIAL EROSION CONTROL PLAN
 - C102-2-41 INTERMEDIATE EROSION CONTROL PLAN
 - C103-2-41 INTERMEDIATE EROSION CONTROL PLAN
 - C101-2-41 FINAL EROSION CONTROL PLAN
 - C102-3-41 FINAL EROSION CONTROL PLAN
 - C103-3-41 FINAL EROSION CONTROL PLAN
 - C401-41 EROSION CONTROL DETAILS
 - C401-41 SANITARY PLAN AND PROFILE
 - S4101-41

PROJECT DATA	
TYPE OF SUBMITTAL	CONTRACT DOCUMENTS
CITY-COUNTY BEARING	400 MAIN STREET, SUITE 605, KNOXVILLE, TN 37902
PROJECT NUMBER	15
APPROXIMATION	CITY OF KNOXVILLE, 4000 W. 15th AVENUE, SUITE 200, KNOXVILLE, TN 37922
DATE	10-15-2015
CITY PROJECT #	141-C-0866



CANNON & CANNON, INC.
 400 MAIN STREET, SUITE 605, KNOXVILLE, TN 37902
 TEL: 615.522.1111 FAX: 615.522.1112
 WWW.CANNONANDCANNON.COM

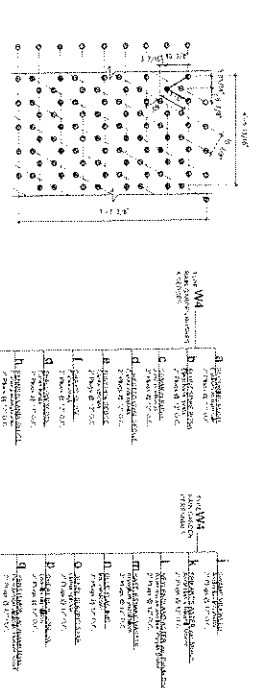
THE CITY OF KNOXVILLE
 ENGINEER OF RECORD
 PROJECT NO. 141-C-0866
 SHEET NO. G001-A1

COVER SHEET

DATE: 10/15/15
 DRAWN BY: [Name]
 CHECKED BY: [Name]
 APPROVED BY: [Name]

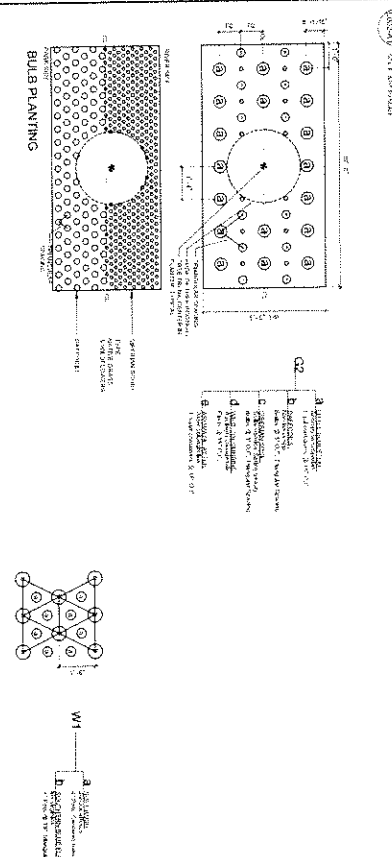
811
 Home Inspection
 Call Before You Dig

G001 - A1



W1 - RAIN GARDEN PLANTING

G2 - RIVERBANK PLANTERS



W1 - WATER QUALITY FEATURE FLOOR PLANTING

LANDSCAPE NOTES

1. ALL PLANTINGS SHALL BE INSTALLED AT THE LOCATION AND DATE SPECIFIED ON THESE PLANS.
2. ALL PLANTINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS AND NOTES ON THESE PLANS.
3. ALL PLANTINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS AND NOTES ON THESE PLANS.
4. ALL PLANTINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS AND NOTES ON THESE PLANS.
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15. ALL PLANTINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS AND NOTES ON THESE PLANS.

QUANTITY	SPECIES	COMMON NAME	SCIENTIFIC NAME	LOCATION	NOTES	SIZE	PLANTING
1	W1	Water Quality Planting	Water Quality Planting	Water Quality Feature	32" O.C. Triangular Spacing	2' - 4'	30/00
2	G2	Riverbank Planters	Riverbank Planters	Riverbank	30/00	2' - 4'	30/00
3	W1	Water Quality Planting	Water Quality Planting	Water Quality Feature	32" O.C. Triangular Spacing	2' - 4'	30/00
4	W1	Water Quality Planting	Water Quality Planting	Water Quality Feature	32" O.C. Triangular Spacing	2' - 4'	30/00

WATER QUALITY PLANTING	PLANTING POINTS	PLANTING POINTS WITH CIRCLES
1. A. Water Quality Planting	1. A. Water Quality Planting	1. A. Water Quality Planting
2. B. Planting Points	2. B. Planting Points	2. B. Planting Points
3. C. Planting Points with Circles	3. C. Planting Points with Circles	3. C. Planting Points with Circles

PLANTING POINTS	PLANTING POINTS WITH CIRCLES
1. A. Water Quality Planting	1. A. Water Quality Planting
2. B. Planting Points	2. B. Planting Points
3. C. Planting Points with Circles	3. C. Planting Points with Circles



811 CALL BEFORE YOU DIG
 For more information, visit www.811.org

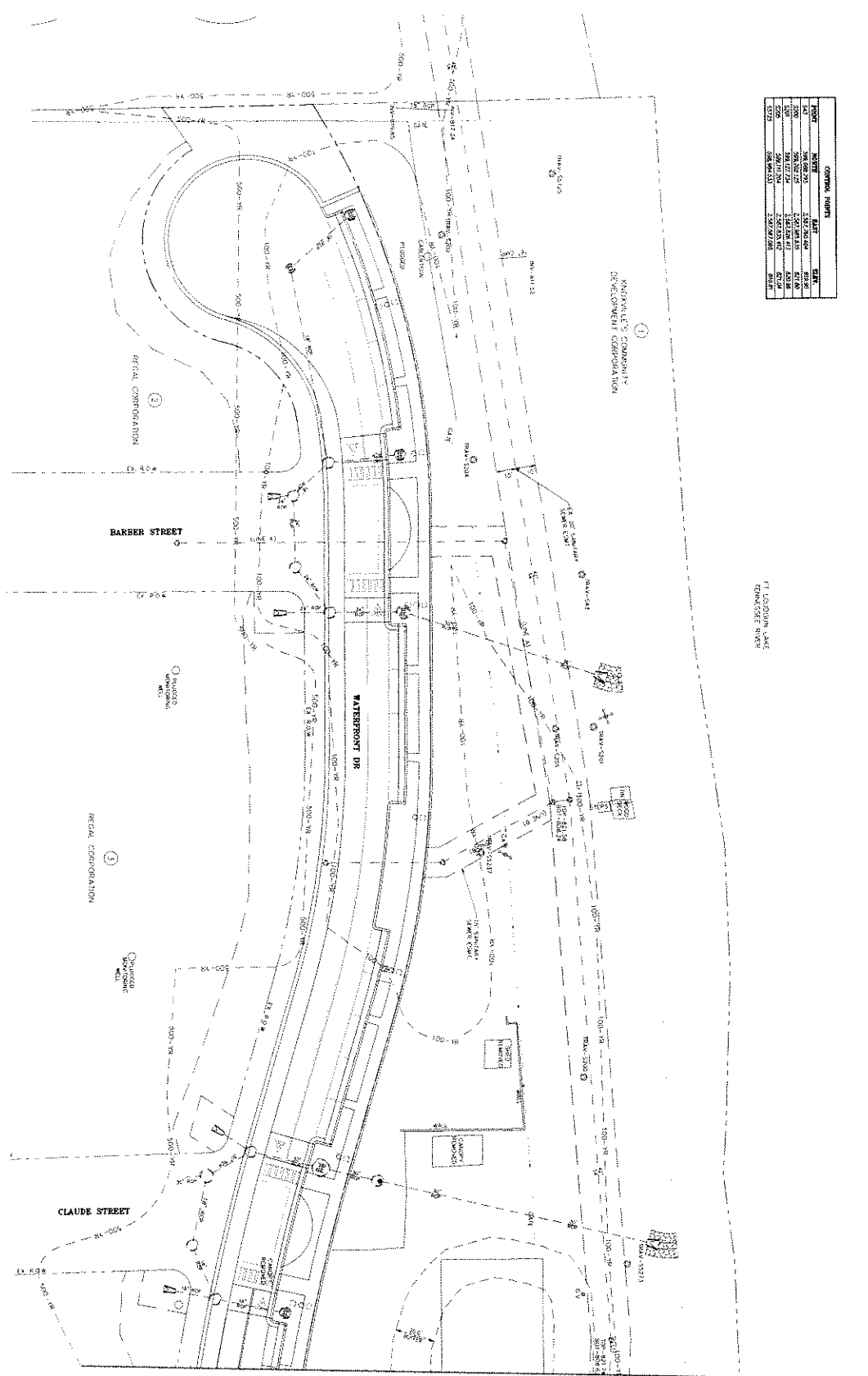


Benefield-Rivers
 1350 S. 15th Street, Suite 100
 Tulsa, Oklahoma 74119
 Phone: 918.563.2222
 Email: info@benefield-rivers.com

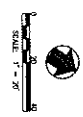
CANNON & CANNON INC.
 1100 S.W. 2nd Avenue
 Gainesville, FL 32601
 Phone: 352.369.1234
 Email: info@cannon-cannon.com

OFFICE: 811
DATE: 10/02/11

POINT	DATE	BY	REVISION
100	08/11/11	WJ	ISSUE FOR PERMIT
90	08/11/11	WJ	ISSUE FOR PERMIT
80	08/11/11	WJ	ISSUE FOR PERMIT
70	08/11/11	WJ	ISSUE FOR PERMIT
60	08/11/11	WJ	ISSUE FOR PERMIT
50	08/11/11	WJ	ISSUE FOR PERMIT
40	08/11/11	WJ	ISSUE FOR PERMIT
30	08/11/11	WJ	ISSUE FOR PERMIT
20	08/11/11	WJ	ISSUE FOR PERMIT
10	08/11/11	WJ	ISSUE FOR PERMIT



71 LASSON WAY
 FORTMILL, WA 98148



MATCH LINE STA. 19+22.44 (SEE SHEET L102.1-11)

NOTES

1. THE DEVELOPER AND ENGINEER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE CITY OF SAN FRANCISCO AND THE STATE OF CALIFORNIA.
2. THE DEVELOPER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE STATE OF CALIFORNIA AND THE CITY OF SAN FRANCISCO.
3. THE DEVELOPER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE STATE OF CALIFORNIA AND THE CITY OF SAN FRANCISCO.
4. THE DEVELOPER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE STATE OF CALIFORNIA AND THE CITY OF SAN FRANCISCO.

LEGEND

- 12" WATER MAIN
- 12" SANITARY SEWER
- 12" GAS
- 12" RAIN
- 12" STORM SEWER
- PROPOSED CONCRETE
- EXISTING CONCRETE

PROJECT INFORMATION

CANNON & CANNON INC.
 CONSULTING ENGINEERS
 100 CALIFORNIA STREET, SUITE 200
 SAN FRANCISCO, CA 94111
 TEL: 415.774.1111
 FAX: 415.774.1112
 WWW.CANNONANDCANNON.COM

THE CITY OF SAN FRANCISCO
 PUBLIC WORKS DEPARTMENT
 315 MARKET STREET, SUITE 300
 SAN FRANCISCO, CA 94102
 TEL: 415.554.4400
 FAX: 415.554.4401
 WWW.SF.PW.DEPARTMENT.CA.GOV

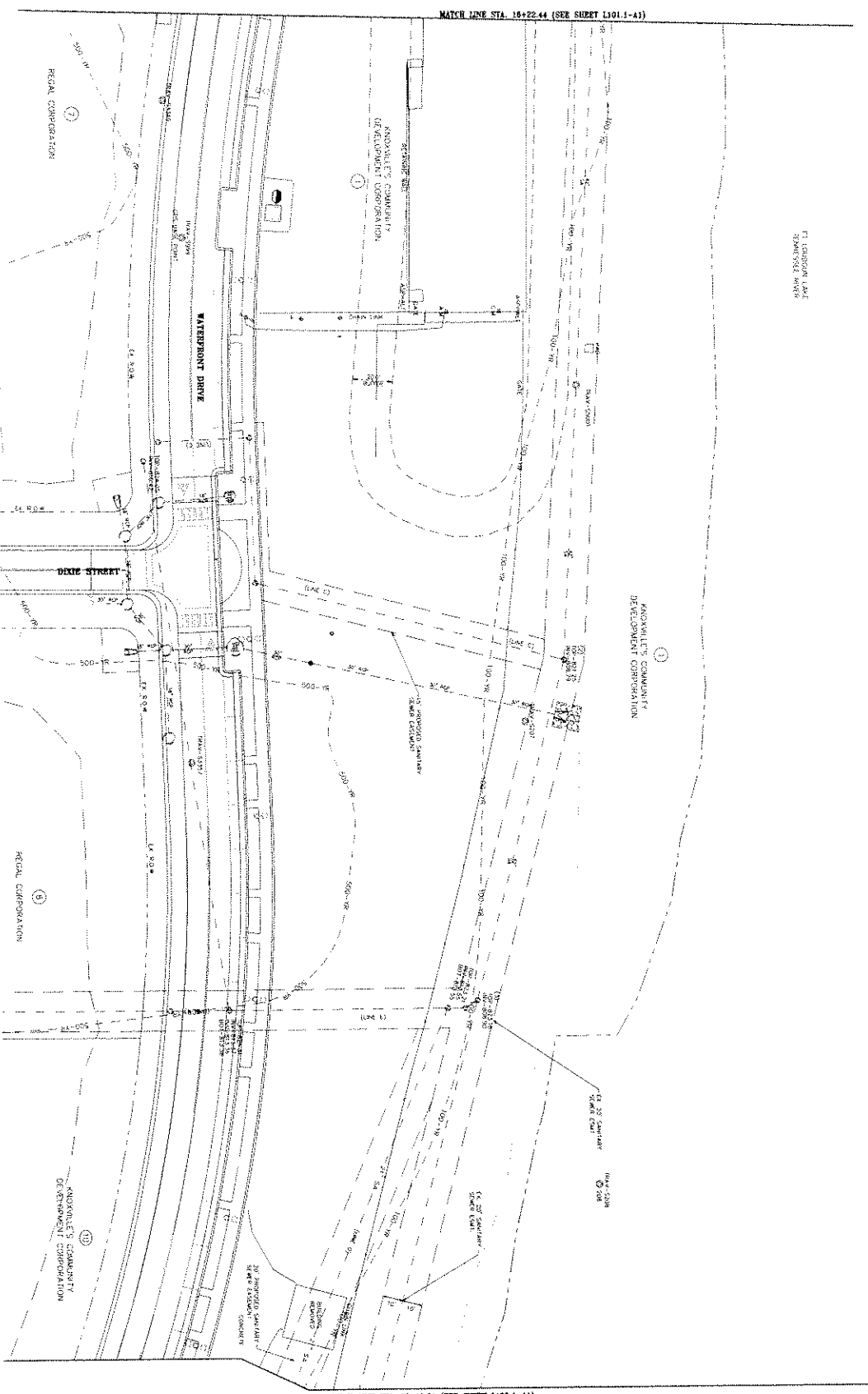
STITCHED LANDING STATE MAPS 118
 IMPROVED PAVE IMPROVEMENTS

PRESIDENT LAYOUT

DATE: 08/11/11
 DRAWN BY: WJ
 CHECKED BY: WJ
 IN CHARGE: WJ

L101.1-A1


CONTROLLING POINT			
POINT	DATE	BY	REVISION
101	09/18/13	J.S.	ISSUE FOR PERMIT
102	09/24/13	J.S.	REVISED PERMIT
103	10/01/13	J.S.	REVISED PERMIT
104	10/01/13	J.S.	REVISED PERMIT
105	10/01/13	J.S.	REVISED PERMIT
106	10/01/13	J.S.	REVISED PERMIT
107	10/01/13	J.S.	REVISED PERMIT

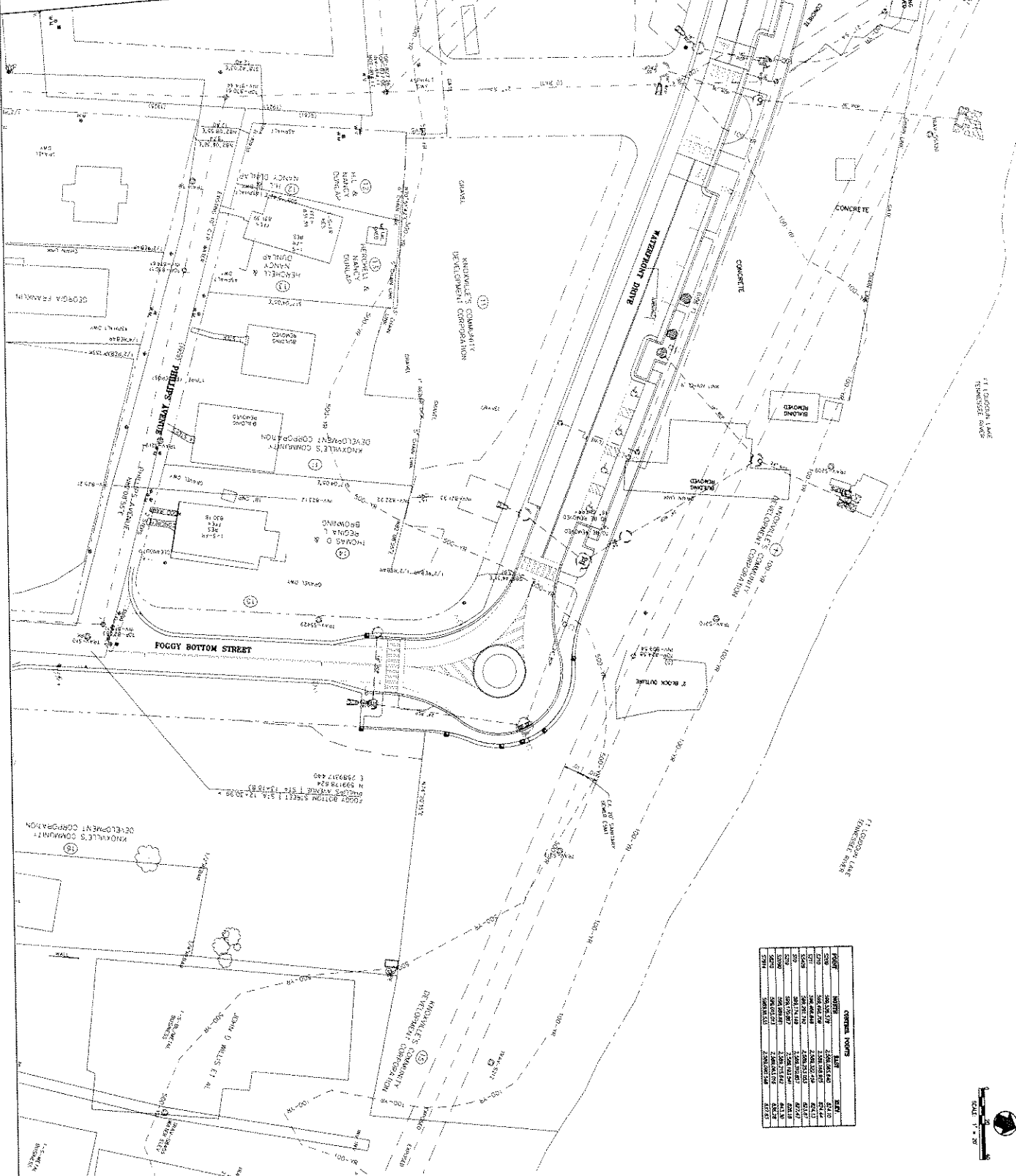


11 LOGS ON LOT
 10' PROPOSED EASEMENT

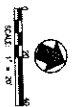


NOTES:
 1. REFER TO SHEET L101.1-A1 FOR GENERAL NOTES.

 <p>CANNON & CANNON INC CONSULTING ENGINEER - CIVIL ENGINEERING 100 WEST WASHINGTON STREET KNOXVILLE, TN 37902</p> <p>PROJECT: THE CITY OF KNOXVILLE DEVELOPMENT OF A 100-UNIT APARTMENT BUILDING 100 WEST WASHINGTON STREET KNOXVILLE, TN 37902</p> <p>DATE: 10/01/13 DRAWN BY: J.S. CHECKED BY: J.S. SCALE: 1" = 20'</p> <p>PROJECT LAYOUT</p> <p style="text-align: center; font-weight: bold; font-size: 1.2em;">L102.1-A1</p>	<p>LEGEND</p> <table border="0" style="width: 100%;"> <tr> <td>— (dashed line)</td> <td>PROPOSED EASEMENT</td> </tr> <tr> <td>— (solid line)</td> <td>EXISTING EASEMENT</td> </tr> <tr> <td>— (solid line)</td> <td>PROPOSED DRIVE</td> </tr> <tr> <td>— (solid line)</td> <td>EXISTING DRIVE</td> </tr> <tr> <td>— (solid line)</td> <td>PROPOSED SIDEWALK</td> </tr> <tr> <td>— (solid line)</td> <td>EXISTING SIDEWALK</td> </tr> <tr> <td>— (solid line)</td> <td>PROPOSED WALKWAY</td> </tr> <tr> <td>— (solid line)</td> <td>EXISTING WALKWAY</td> </tr> <tr> <td>— (solid line)</td> <td>PROPOSED DRIVEWAY</td> </tr> <tr> <td>— (solid line)</td> <td>EXISTING DRIVEWAY</td> </tr> <tr> <td>— (solid line)</td> <td>PROPOSED WALKWAY</td> </tr> <tr> <td>— (solid line)</td> <td>EXISTING WALKWAY</td> </tr> </table>	— (dashed line)	PROPOSED EASEMENT	— (solid line)	EXISTING EASEMENT	— (solid line)	PROPOSED DRIVE	— (solid line)	EXISTING DRIVE	— (solid line)	PROPOSED SIDEWALK	— (solid line)	EXISTING SIDEWALK	— (solid line)	PROPOSED WALKWAY	— (solid line)	EXISTING WALKWAY	— (solid line)	PROPOSED DRIVEWAY	— (solid line)	EXISTING DRIVEWAY	— (solid line)	PROPOSED WALKWAY	— (solid line)	EXISTING WALKWAY
— (dashed line)	PROPOSED EASEMENT																								
— (solid line)	EXISTING EASEMENT																								
— (solid line)	PROPOSED DRIVE																								
— (solid line)	EXISTING DRIVE																								
— (solid line)	PROPOSED SIDEWALK																								
— (solid line)	EXISTING SIDEWALK																								
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— (solid line)	PROPOSED DRIVEWAY																								
— (solid line)	EXISTING DRIVEWAY																								
— (solid line)	PROPOSED WALKWAY																								
— (solid line)	EXISTING WALKWAY																								



NO.	DESCRIPTION	AMOUNT	TOTAL
1	CONCRETE	1,200.00	1,200.00
2	ROCK	500.00	1,700.00
3	PAVING	300.00	2,000.00
4	LANDSCAPING	100.00	2,100.00
5	UTILITIES	100.00	2,200.00
6	DEMOLITION	100.00	2,300.00
7	FOUNDATION	100.00	2,400.00
8	FRAMING	100.00	2,500.00
9	ROOFING	100.00	2,600.00
10	MECHANICAL	100.00	2,700.00
11	ELECTRICAL	100.00	2,800.00
12	PLUMBING	100.00	2,900.00
13	FINISHES	100.00	3,000.00
14	CONTINGENCY	100.00	3,100.00
15	TOTAL		3,100.00



NOTES:
 1. REFER TO SHEET L103.1-A1 FOR GENERAL NOTES

LEGEND

- 500 YEAR FLOOD LINE
- 100 YEAR FLOOD LINE
- EAST PROPERTY
- EAST ROW
- EAST SHARED DRIVE
- EAST SIDEWALK
- EAST EXHIBIT LINE
- IMPROVED CEMENTAL

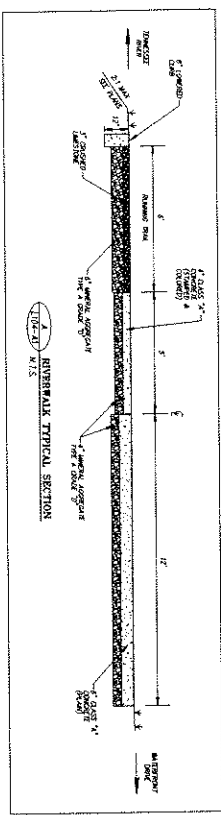
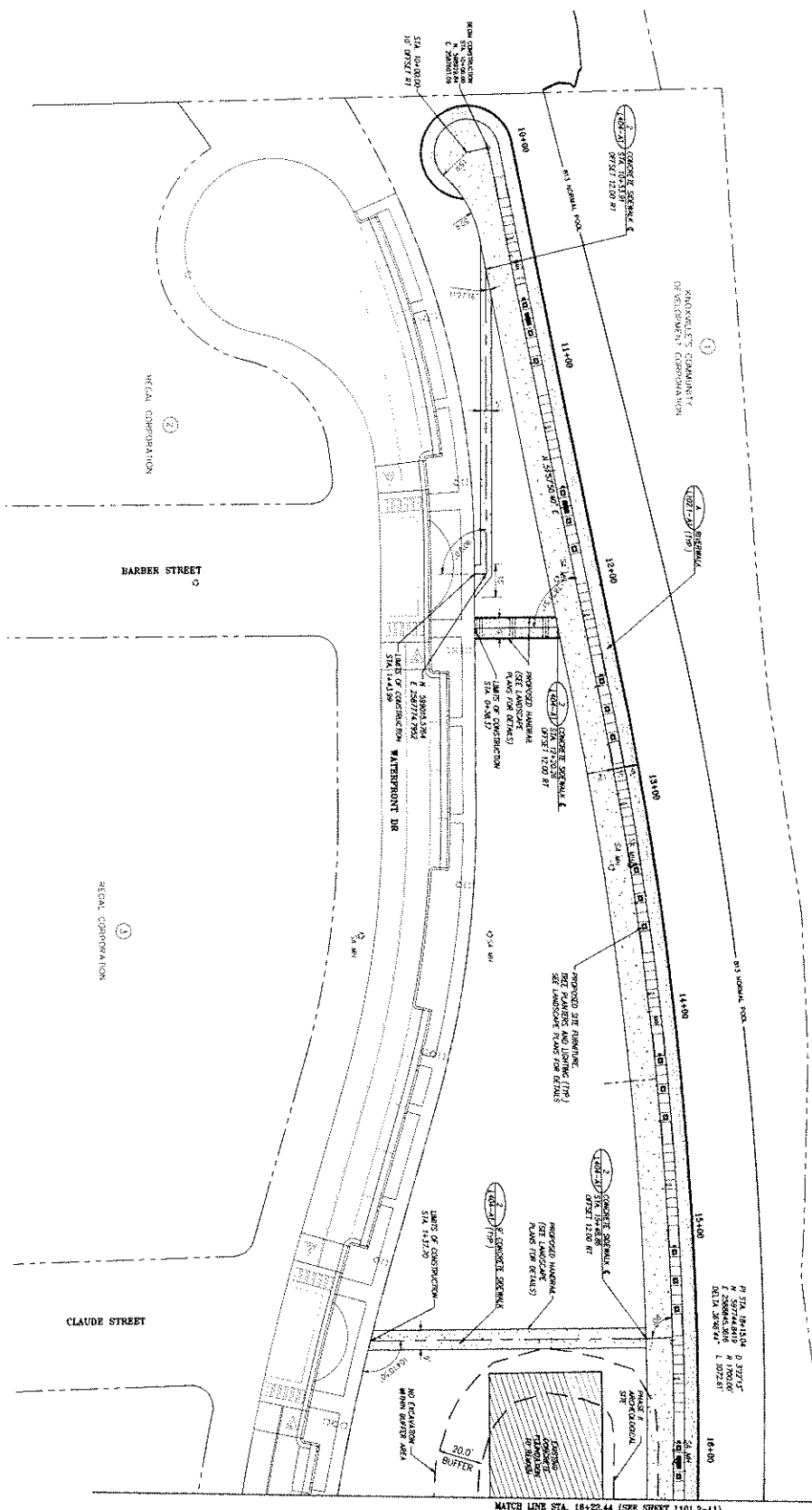
CANNON & CANNON INC.
 COMMERCIAL ARCHITECTS & ENGINEERS
 1000 PHILLIPS AVENUE, SUITE 100
 FOGGY BOTTOM, VA 22031
 TEL: (703) 591-1000

THE CITY OF HOUSTON
 5100 WESTHELL DRIVE, SUITE 100
 HOUSTON, TEXAS 77056
 TEL: (713) 554-2000

SETTLES LAMING PLUMB TRUST AS
 PARTNERING WITH ARCHITECTS

PRESENT LAYOUT

L103.1-A1



LEGEND

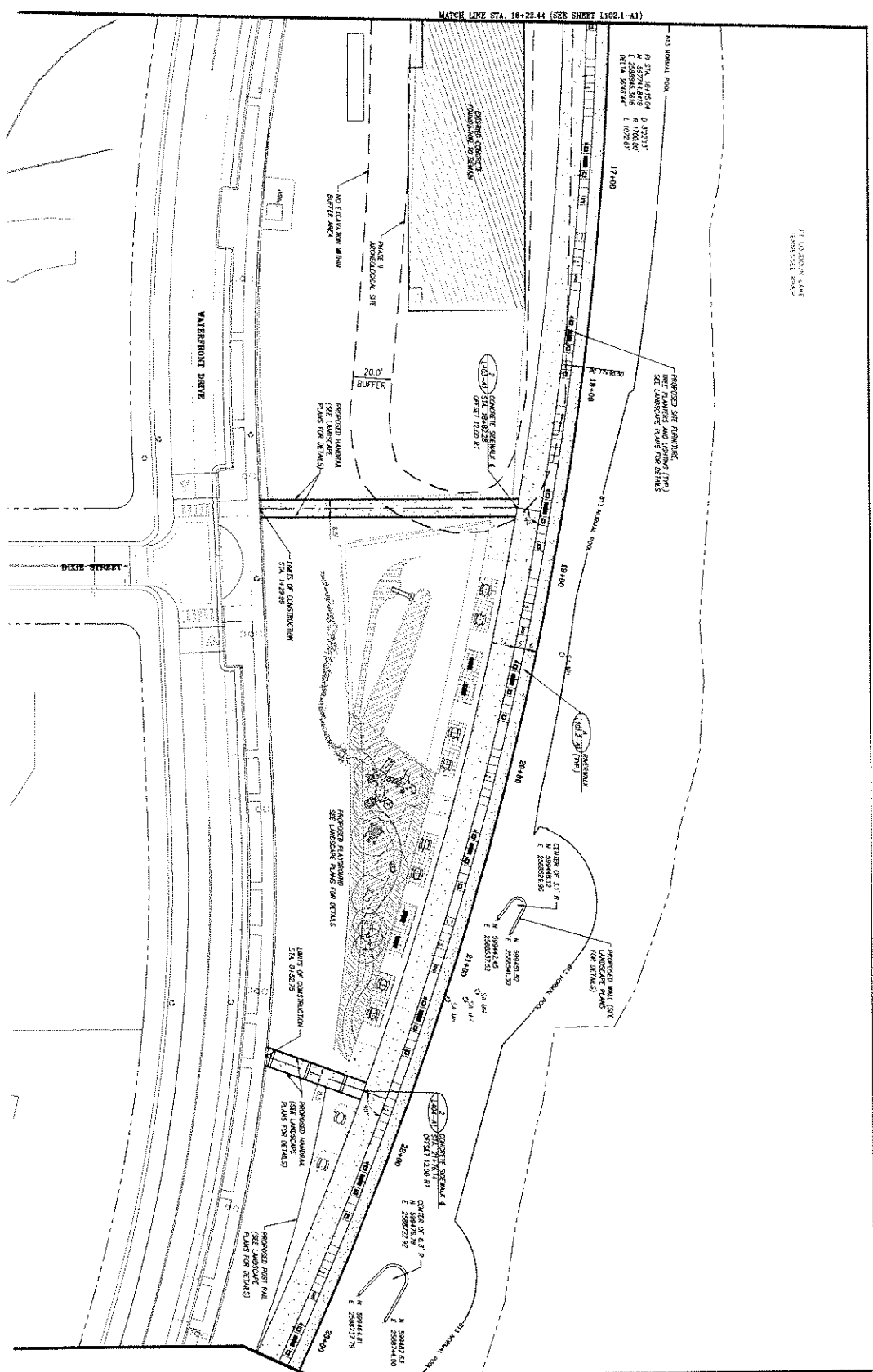
- CONCRETE SIDEWALK
- PAVED SIDEWALK
- CONCRETE
- EXIST SIDEWALK
- PROPOSED SIDEWALK
- EXIST PROPERTY
- EXIST ROW
- PROPOSED DRIVEWAY

CANNON & CANNON, INC.
 CONSULTING ENGINEERS FIELD DIVISION
 1000 10TH AVENUE SOUTH
 SUITE 100
 DELTA, ALABAMA 36828
 TEL: (205) 338-2000
 FAX: (205) 338-2001

PROPOSED LAYOUT PLAN

L101.2-A1

- NOTES**
- THE EXISTING AND PROPOSED DATA SHOWN ARE BASED ON THE RECORD DRAWINGS AND FIELD SURVEY DATA.
 - ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS OTHERWISE NOTED.
 - ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF DELTA SPECIFICATIONS AND THE ALABAMA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROADWAY CONSTRUCTION.
 - ALL MATERIALS SHALL BE APPROVED BY THE CITY ENGINEER.
 - ALL UTILITIES SHALL BE DEPTH MARKED AND LOCATED PRIOR TO CONSTRUCTION.
 - ALL CONSTRUCTION SHALL BE COMPLETED WITHIN THE SPECIFIED TIME FRAME.
 - ALL CONSTRUCTION SHALL BE MAINTAINED AT ALL TIMES.
 - ALL CONSTRUCTION SHALL BE COMPLETED WITHIN THE SPECIFIED TIME FRAME.
 - ALL CONSTRUCTION SHALL BE MAINTAINED AT ALL TIMES.
 - ALL CONSTRUCTION SHALL BE COMPLETED WITHIN THE SPECIFIED TIME FRAME.



LEGEND

- CONCRETE SIDEWALK
- GRAVEL PARKING AREA
- APPROVED SIDEWALK
- CONCRETE DRIVE PAVEMENT
- ASPHALT DRIVE PAVEMENT
- EXIST. PROPERTY
- EXIST. ROAD
- PROPOSED DRIVEWAY

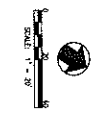
THE CITY OF ANNE ARK
 PUBLIC WORKS DEPARTMENT
 100 WEST MAIN STREET
 ANNE ARK, MISSISSIPPI 39001

CANNON & CANNON, INC.
 CONSULTING ENGINEERS, ARCHITECTS AND PLANNERS
 1000 WEST MAIN STREET
 ANNE ARK, MISSISSIPPI 39001

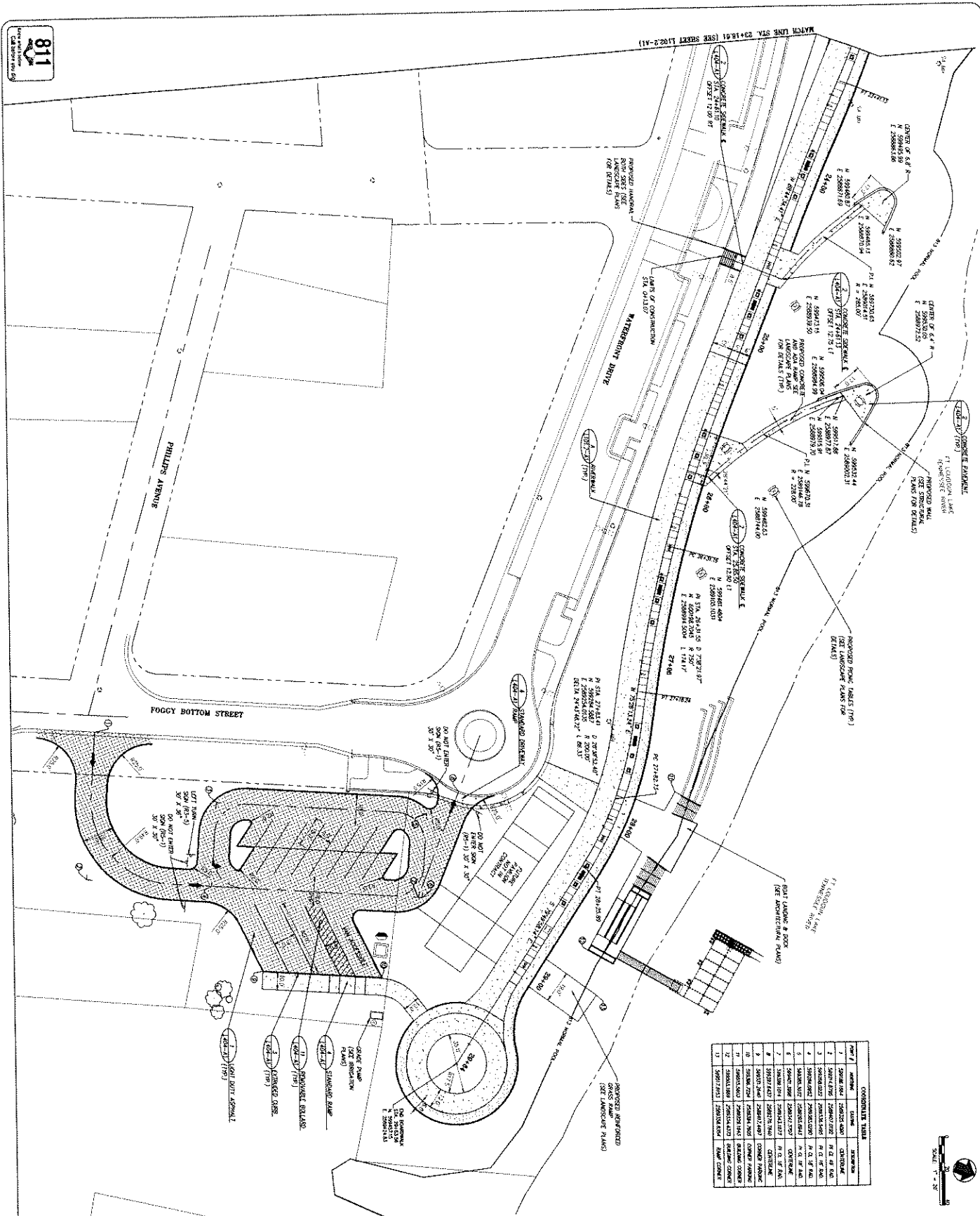
PROPOSED LAYOUT PLAN

DATE: 10/15/11
 DRAWN BY: J. B. BROWN
 CHECKED BY: J. B. BROWN
 APPROVED BY: J. B. BROWN

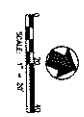
L102.2-A1



NOTES:
 1. REFER TO SHEET L102.1 FOR BOUNDARY AND



NO.	DESCRIPTION	DATE	BY	CHECKED
1	CONCRETE PAVEMENT			
2	LANDSCAPE PLANS			
3	PROPOSED PAVEMENT			
4	PROPOSED PAVEMENT			
5	PROPOSED PAVEMENT			
6	PROPOSED PAVEMENT			
7	PROPOSED PAVEMENT			
8	PROPOSED PAVEMENT			
9	PROPOSED PAVEMENT			
10	PROPOSED PAVEMENT			
11	PROPOSED PAVEMENT			
12	PROPOSED PAVEMENT			
13	PROPOSED PAVEMENT			



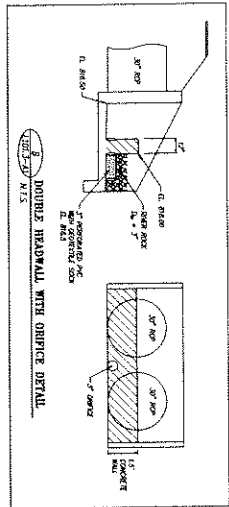
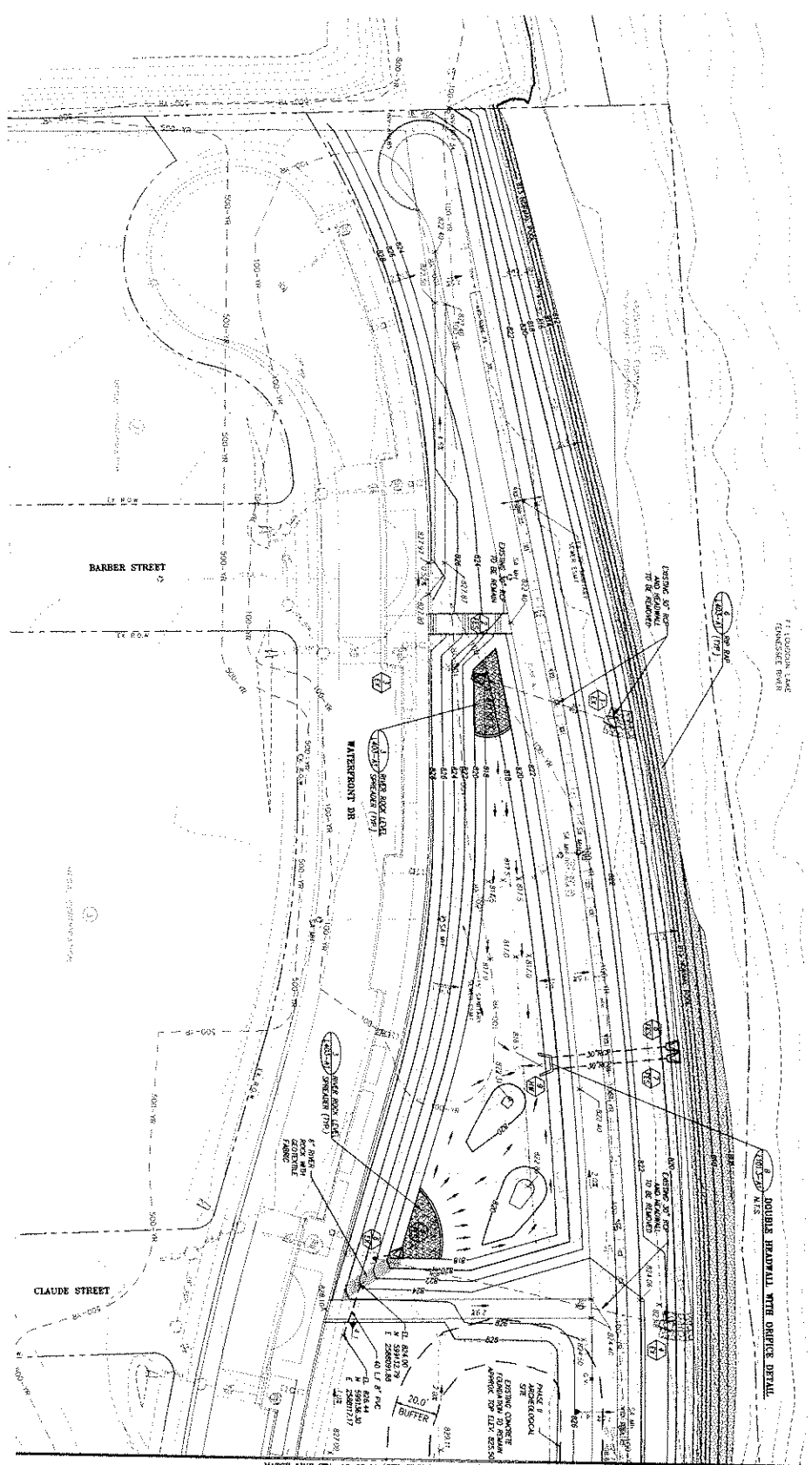
CANNON & CANNON INC.
 CIVIL ENGINEERS
 1000 15th Street, N.W.
 Washington, D.C. 20004
 TEL: (202) 331-2000

THE CITY OF ANNAPOLIS
 ENGINEERING & SURVEYING
 1000 15th Street, N.W.
 Washington, D.C. 20004
 TEL: (202) 331-2000

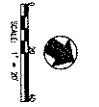
PROPOSED LAYOUT PLAN

DATE: 10/1/01
 DRAWN BY: [Name]
 CHECKED BY: [Name]

NOTES:
 1. REFER TO SHEET L103.2-A1 FOR GENERAL NOTES



NOTES:
 1. ALL NOTES SHALL BE PLACED IN DRAWING AREA.



EXISTING EXISTING STRUCTURES

ID	DESCRIPTION	DATE	STATUS	REMARKS
1	EXISTING 30\"/>			

STRUCTURE TABLE

ID	DESCRIPTION	DATE	STATUS	REMARKS
1	EXISTING 30\"/>			

GENERAL NOTES:
 1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF LOS ANGELES, CALIFORNIA, AND ALL OTHER AGENCIES AND AGENCIES INVOLVED IN THE PROJECT.
 2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF LOS ANGELES, CALIFORNIA, AND ALL OTHER AGENCIES AND AGENCIES INVOLVED IN THE PROJECT.
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MATCH LINE STA. 10+22.44 (SEE SHEET 103.2-2-17)

- GRADING NOTES:**
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF LOS ANGELES, CALIFORNIA, AND ALL OTHER AGENCIES AND AGENCIES INVOLVED IN THE PROJECT.
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LEGEND:

- EXISTING CURB
- PROPOSED CURB
- OPTIMAL PROPOSED (OR FIN. NO./SHEET NO.)
- NORMAL PAV. LANE
- 500 RPM FLOOD LANE
- 100 RPM FLOOD LANE
- EXIST. PROSPECT
- EXIST. R.O.W
- EXIST. SANITARY SEWER
- EXIST. STORM SEWER
- EXIST. EXPOSURE LINE

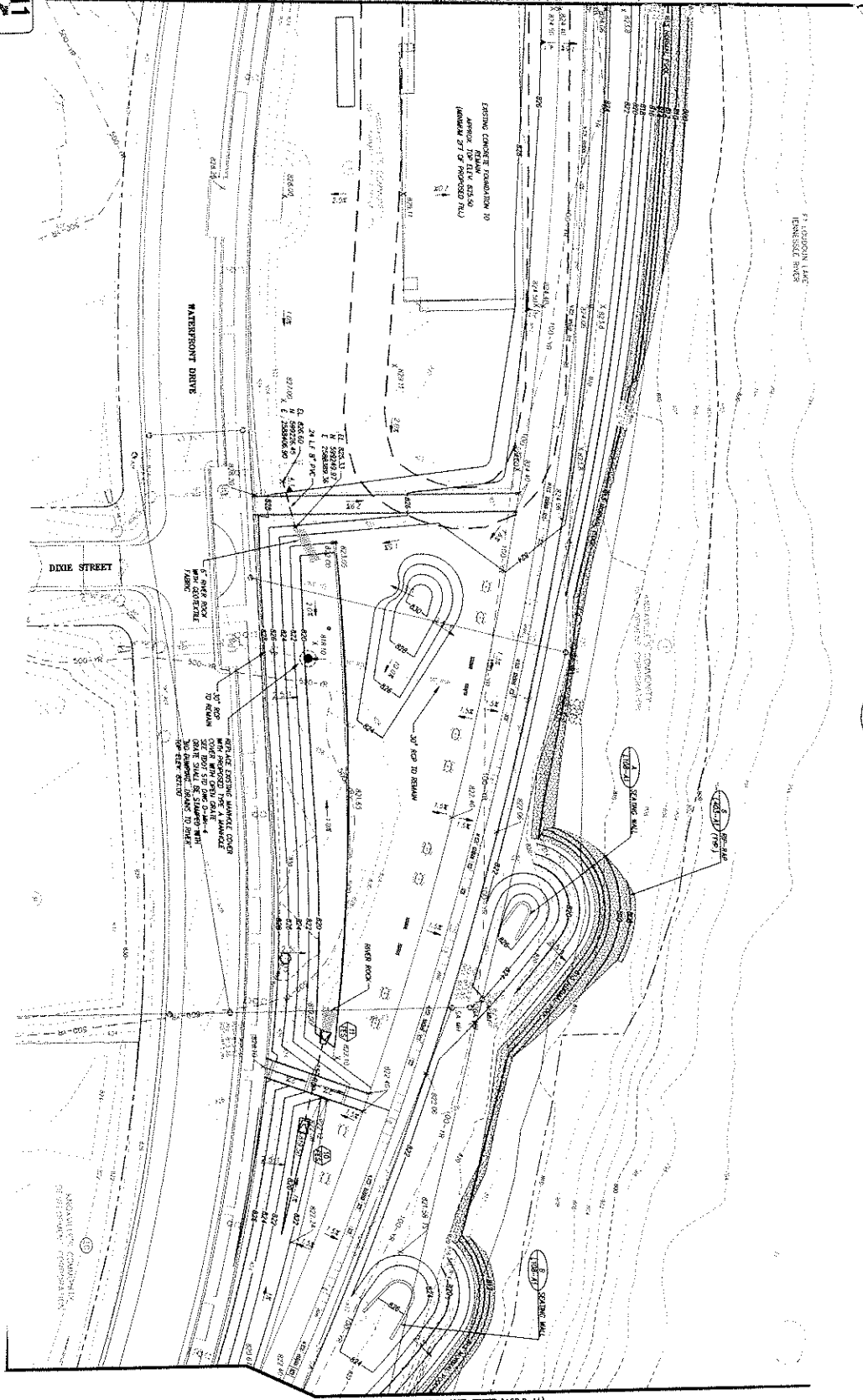
CANNON & CANNON INC.
 CONSULTING ENGINEERS, ARCHITECTS, PLANNERS
 1000 WEST 10TH STREET, SUITE 200
 LOS ANGELES, CALIFORNIA 90015
 TEL: 213.487.1111 FAX: 213.487.1112
 WWW.CANNONANDCANNON.COM

THE CITY OF LOS ANGELES
 ENGINEERING DEPARTMENT
 100 SOUTH MAIN STREET, 10TH FLOOR
 LOS ANGELES, CALIFORNIA 90012
 TEL: 213.473.3111 FAX: 213.473.3112
 WWW.CITYOFLOSANGELES.COM

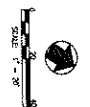
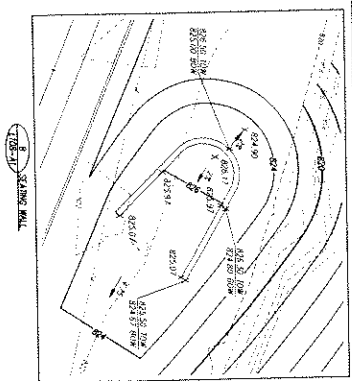
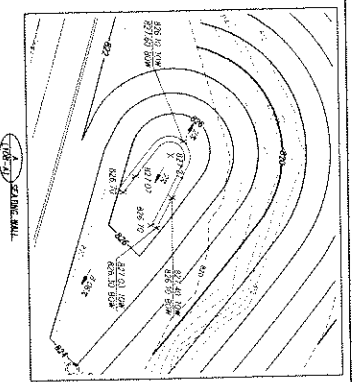
PROPOSED GRADING AND DRAINAGE PLAN
 SHEET 103.2-2-17 (A)
 DATE: 10/11/11
 DRAWN BY: J. [Name]
 CHECKED BY: [Name]

L101.3-A1

MATCH LINE STA. 16+22.44 (SEE SHEET L102.1-A1)



MATCH LINE STA. 23+18.01 (SEE SHEET L102.3-A1)



GRADING NOTES:
 1. GRADE IS SHOWN IN FEET ABOVE SEA LEVEL UNLESS NOTED OTHERWISE.
 2. ALL GRADES SHALL BE ROUNDED TO NEAREST 0.1 FEET.

STORM DRAINAGE STRUCTURES

NO.	DESCRIPTION	LOCATION	TYPE	DIAMETER	DEPTH	INVERT ELEVATION	OUTLET ELEVATION
1	100\"/>						

STONE PITS TABLE

NO.	DESCRIPTION	LOCATION	TYPE	DIAMETER	DEPTH	INVERT ELEVATION	OUTLET ELEVATION
1	100\"/>						

PROPOSED GRADES SHALL BE ROUNDED TO NEAREST 0.1 FEET.

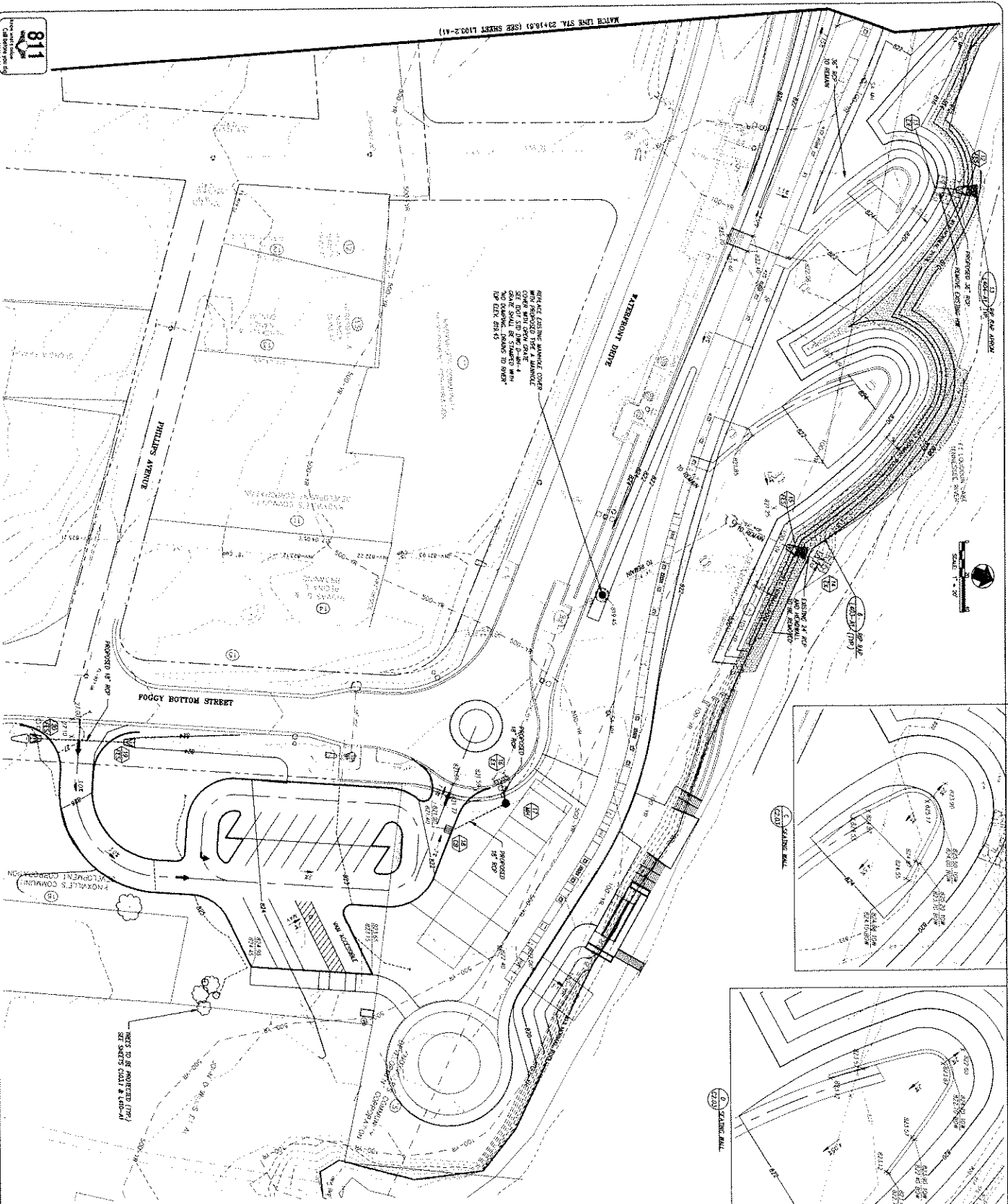
LEGEND

- EXISTING CENTERLINE
- PROPOSED CENTERLINE
- PROPOSED 30\"/>
- 100\"/>
- 500\"/>
- 100\"/>
- EAST PROPERTY
- EAST R.O.W.
- EAST SIDEWALK CENTER
- EAST SIDEWALK
- EAST SIDEWALK LINE

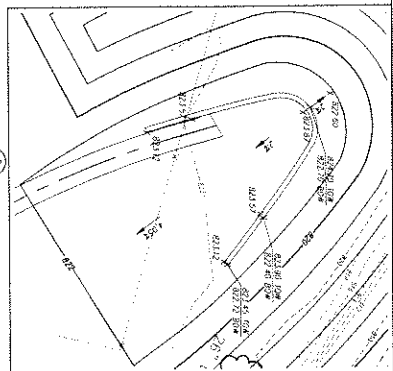
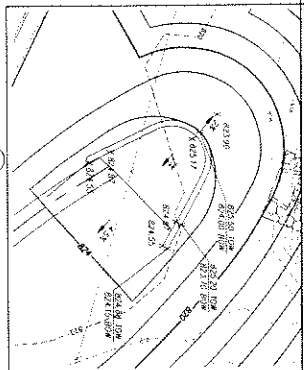
CANNON & CANNON INC.
 1000 N. W. 10th St., Suite 100
 Fort Lauderdale, FL 33304
 Phone: (954) 331-1000
 Fax: (954) 331-1001
 Website: www.cannonandcannon.com

THE CITY OF KNOXVILLE
 100 N. MARKET STREET
 KNOXVILLE, TN 37902
 TEL: (615) 518-2000
 FAX: (615) 518-2001
 WWW.KNOXVILLERIGHTS.COM

PROPOSED GRADING AND DRAINAGE PLAN
 SHEET L102.3-A1



REMOVE EXISTING MANHOLE COVER WITH PROPOSED 12" x 12" MANHOLE SET IN PLACE TO BE 2'-0" DEEP. COVER SHALL BE CONCRETE WITH 12" DIA. 60% SLOPE TO STREET.



STORM DRAINAGE STRUCTURES

NO.	DESCRIPTION	CONCRETE	MANHOLE	DEPTH	DIAMETER
1	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
2	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
3	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
4	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
5	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
6	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
7	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
8	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
9	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"
10	STORM DRAINAGE STRUCTURE	CONCRETE	MANHOLE	2'-0"	36"

STORM PER TABLE

NO.	DESCRIPTION	PERCENT	AREA	PERCENT	AREA
1	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
2	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
3	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
4	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
5	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
6	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
7	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
8	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
9	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00
10	STORM DRAINAGE STRUCTURE	100%	1.00	100%	1.00

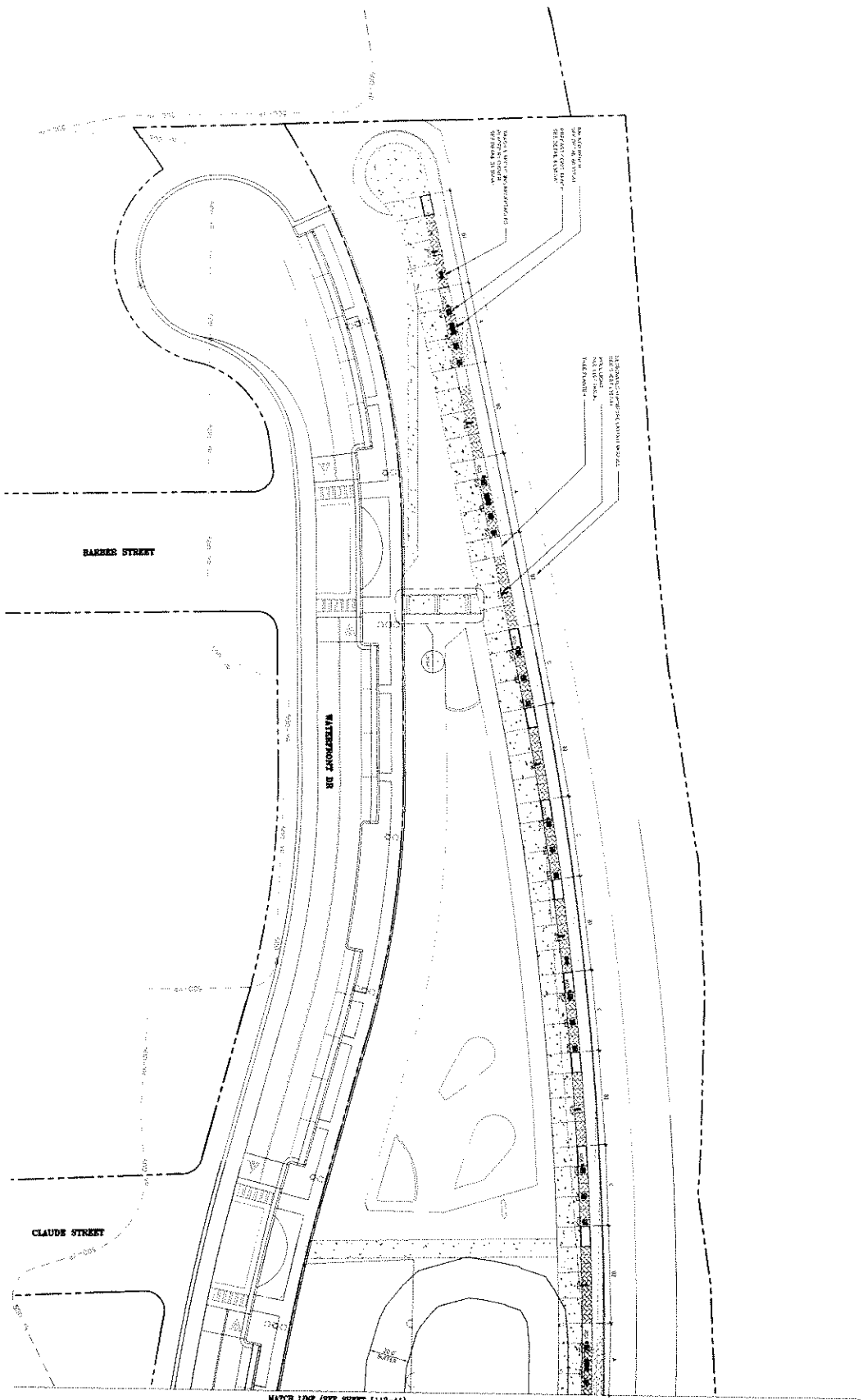
STORM DRAINAGE STRUCTURES SHALL BE CONCRETE.

GRAVING NOTES:
1. REFER TO SHEET L103.2-A1 FOR EXISTING GRAVING AND PROPOSED GRAVING.

CANNON & CANNON INC.
 CONSULTING ENGINEERS & ARCHITECTS
 1000 WEST 10TH AVENUE, SUITE 100
 DENVER, CO 80202
 PHONE: (303) 733-1111
 FAX: (303) 733-1112
 WWW.CANNONANDCANNON.COM

THE CITY OF DENVER
 PUBLIC WORKS DEPARTMENT
 1401 CALIFORNIA STREET, SUITE 100
 DENVER, CO 80202
 PHONE: (303) 229-2000
 FAX: (303) 229-2001
 WWW.DENVER.GOV

PROPOSED GRADING AND DRAINAGE PLAN
 SHEET L103.3-A1



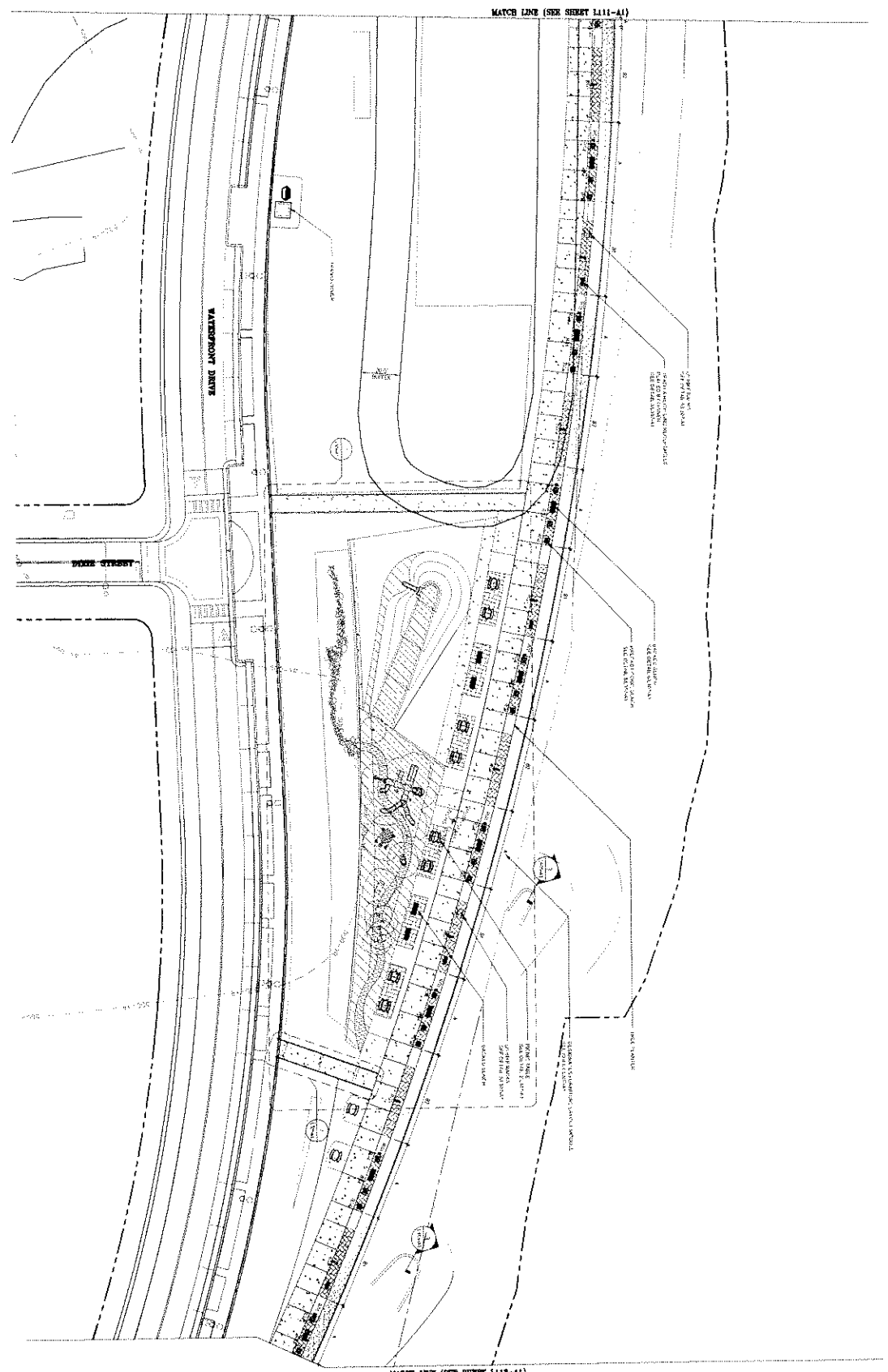
MAPOR LINE (SEE SHEET L112-A1)



<p>CANNON & CANNON, INC. CONSULTING ENGINEERS / ARCHITECTS</p> <p>1101 N. MILITARY TRAIL SUITE 100 WEST PALM BEACH, FL 33411 TEL: 561-833-1234 WWW.CANNONANDCANNON.COM</p>	
<p>PROJECT: SYSTEMS LEARNING PLACE PHASE 1B</p>	<p>DRAWING NO.: 1111-A1</p>
<p>DATE: 08/20/2014</p>	<p>SCALE: AS SHOWN</p>
<p>DESIGNED BY: [Signature]</p>	<p>CHECKED BY: [Signature]</p>
<p>DATE: 08/20/2014</p>	<p>SCALE: AS SHOWN</p>
<p>DESIGNED BY: [Signature]</p>	<p>CHECKED BY: [Signature]</p>

- Legend
- Existing Building Footprint
 - Proposed Building Footprint
 - Existing Parking
 - Proposed Parking
 - Existing Landscape
 - Proposed Landscape
 - Existing Street
 - Proposed Street
 - Existing Utility
 - Proposed Utility
 - Existing Fencing
 - Proposed Fencing
 - Existing Site
 - Proposed Site
 - Existing Water
 - Proposed Water
 - Existing Stormwater
 - Proposed Stormwater
 - Existing Sewer
 - Proposed Sewer
 - Existing Water Table
 - Proposed Water Table
 - Existing Elevation
 - Proposed Elevation
 - Existing Spot Elevation
 - Proposed Spot Elevation
 - Existing Contour
 - Proposed Contour
 - Existing Spot Contour
 - Proposed Spot Contour

MOBILE PLAN
 11-12-A1-11-12-A1



MATCH LINE (SEE SHEET L111-A1)

MATCH LINE (SEE SHEET L112-A1)

benefield-richters
 ARCHITECTS
 1001 13th Street, Suite 100
 San Francisco, CA 94103
 Tel: 415.398.3888
 Fax: 415.398.3889
 www.benefield-richters.com



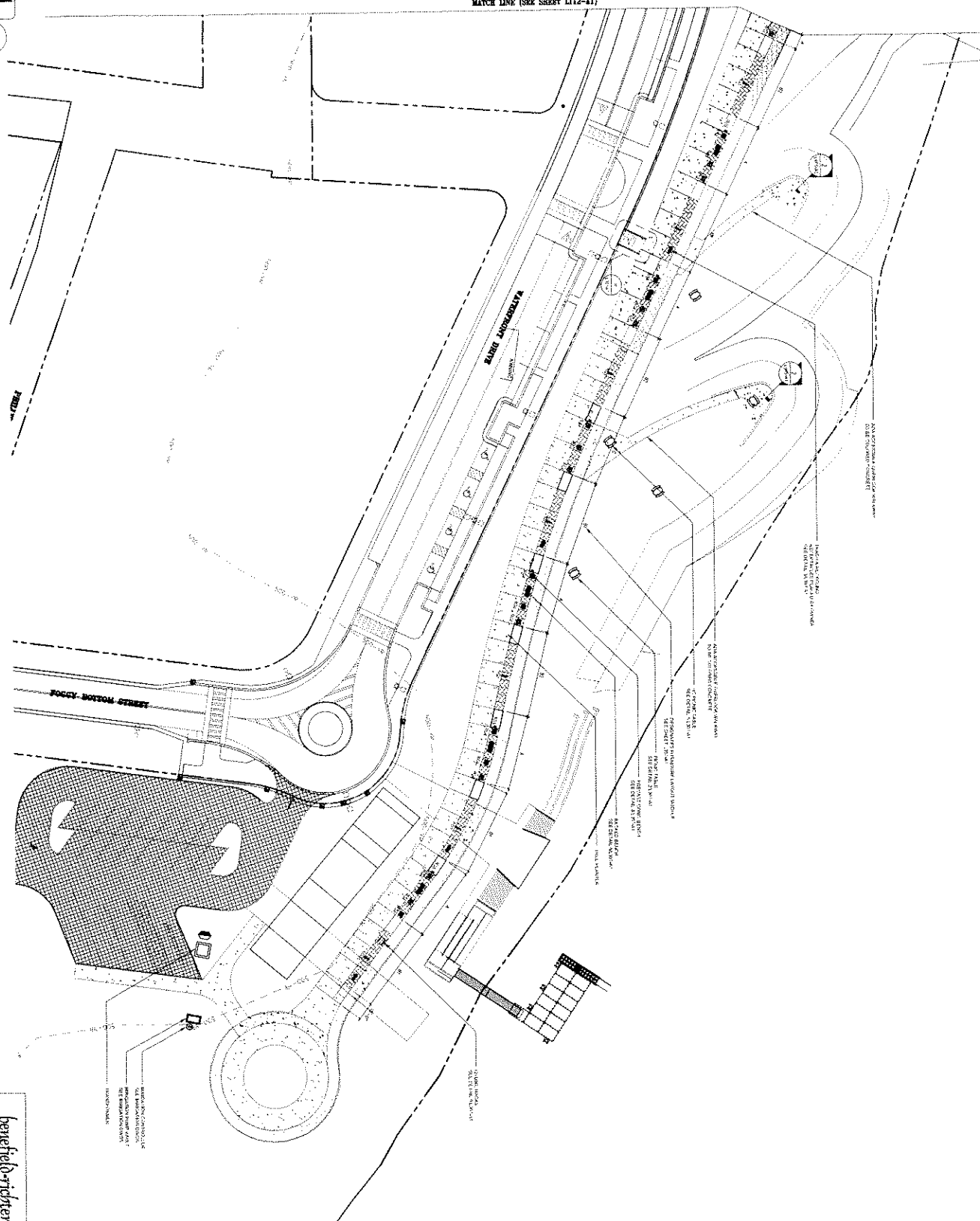
PREPARED BY: BENEFIELD-RICHTERS ARCHITECTS
 DATE: 11/12/11
 PROJECT: POTTER LANDING BLK
 PARKING PLAN 1B

CANNON'S CANNON INC
 CONSULTING ENGINEERS - FIELD ENGINEERS
 1650 STEWART ST. | SAN JOSE, CA 95128
 TEL: 408.951.5555 | FAX: 408.951.5555
 www.cannonscannon.com

- LEGEND
- 1.00 CONCRETE
 - 2.00 ASPHALT
 - 3.00 ASPHALT DRIVEWAY
 - 4.00 ASPHALT DRIVEWAY
 - 5.00 ASPHALT DRIVEWAY
 - 6.00 ASPHALT DRIVEWAY
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 - 50.00 ASPHALT DRIVEWAY

MATCH LINE (SEE SHEET L112-A1)

811
1 EAST PLAN



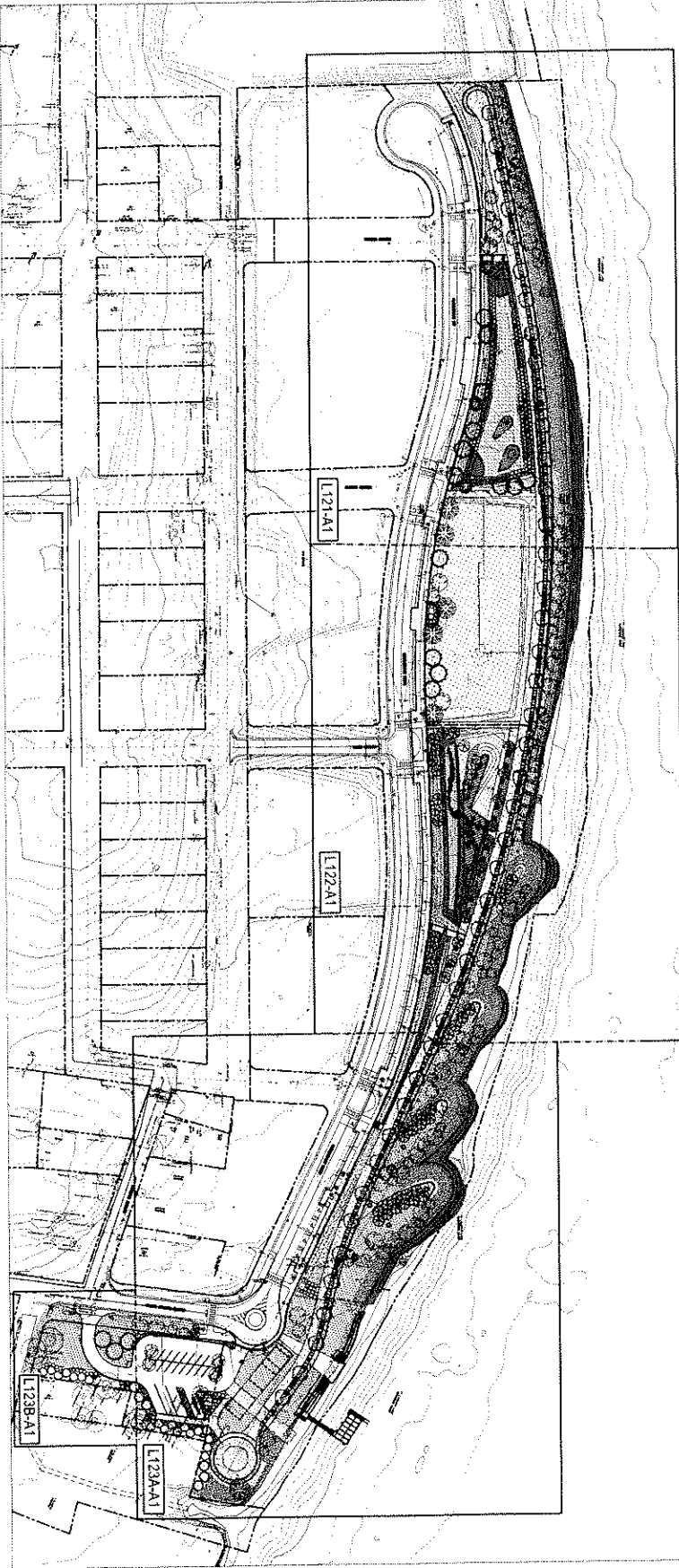
benefield-richters
ARCHITECTS

1133-A1

CANNONS CANNON INC. CONSULTING ENGINEERS - CIVIL ENGINEERS 1100 BERRY ST. SUITE 200 DALLAS, TEXAS 75208	CITY OF HOUSTON PUBLIC WORKS DEPARTMENT 1100 BERRY ST. SUITE 200 DALLAS, TEXAS 75208
PAYMENTS: 100% UPON COMMENCEMENT OF WORK 1133-A1 - 1133-A1	DATE: 11/13/2013 1133-A1

LEGEND

- CONCRETE PAVING
- LANDSCAPING: 1.00' x 1.00' x 10' PLANTING
- LANDSCAPING: 2.00' x 2.00' x 10' PLANTING
- LANDSCAPING: 3.00' x 3.00' x 10' PLANTING
- LANDSCAPING: 4.00' x 4.00' x 10' PLANTING
- LANDSCAPING: 5.00' x 5.00' x 10' PLANTING
- LANDSCAPING: 6.00' x 6.00' x 10' PLANTING
- LANDSCAPING: 7.00' x 7.00' x 10' PLANTING
- LANDSCAPING: 8.00' x 8.00' x 10' PLANTING
- LANDSCAPING: 9.00' x 9.00' x 10' PLANTING
- LANDSCAPING: 10.00' x 10.00' x 10' PLANTING
- LANDSCAPING: 11.00' x 11.00' x 10' PLANTING
- LANDSCAPING: 12.00' x 12.00' x 10' PLANTING
- LANDSCAPING: 13.00' x 13.00' x 10' PLANTING
- LANDSCAPING: 14.00' x 14.00' x 10' PLANTING
- LANDSCAPING: 15.00' x 15.00' x 10' PLANTING
- LANDSCAPING: 16.00' x 16.00' x 10' PLANTING
- LANDSCAPING: 17.00' x 17.00' x 10' PLANTING
- LANDSCAPING: 18.00' x 18.00' x 10' PLANTING
- LANDSCAPING: 19.00' x 19.00' x 10' PLANTING
- LANDSCAPING: 20.00' x 20.00' x 10' PLANTING

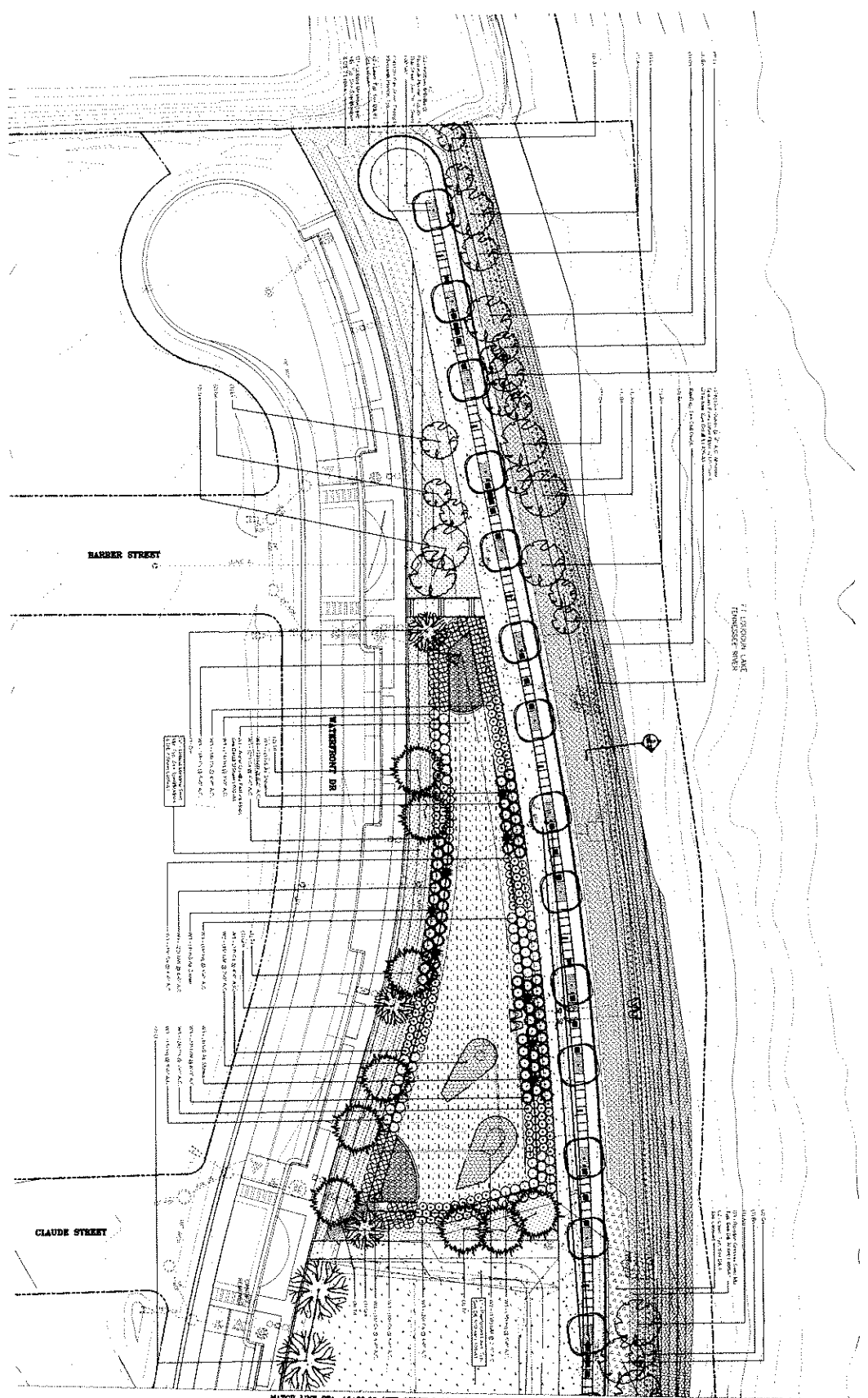


1 OVERALL LANDSCAPE PLAN

benefield-richters
 ARCHITECTS
 1000 LA JOLLA VILLAGE CENTER DRIVE, SUITE 100
 LA JOLLA, CA 92037
 TEL: 619.451.1000
 FAX: 619.451.1001
 WWW.BENEFIELD-RICHTERS.COM

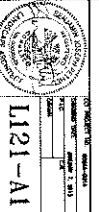
	CANNON & CANNON INC. CONSULTING ENGINEER - FLSB REGISTERED No. 86178-ENG Also Lic. No. 704 1000 LA JOLLA VILLAGE CENTER DRIVE, SUITE 100 LA JOLLA, CA 92037 TEL: 619.451.1000 FAX: 619.451.1001 WWW.CANNON-AND-CANNON.COM
THE CITY OF SAN DIEGO OFFICE OF THE CITY MANAGER 1201 K STREET, SUITE 100 SAN DIEGO, CA 92101 TEL: 619.444.3100 FAX: 619.444.3101 WWW.CITYOFSD.GOV	OFFICE LANDING PARK PARKING PLANS SHEET 13
OVERALL LANDSCAPE PLAN	
DATE: 08/11/2011 TIME: 10:00 AM DRAWN BY: [Name] CHECKED BY: [Name]	
L120-A1	

LANDSCAPE PLAN - SECTION 1



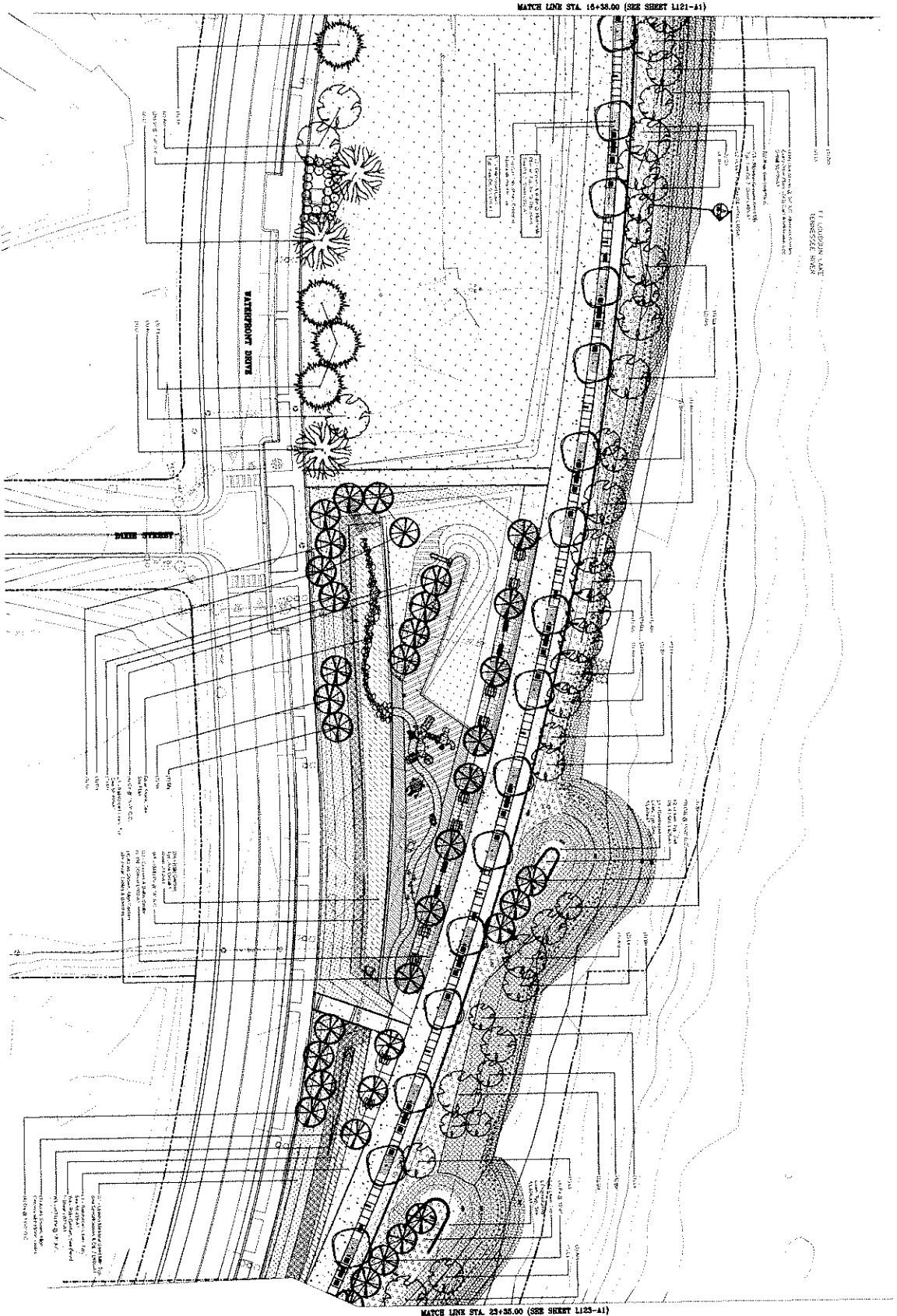
MATCH LINE SEE SHEET L121-AI (17-2217) 164+90.00

benefield-richters
 A SERVICE COMPANY OF THE CITY OF HOUSTON



<p>CANNON & CANNON, INC. 16157 WESTHOPE DRIVE HOUSTON, TEXAS 77060 TEL: 281-416-1000 WWW.CANNONANDCANNON.COM</p>	<p>THE CITY OF HOUSTON 1001 CALLETON DRIVE HOUSTON, TEXAS 77002 TEL: 281-316-2000</p>
<p>PROJECT: SITTERS LANDING PARK PARK IMPROVEMENTS PHASE 1B</p>	<p>DATE: 08/11/2011</p>
<p>LANDSCAPE PLAN - SECTION 1</p>	<p>SCALE: AS SHOWN</p>

LANDSCAPE PLAN - SECTION 2



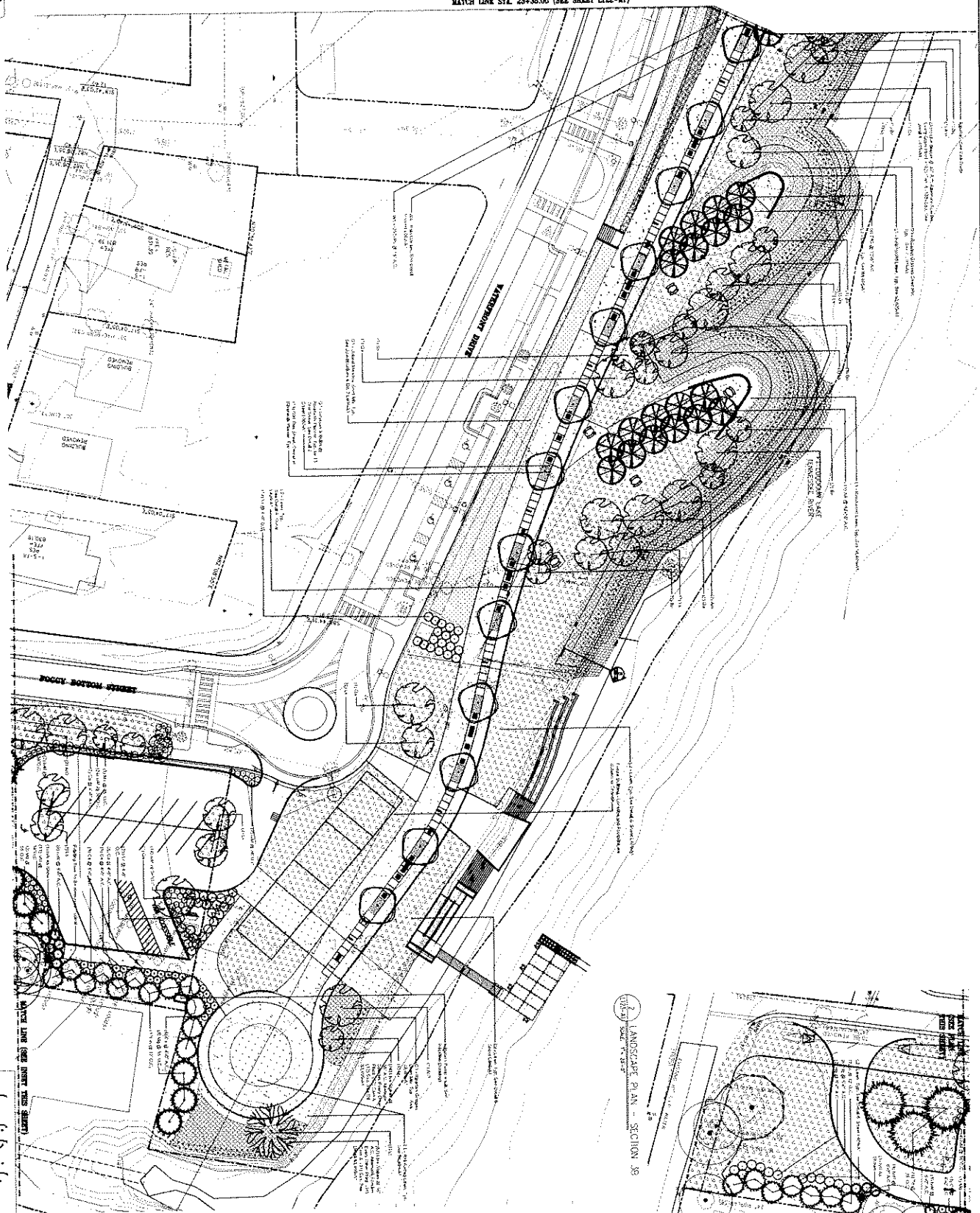
benefield-richters
 CONSULTING ENGINEERS

Professional Seal
 L122-A1

<p>CANNON & CANNON INC. CONSULTING ENGINEERS, ARCHITECTS 1000 BENTLEY BLVD SUITE 200 MEMPHIS, TN 38117 (901) 525-1100 WWW.CANNONANDCANNON.COM</p>	<p>DATE: 04/08/17 TIME: 12:00 PM PROJECT: SITTICK LANDING PARK DRAWING: LANDSCAPE PLAN - SECTION 2</p>
--	---

MATCH LINE STA. 28+36.00 (SEE SHEET L123-A1)

LANDSCAPE PLAN - SECTION 3A



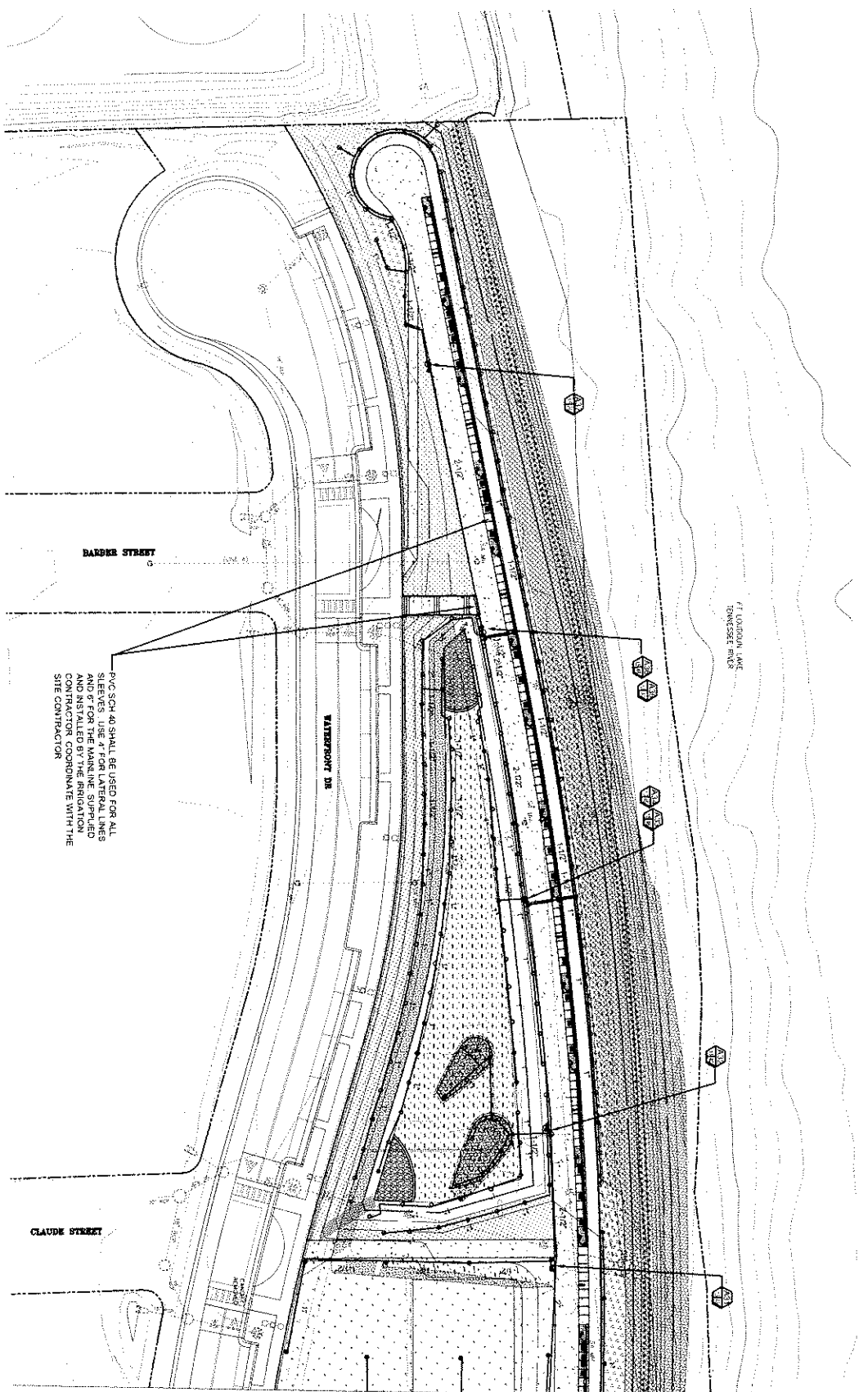
LANDSCAPE PLAN - SECTION 3B

benefield-rothens
 LANDSCAPE ARCHITECTS

L123-A1

CANNON & CANNON INC. CONSULTING ENGINEERS FIELD SERVICES 1000 WEST 19TH STREET, SUITE 100 HOUSTON, TEXAS 77058 TEL: 713/865-1111 FAX: 713/865-1112 WWW.CANNONANDCANNON.COM	
PROJECT: ROYAL LANDING PARK PHASE: PHASE 1B	DRAWING NO.: L123-A1 DATE: 11/15/11 SCALE: AS SHOWN
LANDSCAPE PLAN - SECTION 3 11/15/11	11/15/11

IRRIGATION PLAN - WEST END
 1/11/17 2:28 PM

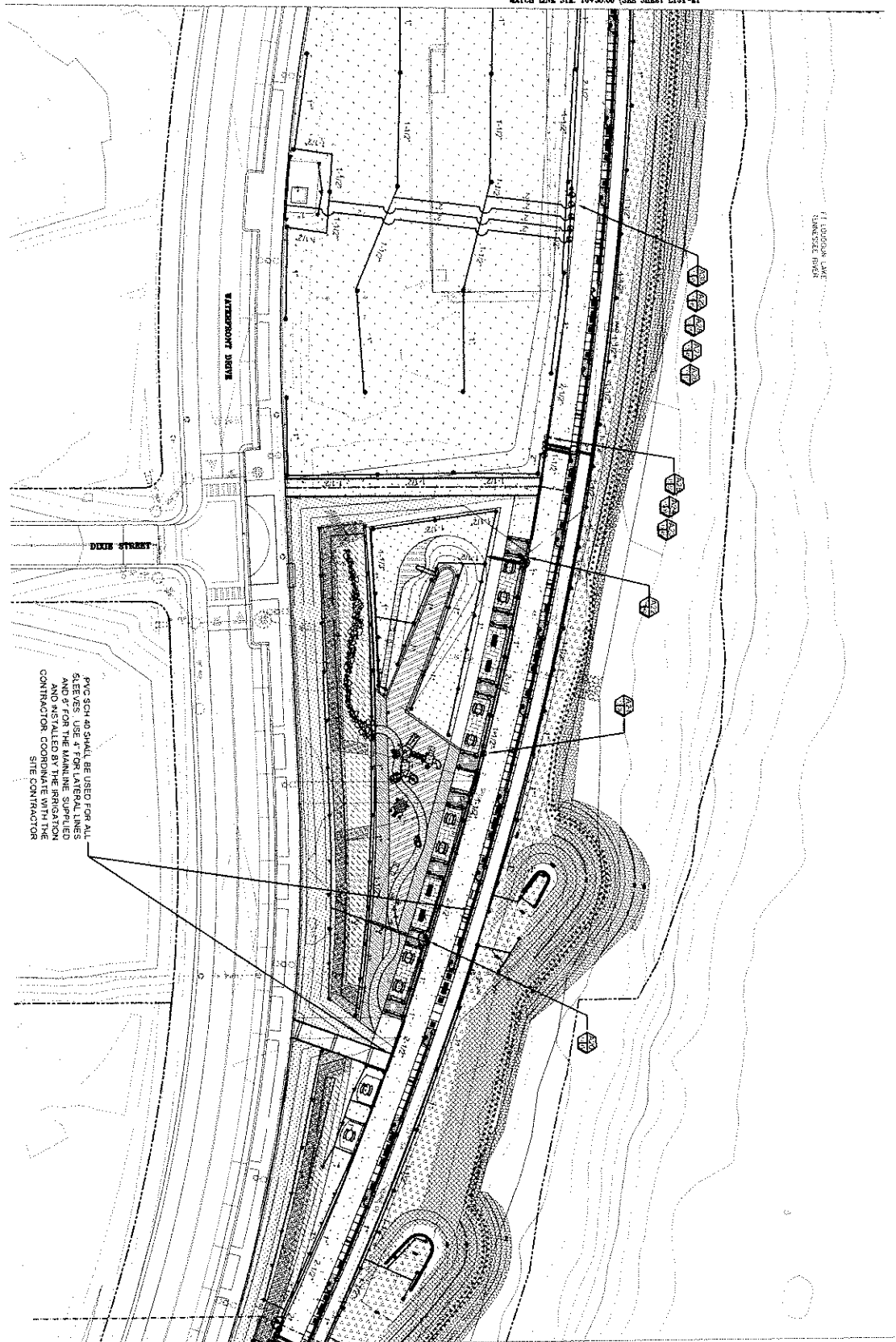


IRRIGATION LEGEND

- 1. 1/2" PVC SCH 40
- 2. 3/4" PVC SCH 40
- 3. 1" PVC SCH 40
- 4. 1 1/2" PVC SCH 40
- 5. 2" PVC SCH 40
- 6. 3" PVC SCH 40
- 7. 4" PVC SCH 40
- 8. 6" PVC SCH 40
- 9. 8" PVC SCH 40
- 10. 10" PVC SCH 40
- 11. 12" PVC SCH 40
- 12. 15" PVC SCH 40
- 13. 18" PVC SCH 40
- 14. 24" PVC SCH 40
- 15. 30" PVC SCH 40
- 16. 36" PVC SCH 40
- 17. 42" PVC SCH 40
- 18. 48" PVC SCH 40
- 19. 60" PVC SCH 40
- 20. 72" PVC SCH 40
- 21. 84" PVC SCH 40
- 22. 96" PVC SCH 40
- 23. 108" PVC SCH 40
- 24. 120" PVC SCH 40
- 25. 144" PVC SCH 40
- 26. 168" PVC SCH 40
- 27. 192" PVC SCH 40
- 28. 216" PVC SCH 40
- 29. 240" PVC SCH 40
- 30. 288" PVC SCH 40
- 31. 336" PVC SCH 40
- 32. 384" PVC SCH 40
- 33. 432" PVC SCH 40
- 34. 480" PVC SCH 40
- 35. 528" PVC SCH 40
- 36. 576" PVC SCH 40
- 37. 624" PVC SCH 40
- 38. 672" PVC SCH 40
- 39. 720" PVC SCH 40
- 40. 768" PVC SCH 40
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- 46. 1056" PVC SCH 40
- 47. 1104" PVC SCH 40
- 48. 1152" PVC SCH 40
- 49. 1200" PVC SCH 40
- 50. 1248" PVC SCH 40
- 51. 1296" PVC SCH 40
- 52. 1344" PVC SCH 40
- 53. 1392" PVC SCH 40
- 54. 1440" PVC SCH 40
- 55. 1488" PVC SCH 40
- 56. 1536" PVC SCH 40
- 57. 1584" PVC SCH 40
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- 59. 1680" PVC SCH 40
- 60. 1728" PVC SCH 40
- 61. 1776" PVC SCH 40
- 62. 1824" PVC SCH 40
- 63. 1872" PVC SCH 40
- 64. 1920" PVC SCH 40
- 65. 1968" PVC SCH 40
- 66. 2016" PVC SCH 40
- 67. 2064" PVC SCH 40
- 68. 2112" PVC SCH 40
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- 70. 2208" PVC SCH 40
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- 72. 2304" PVC SCH 40
- 73. 2352" PVC SCH 40
- 74. 2400" PVC SCH 40
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- 110. 4128" PVC SCH 40
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- 134. 5280" PVC SCH 40
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- 144. 5760" PVC SCH 40
- 145. 5808" PVC SCH 40
- 146. 5856" PVC SCH 40
- 147. 5904" PVC SCH 40
- 148. 5952" PVC SCH 40
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- 566. 26016" PVC SCH 40

MATCH LINE STA. 10+58.00 (SEE SHEET L131-A1)

IRRIGATOR PLAN - MIDDLE SECTION



PVC SCH 40 SHALL BE USED FOR ALL SLEEVES. USE 4" FOR LATERAL LINES AND 6" FOR MAIN LINES. ALL SHALL BE INSTALLED BY THE IRRIGATION CONTRACTOR. COORDINATE WITH THE SITE CONTRACTOR.

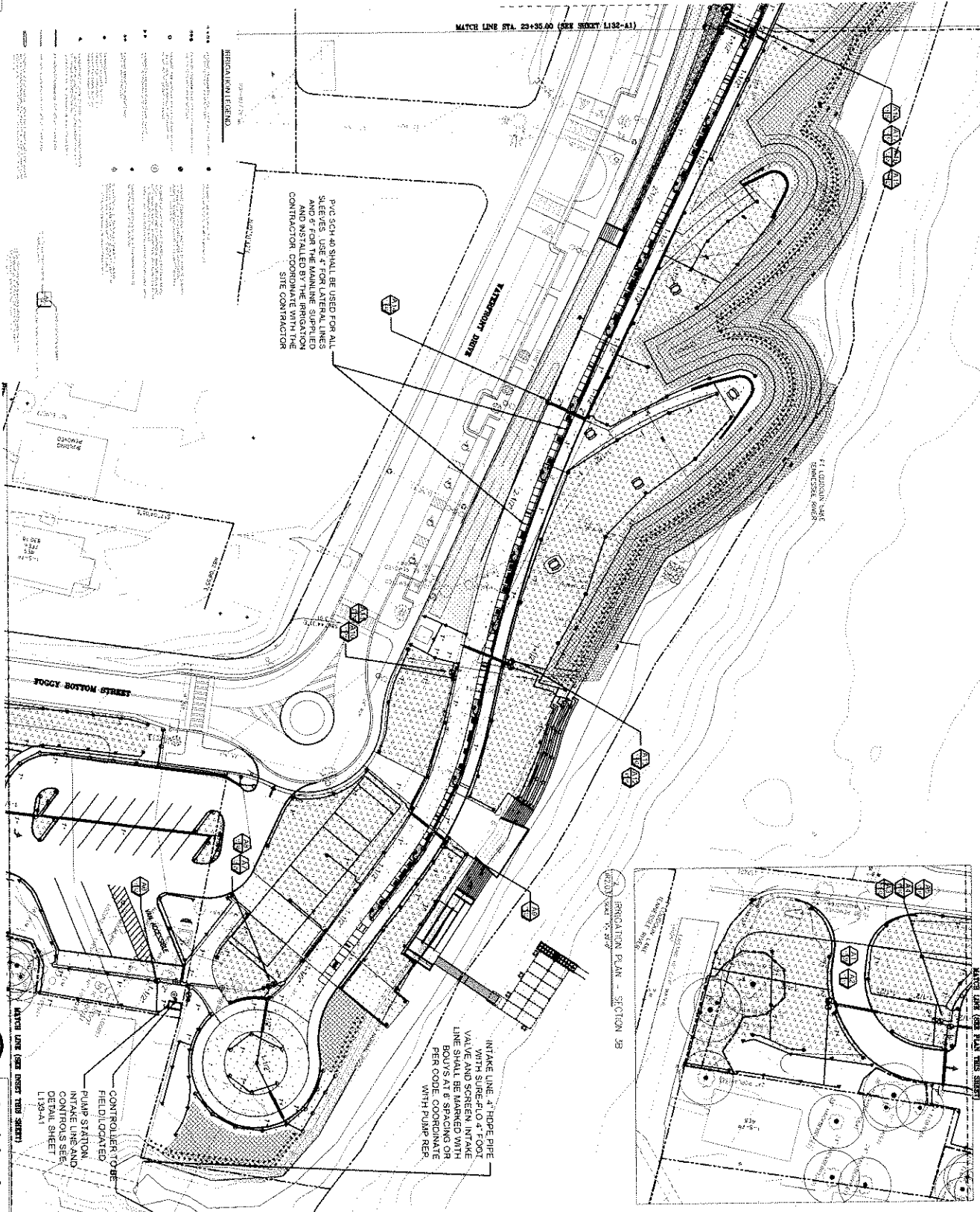
IRRIGATION LEGEND

- 1. IRRIGATION MAIN
- 2. IRRIGATION SUB MAIN
- 3. IRRIGATION LATERAL
- 4. IRRIGATION VALVE
- 5. IRRIGATION SPRINKLER HEAD
- 6. IRRIGATION WATERPOINT
- 7. IRRIGATION DRAIN
- 8. IRRIGATION PUMP
- 9. IRRIGATION CONTROL VALVE
- 10. IRRIGATION ELECTRICAL CONTROL
- 11. IRRIGATION ELECTRICAL CONTROL
- 12. IRRIGATION ELECTRICAL CONTROL
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- 50. IRRIGATION ELECTRICAL CONTROL

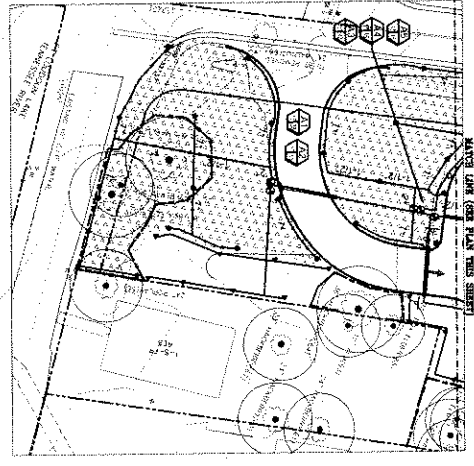
MATCH LINE STA. 23+35.00 (SEE SHEET L133-A1)



CANNON & CANNON INC. CONSULTING ENGINEERS ARCHITECTS 1000 W. WASHINGTON ST. SUITE 1000 LAS VEGAS, NV 89102 TEL: 702.735.1100 FAX: 702.735.1101 WWW.CANNONANDCANNON.COM	
PROJECT: RYTHER LANDING PARK PARK PHASE 1B	
DRAWING: ENLARGED IRRIGATION SECTION	
DATE: 12/15/2010	BY: BENEFIELD-RICHERS
CHECKED: [Signature]	DATE: 12/15/2010
SHEET: L132-A1	



MATCH LINE STA. 23+95.00 (SEE SHEET L133-A1)



- IRREGULARITY LEGEND**
- 1. 1/2\"/>

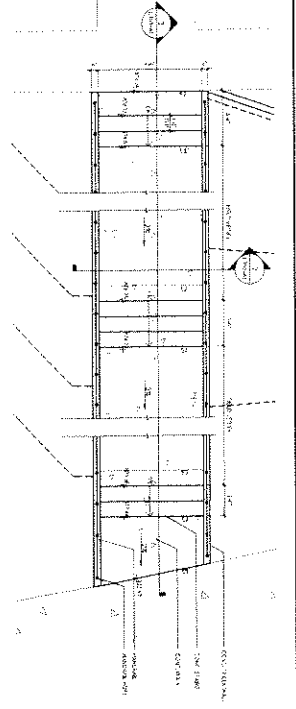
INTAKE LINE, 4" HDPE PIPE
 WITH SURFLO & FOOT
 VALVE AND SCREEN INTAKE
 LINE BOWNS SEE SPACING OR
 PER CODE. COORDINATE
 WITH PUMP REP.

CONTROLLED TO BE
 FIELD-COATED
 PUMP STATION
 INTAKE LINE AND
 CONTROLS SEE
 DETAIL SHEET
 L133-A1

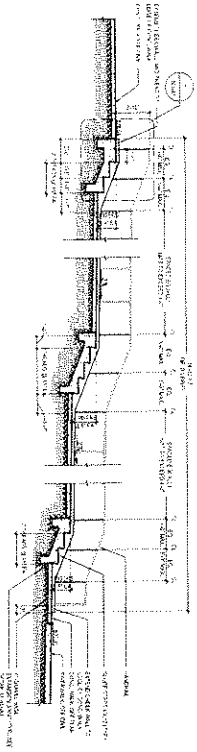


benefield-ryders

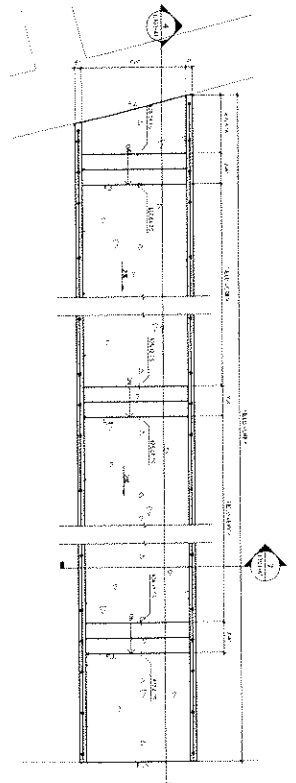
CANNON & CANNON INC. CIVIL ENGINEERS, FLSA LICENSED 14000 W. BOULEVARD SUITE 100 TAMPA, FL 33607 TEL: 813-973-1111 FAX: 813-973-1112 WWW.CANNONANDCANNON.COM	
THE CITY OF TAMPA CIVIL ENGINEERING DIVISION 1201 N. HAVEN AVENUE TAMPA, FL 33602 TEL: 813-246-2000 FAX: 813-246-2000	QUINCY LAMOND PARK PARK MAP # 13 1/23/11
DRAWING AREA DATE 2/20/11 133-A1	133-A1



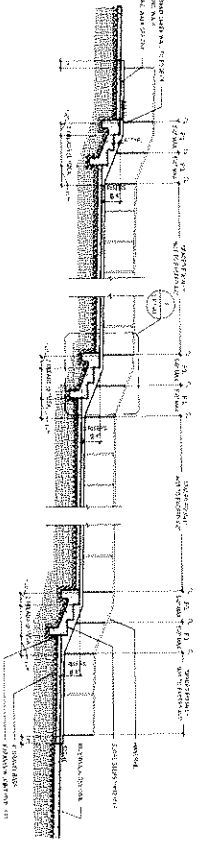
1 ENLARGED PLAN - STAIRS AT BARBER ST
 (SEE PLAN 7/20/20)



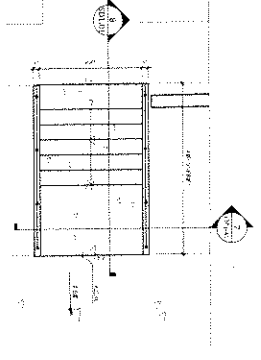
1 SECTION - STAIR AT BARBER ST
 (SEE PLAN 7/20/20)



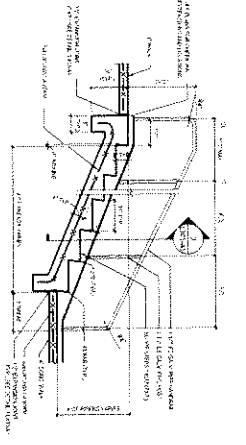
2 ENLARGED PLAN - STAIRS AT PLAYGROUND
 (SEE PLAN 7/20/20)



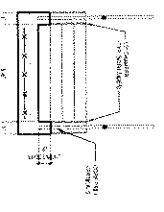
2 SECTION - STAIR AT PLAYGROUND
 (SEE PLAN 7/20/20)



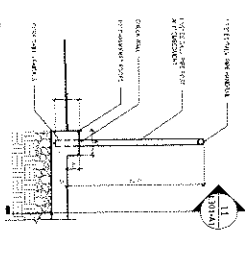
3 ENLARGED PLAN - STAIRS AT E ST
 (SEE PLAN 7/20/20)



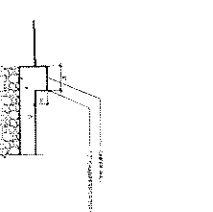
3 SECTION - STAIRS AT E ST
 (SEE PLAN 7/20/20)



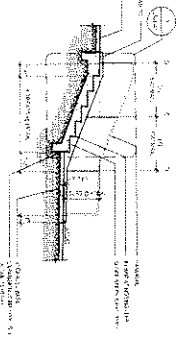
4 EXTERIOR STAIR DETAIL (TYP)
 (SEE PLAN 7/20/20)



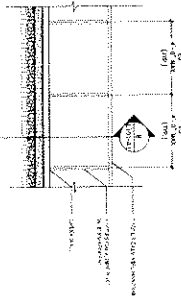
4 SECTION - EXTERIOR STAIR SECTION DETAIL
 (SEE PLAN 7/20/20)



5 HANDRAIL & CHECK WALL DETAIL
 (SEE PLAN 7/20/20)

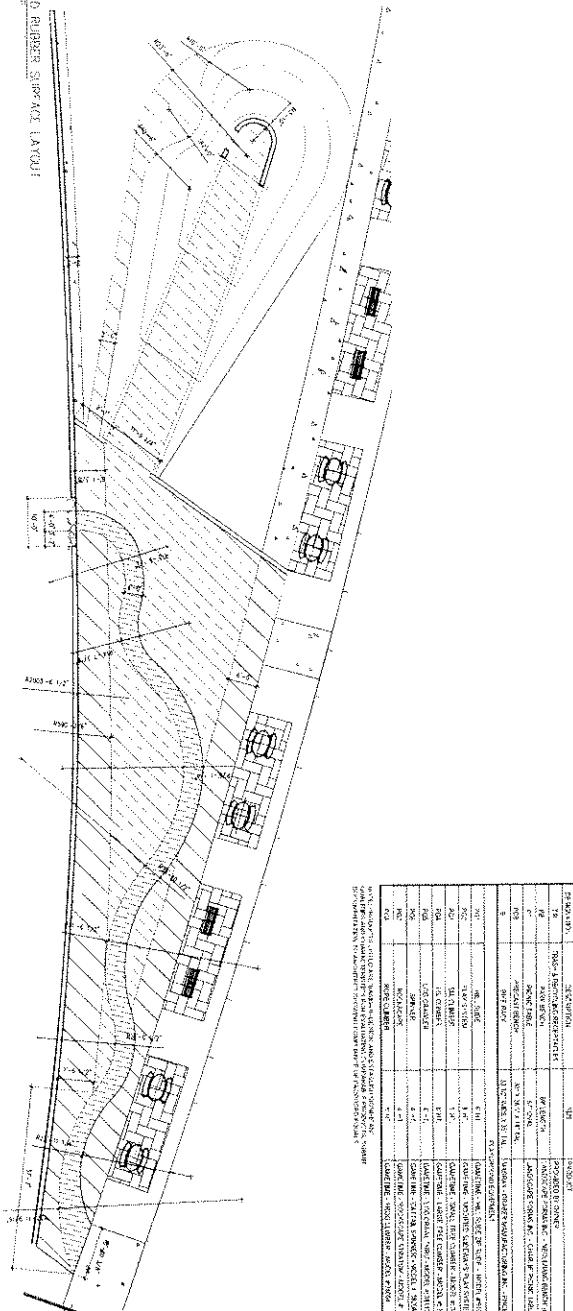
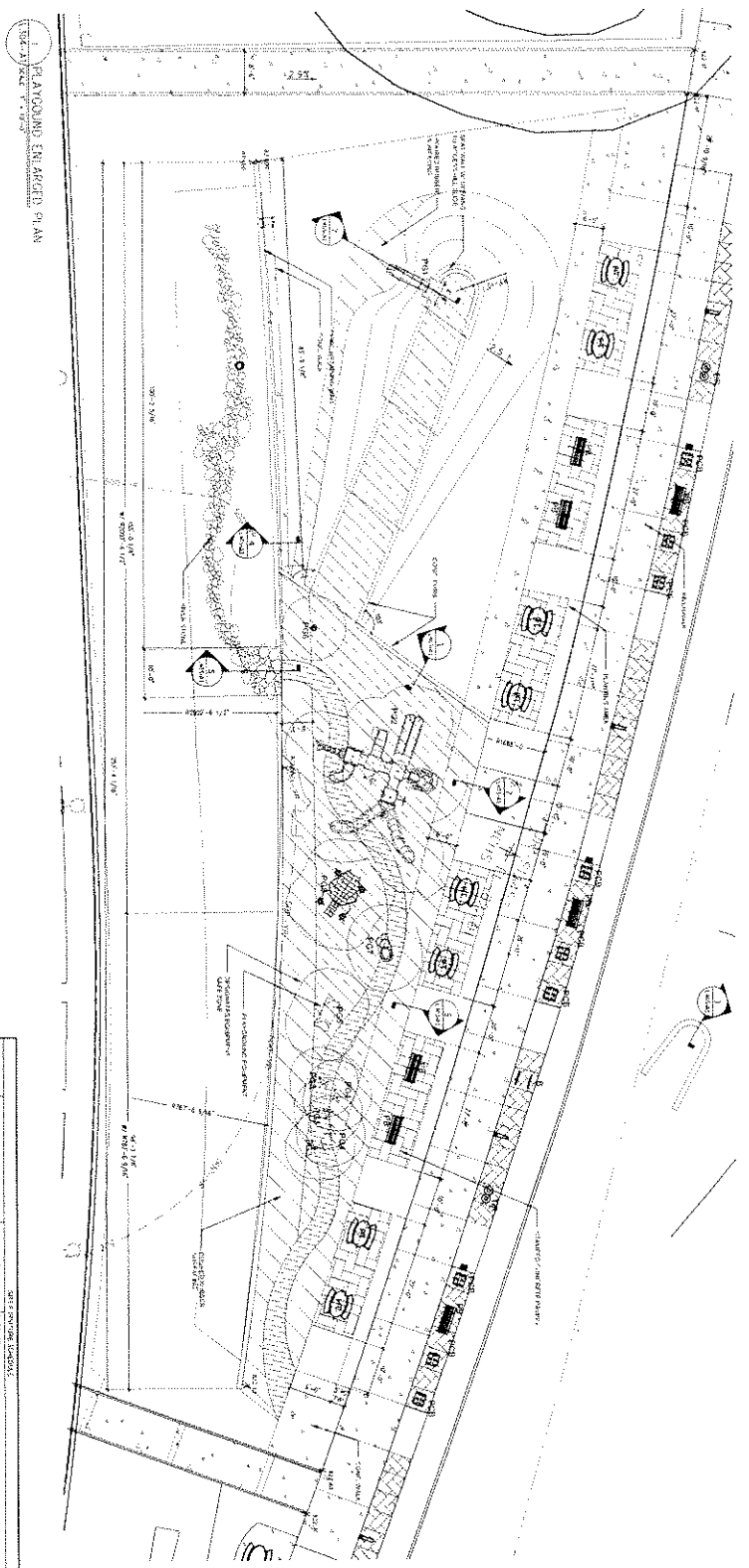


5 SECTION - STAIR AT E ST
 (SEE PLAN 7/20/20)



6 HANDRAIL DETAIL
 (SEE PLAN 7/20/20)

CANNON & CANNON ARCHITECTS 1000 UNIVERSITY AVENUE SUITE 1000 ANN ARBOR, MI 48106 TEL: 734.769.1000 FAX: 734.769.1001 WWW.CANNON-AND-CANNON.COM	
THE CITY OF ESSEXVILLE 1000 UNIVERSITY AVENUE SUITE 1000 ANN ARBOR, MI 48106 TEL: 734.769.1000 FAX: 734.769.1001 WWW.CANNON-AND-CANNON.COM	
OTHER LANDING PARK PARK LANDING #1 PARK LANDING #2	
STAIR/RAIL ENLARGEMENTS SCALE: AS SHOWN DATE: 10/15/2020 DRAWN BY: [Name] CHECKED BY: [Name]	



NO.	DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL PRICE
1	PLAYGROUND EQUIPMENT	1	10000.00	10000.00
2	LANDSCAPE ELEMENTS	1	5000.00	5000.00
3	PLAYGROUND EQUIPMENT	1	10000.00	10000.00
4	LANDSCAPE ELEMENTS	1	5000.00	5000.00
5	PLAYGROUND EQUIPMENT	1	10000.00	10000.00
6	LANDSCAPE ELEMENTS	1	5000.00	5000.00
7	PLAYGROUND EQUIPMENT	1	10000.00	10000.00
8	LANDSCAPE ELEMENTS	1	5000.00	5000.00
9	PLAYGROUND EQUIPMENT	1	10000.00	10000.00
10	LANDSCAPE ELEMENTS	1	5000.00	5000.00

PLAYGROUND RUBBER SURFACE LAYOUT

benefield-richters

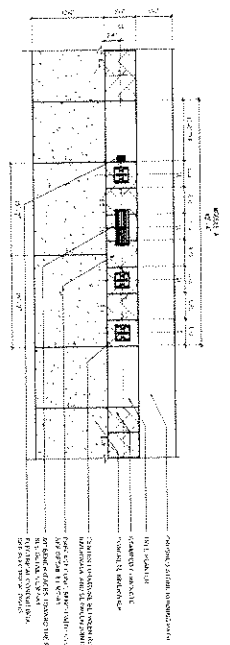


CANNON & CANNON, INC.
 10000 1st Avenue, Everett, WA 98203
 TEL: (828) 855-1100 FAX: (828) 855-1101
 WWW.CANNONANDCANNON.COM

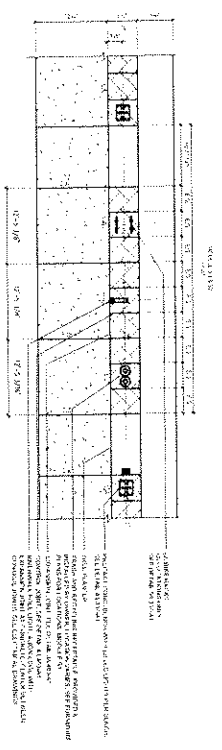
CITY OF EVERETT
 OFFICE OF PUBLIC WORKS
 1000 1st Avenue, Everett, WA 98203
 TEL: (425) 373-3000 FAX: (425) 373-3001
 WWW.EVERETTWA.GOV

PLAYGROUND LAYOUT ENLARGEMENT
 PROJECT NO. 1304-A1

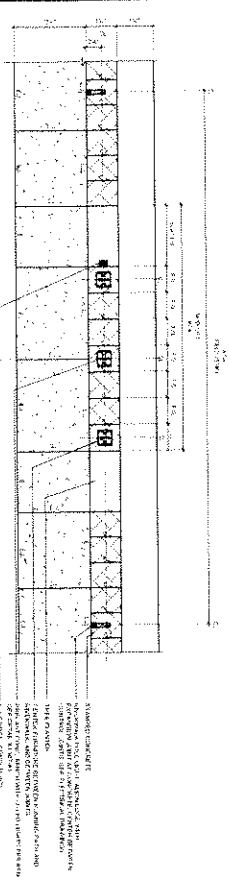
DATE: 08/18/2010
 DRAWN: J. HARRIS
 CHECKED: J. HARRIS
 SCALE: AS SHOWN
 SHEET NO. 1304-A1
 TOTAL SHEETS: 1304-A1



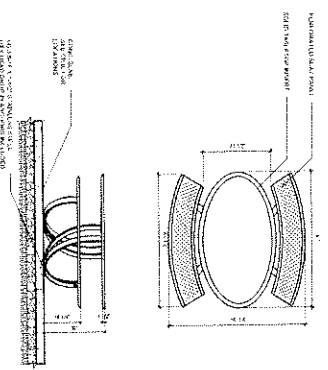
1 FURNITURE LAYOUT BETWEEN PATHERS - MODULE A
 1307-A1 SCALE: 1/8" = 1'-0"



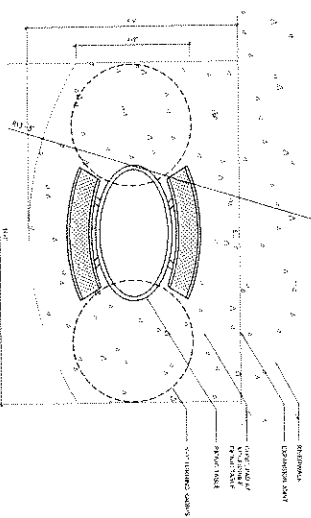
2 FURNITURE LAYOUT - MODULE B
 1307-B1 SCALE: 1/8" = 1'-0"



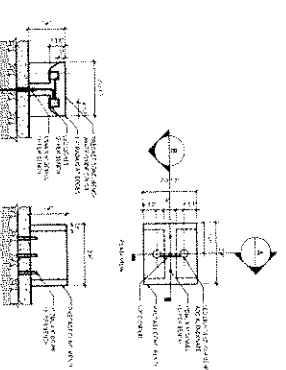
3 FURNITURE LAYOUT ALONG WALKWAYS - MODULE C
 1307-C1 SCALE: 1/8" = 1'-0"



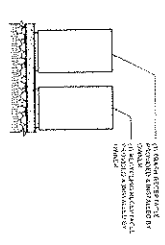
4 SITE FURNITURE - PICNIC TABLE
 1307-41 SCALE: 1/8" = 1'-0"



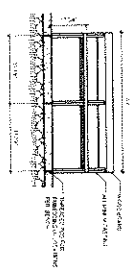
5 SITE FURNITURE - ACCESSIBLE PICNIC TABLE CONC. PAD
 1307-51 SCALE: 1/8" = 1'-0"



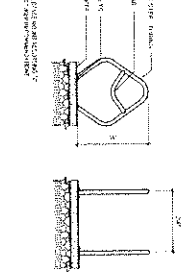
6 SITE FURNITURE - PRECAST CONC. BENCH
 1307-61 SCALE: 1/8" = 1'-0"



7 SITE FURNITURE - TRASH AND RECYCLING RECEPTACLE
 1307-71 SCALE: 1/8" = 1'-0"



8 SITE FURNITURE - BACKREST BENCH
 1307-81 SCALE: 1/8" = 1'-0"

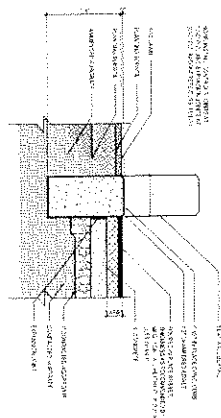


9 SITE FURNITURE - BIKE RACK
 1307-91 SCALE: 1/8" = 1'-0"

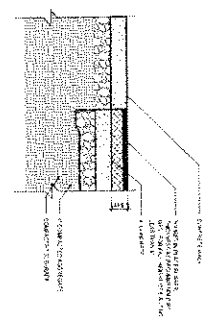
CANNON & CANNON INC.
 CONSULTING ENGINEERS ARCHITECTS INTERIORS
 1000 BENTLEY BLVD. | SUITE 1000 | BOSTON, MA 02118
 TEL: 617.552.1100 | WWW.CANNONANDCANNON.COM

FOR CITY OF BOSTON
 PROJECT: BOSTON LANDING STAIR
 DRAWING: FURNITURE LAYOUTS
 DATE: 08/13/13

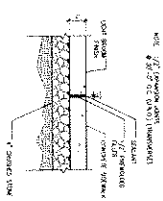
INTERNAL FURNITURE LAYOUTS



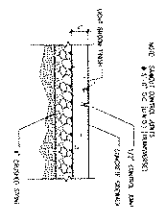
1. POURED RUBBER SURFACE DETAIL AT CURB



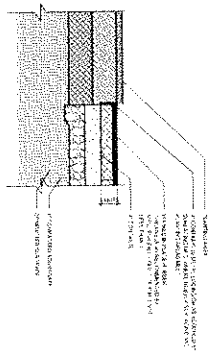
2. POURED RUBBER SURFACE DETAIL AT CONC WALK



3. SIDE WALK EXPANSION JOINT (E.J.)



4. SIDE WALK CONCRETE JOINT (C.J.)



5. POURED RUBBER SURFACE DETAIL AT PAINTING AREA

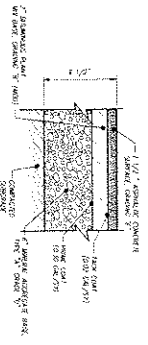
CANNON & CANNON INC.
 CONSULTING ENGINEERS ARCHITECTS INTERIORS
 1000 BROADWAY, SUITE 1000
 NEW YORK, NY 10018
 TEL: 212 692 4000 FAX: 212 692 4001
 WWW.CANNONANDCANNON.COM

THE CITY OF NEW YORK
 DEPARTMENT OF ENVIRONMENTAL CONSERVATION
 OFFICE OF AIR QUALITY MANAGEMENT
 AIR QUALITY CONTROL DIVISION
 609 WEST STREETS
 ALBANY, NY 12242-1199
 TEL: 518 474 3900 FAX: 518 474 3901

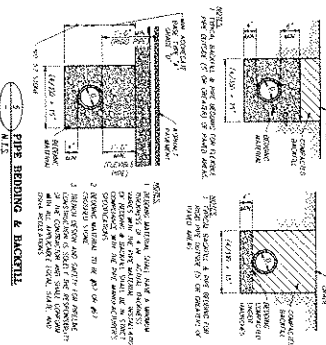
OFFICE ADDRESS:
 1000 BROADWAY, SUITE 1000
 NEW YORK, NY 10018
 TEL: 212 692 4000 FAX: 212 692 4001

DATE: 10/15/03
 DRAWING NO.: 1403-A1
 SHEET NO.: 13 OF 13

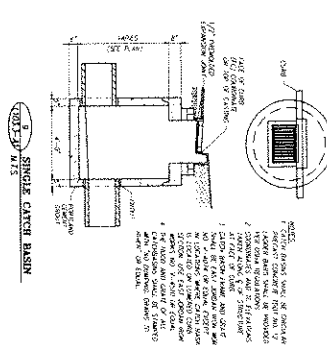
DATE: 10/15/03
 DRAWING NO.: 1403-A1
 SHEET NO.: 13 OF 13



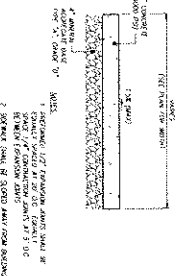
1 LIGHT DUTY ASPHALT SECTION
NOT TO SCALE



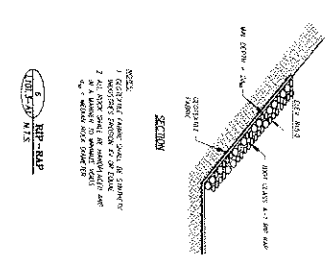
2 PIPE BEDDING & BACKFILL
NOT TO SCALE



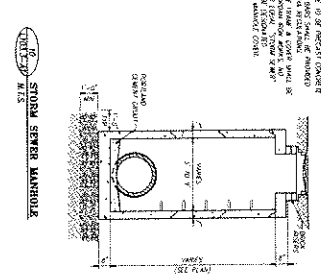
3 SINGLE CATCH BASIN
NOT TO SCALE



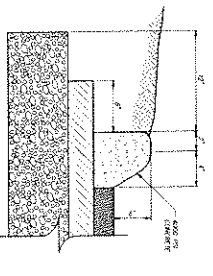
4 CONCRETE SIDEWALK (PAVEMENT)
NOT TO SCALE



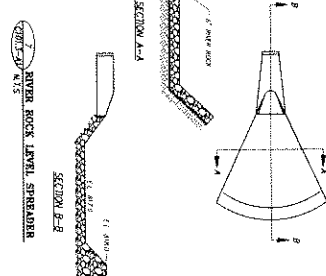
5 RIP-RAP
NOT TO SCALE



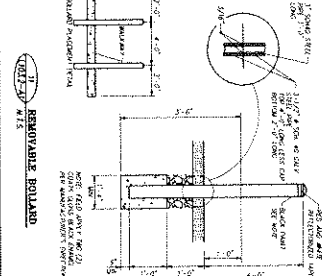
6 STORM SEWER MANHOLE
NOT TO SCALE



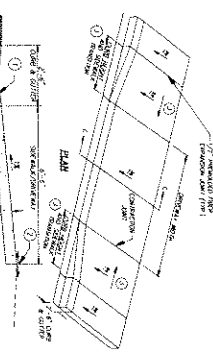
7 EXTENDED CURB
NOT TO SCALE



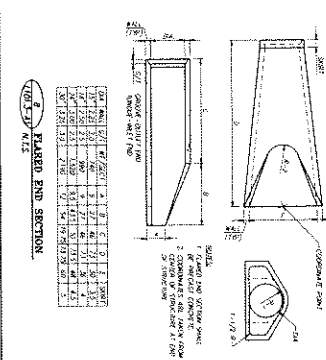
8 RIVER ROCK LEVEL SEPARATION
NOT TO SCALE



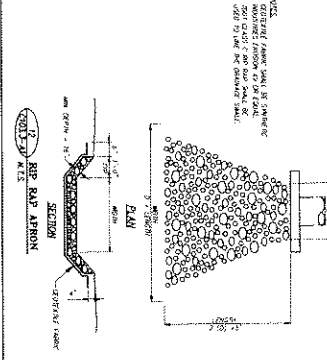
9 REMOVABLE ROLLARD
NOT TO SCALE



10 STANDARD DRIVEWAY RAMP
NOT TO SCALE



11 FLASHED END SECTION
NOT TO SCALE



12 RIP-RAP APRON
NOT TO SCALE

CANNON & CANNON, INC.
CONSULTING ENGINEERS - FIELD SERVICES
1000 WEST 19TH STREET, SUITE 100
HOUSTON, TEXAS 77058
TEL: 713.865.1100

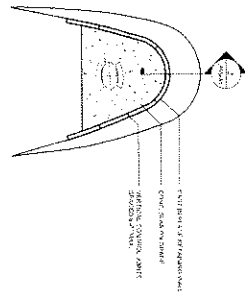
THE CITY OF HOUSTON
PUBLIC WORKS DEPARTMENT
1000 WEST 19TH STREET
HOUSTON, TEXAS 77058

PROJECT: STORM LANDING PARK, PHASE 1B
PROPOSED STORM IMPROVEMENTS

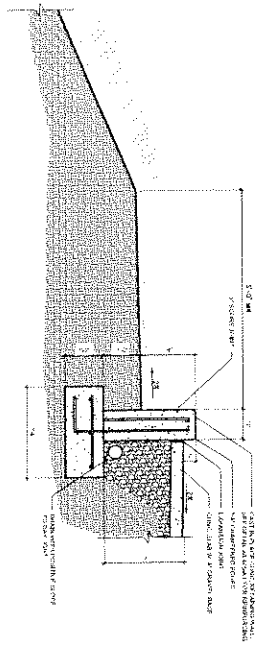
SITE IMPROVEMENT DETAILS

DATE: 11/11/2011
DRAWN BY: [Name]
CHECKED BY: [Name]

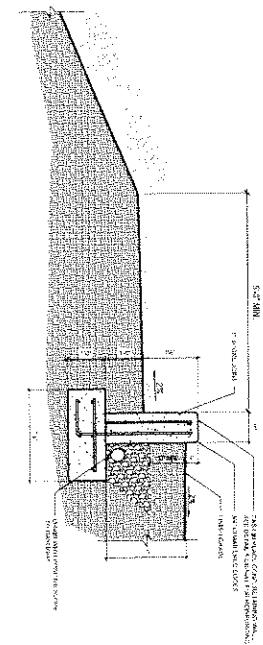
L404-A1



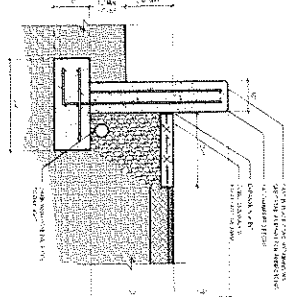
1 RIVER OVERLOOK ENLARGED PLAN
100'-0" X 100'-0" SCALE



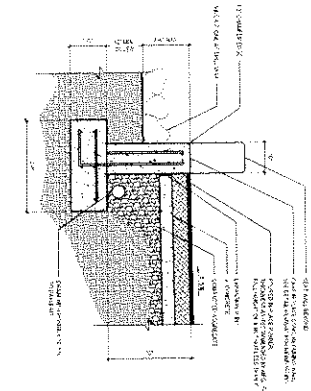
2 RIVER OVERLOOK RETAINING WALL DETAIL
100'-0" X 100'-0" SCALE



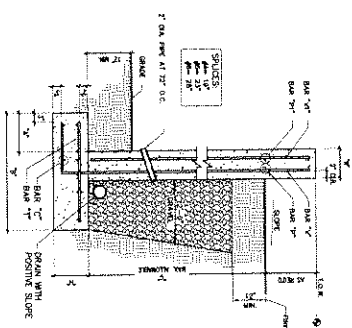
3 RIVER OVERLOOK RETAINING WALL DETAIL
100'-0" X 100'-0" SCALE



4 PLAYGROUND SEAT WALL DETAIL
100'-0" X 100'-0" SCALE



5 PLAYGROUND SEAT WALL DETAIL
100'-0" X 100'-0" SCALE



6 CIP CONCRETE RETAIN WALL
100'-0" X 100'-0" SCALE

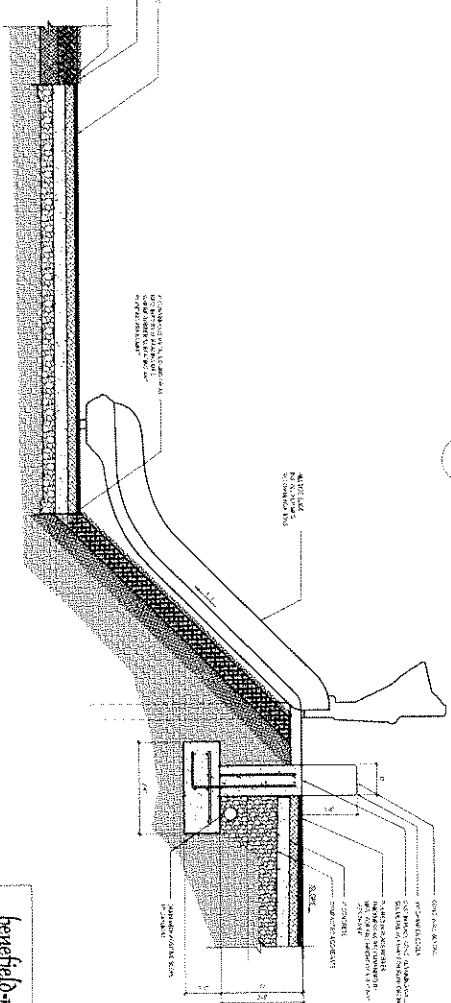
CAST-IN-PLACE CONCRETE RETAINING WALL SCHEDULE

ITEM	DESCRIPTION	UNIT	QTY	PRICE	TOTAL
1	CONCRETE RETAINING WALL	SQ YD	100	100.00	10000.00
2	CONCRETE SEAT WALL	SQ YD	50	50.00	5000.00
3	REINFORCEMENT	TON	10	100.00	1000.00
4	FORMWORK	SQ YD	200	20.00	4000.00
5	PAINT	SQ YD	100	10.00	1000.00
6	GRASS SEED	SQ YD	100	10.00	1000.00
7	SOIL	SQ YD	100	10.00	1000.00
8	ROCK	SQ YD	100	10.00	1000.00
9	CONCRETE	CY	100	100.00	10000.00
10	STEEL	TON	10	100.00	1000.00
11	FORMWORK	SQ YD	200	20.00	4000.00
12	PAINT	SQ YD	100	10.00	1000.00
13	GRASS SEED	SQ YD	100	10.00	1000.00
14	SOIL	SQ YD	100	10.00	1000.00
15	ROCK	SQ YD	100	10.00	1000.00
16	CONCRETE	CY	100	100.00	10000.00
17	STEEL	TON	10	100.00	1000.00
18	FORMWORK	SQ YD	200	20.00	4000.00
19	PAINT	SQ YD	100	10.00	1000.00
20	GRASS SEED	SQ YD	100	10.00	1000.00
21	SOIL	SQ YD	100	10.00	1000.00
22	ROCK	SQ YD	100	10.00	1000.00
23	CONCRETE	CY	100	100.00	10000.00
24	STEEL	TON	10	100.00	1000.00
25	FORMWORK	SQ YD	200	20.00	4000.00
26	PAINT	SQ YD	100	10.00	1000.00
27	GRASS SEED	SQ YD	100	10.00	1000.00
28	SOIL	SQ YD	100	10.00	1000.00
29	ROCK	SQ YD	100	10.00	1000.00
30	CONCRETE	CY	100	100.00	10000.00
31	STEEL	TON	10	100.00	1000.00
32	FORMWORK	SQ YD	200	20.00	4000.00
33	PAINT	SQ YD	100	10.00	1000.00
34	GRASS SEED	SQ YD	100	10.00	1000.00
35	SOIL	SQ YD	100	10.00	1000.00
36	ROCK	SQ YD	100	10.00	1000.00
37	CONCRETE	CY	100	100.00	10000.00
38	STEEL	TON	10	100.00	1000.00
39	FORMWORK	SQ YD	200	20.00	4000.00
40	PAINT	SQ YD	100	10.00	1000.00
41	GRASS SEED	SQ YD	100	10.00	1000.00
42	SOIL	SQ YD	100	10.00	1000.00
43	ROCK	SQ YD	100	10.00	1000.00
44	CONCRETE	CY	100	100.00	10000.00
45	STEEL	TON	10	100.00	1000.00
46	FORMWORK	SQ YD	200	20.00	4000.00
47	PAINT	SQ YD	100	10.00	1000.00
48	GRASS SEED	SQ YD	100	10.00	1000.00
49	SOIL	SQ YD	100	10.00	1000.00
50	ROCK	SQ YD	100	10.00	1000.00

NOTES:

- 1. REFER TO ALL DIMENSIONS IN REAR AND TO MATCH
- 2. ALL CONCRETE SHALL BE 4000 PSI
- 3. ALL CONCRETE SHALL BE 4000 PSI
- 4. ALL CONCRETE SHALL BE 4000 PSI
- 5. ALL CONCRETE SHALL BE 4000 PSI
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- 48. ALL CONCRETE SHALL BE 4000 PSI
- 49. ALL CONCRETE SHALL BE 4000 PSI
- 50. ALL CONCRETE SHALL BE 4000 PSI

7 PLAYGROUND SEAT WALL AT QUAY
100'-0" X 100'-0" SCALE



CANNON & CANNON, INC.
 1000 W. 10TH AVENUE, SUITE 100
 DENVER, CO 80202
 TEL: 303.733.1111
 WWW.CANNONANDCANNON.COM

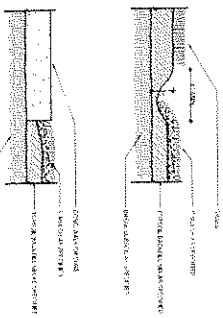
THE CITY OF DENVER
 DEPARTMENT OF UTILITIES
 100 W. WASHINGTON AVENUE
 DENVER, CO 80202
 TEL: 303.733.1111

OUTSIDE LANDING PARK
 PHASE 1B

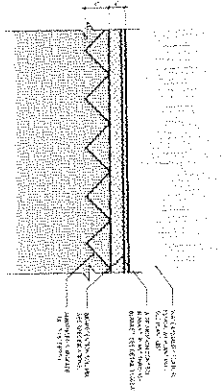
RETAINING & RETAINING WALL DETAILS

DATE: 10/15/2013
 DRAWN: J. B. BROWN
 CHECKED: J. B. BROWN
 APPROVED: J. B. BROWN

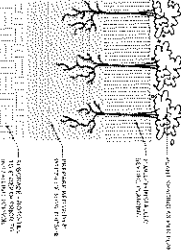
1. BED EDGE DETAIL
 SCALE: 1/4" = 1'-0"



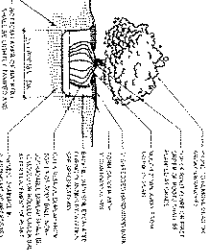
2. WATER QUALITY FEATURE SOIL PROFILE
 SCALE: 1/4" = 1'-0"



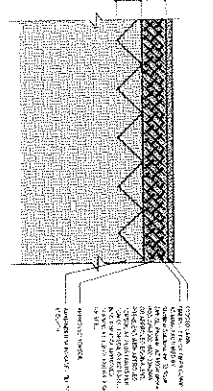
3. GROUND COVER PLANTING DETAIL
 SCALE: 1/4" = 1'-0"



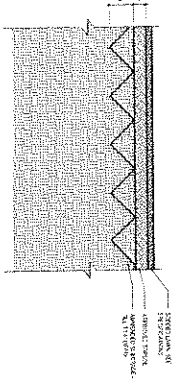
4. SHRUB PLANTING DETAIL
 SCALE: 1/4" = 1'-0"



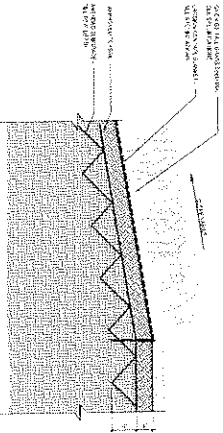
5. FIBER REINFORCED LAWN DETAIL
 SCALE: 1/4" = 1'-0"



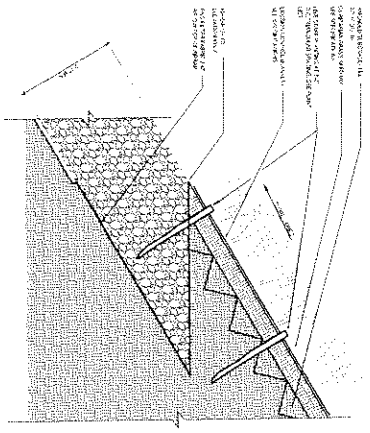
6. 12" SCODDED LAWN DETAIL
 SCALE: 1/4" = 1'-0"



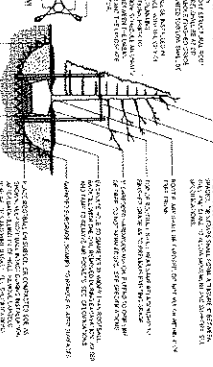
7. 6" & 3" TALL GRASS ON SLOPE DETAIL
 SCALE: 1/4" = 1'-0"



8. TOP OF RIPRAP - LIVE STAKE DETAIL
 SCALE: 1/4" = 1'-0"



9. TREE PLANTING DETAIL
 SCALE: 1/4" = 1'-0"



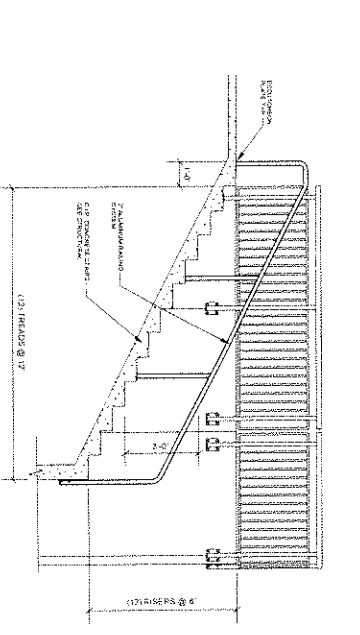
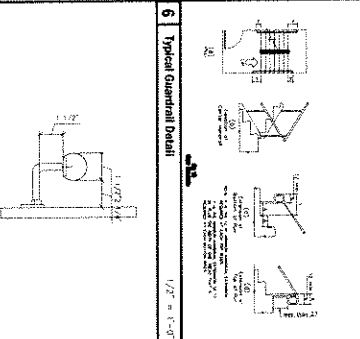
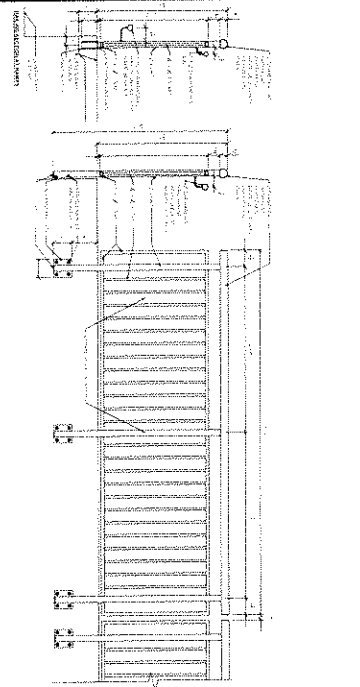
CANNON & CANNON INC.
 CONSULTING ENGINEERS FIELD DIVISION
 8635 STRONG AVENUE, SUITE 100
 SAN DIEGO, CALIFORNIA 92121
 (619) 444-1111

THE CITY OF SAN DIEGO
 DEPARTMENT OF PUBLIC WORKS
 1201 K STREET, SUITE 100
 SAN DIEGO, CALIFORNIA 92101
 (619) 444-1111

PROJECT: OFFICE LANDING PARK
 PHASE: DESIGN OF 12
 PLANNING DETAILS

100 NORTH OF CALLE SAN DIEGO
 SAN DIEGO, CALIFORNIA 92101
 DATE: 08/11/15

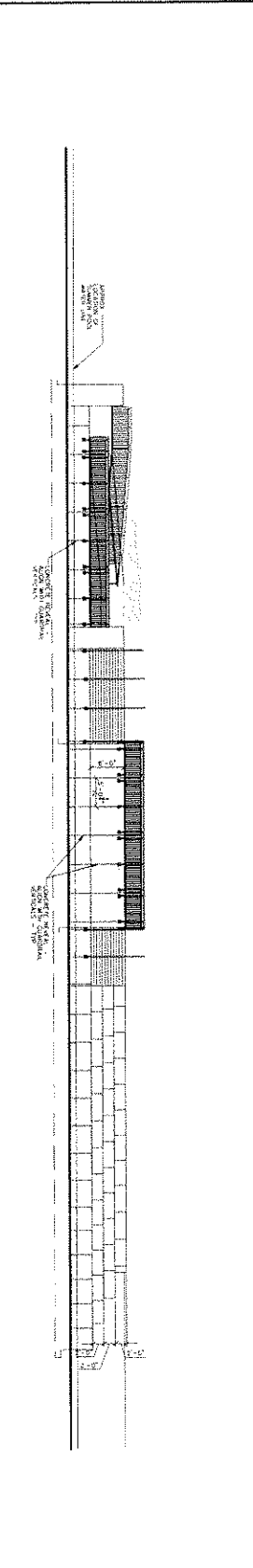
LA09-A1



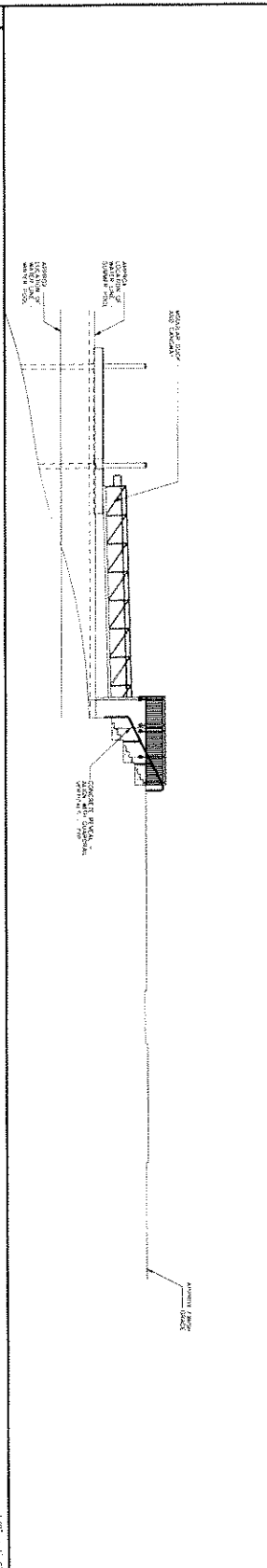
7 Guardrail Detail

5 Typical Handrail Detail

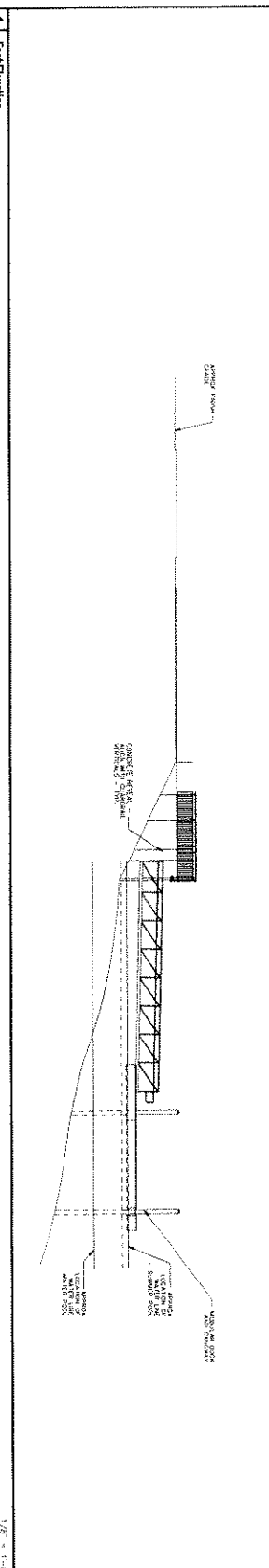
4 Typical Stair Section



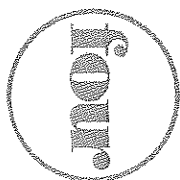
3 North Elevation



2 West Elevation



1 East Elevation



STUDIO FOUR DESIGN
 Architecture & Interiors
 Planning / Graphics Consulting
 10015 Church Ave., Knoxville, TN 37902
 1.865.523.5001 | 1.865.823.5003
 studiofourdesign.com

CANNON & CANNON INC.
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 10015 Church Ave., Knoxville, TN 37902
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 cannonandcannon.com

OFFICE
 10015 Church Ave., Knoxville, TN 37902
 1.865.523.5001 | 1.865.823.5003
 cannonandcannon.com

PROJECT
 10015 Church Ave., Knoxville, TN 37902
 1.865.523.5001 | 1.865.823.5003
 cannonandcannon.com

DATE
 10/15/2013

SCALE
 1/8" = 1'-0"

PROJECT NO.
 10015 Church Ave., Knoxville, TN 37902
 1.865.523.5001 | 1.865.823.5003
 cannonandcannon.com

DATE
 10/15/2013

SCALE
 1/8" = 1'-0"

PROJECT NO.
 10015 Church Ave., Knoxville, TN 37902
 1.865.523.5001 | 1.865.823.5003
 cannonandcannon.com

ELEVATIONS AND DETAILS
 4.1.A-1

SECTION 12 - INTERIORS

1. Provide all interior finishes, including but not limited to, walls, ceilings, floors, doors, windows, and hardware.
2. Provide all interior partitions, including but not limited to, walls, ceilings, floors, doors, windows, and hardware.
3. Provide all interior trim, including but not limited to, baseboards, door and window casings, and crown molding.
4. Provide all interior lighting, including but not limited to, recessed lighting, pendant lighting, and table lamps.
5. Provide all interior painting, including but not limited to, walls, ceilings, and trim.
6. Provide all interior carpeting, including but not limited to, wall-to-wall carpeting and area rugs.
7. Provide all interior tile and stone, including but not limited to, wall tile, floor tile, and stone veneer.
8. Provide all interior glass, including but not limited to, glass doors, glass partitions, and glass windows.
9. Provide all interior hardware, including but not limited to, door handles, window handles, and locksets.
10. Provide all interior accessories, including but not limited to, mirrors, artwork, and plants.

GENERAL NOTES:

1. All interior finishes shall be installed in accordance with the manufacturer's instructions.
2. All interior partitions shall be installed in accordance with the manufacturer's instructions.
3. All interior trim shall be installed in accordance with the manufacturer's instructions.
4. All interior lighting shall be installed in accordance with the manufacturer's instructions.
5. All interior painting shall be installed in accordance with the manufacturer's instructions.
6. All interior carpeting shall be installed in accordance with the manufacturer's instructions.
7. All interior tile and stone shall be installed in accordance with the manufacturer's instructions.
8. All interior glass shall be installed in accordance with the manufacturer's instructions.
9. All interior hardware shall be installed in accordance with the manufacturer's instructions.
10. All interior accessories shall be installed in accordance with the manufacturer's instructions.

SECTION 13 - MECHANICAL, ELECTRICAL, AND PLUMBING (M.E.P.)

1. Provide all mechanical, electrical, and plumbing (M.E.P.) systems, including but not limited to, heating, ventilation, and air conditioning (HVAC), electrical, and plumbing.
2. Provide all mechanical, electrical, and plumbing (M.E.P.) equipment, including but not limited to, furnaces, boilers, air conditioning units, electrical panels, and plumbing fixtures.
3. Provide all mechanical, electrical, and plumbing (M.E.P.) piping, including but not limited to, ductwork, electrical conduits, and plumbing pipes.
4. Provide all mechanical, electrical, and plumbing (M.E.P.) controls, including but not limited to, thermostats, electrical switches, and plumbing valves.
5. Provide all mechanical, electrical, and plumbing (M.E.P.) testing and balancing, including but not limited to, duct testing and balancing, electrical testing, and plumbing testing.
6. Provide all mechanical, electrical, and plumbing (M.E.P.) maintenance, including but not limited to, routine maintenance, repairs, and replacements.

GENERAL NOTES:

1. All M.E.P. systems shall be installed in accordance with the manufacturer's instructions.
2. All M.E.P. equipment shall be installed in accordance with the manufacturer's instructions.
3. All M.E.P. piping shall be installed in accordance with the manufacturer's instructions.
4. All M.E.P. controls shall be installed in accordance with the manufacturer's instructions.
5. All M.E.P. testing and balancing shall be performed in accordance with the manufacturer's instructions.
6. All M.E.P. maintenance shall be performed in accordance with the manufacturer's instructions.

SECTION 14 - FINISHES

1. Provide all interior finishes, including but not limited to, walls, ceilings, floors, doors, windows, and hardware.
2. Provide all interior partitions, including but not limited to, walls, ceilings, floors, doors, windows, and hardware.
3. Provide all interior trim, including but not limited to, baseboards, door and window casings, and crown molding.
4. Provide all interior lighting, including but not limited to, recessed lighting, pendant lighting, and table lamps.
5. Provide all interior painting, including but not limited to, walls, ceilings, and trim.
6. Provide all interior carpeting, including but not limited to, wall-to-wall carpeting and area rugs.
7. Provide all interior tile and stone, including but not limited to, wall tile, floor tile, and stone veneer.
8. Provide all interior glass, including but not limited to, glass doors, glass partitions, and glass windows.
9. Provide all interior hardware, including but not limited to, door handles, window handles, and locksets.
10. Provide all interior accessories, including but not limited to, mirrors, artwork, and plants.

GENERAL NOTES:

1. All finishes shall be installed in accordance with the manufacturer's instructions.
2. All partitions shall be installed in accordance with the manufacturer's instructions.
3. All trim shall be installed in accordance with the manufacturer's instructions.
4. All lighting shall be installed in accordance with the manufacturer's instructions.
5. All painting shall be installed in accordance with the manufacturer's instructions.
6. All carpeting shall be installed in accordance with the manufacturer's instructions.
7. All tile and stone shall be installed in accordance with the manufacturer's instructions.
8. All glass shall be installed in accordance with the manufacturer's instructions.
9. All hardware shall be installed in accordance with the manufacturer's instructions.
10. All accessories shall be installed in accordance with the manufacturer's instructions.

SECTION 15 - FURNITURE

1. Provide all interior furniture, including but not limited to, desks, chairs, tables, and sofas.
2. Provide all interior partitions, including but not limited to, walls, ceilings, floors, doors, windows, and hardware.
3. Provide all interior trim, including but not limited to, baseboards, door and window casings, and crown molding.
4. Provide all interior lighting, including but not limited to, recessed lighting, pendant lighting, and table lamps.
5. Provide all interior painting, including but not limited to, walls, ceilings, and trim.
6. Provide all interior carpeting, including but not limited to, wall-to-wall carpeting and area rugs.
7. Provide all interior tile and stone, including but not limited to, wall tile, floor tile, and stone veneer.
8. Provide all interior glass, including but not limited to, glass doors, glass partitions, and glass windows.
9. Provide all interior hardware, including but not limited to, door handles, window handles, and locksets.
10. Provide all interior accessories, including but not limited to, mirrors, artwork, and plants.

GENERAL NOTES:

1. All furniture shall be installed in accordance with the manufacturer's instructions.
2. All partitions shall be installed in accordance with the manufacturer's instructions.
3. All trim shall be installed in accordance with the manufacturer's instructions.
4. All lighting shall be installed in accordance with the manufacturer's instructions.
5. All painting shall be installed in accordance with the manufacturer's instructions.
6. All carpeting shall be installed in accordance with the manufacturer's instructions.
7. All tile and stone shall be installed in accordance with the manufacturer's instructions.
8. All glass shall be installed in accordance with the manufacturer's instructions.
9. All hardware shall be installed in accordance with the manufacturer's instructions.
10. All accessories shall be installed in accordance with the manufacturer's instructions.

SECTION 16 - SPECIALTIES

1. Provide all interior specialties, including but not limited to, mirrors, artwork, and plants.
2. Provide all interior partitions, including but not limited to, walls, ceilings, floors, doors, windows, and hardware.
3. Provide all interior trim, including but not limited to, baseboards, door and window casings, and crown molding.
4. Provide all interior lighting, including but not limited to, recessed lighting, pendant lighting, and table lamps.
5. Provide all interior painting, including but not limited to, walls, ceilings, and trim.
6. Provide all interior carpeting, including but not limited to, wall-to-wall carpeting and area rugs.
7. Provide all interior tile and stone, including but not limited to, wall tile, floor tile, and stone veneer.
8. Provide all interior glass, including but not limited to, glass doors, glass partitions, and glass windows.
9. Provide all interior hardware, including but not limited to, door handles, window handles, and locksets.
10. Provide all interior accessories, including but not limited to, mirrors, artwork, and plants.

GENERAL NOTES:

1. All specialties shall be installed in accordance with the manufacturer's instructions.
2. All partitions shall be installed in accordance with the manufacturer's instructions.
3. All trim shall be installed in accordance with the manufacturer's instructions.
4. All lighting shall be installed in accordance with the manufacturer's instructions.
5. All painting shall be installed in accordance with the manufacturer's instructions.
6. All carpeting shall be installed in accordance with the manufacturer's instructions.
7. All tile and stone shall be installed in accordance with the manufacturer's instructions.
8. All glass shall be installed in accordance with the manufacturer's instructions.
9. All hardware shall be installed in accordance with the manufacturer's instructions.
10. All accessories shall be installed in accordance with the manufacturer's instructions.

SECTION 17 - EXTERIOR

1. Provide all exterior finishes, including but not limited to, walls, ceilings, floors, doors, windows, and hardware.
2. Provide all exterior partitions, including but not limited to, walls, ceilings, floors, doors, windows, and hardware.
3. Provide all exterior trim, including but not limited to, baseboards, door and window casings, and crown molding.
4. Provide all exterior lighting, including but not limited to, recessed lighting, pendant lighting, and table lamps.
5. Provide all exterior painting, including but not limited to, walls, ceilings, and trim.
6. Provide all exterior carpeting, including but not limited to, wall-to-wall carpeting and area rugs.
7. Provide all exterior tile and stone, including but not limited to, wall tile, floor tile, and stone veneer.
8. Provide all exterior glass, including but not limited to, glass doors, glass partitions, and glass windows.
9. Provide all exterior hardware, including but not limited to, door handles, window handles, and locksets.
10. Provide all exterior accessories, including but not limited to, mirrors, artwork, and plants.

GENERAL NOTES:

1. All exterior finishes shall be installed in accordance with the manufacturer's instructions.
2. All exterior partitions shall be installed in accordance with the manufacturer's instructions.
3. All exterior trim shall be installed in accordance with the manufacturer's instructions.
4. All exterior lighting shall be installed in accordance with the manufacturer's instructions.
5. All exterior painting shall be installed in accordance with the manufacturer's instructions.
6. All exterior carpeting shall be installed in accordance with the manufacturer's instructions.
7. All exterior tile and stone shall be installed in accordance with the manufacturer's instructions.
8. All exterior glass shall be installed in accordance with the manufacturer's instructions.
9. All exterior hardware shall be installed in accordance with the manufacturer's instructions.
10. All exterior accessories shall be installed in accordance with the manufacturer's instructions.

SECTION 18 - ROOFING

1. Provide all roofing systems, including but not limited to, asphalt shingles, metal roofing, and tile roofing.
2. Provide all roofing equipment, including but not limited to, roofers, roofers' assistants, and roofers' supervisors.
3. Provide all roofing piping, including but not limited to, roof drains, roof vents, and roof flashings.
4. Provide all roofing controls, including but not limited to, roof sensors, roof monitors, and roof controllers.
5. Provide all roofing testing and balancing, including but not limited to, roof testing and balancing, roof electrical testing, and roof plumbing testing.
6. Provide all roofing maintenance, including but not limited to, routine maintenance, repairs, and replacements.

GENERAL NOTES:

1. All roofing systems shall be installed in accordance with the manufacturer's instructions.
2. All roofing equipment shall be installed in accordance with the manufacturer's instructions.
3. All roofing piping shall be installed in accordance with the manufacturer's instructions.
4. All roofing controls shall be installed in accordance with the manufacturer's instructions.
5. All roofing testing and balancing shall be performed in accordance with the manufacturer's instructions.
6. All roofing maintenance shall be performed in accordance with the manufacturer's instructions.

SECTION 19 - PAINTS AND COATINGS

1. Provide all interior and exterior paints and coatings, including but not limited to, wall paint, ceiling paint, floor paint, and trim paint.
2. Provide all interior and exterior painting equipment, including but not limited to, paint rollers, paint brushes, and paint sprayers.
3. Provide all interior and exterior painting piping, including but not limited to, paint lines, paint hoses, and paint nozzles.
4. Provide all interior and exterior painting controls, including but not limited to, paint sensors, paint monitors, and paint controllers.
5. Provide all interior and exterior painting testing and balancing, including but not limited to, paint testing and balancing, paint electrical testing, and paint plumbing testing.
6. Provide all interior and exterior painting maintenance, including but not limited to, routine maintenance, repairs, and replacements.

GENERAL NOTES:

1. All paints and coatings shall be installed in accordance with the manufacturer's instructions.
2. All painting equipment shall be installed in accordance with the manufacturer's instructions.
3. All painting piping shall be installed in accordance with the manufacturer's instructions.
4. All painting controls shall be installed in accordance with the manufacturer's instructions.
5. All painting testing and balancing shall be performed in accordance with the manufacturer's instructions.
6. All painting maintenance shall be performed in accordance with the manufacturer's instructions.

SECTION 20 - GLASS AND GLAZING

1. Provide all interior and exterior glass and glazing, including but not limited to, glass doors, glass windows, and glass partitions.
2. Provide all interior and exterior glazing equipment, including but not limited to, glaziers, glaziers' assistants, and glaziers' supervisors.
3. Provide all interior and exterior glazing piping, including but not limited to, glazing lines, glazing hoses, and glazing nozzles.
4. Provide all interior and exterior glazing controls, including but not limited to, glazing sensors, glazing monitors, and glazing controllers.
5. Provide all interior and exterior glazing testing and balancing, including but not limited to, glazing testing and balancing, glazing electrical testing, and glazing plumbing testing.
6. Provide all interior and exterior glazing maintenance, including but not limited to, routine maintenance, repairs, and replacements.

GENERAL NOTES:

1. All glass and glazing shall be installed in accordance with the manufacturer's instructions.
2. All glazing equipment shall be installed in accordance with the manufacturer's instructions.
3. All glazing piping shall be installed in accordance with the manufacturer's instructions.
4. All glazing controls shall be installed in accordance with the manufacturer's instructions.
5. All glazing testing and balancing shall be performed in accordance with the manufacturer's instructions.
6. All glazing maintenance shall be performed in accordance with the manufacturer's instructions.

SECTION 21 - METALS

1. Provide all interior and exterior metals, including but not limited to, steel, aluminum, and copper.
2. Provide all interior and exterior metal equipment, including but not limited to, metal roofers, metal roofers' assistants, and metal roofers' supervisors.
3. Provide all interior and exterior metal piping, including but not limited to, metal lines, metal hoses, and metal nozzles.
4. Provide all interior and exterior metal controls, including but not limited to, metal sensors, metal monitors, and metal controllers.
5. Provide all interior and exterior metal testing and balancing, including but not limited to, metal testing and balancing, metal electrical testing, and metal plumbing testing.
6. Provide all interior and exterior metal maintenance, including but not limited to, routine maintenance, repairs, and replacements.

GENERAL NOTES:

1. All metals shall be installed in accordance with the manufacturer's instructions.
2. All metal equipment shall be installed in accordance with the manufacturer's instructions.
3. All metal piping shall be installed in accordance with the manufacturer's instructions.
4. All metal controls shall be installed in accordance with the manufacturer's instructions.
5. All metal testing and balancing shall be performed in accordance with the manufacturer's instructions.
6. All metal maintenance shall be performed in accordance with the manufacturer's instructions.

SECTION 22 - CONCRETE

1. Provide all interior and exterior concrete, including but not limited to, concrete walls, concrete floors, and concrete ceilings.
2. Provide all interior and exterior concrete equipment, including but not limited to, concrete workers, concrete workers' assistants, and concrete workers' supervisors.
3. Provide all interior and exterior concrete piping, including but not limited to, concrete lines, concrete hoses, and concrete nozzles.
4. Provide all interior and exterior concrete controls, including but not limited to, concrete sensors, concrete monitors, and concrete controllers.
5. Provide all interior and exterior concrete testing and balancing, including but not limited to, concrete testing and balancing, concrete electrical testing, and concrete plumbing testing.
6. Provide all interior and exterior concrete maintenance, including but not limited to, routine maintenance, repairs, and replacements.

GENERAL NOTES:

1. All concrete shall be installed in accordance with the manufacturer's instructions.
2. All concrete equipment shall be installed in accordance with the manufacturer's instructions.
3. All concrete piping shall be installed in accordance with the manufacturer's instructions.
4. All concrete controls shall be installed in accordance with the manufacturer's instructions.
5. All concrete testing and balancing shall be performed in accordance with the manufacturer's instructions.
6. All concrete maintenance shall be performed in accordance with the manufacturer's instructions.

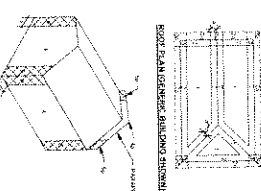
SECTION 23 - MASONRY

1. Provide all interior and exterior masonry, including but not limited to, brick walls, brick floors, and brick ceilings.
2. Provide all interior and exterior masonry equipment, including but not limited to, masons, masons' assistants, and masons' supervisors.
3. Provide all interior and exterior masonry piping, including but not limited to, masonry lines, masonry hoses, and masonry nozzles.
4. Provide all interior and exterior masonry controls, including but not limited to, masonry sensors, masonry monitors, and masonry controllers.
5. Provide all interior and exterior masonry testing and balancing, including but not limited to, masonry testing and balancing, masonry electrical testing, and masonry plumbing testing.
6. Provide all interior and exterior masonry maintenance, including but not limited to, routine maintenance, repairs, and replacements.

GENERAL NOTES:

1. All masonry shall be installed in accordance with the manufacturer's instructions.
2. All masonry equipment shall be installed in accordance with the manufacturer's instructions.
3. All masonry piping shall be installed in accordance with the manufacturer's instructions.
4. All masonry controls shall be installed in accordance with the manufacturer's instructions.
5. All masonry testing and balancing shall be performed in accordance with the manufacturer's instructions.
6. All masonry maintenance shall be performed in accordance with the manufacturer's instructions.

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	PRICE
1	Interior Wall Finish	1000	SQ. FT.	1.50
2	Interior Ceiling Finish	500	SQ. FT.	1.20
3	Interior Floor Finish	200	SQ. FT.	2.00
4	Interior Trim	100	LINEAL FT.	1.00
5	Interior Lighting	50	FIXTURES	2.00
6	Interior Painting	1000	SQ. FT.	1.00
7	Interior Carpeting	200	SQ. FT.	3.00
8	Interior Tile	100	SQ. FT.	4.00
9	Interior Glass	50	SQ. FT.	5.00
10	Interior Hardware	100	PIECES	1.00
11	Interior Accessories	50	PIECES	1.00
12	Exterior Wall Finish	1000	SQ. FT.	1.50
13	Exterior Ceiling Finish	500	SQ. FT.	1.20
14	Exterior Floor Finish	200	SQ. FT.	2.00
15	Exterior Trim	100	LINEAL FT.	1.00
16	Exterior Lighting	50	FIXTURES	2.00
17	Exterior Painting	1000	SQ. FT.	1.00
18	Exterior Carpeting	200	SQ. FT.	3.00
19	Exterior Tile	100	SQ. FT.	4.00
20	Exterior Glass	50	SQ. FT.	5.00
21	Exterior Hardware	100	PIECES	1.00
22	Exterior Accessories	50	PIECES	1.00



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GENERAL NOTES

CANNON & CANNON INC.
 CONSULTING ENGINEERS ARCHITECTS INTERIORS
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 Ft. Lauderdale, FL 33304
 Phone: (954) 561-1111
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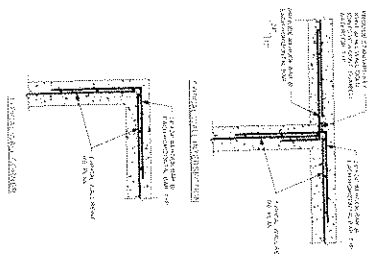
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 PROJECT NAME: 1000
 PROJECT ADDRESS: 1000
 PROJECT CONTACT: 1000

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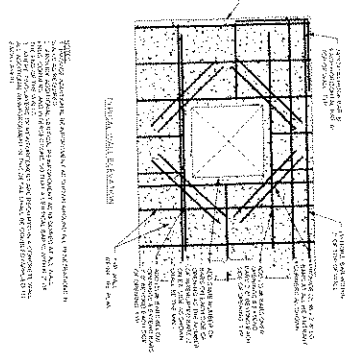
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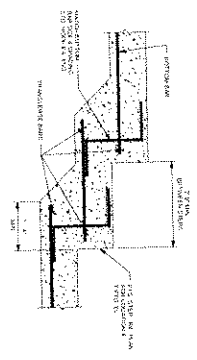
16314 E. Green Ave., Suite 104 • Ft. Lauderdale, FL 33322
 1-866-528-6001 • 1-866-528-5007
 studio@fourdesign.com



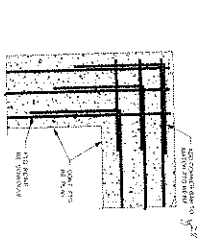
11-1 TYPICAL CONCRETE WALL DETAILS



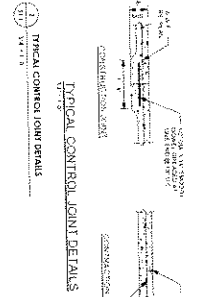
11-2 TYPICAL CONTROL JOINT DETAILS



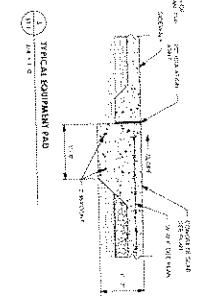
11-3 TYPICAL COOLING SLAB



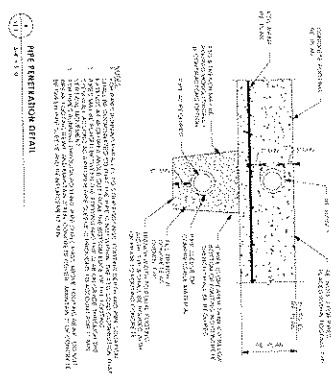
11-4 TYPICAL COOLING COOLING SLAB



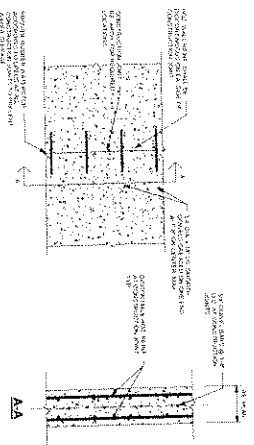
11-5 TYPICAL CONTROL JOINT DETAILS



11-6 TYPICAL JOINT DETAILS



11-7 TYPICAL VERTICAL CONTROL JOINT DETAILS



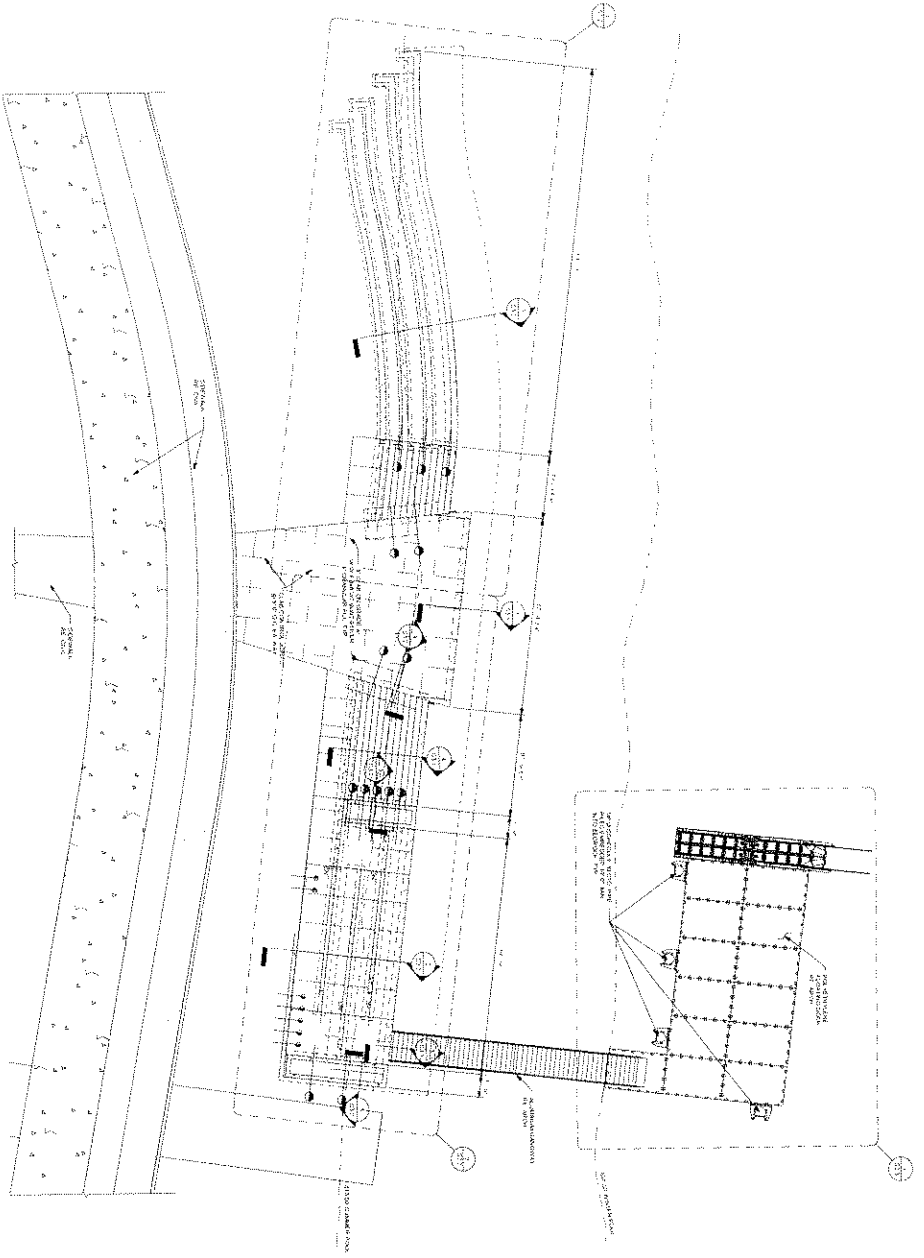
11-8 TYPICAL VERTICAL CONTROL JOINT DETAILS



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<p>CANNON & CANNON INC. ARCHITECTS & INTERIORS 1400 S. UNIVERSITY AVENUE SUITE 100 ANAHEIM, CA 92805 TEL: 714.944.1400 FAX: 714.944.1401 WWW.CANNONANDCANNON.COM</p>	
<p>STUDIO FOUR DESIGN ARCHITECTURE & INTERIORS PLANNING • DESIGN • CONSULTING 1001 G ST. SUITE 200 ANAHEIM, CA 92805 TEL: 714.944.1400 FAX: 714.944.1401 WWW.STUDIOFOURDESIGN.COM</p>	



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- FOUNDATION PLAN**
1. SEE SHEET FOR FOUNDATION PLAN.
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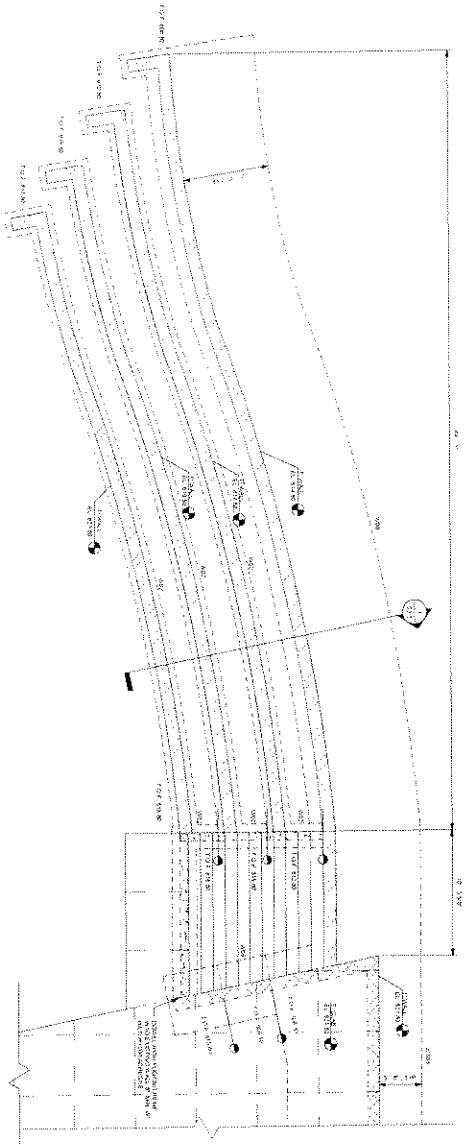
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FOUNDATION PLAN	
CANNON & CANNON INC. ARCHITECTS & INTERIORS 1000 BAYVIEW BLVD, SUITE 1000 MIAMI, FL 33134 TEL: 305.571.1111 WWW.CANNONANDCANNON.COM	
PREPARED BY: J. J. ... CHECKED BY: ... DATE: ...	

four

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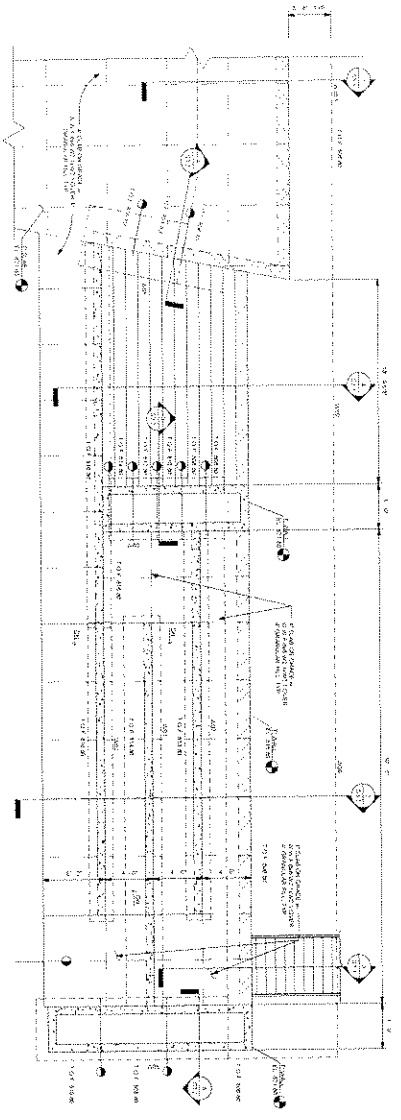


IMACIO COMMONS PLAN - WEST

1. FOUNDATION PLAN FOR WEST WING
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10. FOUNDATION PLAN FOR WEST WING

FOOTING SCHEDULE

NO.	DESCRIPTION	SECTION
1	FOOTING FOR COLUMN	SECTION 1
2	FOOTING FOR WALL	SECTION 2
3	FOOTING FOR WALL	SECTION 3
4	FOOTING FOR WALL	SECTION 4
5	FOOTING FOR WALL	SECTION 5
6	FOOTING FOR WALL	SECTION 6
7	FOOTING FOR WALL	SECTION 7
8	FOOTING FOR WALL	SECTION 8
9	FOOTING FOR WALL	SECTION 9
10	FOOTING FOR WALL	SECTION 10



IMACIO COMMONS PLAN - EAST



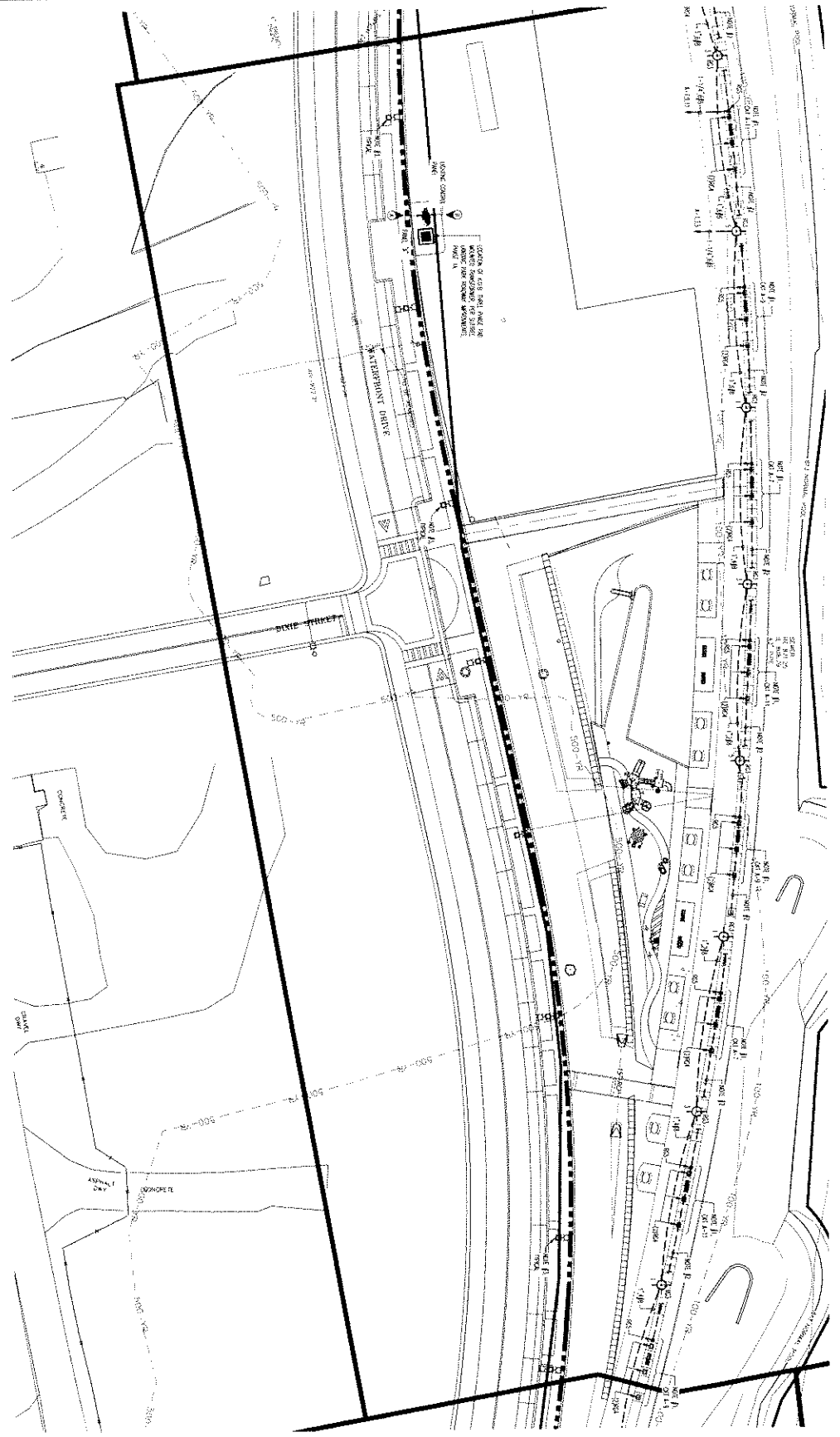
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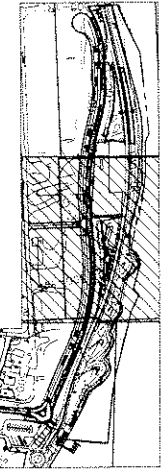


ENLARGED FOUNDATION PLANS
 100% CD
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SITE ELECTRICAL PLAN - SECTION 8

SECTION 8
 SCALE: 1/8" = 1'-0"
 1. ALL WORK SHALL BE IN ACCORDANCE WITH THE CITY OF ANNE ARD SPECIFICATIONS FOR ELECTRICAL INSTALLATIONS.
 2. ALL WORK SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND THE NATIONAL FIRE ALARM AND SIGNAL CODE (NFPA 72).
 3. ALL WORK SHALL BE IN ACCORDANCE WITH THE CITY OF ANNE ARD SPECIFICATIONS FOR ELECTRICAL INSTALLATIONS.
 4. ALL WORK SHALL BE IN ACCORDANCE WITH THE CITY OF ANNE ARD SPECIFICATIONS FOR ELECTRICAL INSTALLATIONS.

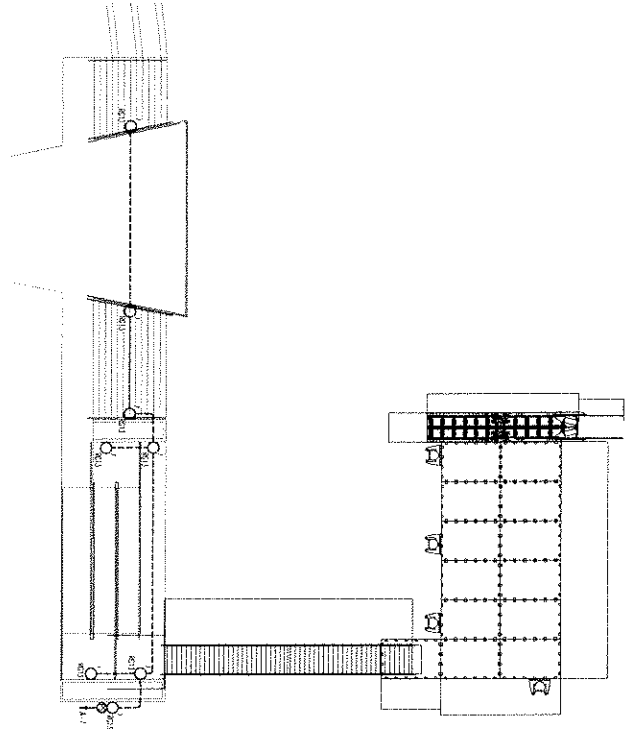


KEY PLAN

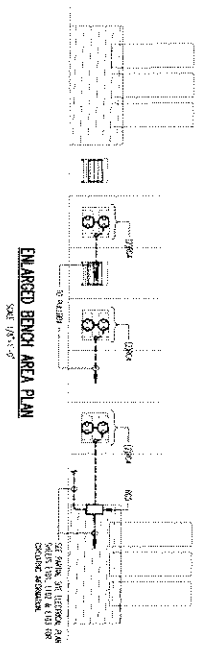


CANNON & CANNON INC. CONSULTING ENGINEERS AND ARCHITECTS 1100 BENTLEY BLVD. SUITE 200 ST. LOUIS, MO 63102 TEL: (314) 433-1000 FAX: (314) 433-1001	
THE CITY OF ANNE ARD ENGINEERING DEPARTMENT 1000 WEST 10TH ST. ANNE ARD, MO 64401 TEL: (314) 251-2000	
PROJECT:	OFFICE LIVING AND JAMES ISLAND PARK IMPROVEMENTS
SHEET:	SITE ELECTRICAL PLAN - SECTION 8
DATE:	08/15/2011
DRAWN BY:	J. W. CANNON
CHECKED BY:	J. W. CANNON
APPROVED BY:	J. W. CANNON

E102-A1



RAMP LANDING PLAN
 SCALE: 1/8" = 1'-0"

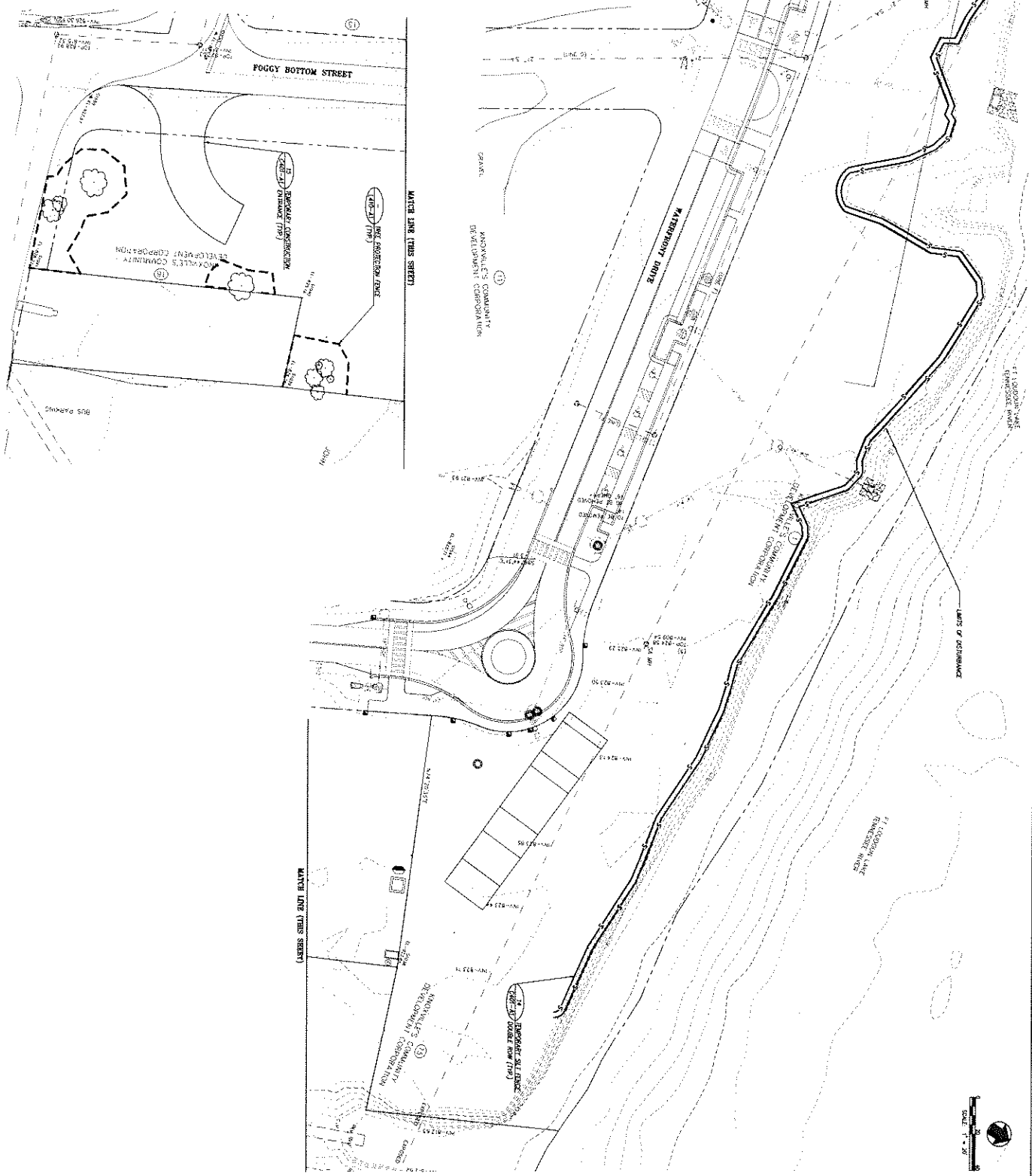


ENLARGED BENCH AREA PLAN
 SCALE: 1/8" = 1'-0"



ACQUITY SYSTEMS CONSULTANTS, LLC 10000 Katy Freeway, Suite 1000 Houston, TX 77054 Tel: 281.465.2100	
CANNON & CANNON INC. CONSULTING ENGINEERS FIELD SERVICES 10000 Katy Freeway, Suite 1000 Houston, TX 77054 Tel: 281.465.2100	
THE CITY OF HOUSTON NAME OF MAIN CLIENT AGENCY PROJECT NO. 10000 Katy Freeway PROJECT NO. 10000 Katy Freeway	
SOUTHERN LANDING PARK PHASE II PARKING AND LANDSCAPE IMPROVEMENTS	
PAVILION LIGHTING PLAN	
PROJECT NO. 10000-KATY-FREEWAY SHEET NO. E104-A1	DATE: 10/15/10 DRAWN BY: J. SMITH CHECKED BY: J. SMITH SCALE: AS SHOWN

(11-100101 SHEET 001-11)



NOTES:
 1. REFER TO SHEET 001-11 OF THIS DRAWING.

LEGEND

- EXISTING CONDOUR
- PROPOSED CONDOUR
- PROPOSED CONDOUR (173)
- PROPOSED SHOP/RESTAURANT
- DETAILED SITE PLAN (SHEET NO.)
- DIRECTIONAL FLOW ARROW
- TEMPORARY AIR INSPECTION
- TEMPORARY ROCK CHECK PILE
- TEMPORARY ACCESSWAY/DRIVEWAY

CANNON & CANNON INC.
 CONSULTING ENGINEERS THIRD DISTRICT
 1000 W. 10TH ST. SUITE 200
 DENVER, CO 80202
 TEL: 303.733.1111
 FAX: 303.733.1112

THE CITY OF DENVER
 DEPARTMENT OF ENVIRONMENTAL HEALTH AFFAIRS
 1000 W. 10TH ST. SUITE 200
 DENVER, CO 80202
 TEL: 303.733.1111
 FAX: 303.733.1112

DIFFERENTIAL TABLE SHALL BE
 PROVIDED WITH IMPROVEMENTS

INITIAL EMISSION CONTROL PLAN

C103.1-11

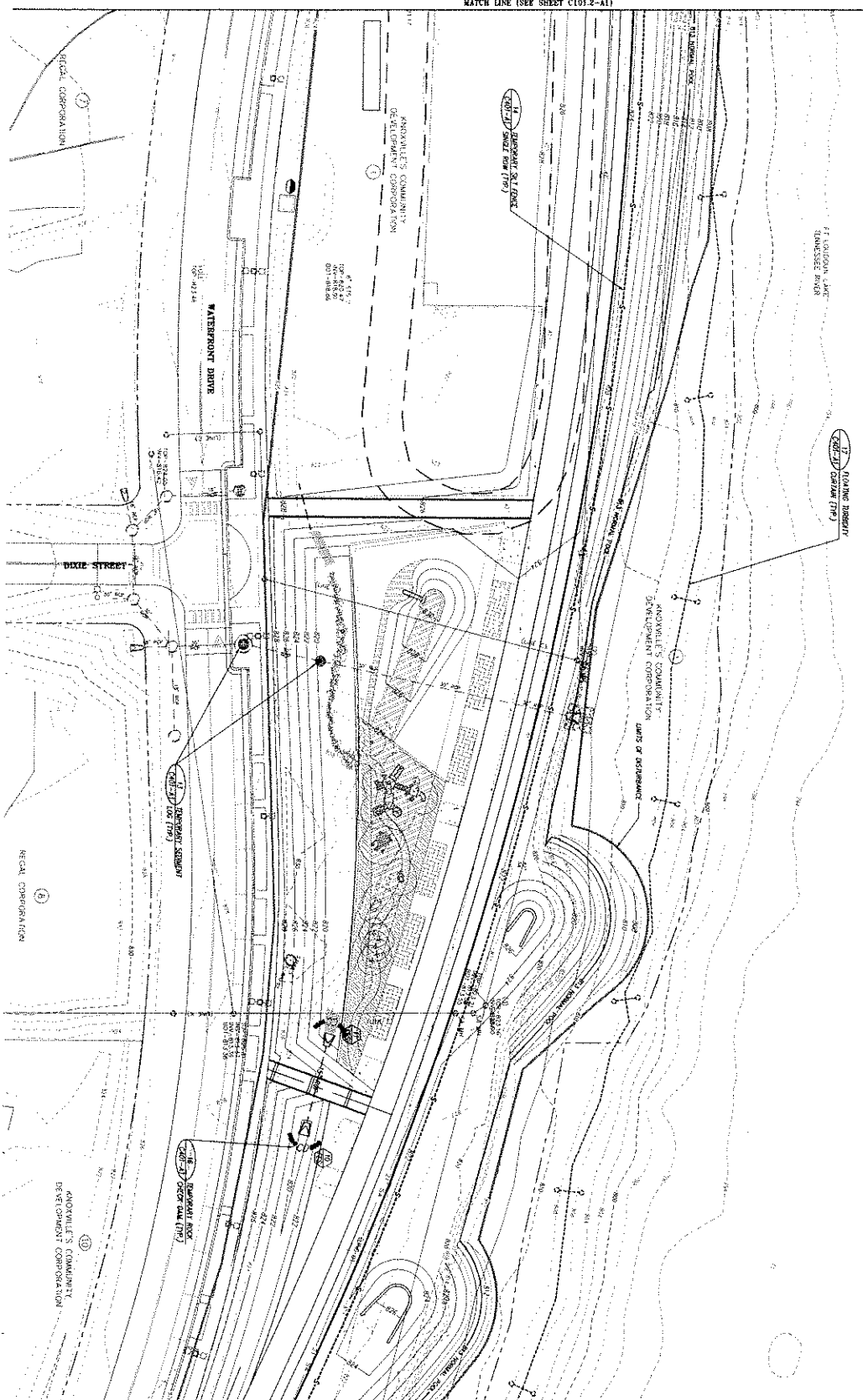
DATE: 11/10/01

BY: [Signature]

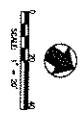
CHECKED: [Signature]

APPROVED: [Signature]

MATCH LINE (SEE SHEET C102.2-A1)



MATCH LINE (SEE SHEET C105.2-A1)



NOTES
 1. REFER TO SHEET C001-A1 FOR GENERAL NOTES

LEGEND

- 844 EXISTING CONTOUR
- 845 PROPOSED CONTOUR (1 FT)
- 846 PROPOSED SPOT ELEVATION
- 847 DETAIL REFERENCE (DETAIL NO./SHEET NO.)
- 848 DIMENSIONAL FLOW ARROW
- 849 TEMPORARY SILT FENCE/ROW
- 850 TEMPORARY SILT FENCE/ROW
- 851 TEMPORARY SEDIMENT BASIN

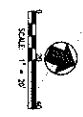
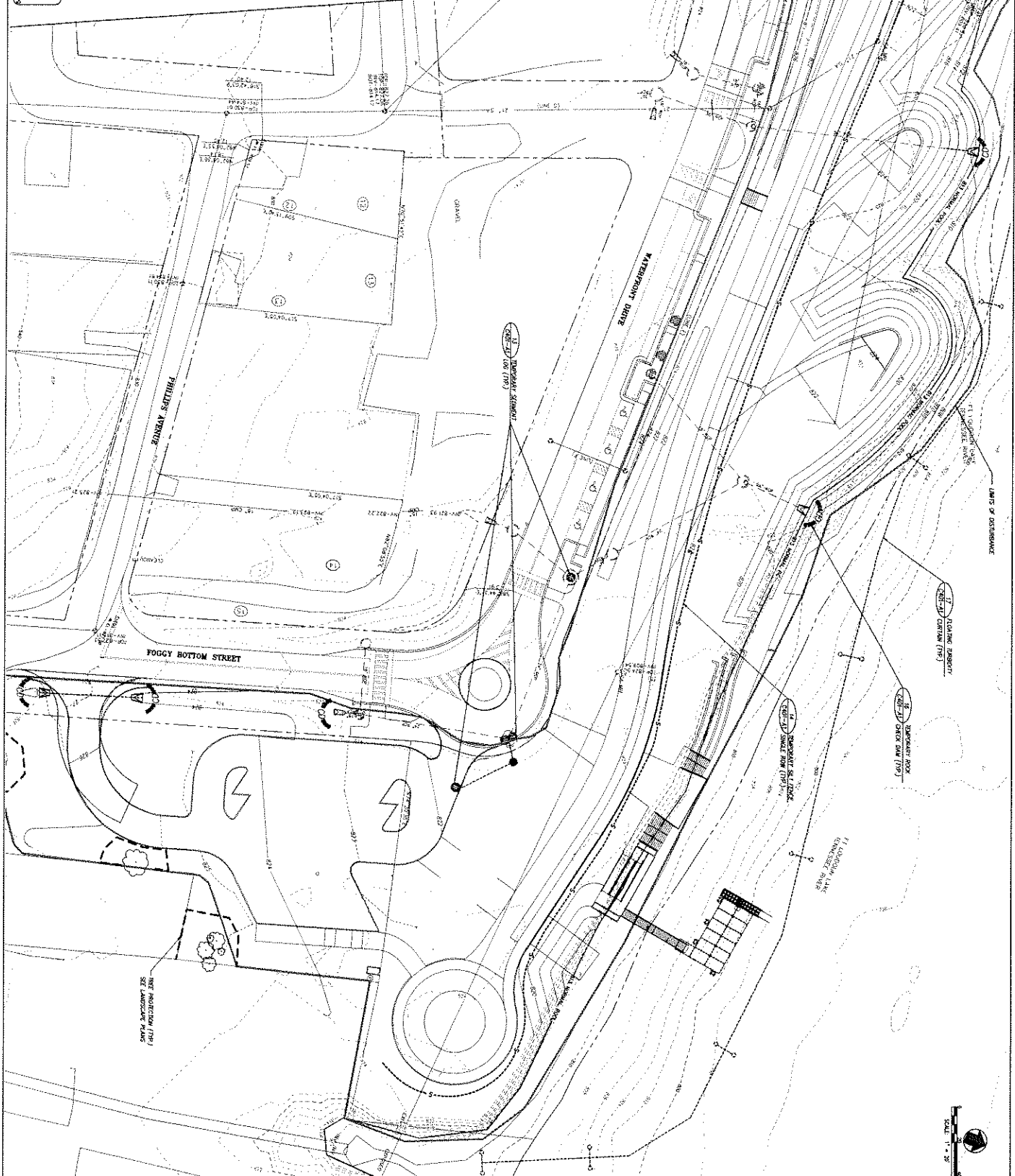
CANNON & CANNON INC.
 CONSULTING ENGINEERS & ARCHITECTS
 1000 SOUTH MAIN STREET, SUITE 200
 MEMPHIS, TENNESSEE 38103
 TEL: 901.527.1000
 FAX: 901.527.1001
 WWW.CANNONANDCANNON.COM

INTERMEDIATE EROSION CONTROL PLAN

DATE: 08/11/2011
 DRAWN BY: J. B. BROWN
 CHECKED BY: J. B. BROWN
 APPROVED BY: J. B. BROWN

C102.2-A1

MATCH LINE (SEE SHEET C103-2-A1)



NOTES:
 1. SEE SHEET C103-1-A1 FOR GENERAL NOTES

LEGEND

- EXISTING CURB
- PROPOSED CURB
- PROPOSED CURB (1 FT)
- PROPOSED SIDE WALK
- DETAILED REFERENCE (SEE PLAN SHEET NO.)
- DIRECTIONAL FLOW ARROW
- TEMPORARY FENCE
- TEMPORARY ROAD CHECK DAM
- TEMPORARY SIGNAGE BARBER

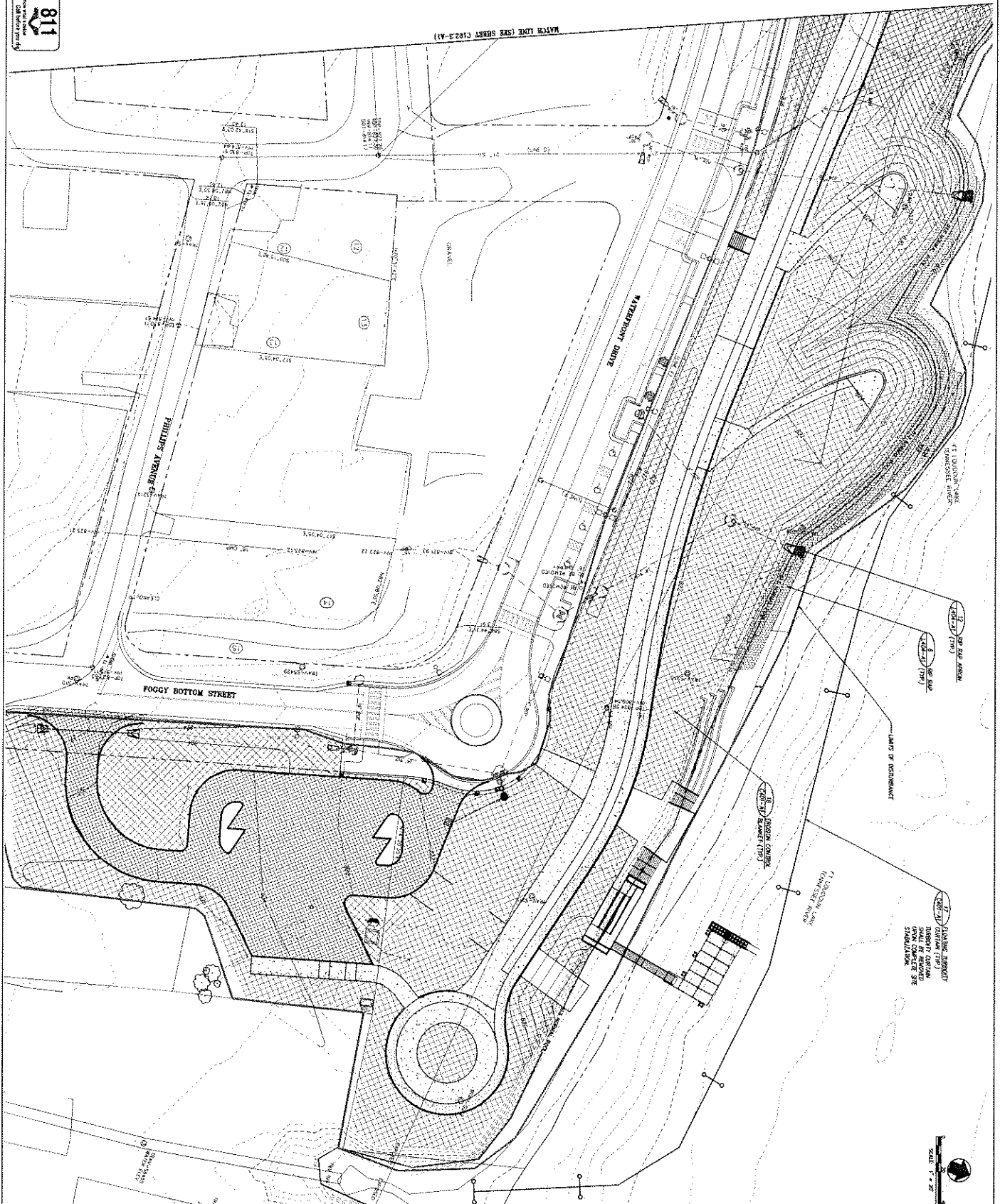
CANNON & CANNON INC.
 CONSULTING ENGINEERS AND ARCHITECTS
 1000 N. W. 10th St., Suite 100
 Ft. Lauderdale, FL 33304
 TEL: (954) 576-8800

THE CITY OF KNOXVILLE
 100 N. W. 10th St., Suite 100
 Ft. Lauderdale, FL 33304
 TEL: (954) 576-8800

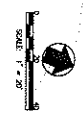
INTERMEDIATE DESIGN
 CONSULTING ENGINEERS

C103-2-A1

MATCH LINE (SEE SHEET C103-3-A1)



- (1) 20' RISE AREA
- (2) 15' RISE AREA
- (3) 10' RISE AREA
- (4) 5' RISE AREA
- (5) 0' RISE AREA
- (6) 5' RISE AREA
- (7) 10' RISE AREA
- (8) 15' RISE AREA
- (9) 20' RISE AREA
- (10) 25' RISE AREA
- (11) 30' RISE AREA
- (12) 35' RISE AREA
- (13) 40' RISE AREA
- (14) 45' RISE AREA
- (15) 50' RISE AREA
- (16) 55' RISE AREA
- (17) 60' RISE AREA
- (18) 65' RISE AREA
- (19) 70' RISE AREA
- (20) 75' RISE AREA
- (21) 80' RISE AREA
- (22) 85' RISE AREA
- (23) 90' RISE AREA
- (24) 95' RISE AREA
- (25) 100' RISE AREA



NOTES:
 1. REFER TO SHEET C01-A1 FOR GENERAL NOTES

LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR (1/7)
- PROPOSED CONTOUR (1/7)
- PROPOSED SPOT ELEVATION
- DETAIL REFERENCE (DETAIL NO./SHEET NO.)
- DIRECTIONAL LIGHT ARROW
- TEMPORARY LIGHT PROTECTION
- TEMPORARY ROCK CHECK BOLL
- TEMPORARY SIGNAGE BOLL
- CROSSING CONTROL SIGNET
- NO SIGN

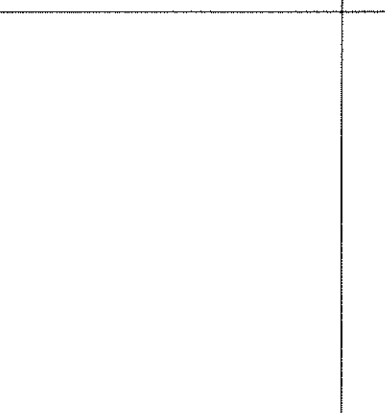
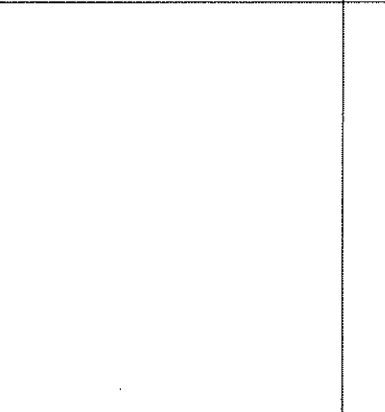
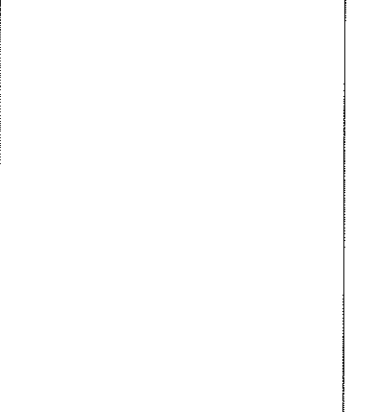
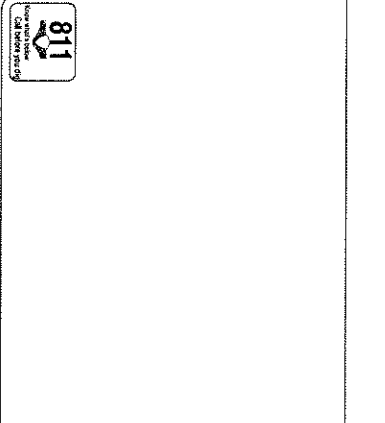
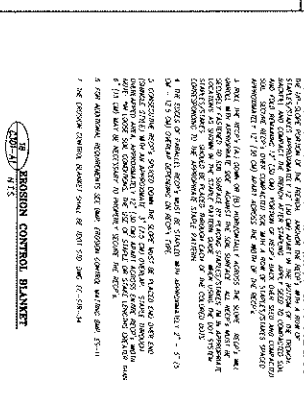
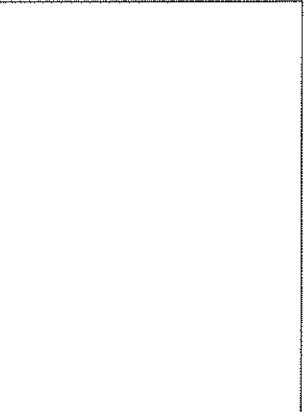
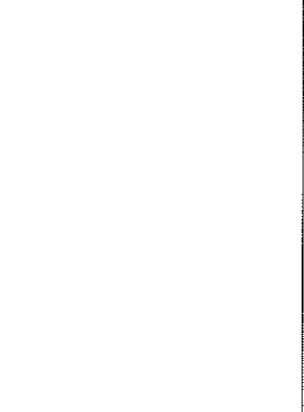
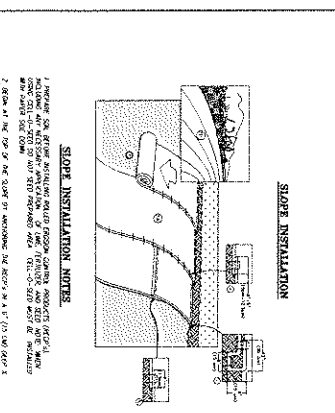
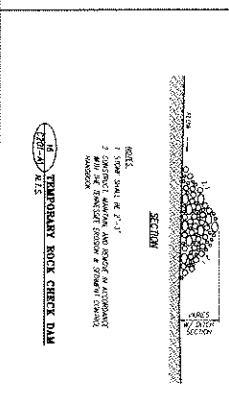
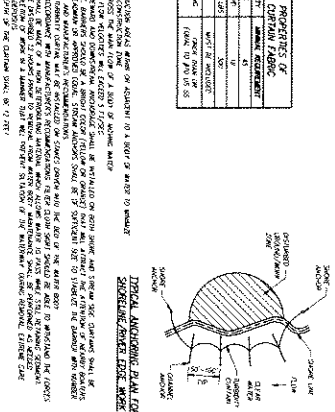
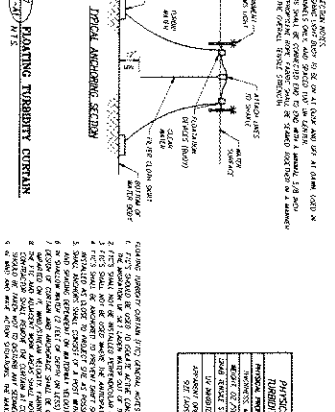
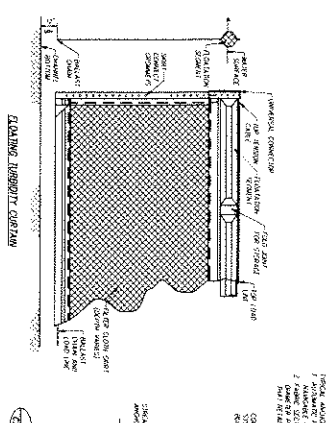
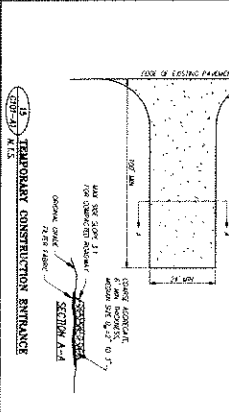
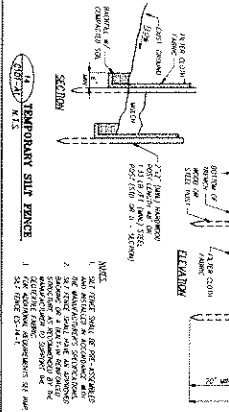
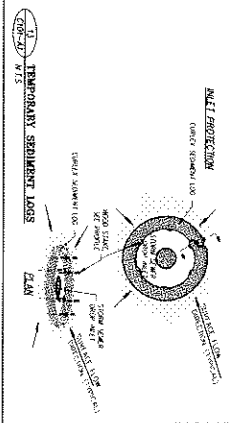
CANNON & CANNON INC. CONSULTING ENGINEERS - CIVIL ENGINEERS 100 STATE STREET, SUITE 2000 BOSTON, MASSACHUSETTS 02109 TEL. NO. (617) 552-8200	
THE CITY OF BOSTON DEPARTMENT OF PUBLIC WORKS 225 N. STATE STREET, SUITE 2000 BOSTON, MASSACHUSETTS 02109 TEL. NO. (617) 552-8200	
SHEET C103-3-A1 FOGGY BOTTOM STREET IMPROVEMENTS FINAL PROVISION CONTROL PLAN	
DATE: 10/15/10 DRAWN BY: J. SMITH CHECKED BY: J. SMITH APPROVED BY: J. SMITH	PROJECT NO.: C103-3-A1 SHEET NO.: 1 OF 1

1. GENERAL: EXPOSED GRAVEL SHOULD BE 1/2" TO 3/4" GRAVEL. ALL OTHERS SHALL BE 1/4" TO 3/8" GRAVEL. ALL GRAVEL SHALL BE WASHED AND FREE OF ORGANIC MATTER.

2. FINISH: ALL GRAVEL SHALL BE FINISHED TO A SMOOTH SURFACE. ALL GRAVEL SHALL BE COMPACTED TO A DENSITY OF 95% OF THE THEORETICAL MAXIMUM DENSITY.

3. NOTES: SEE SPECIFICATIONS FOR DETAILED REQUIREMENTS.

NO.	DESCRIPTION	UNIT	QTY	PRICE	TOTAL
1	GRAVEL	CU YD	100	1.00	100.00
2	GRAVEL	CU YD	100	1.00	100.00
3	GRAVEL	CU YD	100	1.00	100.00
4	GRAVEL	CU YD	100	1.00	100.00
5	GRAVEL	CU YD	100	1.00	100.00
6	GRAVEL	CU YD	100	1.00	100.00
7	GRAVEL	CU YD	100	1.00	100.00
8	GRAVEL	CU YD	100	1.00	100.00
9	GRAVEL	CU YD	100	1.00	100.00
10	GRAVEL	CU YD	100	1.00	100.00



811
 CALL BEFORE YOU DIG
 1-800-4-A-SHIELD

PHYSICAL PROPERTIES OF TYPICAL CURTAIN FABRIC

PROPERTY	VALUE
TENSILE STRENGTH	100 LBS
TEAR STRENGTH	10 LBS
PERMEABILITY	100 GPM
WEIGHT	1.0 LB/SYD
STRETCH	10%

EROSION CONTROL BLANKET

1. THE EROSION CONTROL BLANKET SHALL BE INSTALLED ON ALL EXPOSED SOIL SURFACES TO PREVENT EROSION AND TO PROMOTE VEGETATION GROWTH.

2. THE EROSION CONTROL BLANKET SHALL BE INSTALLED ON ALL EXPOSED SOIL SURFACES TO PREVENT EROSION AND TO PROMOTE VEGETATION GROWTH.

3. THE EROSION CONTROL BLANKET SHALL BE INSTALLED ON ALL EXPOSED SOIL SURFACES TO PREVENT EROSION AND TO PROMOTE VEGETATION GROWTH.

4. THE EROSION CONTROL BLANKET SHALL BE INSTALLED ON ALL EXPOSED SOIL SURFACES TO PREVENT EROSION AND TO PROMOTE VEGETATION GROWTH.

5. THE EROSION CONTROL BLANKET SHALL BE INSTALLED ON ALL EXPOSED SOIL SURFACES TO PREVENT EROSION AND TO PROMOTE VEGETATION GROWTH.

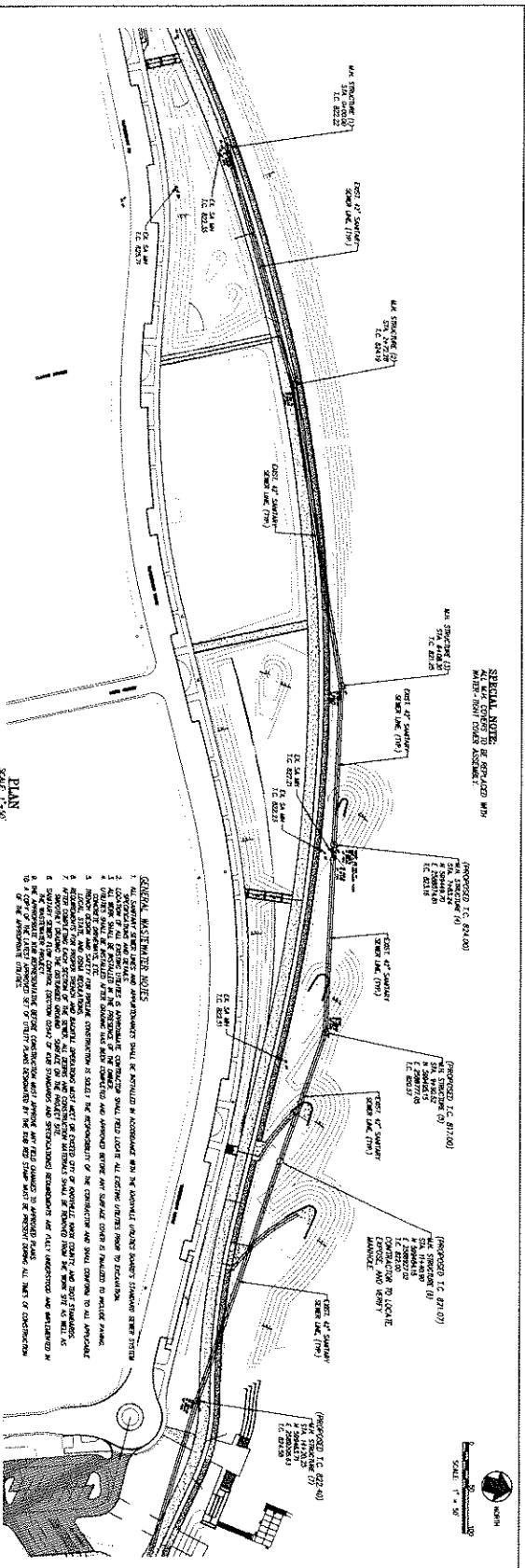
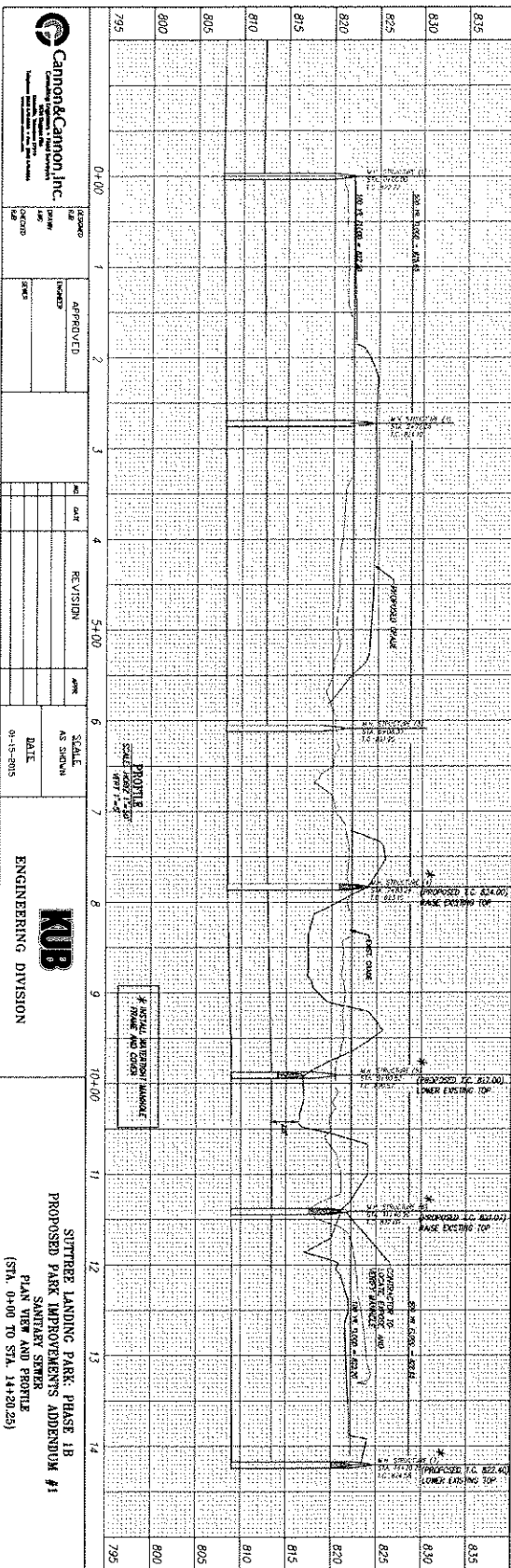
EROSION CONTROL DETAILS

CANNON-CANNON INC.
 1000 W. 10TH AVENUE
 DENVER, CO 80202
 TEL: (303) 733-8000
 FAX: (303) 733-8001

THE CITY OF DENVER
 1400 BROADWAY
 DENVER, CO 80202
 TEL: (303) 555-3000
 FAX: (303) 555-3001

STREET LIGHTING TUBE TYPICAL

C401-A1



- GENERAL NOTES:**
1. THE SANITARY SEWER SHALL BE INSTALLED IN ACCORDANCE WITH THE NATIONAL SANITATION FOUNDATION STANDARDS.
 2. THE STORM SEWER SHALL BE INSTALLED IN ACCORDANCE WITH THE NATIONAL SANITATION FOUNDATION STANDARDS.
 3. THE SEWER SHALL BE INSTALLED IN A TRENCH WITH A MINIMUM COVER OF 4 FEET.
 4. THE TRENCH SHALL BE BACKFILLED WITH COMPACTED SOIL TO THE ORIGINAL GRADE.
 5. THE SEWER SHALL BE INSTALLED IN A TRENCH WITH A MINIMUM COVER OF 4 FEET.
 6. THE TRENCH SHALL BE BACKFILLED WITH COMPACTED SOIL TO THE ORIGINAL GRADE.
 7. THE SEWER SHALL BE INSTALLED IN A TRENCH WITH A MINIMUM COVER OF 4 FEET.
 8. THE TRENCH SHALL BE BACKFILLED WITH COMPACTED SOIL TO THE ORIGINAL GRADE.
 9. THE SEWER SHALL BE INSTALLED IN A TRENCH WITH A MINIMUM COVER OF 4 FEET.
 10. THE TRENCH SHALL BE BACKFILLED WITH COMPACTED SOIL TO THE ORIGINAL GRADE.

NO.	DATE	REVISION
1	01-15-2015	AS SHOWN

CANNON & CANNON, INC.
 CONSULTING ENGINEERS AND ARCHITECTS
 1000 WEST 10TH AVENUE
 SUITE 100
 DENVER, CO 80202
 (303) 733-8800
 WWW.CANNONANDCANNON.COM

THE CITY OF SOUTHERS
 SANITARY SEWER PLAN
 PROPOSED PARK IMPROVEMENTS ADDENDUM #1
 (SHEET 0400 TO STA. 14+50.25)

SA101-A1

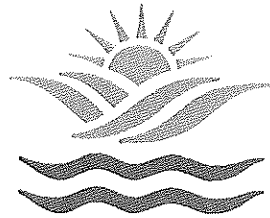
811
 THE CITY OF SOUTHERS
 SANITARY SEWER PLAN

AMENDMENT NO. 1

City of Knoxville, Tennessee

**SUTTREE LANDING PARK; PHASE 1B
PROPOSED PARK IMPROVEMENTS**

PROJECT NO. 14T-G-0566



CITY OF KNOXVILLE



Engineering Department

Knoxville, Tennessee

ADDENDUM NO. 1

DATE: Thursday, January 22, 2015

TO: All Bidders

FROM: Boyce H. Evans, Purchasing Agent, City of Knoxville

SUBJECT: Addendum No. 1 – Suttree Landing Park; Phase 1B
Proposed Park Improvements
COK Project No.14T-G-0566

BIDS TO BE OPENED: **Thursday, February 19, 2015 at 11:00 a.m. (Eastern Time)**

This addendum becomes a part of the Contract Documents and modifies the original plans and specifications as noted.

Changes to the Contract Documents and Specifications:

1. Supplemental Information for Bidders

a. The following paragraphs are added as follows:

“In September 2012, the City sought proposals from the Consulting Teams for the purpose of (a) completion of construction documents for a new roadway (0.566 miles) north of Langford Avenue between Barber Street and Foggy Bottom Street (hereinafter referred to as Phase 1A); (b) “value engineering” of original Suttree Landing Park construction documents (hereinafter referred to as Phase 1B), (c) preparation of Phase 1B bid document addendum based upon City-approved “value engineering” items and, (d) respective construction phase services.”

“In February 2013, the City contracted with a Consultant Team headed by Cannon & Cannon, Incorporated (CCI) for services identified under items a, b c, and d above. This Addendum reflects “value engineering” items as approved by the City as part of the Phase 1B project.”

“In that the design information originally prepared by Hargreaves Associates shall serve as the Base Design, and noting that it is the City’s desire for Phase 1B to be constructed in general accordance with the Base Design intent, the Bidder must familiarize themselves with the 2009 Documents. Likewise, the Bidder is further directed to identify unforeseen conflicts between the Base Design and subsequent Addenda, and bring these to the attention of the City. Failure to do so does not relieve the selected Bidder for constructing the Project in accordance with the Contract Documents for the price(s) as submitted in the Bid Proposal.”

b. **Brownfield Agreement:**

This project must be constructed in accordance with the requirements of the Brownfield Voluntary Agreement Site Number ID 47-584 and the corresponding Soil Management Plan. S&ME, Inc. will be on site during grading operations to monitor excavated soils and identify those materials that may be classified as contaminated. The contractor shall provide personnel who have successfully completed an OSHA accepted 40 hour HAZWOPER training course and have experience in Brownfield site construction.

Excavated material that has been determined to be contaminated but is suitable for fill material shall be placed in an area of the park to be determined by the Engineer.

Only material that has been classified as "clean" and "suitable for fill" may be used as backfill for all utility trenches.

All borrow material must be imported from a site that has been confirmed as clean and accepted by TDEC as a suitable borrow source. It shall be the Contractor's responsibility to select a borrow site and have it tested in coordination with TDEC to document that the material is both clean and suitable.

Three foot thick clay water stops shall be placed near the outlets of all storm drain lines to Fort Loudoun Lake. These water stops shall be notched three feet into the trench side walls, shall completely seal the outside wall of the culvert, and shall extend one foot below the pipe bedding subgrade and one foot above the culvert soffit or to the existing ground line.

- c. The following Drawings are provided as part of this Addendum and reflect "value engineering" items as approved by the City. Said Drawings supplement those provided as part of the "Base Design Drawing Listing" as appropriate and shall be incorporated in preparing the Project Bid:

GENERAL

CANNON & CANNON, INC.

G001-A1 COVER SHEET

LANDSCAPE

BENEFIELD RICHTERS AND CANNON & CANNON, INC.

L002-A1 PLANT SCHEDULE & LANDSCAPE NOTES

L101.1-A1 PRESENT LAYOUT

L102.1-A1 PRESENT LAYOUT

L103.1-A1 PRESENT LAYOUT

L101.2-A1 PROPOSED LAYOUT PLAN

L102.2-A1 PROPOSED LAYOUT PLAN

L103.2-A1 PROPOSED LAYOUT PLAN

L101.3-A1 PROPOSED GRADING AND DRAINAGE PLAN

L102.3-A1 PROPOSED GRADING AND DRAINAGE PLAN

L103.3-A1	PROPOSED GRADING AND DRAINAGE PLAN
L111-A1	PAVEMENTS/LIGHTING/FURNITURE SITE PLAN WEST END
L112-A1	PAVEMENTS/LIGHTING/FURNITURE SITE PLAN - MIDDLE
L113-A1	PAVEMENTS/LIGHTING/FURNITURE SITE PLAN - EAST END
L120-A1	OVERALL LANDSCAPE PLAN
L121-A1	LANDSCAPE PLAN - SECTION
L122-A1	LANDSCAPE PLAN - SECTION 2
L123-A1	LANDSCAPE PLAN - SECTION 3
L131-A1	ENLARGED AREA - WEST END
L132-A1	ENLARGED AREA - MIDDLE SECTION
L133-A1	ENLARGED AREA - EAST END
L134-A1	PUMP/DETAILS
L135-A1	PUMP/DETAILS
L301-A1	STAIR/RAMP ENLARGEMENTS
L304-A1	PLAYGROUND LAYOUT ENLARGEMENT
L307-A1	RIVERWALK FURNITURE LAYOUTS
L403-A1	SITE IMPROVEMENT DETAILS
L404-A1	SITE IMPROVEMENT DETAILS
L405-A1	SEATWALL & RETAINING WALL DETAILS
L409-A1	PLANTING DETAILS
L410-A1	PLANTING DETAILS

STRUCTURAL & MARINE

CSA, INC.

S1.0-A1	GENERAL NOTES
S1.1-A1	TYPICAL DETAILS
S2.1-A1	FOUNDATION PLAN
S2.2-A1	ENLARGED FOUNDATION PLAN
S2.3-A1	ENLARGED FLOATING DOCK PLAN
S3.1-A1	SECTIONS & DETAILS
S3.2-A1	SECTIONS & DETAILS

CIVIL

CANNON & CANNON, INC.

C101.1-A1	INITIAL EROSION CONTROL PLAN
C102.1-A1	INITIAL EROSION CONTROL PLAN
C103.1-A1	INITIAL EROSION CONTROL PLAN
C101.2-A1	INTERMEDIATE EROSION CONTROL PLAN
C102.2-A1	INTERMEDIATE EROSION CONTROL PLAN
C103.2-A1	INTERMEDIATE EROSION CONTROL PLAN
C101.3-A1	FINAL EROSION CONTROL PLAN
C102.3-A1	FINAL EROSION CONTROL PLAN
C103.3-A1	FINAL EROSION CONTROL PLAN
C401-A1	EROSION CONTROL DETAILS
SA101-A1	SANITARY PLAN AND PROFILE

MEP

FACILITY SYSTEM CONSULTANTS LLC

E100-A1	LEGEND, SCHEDULE & DETAILS
E101-A1	SITE ELECTRICAL PLAN - SECTION A
E102-A1	SITE ELECTRICAL PLAN - SECTION B
E103-A1	SITE ELECTRICAL PLAN - SECTION C
E104-A1	PAVILION LIGHTING PLAN

ARCHITECTURAL

STUDIO4

A2.1.A-1	PLAN
A4.1.A-1	ELEVATIONS AND DETAILS

2. Bid Proposal.

The Project Bid Form is included as part of this Addendum.

A "Schedule of Values" shall be provided separately after the Mandatory Pre-Bid Conference and must be included in the Bid Submittal. This is to be provided solely for use by the City in the event a change in design is necessary after bids are received.

3. Project Specifications

The following "Technical Specifications" are provided and considered part of the Phase I B Contract Documents and Specifications:

a. City of Knoxville Technical Specifications as follows:

Section 1.0	Mobilization of Forces, Supplies & Equipment	(March 2013)
Section 2.0	Clearing and Grubbing	(March 2013)
Section 3.0	Removal of Structures and Obstructions	(March 2013)
Section 4.0	Grading	(March 2013)
Section 5.0	Mineral Aggregate Base	(March 2013)
Section 9.0	Bituminous Plant Mix Base	(March 2013)
Section 10.0	Asphaltic Concrete Surface	(March 2013)
Section 11.0	Portland Cement Concrete Pavement (Plain)	(March 2013)
Section 12.0	Concrete Curb, Gutter, and Combined Curb and Gutter	(March 2013)
Section 13.0	Concrete Sidewalks, Driveways, and Median Strip	(March 2013)
Section 18.0	Mineral Aggregate Trail Base and Surface with 5% Portland Cement	(March 2013)
Section 20.0	Storm Sewers and Pipe Culverts	(March 2013)
Section 22.0	Manholes, Catchbasins, Inlets, and Junction Boxes	(March 2013)
Section 23.0	Adjusting Storm Sewer Frames	(March 2013)
Section 25.0	Rip Rap	(March 2013)
Section 26.0	Topsoil	(March 2013)
Section 31.0	Erosion Prevention and Sediment Control	(March 2013)
Section 39.0	Pavement Markings and Temporary Paint	(March 2013)
Section 41.0	Painted Pavement Marking	(March 2013)

Section 50.0 Bollards (March 2013)
Section 63.0 Signage (March 2013)

For all sections referenced above, see Subparagraph 3.d of this Addendum for amendments to "Method of Payment".

- b. For work associated with installation of, and/or connections to utilities under the responsibility of Knoxville Utilities Board (KUB), reference is made to the most recent KUB Specifications and shall be applicable throughout the duration of this Project.

Where conflicts are identified between these and the City of Knoxville Technical Specifications, the City Specifications shall take precedence unless the Bidder is advised otherwise.

Reference is made to Subparagraph 3.d. of this Addendum for "Method of Payment" which shall be applicable to this Project.

- c. The following Technical Specifications as provided by the Consultant Team:

Dated January 22, 2015

Section 03 30 00	Cast-In-Place Concrete	(7 pages)
Section 03 45 00	PreCast Architectural Concrete	(9 pages)
Section 05 52 00	Aluminum Handrails and Railings	(8 pages)
Section 11 68 13	Playground Equipment	(3 pages)
Section 12 93 00	Site Furnishings	(3 pages)
Section 26 05 00	Electrical General Provisions	(2 pages)
Section 26 05 01	Basic Electrical Materials and Methods	(4 pages)
Section 26 05 19	Wire and Cable	(2 pages)
Section 26 05 26	Grounding and Bonding	(4 pages)
Section 26 05 29	Supporting Devices	(4 pages)
Section 26 05 34	Conduit	(3 pages)
Section 32 13 16.23	Stamped Concrete Paving	(5 pages)
Section 32 18 16.13	Playground Protective Surfacing	(4 pages)
Section 32 80 00	Irrigation	(17 pages)
Section 32 91 19	Landscape Grading	(3 pages)
Section 32 92 19	Seeding	(8 pages)
Section 32 92 20	Native Seeding	(11 pages)
Section 32 92 23	Sodding	(6 pages)
Section 32 93 00	Trees, Shrubs, and Ground Covers	(15 pages)
Section 35 15 13.26	Plastic Floating Dock	(5 pages)

- d. Method of Payment

Referencing the Bid Proposal, all line items will be measured by the unit for completion of the work described, and payment will be made on a lump sum basis. Said price will be full compensation for completing that specific task as outlined in these Contract Documents Specifications, and shall include all labor, materials, equipment and incidentals related thereto.

Where specific task of work and/or equipment is not specifically called out in the Bid Proposal, said task and/or equipment shall be included in the price provided for other items in the Bid Proposal that is most closely associated with same.

Partial payment for lumps sum items will be made on the basis of a percentage of the lump sum price bid or of the current maximum allowable as indicated in the Payment Schedule if referenced in the Technical Specifications, whichever is smaller. Full payment for each item will be made in accordance with these provisions, which price shall be full compensation for all labor, supplies, equipment, and incidentals related thereto regardless of the number of times such moves are made and also for all preconstruction costs incurred after award of the Contract.

All references to "Basis of Payment" or other similar paragraphs in the Technical Specifications are considered hereby amended for the Phase 1B Project.

END OF ADDENDUM NO. 1

BID PROPOSAL
CITY OF KNOXVILLE, TENNESSEE

SUTTREE LANDING PARK; PHASE 1B
PROPOSED PARK IMPROVEMENTS
Project No. 14T-G-0566

TO THE PURCHASING AGENT
CITY OF KNOXVILLE, TENNESSEE

_____ hereby propose(s) to furnish all material, labor, and appliances and do all work required to complete the Contract for the Suttree Landing Park; Phase 1B, Proposed Park Improvements, Project No. 14T-G-0566, located in the City of Knoxville, Tennessee, in a workmanlike manner and in accordance with the plans of the Department of Engineering and specifications

_____ further agree(s) that in case of failure on _____ part to sign this within fifteen (15) days, the certified check or bid bond accompanying this proposal and the proceeds thereof shall be the property of the City of Knoxville.

BID SCHEDULE

ITEM NO.	DESCRIPTION	UNITS	TOTAL QUANTITY	PRICE PER UNIT	TOTAL PRICE PER ITEM
1.01	Mobilization of Forces, Supplies and Equipment	LS	1	_____	_____
1.02	Clearing and Grubbing	LS	1	_____	_____
1.03	Removal of Structures and Obstructions, Complete	LS	1	_____	_____
1.04	Construction Staking, Lines & Grades	LS	1	_____	_____
1.05	Excavation & Fill (Unclassified)	LS	1	_____	_____
1.06	Riverwalk/Sidewalks	LS	1	_____	_____
1.07	Storm Sewer Improvements	LS	1	_____	_____
1.08	Sanitary Sewer Modifications/Improvements	LS	1	_____	_____
1.09	Permanent Erosion Control (incl. Rip Rap)	LS	1	_____	_____
1.10	Temporary Erosion Control	LS	1	_____	_____
	Subtotal			_____	_____
2.01	Paving, Curb, Striping, and Signage (Parking area only)	LS	1	_____	_____
2.02	Storm Sewer (Parking area only)	LS	1	_____	_____
2.03	Landscape (Parking area only)	LS	1	_____	_____
	Subtotal; Parking Area			_____	_____
3.01	Floating Dock	LS	1	_____	_____
3.02	Gangway	LS	1	_____	_____
3.03	Pilings	LS	1	_____	_____
3.04	Accesible Launch	LS	1	_____	_____
	Subtotal; Dock			_____	_____

ITEM NO.	DESCRIPTION	UNITS	TOTAL QUANTITY	PRICE PER UNIT	TOTAL PRICE PER ITEM
4.01	Concrete Work (Bleachers, Overlook and Ramp)	LS	1	_____	_____
4.02	Handrails (Bleachers, Overlook and Ramp)	LS	1	_____	_____
	Subtotal			_____	_____
5.01	Electrical Service	LS	1	_____	_____
5.02	Pedestrian Scale Pole Mounted Lights	LS	1	_____	_____
5.03	Parking Lot Scale Pole Mounted Lights	LS	1	_____	_____
5.04	Bench Lights	LS	1	_____	_____
5.05	Underground Branch Circuit Wiring	LS	1	_____	_____
	Subtotal	LS	1	_____	_____
6.01	Plantings, General	LS	1	_____	_____
6.02	Topsoil, General	LS	1	_____	_____
6.03	Irrigation	LS	1	_____	_____
6.04	Site Furnishings	LS	1	_____	_____
6.05	Playground Equipment	LS	1	_____	_____
	Subtotal			_____	_____

TOTAL BID (combination of above totals)

\$ _____

TOTAL BID (In Words):

In submitting this bid it is understood that the right is reserved by the City of Knoxville to reject any and all bids. If written notice of the acceptance of this bid is mailed, tele-graphed or delivered to the undersigned within ninety (90) days after the opening thereof, or at any time thereafter before this bid is withdrawn, the undersigned agrees to execute and deliver a contract in the prescribed form and furnish the required bond within fifteen (15) days after the contract is presented to him for signature.

Security of the sum of _____ Dollars (\$ _____),
in the form of _____, is submitted
herewith in accordance with the Specifications.

The bidder certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The bidder agrees that a breach of this certification will be a violation of the Equal Opportunity clause in any contract resulting from acceptance of this bid. As used in this certification, the term "segregated facilities" means any waiting room, work areas, rest rooms and wash rooms, restaurants and other eating areas, time-clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment area, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. The bidder agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in the Notice to Proceed and to fully complete the Project within three-hundred (300) calendar days thereafter. Bidder further agrees to pay liquidated damages in the sum of two hundred dollars (\$200.00) for each consecutive calendar day thereafter as provided in the General Conditions.

Bidder acknowledges receipt of the following addendum:

- Addendum No. 1 – January 22, 2015

The Bidder is prepared to submit a financial and experience statement upon request.

Attached hereto is an affidavit in proof that the undersigned has not entered into any collusion with any person in respect to this proposal or any other proposal. Also attached is a Statement of Bidder's Qualifications.

Date: _____, 2015

Name of Bidder

State License No: _____

By

Treasury Number: _____

Title

Official Address (including Zip Code):

Incorporated under the laws of the State of

TECHNICAL SPECIFICATIONS



Section 1.0

Knoxville, Tennessee
March 2013

TECHNICAL SPECIFICATIONS
FOR
MOBILIZATION OF FORCES, SUPPLIES, AND EQUIPMENT

1. Description

This work shall consist of the mobilization of forces, supplies, equipment and incidentals at the project site. It shall include all preconstruction costs incurred after award of the contract which are necessary costs to the project and are of a general nature rather than directly attributable to other pay items.

2. Method of Measurement

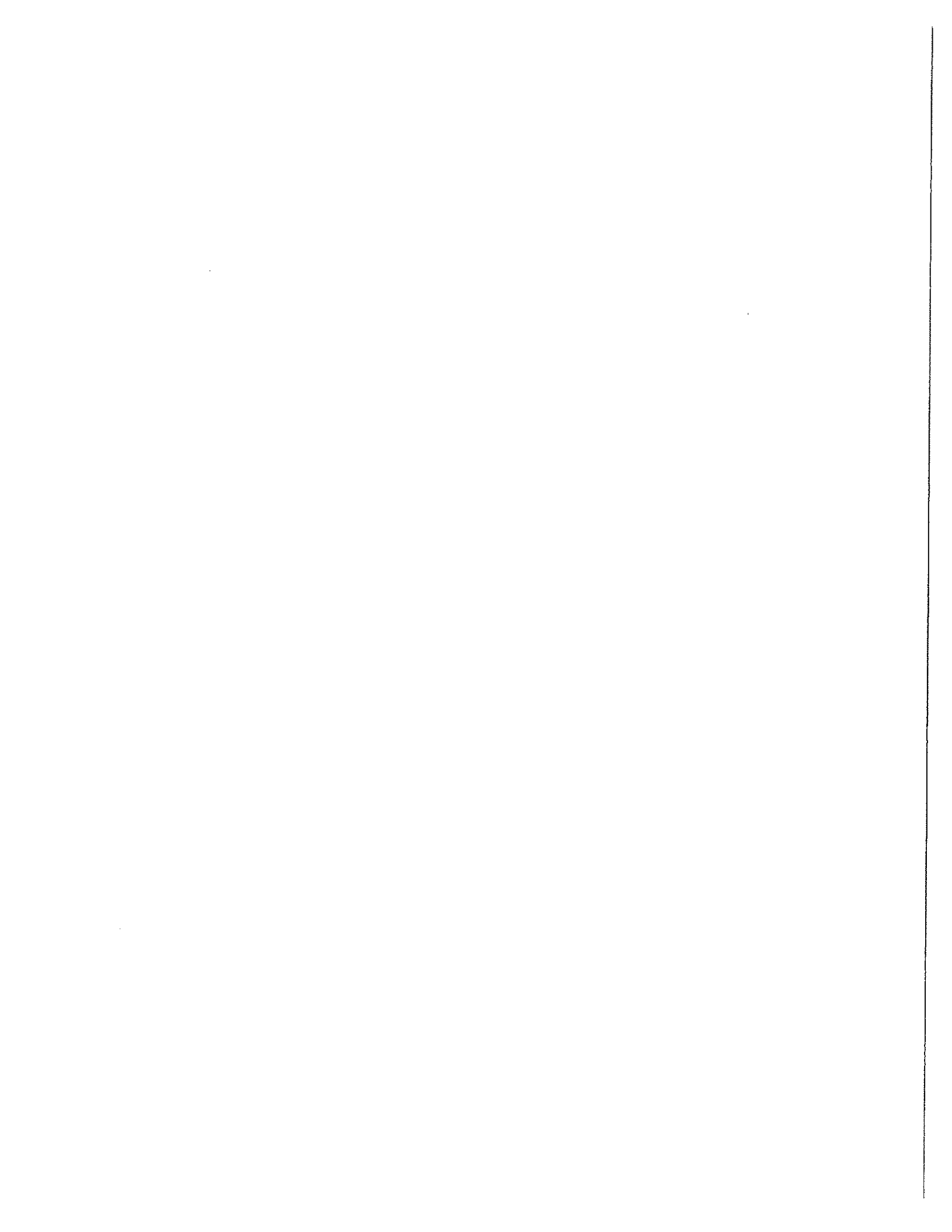
Mobilization will be measured by the unit for the completion of the work as described above, and payment will be made on a lump sum basis.

<u>% of Total Contract Amount on Estimate</u>	<u>% Allowed This Item</u>
Not less than	
5%	40%
10%	70%
25%	100%

<u>Amount of Contract</u>	<u>Maximum Amount Allowed</u>
0 - \$100,000	8% of Contract Amount
\$100,000 - \$500,000	\$4,000 + 3% of Contract Amount
\$500,000 or greater	\$14,000 + 1% of Contract Amount

3. Basis of Payment

Partial payments for Mobilization will be made on the basis of a percentage of the lump sum price bid or of the current maximum allowable as indicated in the Payment Schedule above, whichever is smaller. Full payment for Mobilization will be made in accordance with the provisions set out in the Payment Schedule above, which price shall be full compensation for organizing the moving all forces, supplies, equipment, and incidentals to the project site, regardless of the number of times such moves are made and also for all preconstruction costs incurred after award of the Contract.





TECHNICAL SPECIFICATIONS
FOR
CLEARING AND GRUBBING

1. Description

This work shall consist of clearing, grubbing, removal, and satisfactory disposal of all materials within the project limits, except those items designated to remain, or to be removed in accordance with other sections of these Specifications.

2. Construction Methods

- (a) The project area shall be cleared of all dead trees, stumps, brush, hedges, weeds, logs and other objectionable material and vegetation within 6" of the ground surface.
- (b) In areas where excavation is to be made and 5 feet beyond the excavation limits, all trees, stumps, roots, brush, hedge, heavy growth of vegetation, etc., shall be cleared and grubbed.
- (c) In areas where embankments are to be constructed, all trees, stumps, roots, brush, hedge, heavy growth of vegetation, etc., shall be cleared and grubbed to a point 5 feet beyond slope intercepts. All depressions made below the ground surface shall be refilled with suitable material and compacted before the embankment is started. Unsatisfactory material such as brush, hedge, roots, stump, branches and logs of trees, heavy vegetation, etc. shall not be embedded or buried within the embankment.
- (d) This work shall include the preservation from injury of all trees and other vegetation that are not within designated areas of clearing and grubbing, unless marked for removal by the Engineer.
- (e) Branches of trees extending over the roadway shall be trimmed symmetrically to provide a clear height of twenty feet above the finished roadway elevation.
- (f) All slopes of cuts, embankments, ditches, channels, waterways and all structures, both old and new, shall be cleared and cleaned of all brush, hedges, weeds, heavy vegetation, obstruction, rubbish and other objectionable material or growth; and shall be maintained in a neat, serviceable and satisfactory condition until the project is accepted.
- (g) Borrow pits and other material pits shall be cleared and grubbed of all trees, stumps, roots, brush, hedge, and other heavy growths of vegetation, and in addition shall be stripped of overburden laying above the material to be obtained. This work is to be completed before any excavation is made in the pit area.
- (h) All clearing and grubbing shall be completed a satisfactory distance ahead of the construction operations before construction stakes are set.

- (i) All materials and debris from the clearing and grubbing operation shall be burned, completely destroyed, or otherwise disposed of from the project limits by the Contractor in a satisfactory manner. The Contractor must obtain written permission from any property owner if private property is used for disposal, and furnish a copy to the Engineer. All Federal, State, County and City laws, regulations and ordinances related to burning or disposal shall be observed.
3. Method of Measurement
- (a) Clearing and Grubbing shall be of all areas indicated in the Contract Documents and paid for as a lump sum. No measurement of area will be made.
 - (b) When changes in the Contract Documents affect the area to be cleared and grubbed, a proportionate adjustment for increased or decreased area will be made.
4. Basis of Payment
- (a) This item will be paid for at the Contract unit price per lump sum for Clearing and Grubbing. This price will be full compensation for completing the Clearing and Grubbing as outlined in the Plans and these Specifications including all labor, materials, and equipment necessary to complete the work.
 - (b) When proportionate payments are made, they will be based on the completed percentage of the total clearing and grubbing specified.



TECHNICAL SPECIFICATIONS
FOR
REMOVAL OF STRUCTURES AND OBSTRUCTIONS

1. Descriptions

This work shall consist of the removal, wholly or in part, and satisfactory disposal of all structures, old pavements, and other designated obstructions not designated to be removed and disposed of under other items in the Contract.

2. Construction Requirements

(a) General - The Contractor shall raze, remove, and dispose of all buildings and foundations, structures, culvert pipes, pavements, sidewalks, curb and gutter, fences, and other obstructions, any portions of which are on the right-of-way, except utilities and those for which other provisions have been made for removal.

(b) Removal of Foundations & Structures - Foundations of buildings and structures shall be removed to a depth of not less than two feet below subgrade elevation, or two feet below original ground in areas outside the roadway slope intercepts. Basement floors and other large slabs shall be broken up to prevent holding of water. Cavities left by structure removal shall be filled to the level of surrounding ground, and within the slope intercepts and below subgrade elevation shall be compacted in accordance with the provisions for embankment fills.

(c) Removal of Bridges and Culverts - Bridges, culverts and other drainage structures in use by traffic shall not be removed until satisfactory arrangements have been made to accommodate traffic.

Substructure of bridges shall be removed to 1 foot below adjacent ground level or natural stream bottom for such portions located in the stream. Blasting or other operations, which may damage new construction, shall be completed prior to placing new work, or adequate precautions shall be taken to prevent damage.

(d) Removal of Pipes - All designated pipe (existing pipe that is to be replaced by new pipe or determined not to be necessary due to new construction) shall be removed and disposed of by the Contractor. All existing pipe (within the roadway or within 5 feet of the outside edge of the roadway) which is removed and not necessary due to new construction shall be backfilled with mineral aggregate base as described in Section 5 of these Specifications and compacted as described in Section 5 of these Specifications. Pipe not designated to be removed shall be protected by the Contractor and if damaged replaced at the Contractor's expense.

(e) Removal of Concrete Pavement –

- 1) All concrete pavement, including driveways, sidewalks, and curb and gutter, that exist outside of the proposed slope intercepts and becomes abandoned because of new construction shall, if so designated on the plans or by the Engineer, be completely removed and disposed of as directed. Grading and seeding shall follow according to Plans and Specifications.
- 2) All concrete pavement, including driveways, sidewalks, curb and gutter, that exist within the slope intercepts of the project and are at an elevation higher than two feet below subgrade elevation shall be removed and disposed of as directed.
- 3) All concrete pavement, including driveways, sidewalks, and curb and gutter that exist within the slope intercepts of the project and are more than two feet below subgrade elevation, shall be broken into size not to exceed two feet in maximum dimension and remain in place.

(f) Removal of Bituminous Pavement -

- 1) All bituminous pavement outside of the proposed slope intercepts shall be removed and paid for as common excavation. All bituminous pavement within the slope intercepts, at an elevation higher than two feet below subgrade elevation, shall be removed and paid for as common excavation.
- 2) All bituminous pavement within the slope intercepts and more than two feet below subgrade shall be broken into size not to exceed two feet in maximum dimension and remain in place.

- (g) All material obtained from the removal of structures, obstructions, etc. that may be satisfactorily incorporated into the embankments in the opinion of the Engineer, may be disposed of in the embankments where directed, provided that the material is broken into sizes no larger than one cubic foot and with a maximum dimension of one foot and provided that the material will be covered with at least two feet of earth embankment. The Contractor shall remove all other salvageable or discarded material, rubbish or debris from the project area and dispose of the same.

3. Method of Measurement

When the Bid Schedule stipulates that payment will be made for removal of structures and obstructions on a lump sum basis, the pay item, Removal of Structures and Obstructions, will include all structures and obstructions encountered within the rights-of-way in accordance with the provisions of this Section. Where the Bid Schedule stipulates that payment will be made for the removal of specific items on a unit basis, measurement will be made by the unit stipulated.

4. Basis of Payment

- (a) The accepted quantities of Removal of Structures and Obstructions will be paid for at the Contract lump sum price bid, which price shall be full compensation for removing and disposing of obstructions in accordance with the Plans and Specifications including all labor, materials, and equipment necessary to complete the work.

- (b) Specific obstruction items such as bridges and culverts, pipes, concrete pavement, and other structures, stipulated for removal and disposal under unit price pay items will be paid for at the Contract unit price bid per unit specified in the proposal, which price shall be full compensation for removal, disposal (and backfill where required) of materials, and equipment necessary to complete the work.





TECHNICAL SPECIFICATIONS
FOR
GRADING

1. Description

This work shall consist of excavating and grading the roadway, borrow pits, waterways, ditches, intersections, and other specified items, within the project limits; excavation of unsuitable material from roadbed and beneath embankment areas; excavating select material found in the roadway which is ordered for specific use in the construction; the construction and removal of detours authorized by the Engineer; trimming, shaping and dressing of all slopes; preparation of the roadbed; and disposing of all excavated materials all in accordance with the Specifications and in reasonably close conformity with the lines, grades, and typical cross-sections indicated on the Plans or established by the Engineer. It shall include the constructing of roadway embankments and the placing and compacting of approved material in the project area.

2. Classification

(a) Excavation (Unclassified)

All excavation performed under this section, including portland cement concrete located above subgrade elevation, other than Borrow Excavation, Channel Excavation and Undercutting will be considered Unclassified Excavation regardless of the nature of the material excavated.

(b) Common Excavation

Common Excavation shall consist of the removal and satisfactory placement of material classified as loam, sand, clay, loose chert, loose gravel, cemented chert, cemented gravel, gravel, soft shale, soft slate, and all pavements except those using portland cement as a bonding agent, decomposed rock, loose rock boulders, slabs or fragments of rock of less than $\frac{1}{2}$ cubic yard in volume and all other material not otherwise classified in these Specifications.

This item shall also consist of the removal and satisfactory disposal of unsatisfactory materials below grade in cut sections, from areas upon which embankments are to be placed, and undercutting for pipe and box culverts where required. Common Excavation does not include the stripping, stockpiling and placing of topsoil, nor does it include step benching in preparation of embankment areas on hillsides.

(c) Rock Excavation

Rock Excavation shall consist of the removal and satisfactory disposal of non-degradable rock which, in place, rings under the hammer or which cannot be economically excavated by the proper use of a power shovel or without the use of explosives; and any boulder, slab or fragment of rock having a volume of 2 cubic yard or more.

(d) Borrow Excavation

Borrow Excavation shall consist of material required for the construction of embankments or other portions of the work, and shall be obtained from approved sources outside the right-of-way limits, unless otherwise designated in the Plans. This item shall consist of the satisfactory removal and placement of the approved material.

(e) Channel Excavation

This item shall consist of the removal and satisfactory disposal of all material, regardless of its nature or the manner in which it may be removed, that is excavated for channel changes in widening, deepening and straightening existing channels or constructing new channels, which have a width at the bottom of more than fourteen feet as indicated on the Plans. All other similar excavation with a bottom width fourteen feet or less, as shown on the Plans, shall be paid for as Common and Rock excavation.

3. Construction Requirements

(a) General

- 1) Prior to the beginning of grading, all necessary Clearing and Grubbing, Removal of Structures and Obstructions, and placement of Erosion Control in that area shall have been completed.
- 2) All suitable materials removed from the excavation shall be used in the construction of the embankments, intersecting road approaches and at such other places as indicated or directed.
- 3) The material to be used in excavations shall be removed in such a manner that the slopes may be neatly trimmed to the slope lines given, when being dressed. Cuts may be widened or the slopes varied during the progress of the construction, according to the stability of the material excavated or the necessity of securing additional material, and without additional compensation.
- 4) Excavation material shall not be wasted, deposited, or disposed of outside of the construction lines unless directed, in writing, by the Engineer.
- 5) Only excess or unsuitable material will be considered for disposal outside the construction limits. The material that cannot be used to widen or flatten the slopes, or other locations, and for such purposes as may be directed by the Engineer, shall be disposed of by the Contractor to the satisfaction of the Engineer. The site of disposal shall be approved by the Engineer. All applicable permits for the disposal of material shall be obtained by the Contractor.
- 6) Old roadways shall be obliterated by the grading operation in a manner that will incorporate the old roadway into the new roadway and the surroundings in a pleasing appearance from the new roadway.

- 7) The Contractor shall be responsible until final acceptance for the stability of all embankments and cut slopes made under the contract and shall replace at his own expense any portion which, in the opinion of the Engineer, has become displaced or damaged due to carelessness or negligent work by the Contractor or by normal rainfall and weathering.
- 8) Final clearing up shall be performed in accordance with the provisions set out in the Conditions of the Contract.

(b) Rock Excavation

Rock, including boulders, shall be removed to a depth of not less than 12 inches below subgrade and the cavities thus formed shall be backfilled with suitable material and compacted. All loose rock on the cut slopes shall be removed immediately.

(c) Borrow Excavation

- 1) The Contractor shall notify the Engineer 14 days in advance of the opening of any borrow pit so that the borrow material can be tested and cross-sections taken.
- 2) If the Contractor places more borrow than is required and thereby causes a waste of excavation, the amount of such waste will be deducted from the borrow volume.
- 3) The borrow pit shall be excavated in such a manner as to be self-draining whenever possible and have a neat appearance. The pit shall be covered with topsoil and seeded in accordance with the Specifications for Seeding and Topsoil, but no direct payment will be made for these items as they shall be included in prices bid for other items of construction.
- 4) All local, state, and federal laws must be complied with for any borrow pits that are not self-draining.

(d) Undercutting

- 1) Unsuitable or unsatisfactory materials shall be removed to a depth not less than 2 feet below subgrade in cut sections and areas upon which embankments are to be placed. Undercutting for pipes and box culverts may also be required. These areas are to be refilled with suitable material and properly compacted.
- 2) The Contractor shall conduct his operation in such a manner as to allow the Engineer to take necessary cross-sections.
- 3) This unsuitable material can be used to flatten or widen slopes or for such purposes as the Engineer may direct. Excess material shall be disposed of by the Contractor to the satisfaction of the Engineer.

(e) Embankments

1) Preparation of Embankment Areas

- a. All depression and holes below ground surface, whether caused by grubbing or otherwise, shall be filled with suitable matter and properly compacted.

- b. The original ground surface, or the surface of embankment layers, shall not be frozen and shall be free from quantities of ice and mud when the subsequent layer is placed thereon.
- c. Backfilling around a structure, or any unit thereof, shall have been completed and thoroughly compacted to ground surface before any embankment materials are placed thereon.
- d. When embankment is to be placed and compacted on hillsides or when new embankment is to be compacted against existing embankments or when embankment is built in phases, the slopes that are steeper than 4:1 when measured at right angles to the roadway shall be continuously benched over those areas where it is required as the work is brought up in layers. Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each successive cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut shall be recompacted along with the new embankment material at the Contractor's expense.
- e. Where embankments are three feet or less in height, the entire surface upon which the embankment is to be placed shall have all vegetation and unsuitable material removed and replaced with suitable material, be thoroughly plowed and scarified, have all cleavage planes destroyed, and be recompacted.
- f. Every portion of existing pavement upon which an embankment is to be constructed at an elevation higher than two feet below subgrade shall be removed and paid for as described in Section 2 (e & f) of Removal of Structures and Obstructions.

Every portion of existing pavement upon which an embankment is to be constructed more than two feet below subgrade shall be broken as described in same sections as above.

2) Embankment Materials

- a. Unsuitable or perishable materials such as brush, hedge, stumps, roots, logs, rubbish heavy vegetation, etc. shall not be incorporated, buried or embedded in the embankment.
- b. All rock shall be broken into sizes not to exceed one foot in maximum direction and have enough common excavation to fill all voids between the rocks.
- c. Stones or rock four inches or greater in their greatest dimension will not be allowed in the top one foot of any embankment.

3) Formation of Embankments

- a. Embankments shall be formed of suitable materials placed in successive level layers of not more than eight (8) inches in compacted depth, unless otherwise stipulated, for the full width of the cross-section. Each layer shall be thoroughly rolled and compacted by the use of compacting equipment that will produce the required compaction of 95% of maximum density. At all times the contractor shall keep the embankment in such form as to insure proper surface drainage.
- b. When the embankment material consists of rock fragments of such size that the material cannot be placed in layers of the thickness prescribed without crushing or further breaking down the pieces resulting from excavation methods, such material may be placed in the embankment in layers not exceeding in thickness the approximate average size of the larger rocks. Each layer shall be leveled and smoothed with suitable leveling equipment and by distribution of spalls and finer fragments of earth. The lifts shall not be constructed above an elevation 2 feet below the finished subgrade. At no time shall any layer exceed two feet in depth.
- c. The top six inches in both cut and fill sections shall be compacted to a density equal to 100% of maximum density.
- d. The moisture content of the material being compacted shall meet both the following conditions: (1) The moisture content shall be within

the range of values at which 95 percent of the maximum density can be obtained as indicated by the moisture-density relationship curve and (2) the moisture content shall not exceed the optimum moisture content to the extent that the material pumps under loads applied by the construction equipment. Where 100 percent of maximum density is required, the moisture content of the material being compacted shall meet condition 3(d)2 above and shall not vary from the optimum moisture content by more than plus or minus three percentage points.
- e. Determination of optimum moisture and maximum density will be made by the Engineer in accordance with the "Standard Method of Test for Moisture Density Relationship of Soils Using a 5.5 Pound Rammer and a 12-inch Drop," AASHTO Designation: T 99, Method C. The determination of the density of the soil in place will be in accordance with an approved AASHTO method.
- f. Embankment materials shall not be placed within 50 feet of any structure until the structure has sufficiently cured in the opinion of the Engineer. The backfill material used within 50 feet shall be as free of rock as possible and carefully selected to the satisfaction of the Engineer. Special precautions shall be used to prevent any damage to the structure.

- g. Each layer of embankment formation shall be compacted to the required density before the formation of the next layer is begun.

(f) Shaping and Dressing

- 1) The roadbed shoulders, ditches, channels, borrow pits, and slopes shall be shaped within close conformity to the specified lines, grades, and cross-sections.
- 2) Rock Cuts shall be scaled of all loose fragments and left in a neat safe and workmanlike condition.
- 3) The Contractor shall clean the entire right-of-way of all rubbish, brush, sediment, etc. and dispose of the excess material.

(g) Subgrade Preparation

- 1) The subgrade shall be prepared to the lines and grades staked by the Engineer and to the cross-sectional shape as indicated on the plans or as directed.
- 2) The finished subgrade shall be compacted to a minimum density of 100% of the maximum density as specified in subsection referring to Formation of Embankments.
- 3) All soft, yielding material which will not compact readily shall be reworked or removed and replaced, and the replacement material shall be compacted to the specified density.
- 4) The subgrade shall be graded in a manner that will provide ready drainage of water from the subgrade. Ditches and drains shall be maintained to provide proper drainage during construction.
- 5) The Contractor shall protect the subgrade from damage. Only hauling essential to the construction of the project will be allowed. Any ruts or rough places that develop will be reshaped and recompacted.
- 6) The subgrade will be checked after rolling and adjusted to conform to the lines, grades and cross-section as indicated or directed. After conforming to the proper lines, grades, and cross-sections, being free of dust and loose material, and of a uniform bearing the subgrade will be approved at least 500 feet in advance of the placing of materials, except when the distance is reduced due to unusual circumstances by the Engineer.

4. Method of Measurement

(a) General

- 1) All excavation shall be computed by the cubic yard.
- 2) The volume of all accepted excavation shall be measured by cross-sectioning the area excavated and computed by the average-end-area method.
- 3) Initial cross-sections will be taken during design if necessary as determined by the Engineer, and final cross-sections will be taken after topsoil has been placed. Top soil will be deducted from the final cross sections to determine the volume of road and drainage excavation.

- 4) Additional measurements will be taken to determine the volume of materials, removed and satisfactorily disposed of, whose volume cannot be secured by cross-section methods.
- 5) The volume of all materials will be measured and computed for only one pay item, unless material which has been deposited as specified, must be removed and disposed of again to conform to a change of the plans, or as directed. The volume of such material shall be reclassified and remeasured for its proper class of excavation.
- 6) Where excavation of different classifications overlap, the following order of measurement and computation for payment is designated as a contract provision, namely:
 - Excavation included in lump sum items shall supersede all other excavations.
 - Excavation (unclassified) shall supersede common excavation, rock excavation and channel excavation.
 - Common excavation and solid rock excavation shall supersede channel excavation.
- 7) Hauling of excavation and borrow materials shall be considered incidental to this construction and the costs thereof shall be included in the unit price bid for excavation items.
- 8) Embankment construction, sloping, shaping, dressing, subgrade preparation, disposal of excess, or unsuitable material, final clearing up, etc., and completing all incidentals connected therewith will not be paid for directly but will be considered to be contingent items, payment for which is included in the contract price for excavation items.
- 9) Excavation (unclassified) and common excavation shall be measured by initial cross-sections. The method of measurement will be the average end-area method (utilizing the initial cross-section and the design cut and fill slopes and roadway template).

(b) Rock Excavation

- 1) Measurements of solid rock will be taken to include only 12 inches below grade, unless the Contractor is directed, in writing, by the Engineer to excavate the rock to a depth greater than 12 inches.
- 2) Measurements will include over-breakage from the back slopes beyond 12 inches if it is not attributable to Contractor's carelessness.

(c) Borrow Excavation

- 1) Initial cross-sections will be taken after the borrow pit is cleared and grubbed, cleared of topsoil and unsuitable material, and smoothed in a manner to make cross-sectioning possible. Final cross-sections will be taken after all material is removed and before topsoil is replaced.
- 2) Topsoil shall be replaced and the pit seeded as instructed without any direct payment and the cost thereof shall be included in the unit price for borrow excavation.

(d) Undercutting

- 1) The volume of unsuitable or unsatisfactory material actually excavated, removed, and disposed of will be measured by the most feasible method and included in the volume of common excavation computed.
- 2) Topsoil undercut from proposed embankment areas will not be measured as common excavation unless the depth of undercut exceeds six (6) inches. All undercut exceeding six (6) inches shall be paid as Common Excavation.

(e) Embankments

- 1) Embankments will not be measured. The construction of embankments is the responsibility of the Contractor as specified.
- 2) Excavation of embankment will not be measured for payment unless specified by the Engineer.

(f) Channel Excavation

- 1) Channel excavation will be measured only for material indicated, or directed, to be removed in construction of a channel.
- 2) If channel excavation is not listed in the Bid Schedule excavation (unclassified), common excavation and/or rock excavation will be measured and computed as applicable.

5. Basis of Payment

- (a) The accepted quantities of the items listed below will be paid for at the Contract Unit Price per cubic yard, complete in place, and shall be full compensation for all work, materials, including water, labor and other incidentals required to complete the work in accordance with the Plans and Specifications.
- (b) Payment will be made under the following bid items as set forth in the Bid Schedule:

Excavation (Unclassified)	- per cubic yard
Common Excavation	- per cubic yard
Rock Excavation	- per cubic yard
Borrow Excavation	- per cubic yard
Channel Excavation	- per cubic yard
- (c) Embankments, shaping and dressing, subgrade preparation, and water will not be paid for directly as the cost of these items is to be included in the pay items for grading as listed in the Bid Schedule.



TECHNICAL SPECIFICATIONS
FOR
MINERAL AGGREGATE BASE

1. Description

This work shall consist of furnishing and placing one or more courses of aggregates and additives, if required, on a prepared subgrade in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses and typical cross-section shown on the Plans or established by the Engineer. This work also includes furnishing and placing Maintenance Stone and Backfill Stone in accordance with these Specifications and the Plans.

2. Materials

All materials used in this construction, in addition to the general requirements of these Specifications, unless otherwise stipulated, shall conform to the following:

- (a) Mineral Aggregate Base shall be crushed stone, Class A Aggregate Grading D, as specified in Subsection 903.05 of the TDOTSS, March 1, 2006, and all Special Provisions pertaining thereto through the date of advertisement for this Contract.

<u>Sieve Size</u>	<u>Total Percentage by Weight Passing Sieves</u>
1-1/2 inch	100
1 inch	85 - 100
3/4 inch	60 - 95
3/8 inch	50 - 80
No. 4	40 - 65
No. 16	20 - 40
No. 100	9 - 18

- (b) Calcium Chloride shall meet the requirements of the AASHTO Specification for Calcium Chloride, Designation M-144 and shall be Type 2.
- (c) Maintenance Stone and Backfill Stone shall be of quality and gradation as specified in Subsection 2(a) above. The backfill stone in the roadway or less than 5 feet from the outside edge of the roadway, curbs, gutters and sidewalks shall be compacted to 100% of the Standard Proctor Density at 2% less than the optimum moisture content as determined by AASHTO T99 Method D.

3. Equipment & Construction Requirements

- (a) Equipment and Construction Requirements shall conform to Subsections 303.05 to 303.12 of the TDOTSS, March 1, 2006, and all Special Provisions Pertaining thereto through the date of advertisement of this Contract. In addition, the following compaction, will be required: Mineral Aggregate Base shall be compacted to 100% of the Standard Proctor Density at 2% less than the optimum moisture content as determined by AASHTO T99 Method D.
- (b) The maximum speed of trucks hauling or traveling over any part of the project under construction shall be 20 mph.

4. Method of Measurement

- (a) Mineral Aggregate Base, Maintenance Stone, and Backfill Stone will be measured by the ton in place, as by the actual scale weight.
- (b) All moisture in the Aggregate at the time of weighing in excess of eight percent will be deducted from the weight of the Aggregate.
- (c) Any water added on the road will be at the Contractor's expense.

5. Basis of Payment

- (a) The accepted quantities of Mineral Aggregate Base, Maintenance Stone, and Backfill Stone of the type specified will be paid for at the Contract unit price per ton, complete in place. This price shall be full compensation for all work, materials, including calcium chloride where specified and water; labor and other incidentals required to complete the work in accordance with the Plans and Specifications.
- (b) Payment will be made under the following bid item as set forth in the Bid Schedule:

- Mineral Aggregate Base
- Mineral Aggregate Base with Calcium Chloride
- Maintenance Stone



TECHNICAL SPECIFICATIONS
FOR
BITUMINOUS PLANT MIX BASE

1. Description

This work shall consist of a foundation composed of hot mixture of aggregate and asphalt prepared in a hot bituminous mixing plant. It shall be constructed in one or more layers, on a prepared subgrade, subbase, or base, in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the Plans or as directed by the Engineer. Each course shall have a thickness after compaction of not more than 4 inches. This construction shall include a leveling course if specified on the Plans.

2. Materials

- (a) Asphalt Cement shall conform to the requirements of AASHTO Designation M 226 for Viscosity Grade AC-20.
- (b) Aggregates shall conform to Subsection 903.06 of TDOTSS, March 1, 2006, and all Special Provisions through the date of the advertisement for this Contract. Grading B and B-M shall be used for base placed upon subgrade or base, and Grading C shall be used on existing pavement for leveling courses, Grading C-S and C-W shall be used for surface unless otherwise specified in the Contract or Plans.

3. Composition of Mixtures

- (a) The bituminous base shall be composed of aggregate and bituminous material. The mix shall comply with the applicable requirements of Subsection 407.03 of TDOTSS, March 1, 2006.
- (b) The proportions by weight of the total mixture shall be as follows:

<u>Mixtures</u>	<u>Combined Mineral Aggregate</u>	<u>Asphalt Cement</u>
Grading "B" and "B-M"	93.8 - 95.8	4.2 - 6.2
Grading "C" and "C-W"	93.8 - 95.8	4.2 - 6.2
Grading "C-S"	92.3 - 94.7	5.3 - 7.7

4. Equipment

All equipment necessary for the construction shall be approved before the work will be permitted to begin. The equipment shall meet the requirements of Subsections 407.04 through 407.08 of TDOTSS, March 1, 2006, and as revised by all Special Provisions dated through the date of the advertisement for this Contract.

5. (a) The construction requirements shall be as prescribed in Subsection 407.09 and Subsections 407.11 through 407.16 TDOTSS, March 1, 2006, and as revised by all Special Provisions dated through the date of this advertisement, and the requirements listed below.
- (b) The Plans will indicate whether the bituminous pavement is to be constructed on a subbase, mineral aggregate base, asphalt base, or an existing surface. The surface of the base or subbase upon which the construction is to be placed shall meet the requirements of the applicable Sections of the Grading, Mineral Aggregate Base, and Bituminous Plant Mix Base Specifications.
- (c) When bituminous mixes are placed upon existing concrete pavement, with or without bituminous overlay, all excess bituminous material shall be removed from joints and cracks.

When bituminous mixes are placed upon existing bituminous pavement, any areas containing excess bitumen and any failures in existing pavement shall be removed to a depth up to 3 feet and backfilled with crushed stone base up to the bottom of the surrounding pavement structure and with appropriate asphaltic base, leveling or surface material to the existing surface, all as directed by the Engineer. Crushed stone base material, asphaltic base, leveling, and surface materials to be paid at the Contract Unit Price for those items. Pavement removal and undercut up to 3 feet will be measured and paid in accordance with subparagraph 6(c) and 7(b) of this Section.

The existing pavement surface shall be thoroughly cleaned of all dirt and loose particles prior to the application of tack coat or prime coat as specified in Specifications for Tack Coat and Prime Coat.

- (d) Thickness shall be controlled during the spreading operation by frequent measurements taken of the freshly spread mixture to establish relationship between the uncompacted mixture and the completed course. Thickness or pounds per square yard shall be within reasonably close conformity with that specified on the Plans.
- (e) Under Subsection 407.18 of TDOTSS, March 1, 2006, the surface of the bases meet the requirements specified and when tested in accordance with the provisions of that Subsection, the deviation of the surfaces from the testing edge of the straightedge shall not exceed the amounts shown below for the several types of mixtures.

Grading B and B-M Mixture	3/8 inch
Grading C Mixture	3/8 inch
Grading C-W Mixture	3/8 inch
Grading C-S Mixture	3/8 inch

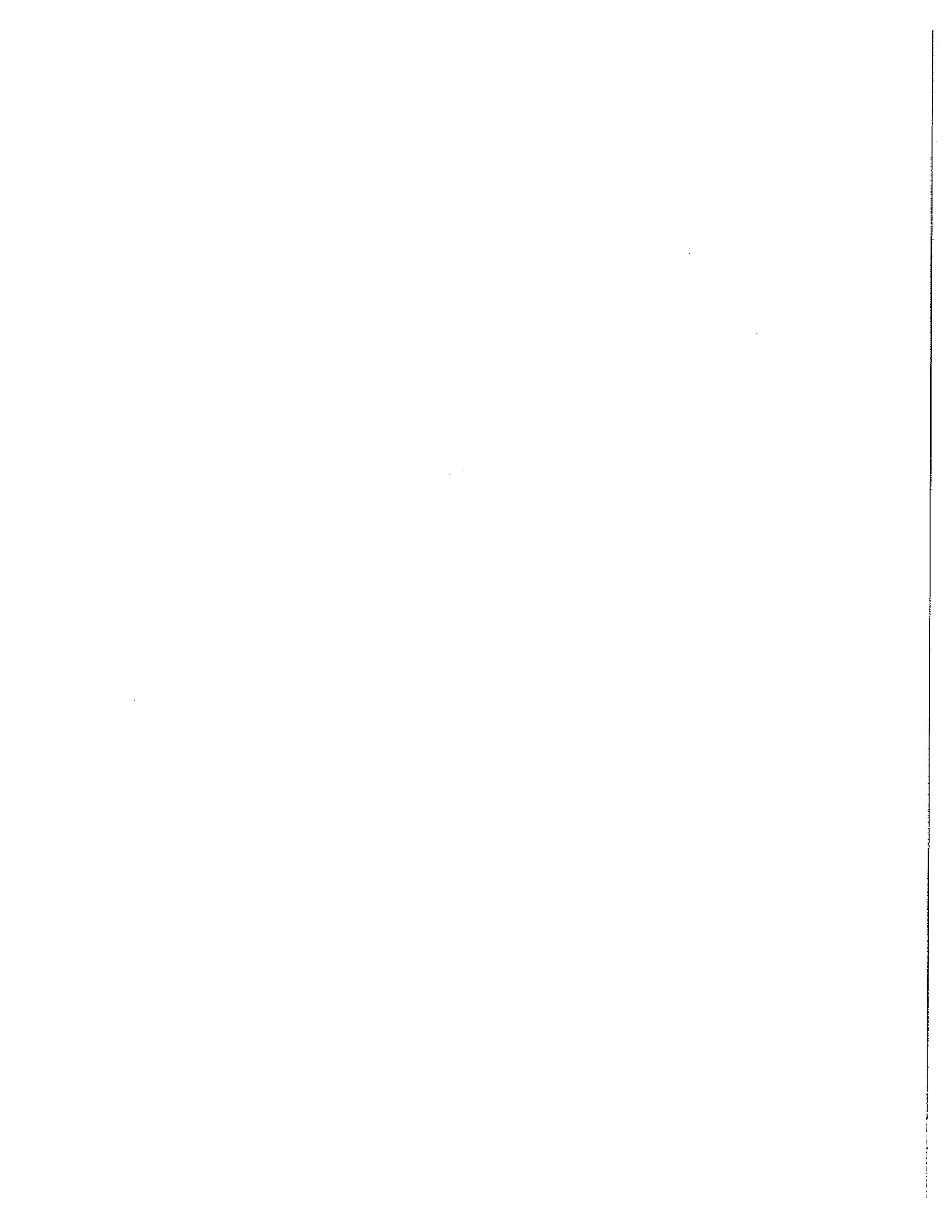
- (f) Subsection 307.03(b), Recycled Asphalt Pavement, will be accepted for Grading B, Grading B-M and Grading C with the following exception: The Contractor shall be responsible for providing a fully coated and workable mixture that shall have a marshall stability of not less than 1,000 pounds when tested in accordance with AASHTO - T-245, and the compactive effort for all specimens shall be 75 blows of the hammer on each end. No adjustments for asphalt content increases or decreases shall be provided under these Specifications.

6. Method of Measurement

- (a) Bituminous plant mix base, including the mineral aggregate and asphalt cement as specified or required by these Specifications, will be measured by the ton of 2,000 pounds, accepted and placed as indicated or directed.
- (b) Materials for prime or tack coat will be measured for payment as prescribed in their Specifications.
- (c) The surface measurements of any pavement, base or subbase removal shall be made in square yards by the Engineer prior to backfilling.
- (d) Bituminous mixtures used to fill openings left by pavement removal will be measured for payment. Base materials used to fill openings left by base removal will be measured as provided for in the respective Sections for each type specified.
- (e) Adjustment of sewer manholes and castings will be measured for payment as prescribed in its Specification.
- (f) No allowance will be made for unacceptable material; for material used in replacing defective or condemned construction; or for material wasted in handling, hauling or otherwise.

7. Basis of Payment

- a) The accepted quantity of bituminous plant mix base, complete in place, will be paid for at the Contract Unit Price per ton for each "Grading" listed in the Bid Schedule and constructed in accordance with the Plans and Specifications.
- b) The accepted quantity of pavement, base and subbase removal up to 3 feet in depth will be paid for at the Contract Unit Price per square yard listed in the Bid Schedule and performed in accordance with the Plans, Specifications, and under the direction of the Engineer.





TECHNICAL SPECIFICATIONS
FOR
ASPHALTIC CONCRETE SURFACE

1. Description

This work shall consist of an asphaltic concrete pavement composed of a mixture of coarse aggregate, fine aggregate, mineral filler if specified or required, and asphalt cement, constructed on a prepared roadbed in accordance with these Specifications and in reasonably close conformity with the lines, grades, typical cross sections and rate of application shown on the Plans, or established by the Engineer.

2. Materials

(a) Asphalt Cement

- 1) Asphalt cement shall conform to the requirements of PG-64-22 as specified in Subsection 904.01 TDOTSS, March 1, 2006, and all special provisions pertaining thereto through the date of the advertisement for this Contract.
- 2) Asphalt cement used with aggregate Grading D and E mixtures shall be treated with an anti-stripping additive as specified in Subsection 918.09(B) TDOTSS, March 1, 2006, and all special provisions pertaining thereto through the date of the advertisement for this Contract.

(b) Mineral Aggregate

Mineral aggregates shall conform to the following requirements and Subsection 903.11, TDOTSS, March 1, 2006, and as revised by all Special Provisions dated through the date of the advertisement of this Contract, with the following exceptions and additions:

The Combined Grading:

The several aggregate fractions shall be sized, graded, and combined in such proportions that the resulting composite blend will meet one of the following grading requirements, as specified, together with the stipulations pertaining to the constituents of the blend hereinafter specified.

ASPHALTIC CONCRETE SURFACE COURSE
MIXTURE DESIGNATION

MASTER RANGE OF GRADATIONS

Total Percent Passing, by Weight

Grading Sieve Size	D	E
1/2"	95-100	95-100
3/8"	80-93	80-93
No. 4	54-76	54-76
No. 8	35-57	35-57
No. 30	17-29	17-29
No. 50	10-18	10-18
No. 100	3-10	3-11
No. 200	0-6.5	0-8

Grading D

The coarse aggregate shall consist of crushed gravel, crushed granite, crushed quartzite or crushed gneiss. Other crushed aggregate may be used provided it has the following chemical, physical, and performance characteristics for Type I, Type II or Type III aggregate, per TDOTSS 903.11. Crushed slag will not be permitted as a coarse or fine aggregate.

The fine aggregate shall consist of natural sand or sand manufactured from gravel or from crushed stone aggregate meeting the physical and chemical requirements listed above. The use of carbonate rocks such as limestone and dolomite or other aggregates tending to polish under traffic will not be permitted in the coarse aggregate and will be permitted only to the extent specified herein in the fine aggregate.

In addition to the other requirements of these Specifications, the composition of the mineral aggregate shall be such that when combined with the required amount of bitumen the resultant mixture shall have:

High Volume Roads (ADT over 1000)

*Minimum Stability, kN (lbs) -	9.0 (2000)
*Void Content (%) -	3-5.5
*Flow, mm (.01 inch) -	2-4 (8-16)
*Minimum VMA (%) -	14
**Dust to Asphalt Ratio -	0.6-1.2

*Tested in accordance with AASHTO T 245 with 75 blows of the hammer on each side of the test specimen, using a Marshall Mechanical Compactor.

**The dust to asphalt ratio is the percent of the total aggregate sample that passes the 75 um (200 mesh) sieve as determined by AASHTO T11 divided by the percent asphalt in the total mix.

The addition of limestone screenings or agricultural limestone in a maximum amount of 25 percent by weight of the mineral aggregate may be required to comply with this section. When crushed stone screenings meeting the requirements of Subsection 903.11(c) are used, all additional fines shall be natural or manufactured sand. A maximum of 5 percent mineral filler meeting the requirements of Subsection 903.16 may be substituted for an equal quantity of the limestone fines. If the mixture does not comply with the design criteria, another source of aggregate shall be required.

When gravel is used as the coarse aggregate for a 411 Grading "D" mix, a minimum of 20 percent by weight limestone screenings, agricultural limestone and/or mineral filler shall be required.

Grading E:

When Grading E is to be used as a surface for traffic lanes, the mineral aggregate shall be composed of not less than 50 percent, nor more than 80 percent crushed limestone, and not more than 50 percent or not less than 20 percent natural sand, sand manufactured from gravel, or any combination of these materials, except as herein specified. All or any part of this mix may be calcareous sandstone, including Size 10 (screenings) or manufactured sand.

The sand percentage on the job mix formula shall be in the range of 20-50 percent. However, if needed to meet or improve the specified design criteria, the limestone and sand percentage may be altered by the numerical value of 5 percent from the percentage shown by the Contractor on the original job mix formula. If the aggregate percentages shown on the original job mix formula are altered, the Contractor shall submit a new job mix formula using the aggregate percentages shown on the Design.

In addition to the other requirements of these Specifications where Grading E is used for the riding surface, the composition of the mineral aggregate shall be such that when combined with the required amount of bitumen, the resultant mixture shall have:

High Volume Roads (ADT over 1000)

*Minimum Stability, kN (lbs) -	9.0 (2000)
*Void Content (%) -	3-5.5
*Flow, mm (.01 inch) -	2-4 (8-16)
*Minimum VMA (%) -	14

*Tested in accordance with AASHTO T245 with 75 blows of the hammer on each side of the test specimen, using a Marshall Mechanical Compactor.

If the design criteria above cannot be obtained with the aggregate submitted to the laboratory for design, another source of aggregate will be necessary.

3. Composition of Mixtures

- (a) The asphaltic concrete surface shall be composed of aggregate, filler if required, and bituminous material. The mix shall meet all applicable requirements of Subsection 407.03 of TDOTSS March 1, 2006.
- (b) The proportions by weight of the total mixture shall be combined in such proportions as to produce mixtures within the following master composition limits.

Proportions of Total Mixture, Percent by Weight

<u>Surface Courses</u>	<u>Combined Mineral Aggregate</u>	<u>Asphalt Cement</u>
Grading D and E*	93.0 - 94.7%	5.3 - 7.0

* If Grading "E" is used as a roadway surface mix, the above proportions shall be changed to 93.0-95.5 and 4.5-7.0 for mineral aggregate and asphalt cement respectively.

4. Equipment

All the equipment necessary for the construction shall be approved before the work will be permitted to begin. The equipment shall meet the requirements of Subsections 407.04 through 407.08, TDOTSS, March 1, 2006, and as revised by all Special Provisions dated through the date of advertisement for this Contract.

5. Construction Requirements

- (a) The construction requirements shall be as prescribed in Subsection 407.09 and Subsections 407.11 through 407.16 of TDOTSS, March 1, 2006, and the requirements listed below.
- (b) The Plans will indicate whether the bituminous pavement is to be constructed on an asphalt base or an existing surface.
- (c) When bituminous mixes are placed upon existing bituminous pavement, any areas containing excess bitumen and any failures in existing pavement shall be removed to a depth up to 3 feet and backfilled with crushed stone base up to the bottom of the surrounding pavement structure and with appropriate asphaltic base, leveling or surface material to the existing surface, all as directed by the Engineer. Crushed stone base material, asphaltic base, leveling and surface materials to be paid at Contract Unit Price for those items. Pavement removal and undercut up to 3 feet will be measured and paid in accordance with Subparagraphs 6(e) and 7(c) of this section.

The existing pavement surface shall be thoroughly cleaned of all dirt and loose particles prior to the application of tack coat as specified in Specifications for Tack Coat.

- (d) The joints, between new asphaltic pavement and bridges, concrete pavement, etc. shall have a joint prepared with the existing pavement by grinding, scarifying, or saw cutting the existing pavement for a length of six (6) feet, the full width of the existing pavement, and to the depth of the overlay of new material. The six (6) feet length of cut may be a wedge cut varying from zero (0) to the required depth over six (6) feet). On new construction projects, all joints shall be constructed as above.

- (e) Thickness shall be controlled during the spreading operation by frequent measurements taken of the freshly spread mixture to establish relationship between the noncompacted mixture and the completed course. Thickness or pounds per square yard shall be within reasonably close conformity with that specified on the Plans.
- (f) The surface shall meet the requirements of Subsection 407.18 of TDOTSS, March 1, 2006, and when tested the deviation of the surface from the testing straightedge shall not exceed 1/4 inch.
- (g) Costs for joints shall be included in the cost of the aggregate for asphaltic concrete surface.

6. Method of Measurement

- (a) Asphaltic concrete surface shall include mineral aggregate and asphaltic cement. Measurement shall be by the ton of 2,000 pounds of asphaltic concrete surface accepted and placed as indicated or directed.
- (b) Material for tack coat will be measured for payment as prescribed in the Specifications for tack coat.
- (c) Adjustment of sewer manholes and castings will be measured for payment as prescribed in its Specifications.
- (d) No allowance will be made for unacceptable material, for material used in replacing defective or condemned construction, or for materials wasted in handling, hauling, or otherwise.
- (e) The surface measurements of any pavement, base or subbase removal shall be made in square yards by the Engineer prior to backfilling.

7. Basis of Payment

- (a) The accepted quantity of Mineral Aggregate and Asphalt Cement (PG-64-22) for Asphaltic Concrete Surfaces, complete in place shall be paid for at the Contract unit price per ton listed in the Bid Schedule. This price shall be full compensation for all work, materials, labor and other incidentals required to complete the work in accordance with the Plans and Specifications.
- (b) The acceptance of the mixture shall be as determined in Subsection 407.20(B) of TDOTSS, March 1, 2006, and all Special Provisions pertaining thereto through the date of the advertisement for the Contract.
- (c) The accepted quantity of pavement removal (up to 3' in depth) shall be paid for at the Contract Unit Price per square yard listed in the Bid Schedule. This price shall be full compensation for all work, labor, equipment, and other incidentals required to complete the work in accordance with the Plans and Specifications.

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TECHNICAL SPECIFICATIONS
FOR
PORTLAND CEMENT CONCRETE PAVEMENT (PLAIN)

1. Description

This work shall consist of a pavement composed of portland cement concrete constructed on a prepared roadbed in accordance with these specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross-sections shown on the Plans or established by the Engineer.

2. Materials

(a) Concrete

Concrete shall be composed of portland cement, aggregates, and water. Air-entrainment shall be provided by adding an air-entraining agent.

(b) Portland Cement

Portland cement shall conform to AASHTO M85 or ASTM C150. The cement used in the work shall correspond to that on which selection of concrete proportions was based.

When Types IV and V cements are used, proper recognition shall be given to the effects of slower strength gain and lower heat of hydration on concrete proportioning and construction practices.

The Contractor shall provide suitable means for storing and protecting the cement against dampness. Cement, that for any reason has become partially set or which contains lumps of caked cement shall be rejected.

(c) Aggregates

Fine aggregate for concrete shall conform to the requirements of Subsection 903.01 of TDOTSS, May 1, 2006. Coarse aggregate for concrete shall conform to the requirements of Subsection 903.03 of TDOTSS, March 1, 2006.

Fine aggregate manufactured from limestone or other polishing aggregate will not be permitted in traffic lanes.

(d) Water

Water used in mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter, or other substance injurious to the finished product. Water shall be tested in accordance with and shall meet the requirements of AASHTO T26. Water known to be potable may be used without test.

(e) Admixtures

No admixtures shall be used in the concrete without prior approval, and all approved admixtures shall conform to applicable AASHTO and ASTM requirements.

Air-entraining agents shall conform to AASHTO M154 and shall have proven compatibility with all local concrete materials, including cement, and shall be capable of providing in the concrete the required air contents and an air-void system known to produce durable, scale resistant concrete.

Admixtures other than air-entraining agents shall not be used until trial mixes with job materials have shown them to be compatible at job temperatures. Trial mixes must also show that desired properties will be imparted to the fresh concrete without any subsequent loss of strength or durability in the hardened concrete.

(f) Steel

Unless otherwise specified, all steel reinforcement for concrete shall meet the requirements of TDOTSS, March 1, 2006.

(g) Joint Materials

Unless otherwise specified or requested by the Engineer, poured sealer for joints shall conform to the requirements of Subsection 905.05 of TDOTSS, March 1, 2006, for Hot Poured Elastic Type Sealant.

Preformed fillers for joints shall meet the requirements of Subsection 905.01 of TDOTSS, March 1, 2006.

(h) Curing materials

Curing materials shall conform to the requirements of Section 913 of TDOTSS, March 1, 2006.

3. Proportioning

Unless otherwise provided herein, each cubic yard of concrete shall contain a minimum of 470 lb. of cement, and the water-cement ratio by weight shall not exceed 0.50. An air-entraining agent shall be used to produce an air content of 5 %, plus or minus 1%, by volume of concrete as determined by AASHTO T152.

After the materials have been accepted by the Engineer, they shall be so proportioned as to produce a workable concrete having a maximum slump of 3 in. for vibrated placement or 1 in. for slip-formed placement as determined by AASHTO T119. The concrete shall have a flexural strength at 14 days of not less than 550 pounds per square inch when tested in accordance with AASHTO T97, or a compressive strength of 3,500 pounds per square inch when tested in accordance with AASHTO T22.

The Contractor shall submit a job-mix design and certified test reports indicating compliance of the materials to the applicable specifications in 2. and the job mix to those listed above. Such design and reports shall be submitted in duplicate to the Engineer and other such agencies or persons he may designate well in advance of the time scheduled for starting the work. The Engineer must approve such information before starting concrete operations. Reports or certificates indicating compliance of any shipment of materials shall be placed in the hands of, and approved by the Engineer, prior to use of such materials. The cost of testing materials and the job-mix design shall be borne by the Contractor.

Where reputable materials suppliers maintain regular recognized testing services, certified copies of such tests will be accepted by the Engineer. However, in any case of

doubt as to the accuracy and/or adequacy of such tests, the Engineer may require that materials be tested by a recognized commercial testing laboratory which has been selected by the Contractor and approved by the Engineer. The testing laboratory shall then test the cement and aggregates and prepare written reports showing the results of such tests on each shipment. The laboratory shall also certify that the materials covered by the report comply in all respects with these Specifications. In general, materials shall be tested by the manufacturer/producer, but if untested shipments require sampling and testing after arrival at the site of work, the Contractor shall be fully responsible for delays in the progress of the work due to delays in testing and reporting.

If it is impossible to obtain concrete of the desired plasticity and workability with the proportions originally designated, the Engineer shall change aggregate weights as required, maintaining the cement content originally designated. No change in the sources or character of the materials shall be made without due notice to the Engineer.

4. Equipment

All the equipment necessary for the construction shall be approved by the Engineer before the work will be permitted to begin. The equipment shall meet the requirements of Subsection 501.04 of TDOTSS, March 1, 2006.

5. Construction Requirements

(a) Subgrade Preparation

Subgrade preparation shall be performed as provided for under Section 4.0 of these Specifications.

(b) Construction of Base

The base course, if required by the plans, shall be constructed in accordance with Section 5.0 of these Specifications and the requirements listed:

- 1) The Contractor shall be responsible for constructing or correcting the base to such grade tolerances as will insure the concrete pavement thickness required.
- 2) The base shall be completed not less than 500 linear feet in advance of the paving unless otherwise authorized by the Engineer.
- 3) The base shall be in a moist condition at the time of placing concrete. If it becomes dry prior to the actual placing of the concrete, it shall be sprinkled, but the formation of pools of water shall be avoided. The base shall not be muddy or soft.

(c) Setting Forms

Forms shall be set in accordance with the requirements of Subsection 501.07 of TDOTSS, March 1, 2006. In lieu of setting forms, the edge of a previously placed curb and gutter section may be used as a form if approved by the Engineer.

(d) Handling, Measuring, and Batching Materials

All handling, measuring, and batching of materials shall be performed in accordance with the requirements of Subsection 501.09 of TDOTSS, March 1, 2006.

(e) Mixing Concrete

Concrete shall be mixed in accordance with the requirements of Subsection 501.10 of TDOTSS, March 1, 2006, with the limitations of Subsection 501.11 of TDOTSS, March 1, 2006.

(f) Placing Concrete

Concrete shall be placed in accordance with Subsection 501.12 of TDOTSS, March 1, 2006, except as herein noted.

Paragraphs one, three, and five of Subsection 501.12 of TDOTSS, March 1, 2006, shall be deleted and the following added:

- 1) The mechanical spreader may not be required at the discretion of the Engineer.
- 2) All concrete placed shall be vibrated. The use of hand vibrators will only be permitted at the discretion of the Engineer. Vibrators mounted on a machine shall be operated only while the machine is in motion.

(g) Test Specimens

The Contractor shall furnish the concrete necessary for casting test specimens in the field and shall provide water-tight tanks of satisfactory size and number to accommodate the test specimens. The Engineer will designate the frequency of sampling the fresh concrete and will prepare the test specimens. The method of making and curing test specimens will be in accordance with AASHTO T23. The cost of testing shall be borne by the City of Knoxville.

(h) Strike-Off, Consolidation, and Finishing

The strike-off, consolidation, and finishing of the concrete shall be performed in accordance with Subsection 501.16 of TDOTSS, March 1, 2006, and the following.

The Contractor shall always have available materials to protect the surface of the plastic concrete against rain. These materials shall consist of burlap, curing paper, or plastic sheeting. When slip-form construction is being used, materials such as wood planks or forms to protect the edges of the pavement shall also be required.

Transverse grooving after the burlap drag finishing shall not be required unless shown in the plans or directed by the Engineer.

(i) Surface Test

The pavement surface shall be tested in accordance with Subsection 501.17 of TDOTSS, March 1, 2006.

(j) Curing

Curing operations shall be done in accordance with Subsection 501.18 of TDOTSS, March 1, 2006, except as follows.

Membrane curing will not be permitted in frost-affected areas or paving that will be exposed to deicing chemicals within 30 days after completion of the curing period.

(k) Removal of Forms

Removal of the concrete forms shall meet the requirements of Subsection 501.19 of TDOTSS, March 1, 2006.

(l) Joints

Joints shall be constructed of the type and dimensions, and at the locations required by the plans, and in accordance with the provisions of the Specifications.

Longitudinal joints shall be perpendicular to the pavement surface and shall be along or parallel to the centerline of the pavement, unless otherwise specified. Transverse joints shall be straight, vertical to the pavement surface and shall be at the angle to the centerline of the pavement as shown on the Plans.

1) Transverse Contraction Joints

Transverse contraction joints shall be placed at the intervals and dimensions specified and shall be of the plain sawed groove type as detailed on the Plans and in accordance with these Specifications.

Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually six to twelve hours. All joints shall be sawed before uncontrolled shrinkage cracking takes place. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions. The sawing of any joint shall be omitted if a crack occurs at or near the joint location prior to the time of sawing. The sawing of a joint shall be discontinued when a crack develops ahead of the saw. In general, all joints shall be sawed in sequence.

All contraction joints in lanes adjacent to previously constructed lanes shall be sawed before uncontrolled cracking occurs. If extreme conditions exist which makes it impractical to prevent erratic cracking by early sawing, a contraction joint groove shall be formed at intervals of every third or fourth joint, or as often as required prior to initial set of concrete by placing inserts in the plastic concrete at the angle to the centerline of the pavement indicated on the plans and perpendicular to the surface. When the concrete has attained its initial set and after the joint has been carefully finished, the insert shall be removed. The groove so formed shall maintain its full width and depth as shown on the Plans, and the pavement at the joint shall meet surface requirements.

Immediately after sawing, the joints shall be cleaned of all residue by flushing with water under pressure.

2) Transverse Construction Joints

Transverse construction joints of the type shown in the plans shall be placed whenever the placing of concrete is suspended for more than 30 minutes. A butt joint with dowels shall be used if the joint occurs at the location of a contraction joint. Keyed joints with tie bars shall be used if the joint occurs at any other location.

3) Transverse Expansion Joints

Transverse expansion joints shall consist of a vertical expansion joint filler placed on a butt-type joint with dowel bars as shown in the plans. The expansion joint filler shall be continuous from form to form for the full depth of the pavement and shaped to the subgrade, curb section, and to the key way along the form. Preformed joint filler shall be furnished in lengths equal to the pavement width or equal to the width of one lane. Damaged or repaired joint filler shall not be used unless approved by the Engineer.

The expansion joint filler shall be held in a vertical position. An approved installing bar or other device shall be used if necessary to ensure proper grade and alignment during placing and finishing of the concrete.

Finished joints shall not deviate in horizontal alignment more than 1/4 in. from a straight line. If joint fillers are assembled in sections, there shall be no offsets between adjacent units. The top edge of the filler shall be protected, while the concrete is being placed, by an approved metal channel cap. Dowels shall be held in position, parallel to the surface and centerline of the slab, by an approved metal device that is left in the slab. Dowels that are not corrosion-resistant shall be painted with one coat of approved primer. When the paint has dried and immediately before placing the dowel in position, the sleeve-end of the dowel shall be thoroughly greased. Bond breaker for corrosion-resistant dowels shall be as recommended by the coating manufacturer.

4) Longitudinal Joints

Longitudinal joints shall be constructed by forming a keyed butt-type joint or sawing a groove in the surface of the pavement as detailed in the Plans.

If required by the Plans, deformed steel tie bars of specified length, size, spacing, and materials shall be placed across and perpendicular to the longitudinal joints. They shall be placed by approved mechanical equipment or rigidly secured by chairs, or other approved mechanical equipment, or rigidly secured by chairs or other approved supports to prevent displacement.

When adjacent lanes of pavement are constructed separately, a key-way shall be formed along the construction joint of the first lane constructed by any method approved by the Engineer and to

the dimensions shown on the Plans. If required, tie bars may be bent at right angles against the form and straightened into final position before the concrete of the adjacent lane is placed, or they may be placed in holes drilled through the forms.

Longitudinal sawed joints shall be cut by means of approved concrete saws to the depth, width and line shown on the Plans, not later than 4 days after placing concrete and before any equipment or vehicles are allowed on the pavement.

Immediately after sawing, all longitudinal contraction and construction joints shall be thoroughly cleaned of all residue by flushing with water under pressure.

5) Isolation Joints

Expansion joints shall be formed about all structures and features projecting through, into or against the slab by the use of premolded joint filler. Unless otherwise indicated, such joints shall be 3/4 inch in width.

(m) Sealing Joints

Joints shall be sealed in accordance with the requirements of Subsection 501.20 of TDOTSS, March 1, 2006.

(n) Protection of Pavement

The pavement shall be protected in accordance with the provisions of Subsection 501.21 of TDOTSS, March 1, 2006.

(o) Opening to Traffic

The Engineer shall decide when the pavement shall be opened to traffic. It shall not be opened to traffic until the field-cured concrete has attained a flexural strength of 550 psi, or a compressive strength of 3,500 psi. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Before opening to traffic, the pavement shall be cleaned.

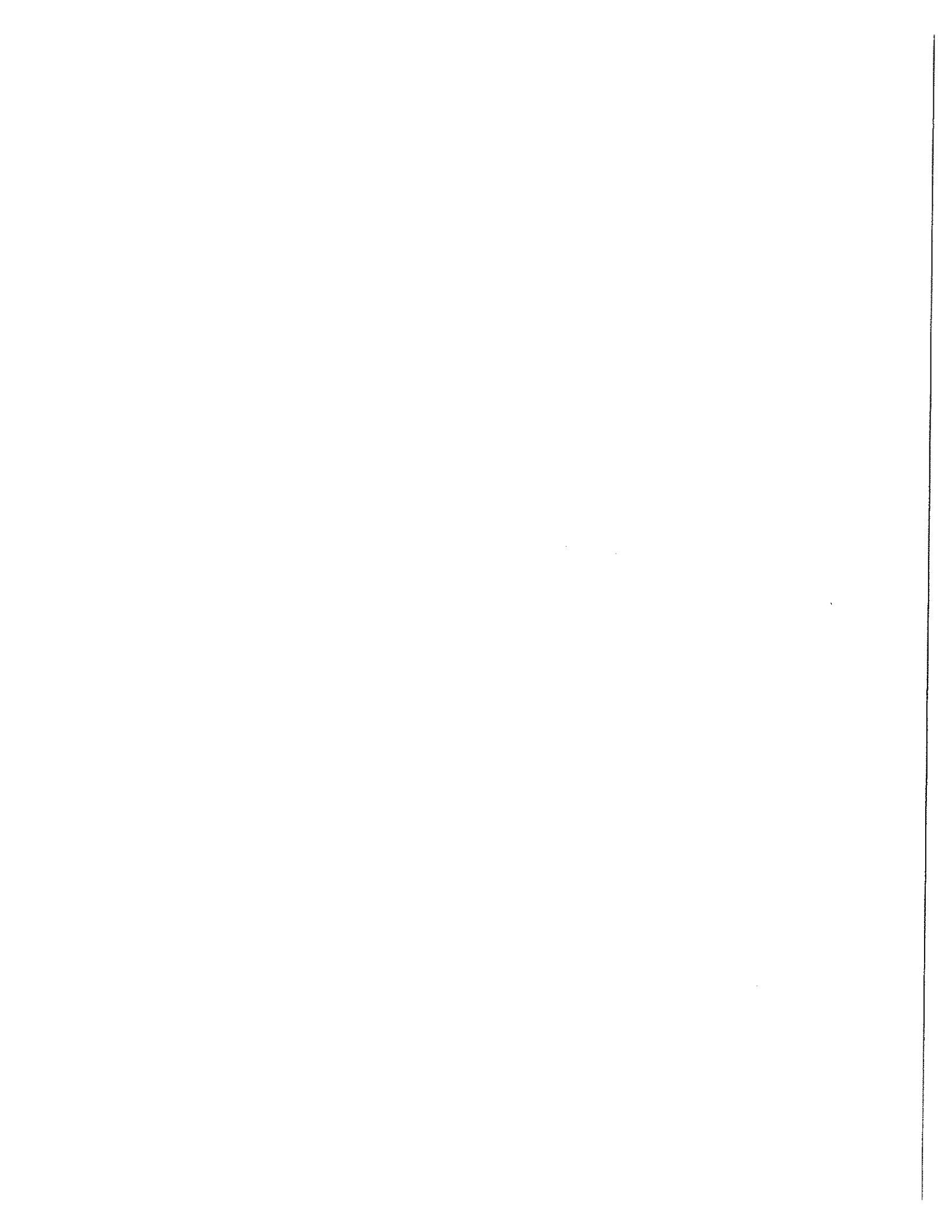
6. Method of Measurement

The quantity of pavement laid shall be the number of square yards of full-depth pavement. The number of square yards shall be determined by the Engineer after construction of the pavement has been completed.

7. Basis of Payment

The accepted quantities of concrete pavement will be paid for the contract unit price per square yard for the specified thickness for Portland Cement Concrete Pavement (Plain).

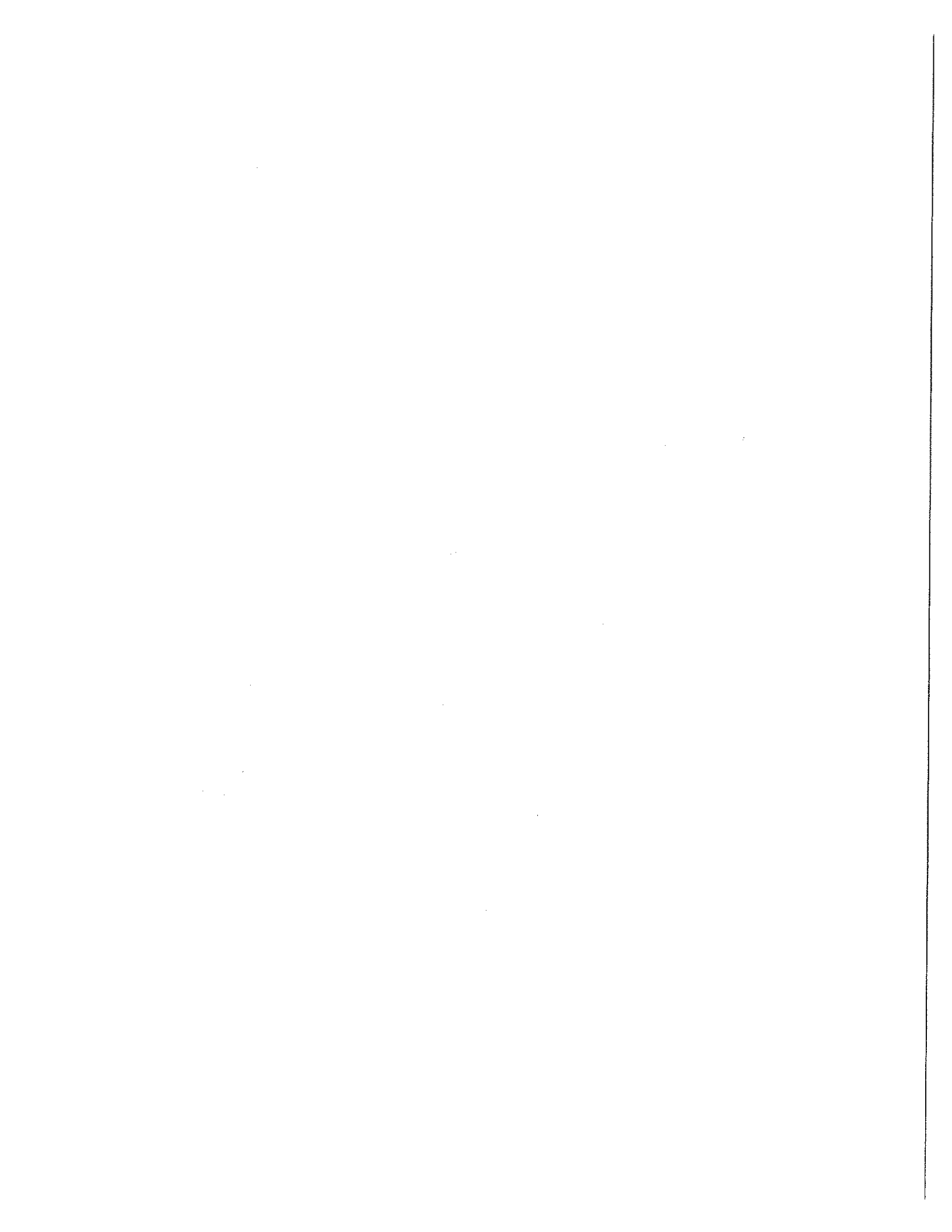
Payment shall constitute full compensation for furnishing and preparation of all materials, including all joints, joint fillers, dowels and reinforcing if required in the construction drawings or special provisions; placing, finishing, curing; and all labor, equipment, tools, incidentals, and testing necessary to complete these items. No additional payment over the contract unit bid price will be made for pavement which has an average thickness in excess of that shown on the Plans.





TECHNICAL SPECIFICATIONS
FOR
CONCRETE CURB, GUTTER, AND COMBINED CURB AND GUTTER

1. Description
This work shall consist of Curb, Extruded Curb, Gutter, or Combined Curb and Gutter constructed of portland cement concrete in accordance with these Specifications and in conformity with the lines, grades and dimensions shown on the Plans, or established by the Engineer.
2. Materials
 - (a) Materials shall meet the applicable requirements of Section 15, City of Knoxville Standard Specification for Concrete Structures together with Section 702 of TDOTSS, March 1, 2006, and all Special Provisions thereto dated prior to the advertisement of the Contract.
 - (b) Sampling and testing cement aggregates shall be performed as specified in Section 15-2(b) of these Specifications.
3. Equipment and Construction Requirements
Equipment and construction shall meet the requirements of Subsection 702.03 and 702.05 through 702.11 TDOTSS, March 1, 2006.
4. Method of Measurement
 - (a) Concrete curb, extruded curb, concrete gutter, and concrete combined curb and gutter will be measured for payment by the linear foot, complete in place. Sections formed by curb inlets shall not be measured for payment under this item.
 - (b) No measurement for payment will be made for excavation in preparing the foundation or for backfill materials, unless otherwise indicated on the plans, as these are a necessary part of the construction and a responsibility to be assumed by the Contractor.
5. Basis of Payment
These items will be paid for at the Contract unit price per linear foot for concrete curb, extruded curb, gutter, and combined curb and gutter, complete in place, which price shall be full compensation for work, materials, labor, and incidentals required to complete this item in accordance with the Plans and Specifications.





Section 13.0

Knoxville, Tennessee
March 2013

TECHNICAL SPECIFICATIONS
FOR
CONCRETE SIDEWALKS, DRIVEWAYS, AND MEDIAN STRIP

1. Description

- (a) This work shall consist of constructing sidewalks, driveways and median strip, except sidewalk driveways and median strip that is integrally a part of a structure, constructed of portland cement concrete, at the locations and to the dimensions, lines, grades, and cross section indicated on the Plans or as directed by the Engineer, and in conformity with the provisions and requirements set out in these Specifications.
- (b) Concrete sidewalk, driveway, and median strip shall include all the necessary excavation, unless otherwise indicated; the subgrade and subbase preparation; the backfilling; the final clearing up; and completing all incidentals thereto; as indicated on the Plans or as directed by the Engineer.

2. Materials

- (a) Materials shall meet the applicable requirements of Section 15, City of Knoxville Standard Specification for Concrete Structures together with Section 701 of the TDOTSS, March 1, 2006, and all Special Provisions thereto dated prior to the advertisement of the Contract.
- (b) Sampling and testing Cement Aggregates shall be performed as specified in Section 15 - 2(b) of these Specifications.

3. Equipment and Construction Requirements

Equipment and construction shall meet the requirements of Subsection 701.03 and 701.05 through 701.12 TDOTSS, March 1, 2006.

4. Method of Measurement

- (a) Concrete sidewalks, driveways, and medians will be measured for payment per square foot, complete in place.
- (b) The area shall be obtained from surface measurements. The area measured shall not exceed standard widths indicated on the plans, unless otherwise directed in writing by the Engineer.
- (c) Concrete sidewalks, driveways, and medians will be measured separately.
- (d) No measurement for payment will be made for excavation, subgrade preparation, jointing, jointing materials, or for backfill materials, unless the otherwise indicated on the Plans, as these are a necessary part of the construction and a responsibility to be assumed by the Contractor.

5. Basis of Payment

This item will be paid for at the Contract unit price per square foot for concrete sidewalk, driveway, and median, complete in place. The price shall be full compensation for all work, materials, labor and incidentals required to complete this item in accordance with the Plans and Specifications.



TECHNICAL SPECIFICATIONS
FOR
MINERAL AGGREGATE TRAIL BASE AND SURFACE
WITH 5% PORTLAND CEMENT

1. Description

This work shall consist of furnishing and placing one or more courses of aggregates and additives, if required, on a prepared subgrade in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses and typical cross-section shown on the Plans or established by the Engineer.

2. Materials

All materials used in this construction, in addition to the general requirements of these Specifications, unless otherwise stipulated, shall conform to the following:

- (a) Mineral Aggregate Trail Base and Surface (i.e., "CHATT") shall be crushed stone, Class A Aggregate for Micro-Surface, as specified in Subsection 903.05 and Subsection 903.12 of the TDOTSS, March 1, 2006, and all Special Provisions pertaining thereto through the date of advertisement for this Contract.

<u>Sieve Size</u>	<u>Total Percentage by Weight Passing Sieves</u>
3/8 inch	100
No. 4	70 - 98
No. 8	45 - 70
No. 16	30 - 55
No. 30	20 - 35
No. 50	12 - 25
No. 100	7 - 18
No. 200	4 - 12

- (b) Hydraulic Cement shall be Portland Cement as specified in TDOTSS Section 901.01 and shall conform to the specifications of AASHTO M 85.
- (c) Proportioning: The placed material shall contain 5% Portland Cement by weight.

3. Equipment & Construction Requirements

- (a) Equipment and Construction Requirements shall conform to Subsections 303.05 to 303.12 of the TDOTSS, March 1, 2006, and all Special Provisions Pertaining thereto through the date of advertisement of this Contract. In addition, the following compaction, will be required: Mineral Aggregate Trail Base and Surface shall be compacted to 100% of the Standard Proctor Density at 2% less than the optimum moisture content as determined by AASHTO T99 Method D.

- (b) The Portland Cement shall be mixed with the Class A aggregate for Micro Surface at such time and in such a way that the Portland Cement will be uniformly spread throughout the material. The Portland Cement shall be mixed with the Class A Aggregate for Micro-Surface and this mixture shall be transported in such a way that the Portland Cement neither settles nor separates from the aggregate. The moisture content of the Aggregate for Micro-Surface shall be controlled and the method and residence time in transport of the Class A Aggregate for Micro Surface once improved with the cementitious additive shall be controlled. Any Class A Aggregate for Micro Surface improved with Portland Cement which for any reason has become partially set or which contains lumps of caked cement at the location and time of placement will be rejected.
- (c) The maximum speed of trucks hauling or traveling over any part of the project under construction shall be 10 mph.

4. Method of Measurement

- (a) Mineral Aggregate Trail Base and Surface will be measured by the ton in place, as by the actual scale weight.
- (b) All moisture in the Aggregate at the time of weighing in excess of eight percent will be deducted from the weight of the Aggregate.
- (c) Any water added on the road will be at the Contractor's expense.

5. Basis of Payment

- (a) The accepted quantities of Mineral Aggregate Trail Base and Surface of the type specified will be paid for at the Contract unit price per ton, complete in place. This price shall be full compensation for all work, materials, including calcium chloride where specified and water; labor and other incidentals required to complete the work in accordance with the Plans and Specifications.
- (b) Payment will be made under the following bid item as set forth in the Bid Schedule:

Mineral Aggregate Trail Base and Surface



TECHNICAL SPECIFICATIONS
FOR
STORM SEWERS AND PIPE CULVERTS

1. Description

This work shall consist of the placing of precast concrete pipe, corrugated metal pipe, structural plate pipe and pipe arches, and all fittings as called for in the Plans and in accordance with the Specification including trench excavation, bedding, and backfill.

2. Materials

(a) Pipe Materials

- 1) Reinforced concrete pipe shall conform to AASHTO M 170 for the specified diameters and strength classes. Horizontal and vertical elliptical pipe shall conform to AASHTO M 207. Precast end sections shall conform to the above specifications to the extent to which they apply. The pipe shall have tongue and groove joints for mortar joints, or bell and spigot joints suitable for the use of a rubber gasket to be provided as a part of this item.
- 2) Corrugated metal pipe, pipe arches, and their coupling bands shall conform to AASHTO M 36 for the specified sectional dimensions and gauges. Special sections such as elbows and end sections shall be the same gauge as the pipe and conform to the applicable requirements of AASHTO M 36. All pipes and pipe arches shall be bituminous coated as specified on the Plans and conforming to AASHTO M 190 Specifications.
- 3) Structural Plate for pipe, pipe arches, arches and their accessories shall conform to the requirements of AASHTO M 167.
- 4) Each pipe shall be clearly marked to show its class or gauge, date of manufacture, name of manufacturer, and mark of approval by an approved commercial testing laboratory prior to delivery. All costs of inspection are to be included in the cost of furnishing and installing the pipe.
- 5) All pipe and special fittings shall be new materials which have not been previously used and free of any defects or damage.
- 6) Pipe sizes, class or gauge, and type of bituminous coating will be shown on the Plans. Size of the pipe is nominal inside diameter.

(b) Joint Material

- 1) Pipe joint mortar shall consist of one part Portland Cement and 1 parts sand with water necessary to obtain the required consistency. The materials used shall meet the requirements for these items as specified in the Standard Specifications for Concrete Structures.

- 2) Rubber Gaskets for concrete pipe shall be O-ring rubber gasket joints conforming to the requirements of AASHTO M 198 or an approved equal.
- 3) Joints for corrugated metal pipe, pipe arches, and fittings shall be coupling bands that have galvanized steel angles riveted near the ends and bolts through the angles to draw the bands tight.

(c) **Bedding Material**

Bedding Material shall consist of well-graded crushed stone or crushed gravel meeting the requirements of TDOTSS, March 1, 2006, Section 903, Grading Size No. 57 or No. 67.

(d) **Backfill Material**

Backfill Material for pipe in the roadway or less than 5 feet from the outside edge of the roadway shall be of quality and gradation as specified in Section 5, Subsection 2-a of these Specifications. Also, this backfill shall be compacted to 100% of the standard Proctor Density at 2% less than the optimum moisture content as determined by AASHTO T99, Method D. In addition, all backfill material for pipe more than 5 feet from the outside edge of the roadway shall be fine compactable soil free of sod, brush, roots, and other perishable material and stones having a maximum dimension of more than six (6) inches. Also, this material shall be compacted in layers of not more than six inches to 95% of the Standard Proctor Density at the optimum moisture content as determined by AASHTO T99, Method D.

3. **Equipment**

- (a) The Contractor shall provide all equipment necessary and required for the construction of storm sewers and culverts, and have all equipment on the project in proper working condition before construction will be permitted to begin.
- (b) The Contractor shall provide hoisting equipment to handle the pipe in unloading and placing in its final position, without damage to the pipe.
- (c) The Contractor shall provide mechanical tampers of a design or designs approved by the Engineer.

4. **Construction Requirements**

(a) **Excavation (unclassified)**

- 1) Excavation (unclassified) shall consist of the removal of all materials necessary for the construction of storm sewers, culvert pipes, other pipe lines and all drainage structures such as manholes, catch basins, junction boxes, head walls, wing walls and concrete collars.
- 2) Excavation shall be made in open cuts unless shown otherwise on the Plans. Excavation shall be made to the lines and grades shown on the Plans or established by the Engineer. The width of trenches shall be sufficient to permit satisfactory jointing of the pipe, but shall not exceed the width where specified for Class "A" Bedding and permit thorough tamping around the pipe. The bottom of the trenches shall be carefully cut to the required grade of the pipe except where bedding material or cradles are shown; in which case the excavation shall extend to the bottom of the

bedding or cradles as shown on the plans. Excavation around manholes, catch basins, junction boxes, and end walls shall be such as to allow proper compaction around the structure.

- 3) Any unsatisfactory material shall be excavated below the grades shown on the Plans as directed by the Engineer, and backfilled with bedding material or other approved material and compacted.
- 4) Any excavation below the elevations shown on the Plans other than unsuitable material as designated by the Engineer shall be filled at the Contractor's expense with properly compacted bedding material or concrete.
- 5) Pipe trenches shall not be excavated more than 400 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.
- 6) In all cases where materials are deposited along open trenches they shall be placed so that no damage will result to the work and/or adjacent property in case of rain or other surface wash.
- 7) Rocks and/or boulders not classified as rock excavation shall be removed to the limits of excavation and grades shown on the plans. The spaces created outside the excavation limits by such removal shall be backfilled with suitable material and compacted to the proper lines and grades.

(b) Rock Excavation

Rock excavation when specifically provided for in the Contract Documents and Plans shall be performed and paid for as set forth in Section 4 of the Standard Specifications for Sewer and Pipe Excavation.

(c) Laying and Bedding Pipe

- 1) Pipe shall be laid true to line and grade on a bed which is uniformly firm throughout its entire length. If material in the bottom of the excavation is of such character as to cause unequal settlement along the length of the storm sewer or culvert, the material shall be removed below the grade given, to such depth as ordered and shall be backfilled with bedding material and thoroughly tamped or otherwise compacted to insure an unyielding foundation.
- 2) Pipes shall be laid only on a foundation which is practically free of water.
- 3) Pipes shall be laid beginning at the downstream end of the pipe line. The lower segment of the pipe shall be in contact with the shaped bedding throughout its full length.
- 4) Concrete pipe shall be laid with the hubs or receiving ends up grade. The spigot or tongue end shall be inserted into the receiving end as far as the pipe will permit. Circumferential laps of corrugated metal pipe shall be placed facing upstream and any longitudinal seams at the sides.

- 5) Concrete pipe joints shall be made with portland cement mortar, rubber gaskets, or other joints recommended by the pipe manufacturer and approved by the Engineer.

When mortar joints are used the pipe ends shall be thoroughly cleaned and wetted before the joint is made. Stiff mortar shall then be placed so as to completely fill and seal the joint. The inner surface shall be finished smooth and any surplus material removed. The completed joint shall be protected against rapid drying by suitable covering material.

Rubber ring gaskets shall be installed so as to form a flexible watertight seal.

Other type joints that are permitted shall be installed according to manufacturer's specifications.

- 6) Each section or joint of corrugated metal pipe shall be securely attached to the adjoining section or joint of pipe with connecting bands or other approved type of joint and drawn or connected as to form a rigid joint.
- 7) Any breaks in the bitumen or treatment of bituminous coated pipe shall be refilled with the type and kind of bitumen used in coating the pipe originally.
- 8) The ends of pipe shall be rigidly supported to prevent any movement pending and during the construction of end supports.
- 9) Any pipe which is not in true alignment or which shows any settlement after laying or is damaged shall be taken up and relaid at the Contractor's expense.

(d) Bedding and Backfilling

- 1) The bed for the pipe shall be shaped as specified for Class B in the City of Knoxville Standard Drawing for Storm Pipe Bedding and Backfilling. If bell and spigot pipe is used, the area under the bell shall be excavated so that the barrel supports the entire weight of the pipe.
- 2) Bedding material shall be Mineral Aggregate Base, Section 5, No. 57 or No. 67 stone and the cost of furnishing and placing the bedding material shall be included in the bid price per linear foot.
- 3) After the pipe has been laid to line and grade and properly bedded, the backfill material shall be placed and where required compacted by means of a vibrator or mechanical tamper. Tamping by hand will not be permitted. The trench shall be filled in 6-inch lifts and each lift shall be compacted with mechanical tampers. Compaction shall be 100% of the Standard Proctor Density at 2% less than the optimum moisture content as determined by AASHTO T99, Method D.
- 4) Backfill of pipes, sewers and culverts under streets (or less than 5 feet from the outside edge of the roadway), curbs, gutters and sidewalks shall be accomplished with Mineral Aggregate Base Material meeting the requirements of Section 5 of these Specifications and compacted as herein above specified. The cost of the backfill is not a separate pay item and shall be included in the bid price per linear foot.

5) The bedding for pipe must be laid in a dry trench. Removal of water encountered in ditches, springs, etc. shall be considered a necessary part of construction and shall be handled by pumping, ditching or any other method satisfactory to the Engineer.

(e) Existing Utilities

1) All existing sewers, water lines, gas lines, underground conduits, telephone lines, electric lines, or other utilities or structures in the vicinity of the work shall be carefully protected by the Contractor from damage at all times.

5. Method of Measurement

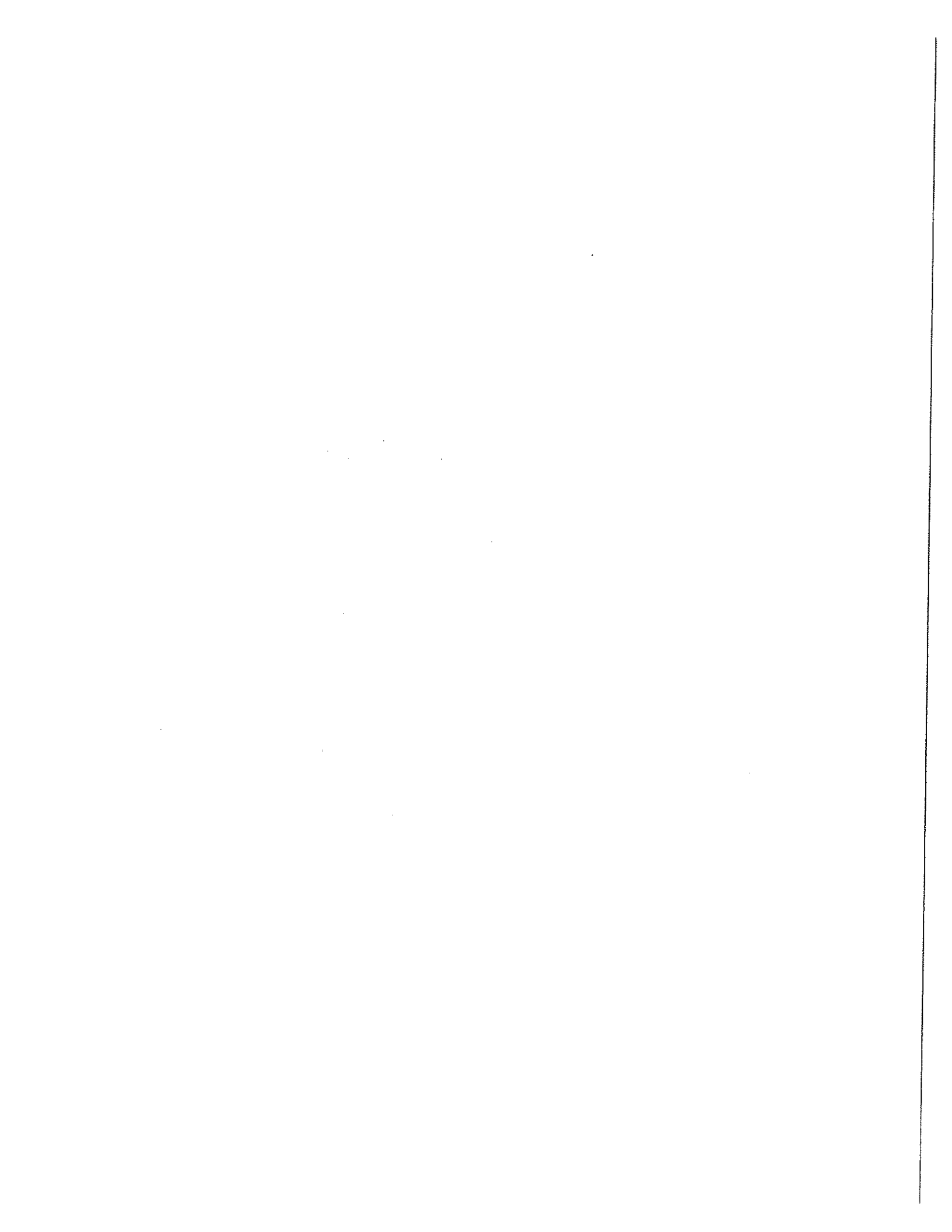
(a) The quantities of concrete pipe, corrugated metal pipe, corrugated metal pipe arches, and structural plate pipe arches shall be measured by the linear foot for each size and type of pipe and pipe arch shown on the Bid Schedule and shall be the horizontal length of pipe or pipe arch installed complete in place as measured along the centerline of the conduit from end to end with no deduction for fittings or bends.

(b) No separate payment will be made for unclassified or common excavation, bedding, or backfill. The cost of these items is to be included in the bid price per linear foot for pipe and pipe arch.

(c) Concrete for collars, cradles, piers, pipe protection and/or encasement shall be measured in cubic yards of concrete furnished and placed in accordance with Plan dimensions and these Specifications and payment for this item of work shall be made at the applicable unit price per cubic yard of the class of concrete placed as set forth under Standard Specifications for Concrete Structures.

6. Basis of Payment

The accepted quantities of pipe culverts and storm sewers, measured as provided for above, will be paid for at the Contract unit price per linear foot for each type, class, shape and size constructed, complete in place, which price shall be full compensation for labor and materials used in bedding, making joints and connections to other structures, for strutting, when required for backfilling, and for completing all incidentals necessary to complete the item in accordance with the Plans and Specifications.





TECHNICAL SPECIFICATIONS
FOR
MANHOLES, CATCHBASINS, INLETS, AND JUNCTION BOXES

1. Description
 - (a) This work shall consist of constructing the following drainage structures: manholes, catch basins, inlets, and junction boxes. Construction shall be in conformity to the lines, grades, dimensions, and sizes shown on the Plans or as directed by the Engineer.
 - (b) The height or depth of these drainage structures will vary with location, but unless otherwise shown on the plans, shall be such that the frames will match the grades and lines of the roadway surface and the invert will be at designed elevations.
 - (c) Cast iron frames, grates, and covers shall be provided as specified on the Plans.
 - (d) Connections to pipes and other existing structures as may be necessary as a required part of the construction.
2. Materials
 - (a) Concrete, cement, sand, and water shall conform to the applicable requirements of the Standard Specifications, Section 15.0, Concrete Structures. Concrete shall be Class A.
 - (b) Brick shall conform to AASHTO Designation M 91 Grade SM.
 - (c) Frames, covers, and grates shall be the type specified on the drawings. The castings shall conform to AASHTO Designation M 105, Class 30 (ASTM A 48, Class 30). All castings shall be true to pattern, to form and dimension, free from any faults or cracks, and cleaned of sand in a manner to provide a clean uniform surface. Bearing surfaces between frames and grates shall be machined to provide uniform bearing. Castings shall be treated with two coats of bituminous paint. All castings shall weigh at least 95% of the theoretical weight shown on the drawings. All castings shall have the date of manufacture cast into each unit.
 - (d) Round precast concrete structures shall conform to ASTM C 478. Square and rectangular precast concrete structures shall conform to ASTM C 913 for wall thickness, slab thickness, concrete strength and steel reinforcement requirements.
 - (e) Prior to delivery all basic materials specified herein shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the Engineer, certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable. All materials which fail to conform to these Specifications shall be rejected. After delivery to the site, any materials which have been damaged in transit or are otherwise unsuitable for use in the work shall be rejected and removed from the site.

3. Construction Requirements

(a) General

- 1) Manholes, inlets, catch basins, and junction boxes shall conform to the Standard Detail Drawings and Specifications. Deviations from these drawings may be approved by submitting a detailed drawing to the Engineer before construction begins. When poured concrete is to be used instead of brick, a minimum wall thickness of 8 inches for unreinforced concrete and 6 inches for reinforced concrete must be used on the detailed drawing submitted.
- 2) Structural excavation and backfill shall be done in accordance with the Standard Specifications for Grading.
- 3) After the foundation has been prepared, the bottom shall be constructed to the required lines and grades. After the bottom has been allowed to set for at least 24 hours, the structure shall be constructed with care being exercised to form the incoming and outgoing sewer pipes into the walls of the structure at the required elevations. Pipe shall be placed in 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 so there will be no leakage around the outer surface. Inverts shall be constructed as shown on the drawings, and be smooth and accurately shaped to the same cross section as the invert of the sewer pipes which they connect.
- 4) Cast iron frames shall be set in cement mortar beds accurately to line, finished elevation, slope, and crown so that subsequent adjustments will not be necessary.
- 5) After the masonry and frames have time to set, but in no case less than 24 hours, the space around the drainage structure shall be backfilled and compacted to the required grade. The interior shall be cleaned of debris and excess material, the grating or cover placed, and all unused material, equipment, tools, and debris removed from the area.

(b) Precast Reinforced Concrete Manholes

- 1) Precast sections shall consist of reinforced concrete sections manufactured, tested, and marked in accordance with the provisions of AASHTO Designation M 199 (ASTM C 478).
- 2) Each section of the precast manhole shall have not more than three holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with stoppers or mortar after installation.

(c) Drop Manholes

- 1) Where the difference in the invert elevation of a sewer 18 inches in diameter or smaller and any other sewer intersecting in one manhole is 3 feet or more, a drop manhole shall be constructed as shown on the plans. They shall be similar in construction to the standard manhole except that a drop connection of pipe and fittings of the proper size and material shall be constructed outside the manhole and supported by Class A concrete.

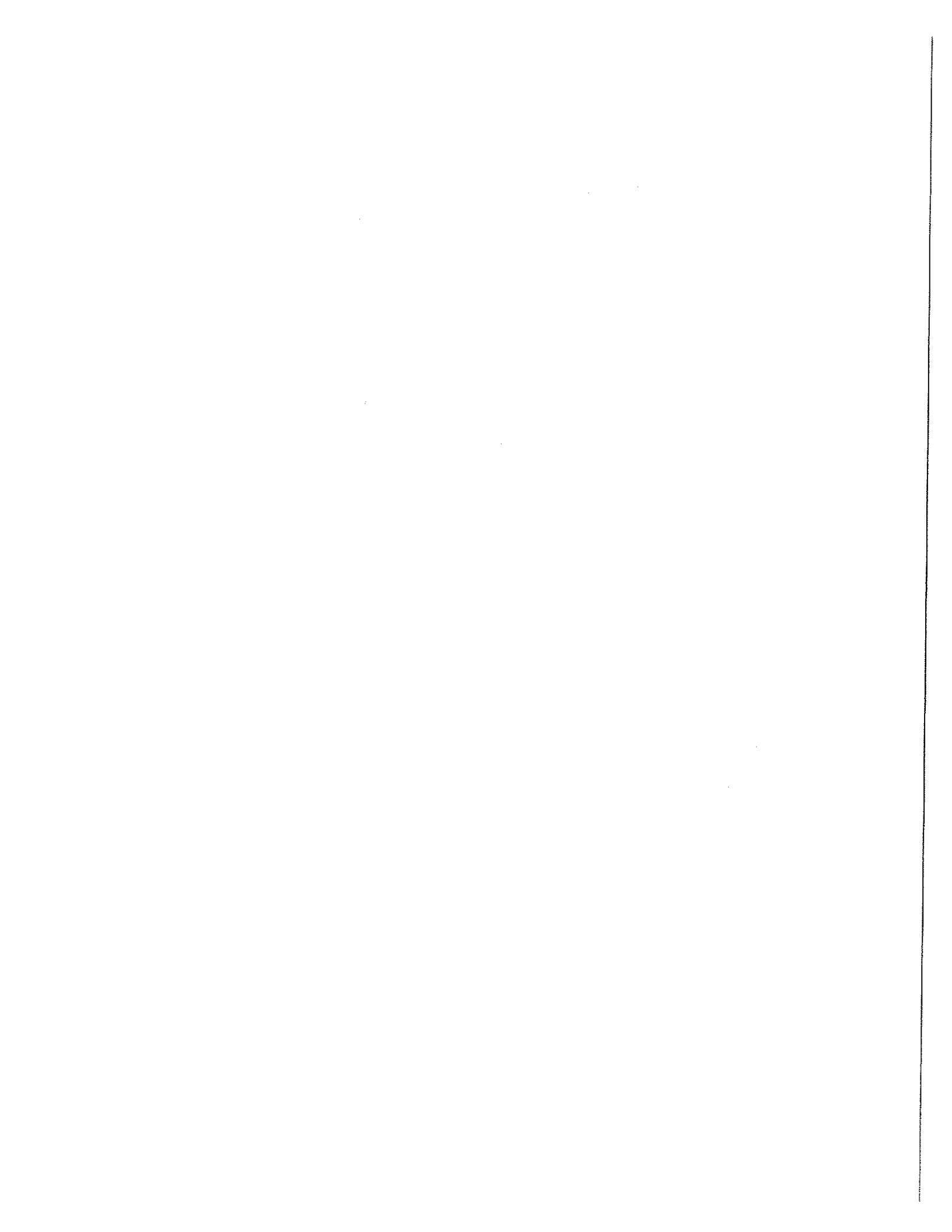
4. Method of Measurement

- (a) Manholes, catch basins, inlets, and junction boxes will be listed on the Bid Schedule for each type as detailed on the Plans.
- (b) The quantity of each type of drainage structure for which payment will be allowed shall be the actual number constructed by the Contractor in accordance with the Plans and Specifications accepted by the Engineer.

5. Basis of Payment

Payment shall be made for the quantities as measured and listed under the applicable pay items in the Bid Schedule.

Payment shall constitute full compensation to the Contractor under this item and shall cover the cost of furnishing all labor, materials, tools, plant equipment, services and other expenses in connection with the construction of manholes, inlets, catch basins and junction boxes complete in place including common excavation, shoring, backfill, masonry, castings, concrete reinforcing steel, inspection and test, all as herein specified and shown on the Plans.





TECHNICAL SPECIFICATIONS
FOR
ADJUSTING STORM SEWER FRAMES

1. Description

This item shall consist of adjusting storm sewer frames and furnishing all labor, materials, and other items necessary to bring them to the grades as shown on the Plans or as specified by the Engineer.

The adjustment of frames includes only storm sewer frames, such as storm sewer manholes, and catch basins. All other frames such as water, electric, gas, etc. shall be adjusted by the Knoxville Utilities Board or other companies and are not included as a part of this Contract unless otherwise noted.

2. Materials

- (a) Concrete or mortar shall be Class A. Mortar shall be one part Portland cement and two parts sand. Concrete materials shall comply with the Specifications for Concrete.
- (b) Brick shall conform to AASHTO M91, Grade SM. Sand for mortar shall conform to AASHTO M45. Hydrated lime shall conform to ASTM C 206.
- (c) Backfill material shall conform to the Specifications for Mineral Aggregate Base.

3. Construction Requirements

- (a) All Sewer frames shall be reset as follows:
 - 1) Manholes that are more than 1/4 inch over or under the specified grade.
 - 2) Catch basins that are specified on the Plans or determined necessary by the Engineer.
- (b) The sewer frames shall be accurately set to line and grade by one of the following methods:
 - 1) Removing the frame and cover grating and raising or lowering the masonry top of the structure and resetting on a cushion of cement mortar and brick.
 - 2) Use of an adjustment ring fitted to the manhole frame.
- (c) Excavation shall be performed whenever necessary to bring the frames to grade on the Plans and as designated by the Engineer. Backfill material and compaction shall conform to the Specifications for Mineral Aggregate Base.
- (d) All frames shall be thoroughly cleaned of all excess mortar and accumulations of silt, clay, debris or foreign matter of any kind and shall be free from such at the time pavement is to be laid.

(e) Flat metal manhole covers shall be temporarily placed immediately ahead of the paver so that the paver shall never pass over crowned manholes. A sufficient number of flat covers shall be available on the job site to allow the paving operation to progress smoothly.

4. Measurement

The number of storm sewer frames adjusted and accepted will be measured for payment per each.

5. Payment

Payment will be made at the Contract unit price per each frame adjusted and shall be full compensation for all work, materials, labor, and incidentals required to complete the work in accordance with the Plans and Specifications.



TECHNICAL SPECIFICATIONS
FOR
RIP RAP

1. Description

This work shall consist of furnishing and placing one or more classes of crushed or fractured limestone on a prepared surface in accordance with these Specifications and in reasonably close conformity with the sizes, thicknesses and typical cross-section shown on the Plans or established by the Engineer.

2. Materials

All materials used in this construction, in addition to the general requirements of these Specifications, unless otherwise stipulated, shall conform to the following:

Class I

Stones ranging from 1" to 5" with 75% greater than 4".

Class II

Stones ranging from 6" to 10" with 75% greater than 8".

Class III

Stones ranging from 9" to 12" with 75% greater than 11".

Class IV

Stones ranging from 12" to 18" with 75% greater than 15".

3. Preparation of Foundation

Immediately prior to the construction of rip rap, the sand filter bed, filter fabric surface or natural ground surface shall be trimmed within reasonably close conformity to the lines and grades indicated on the Plans or as directed by the Engineer. The natural ground or sand filter bed shall be thoroughly compacted by the use of hand or mechanical tamps. On slopes, the bottom of the rip rap shall be placed at least 2 feet below the natural ground surface, unless otherwise directed.

4. Construction

Rip rap shall be constructed upon the prepared foundation by hand placing, so that the stones shall be as close together as is practicable, in order to reduce voids to a minimum.

When rip rap is constructed in more than one layer, it shall be placed so that it will be thoroughly tied together with the larger stone protruding from one layer into the other.

The standard depth of rip rap shall be 12 inches for Class I, and Class II, 18 inches for Class III and 24 inches for Class IV, unless otherwise directed; and in no instance shall be less than 10 inches in depth.

The main stones shall be thoroughly "chinked" and filled with the smaller stones by throwing them over the surface in any manner that is practical to fill the voids. Napping

the stones will not be required, except stones protruding more than 4 inches above what is considered normal surface of the stones.

5. Method of Measurement

Rip rap will be measured by the ton, complete in place. The volume shall be obtained from the thickness shown on the Plans and surface measurement. No measurement for payment will be made for excavation or for preparing the foundation for rip rap.

6. Basis of Payment

Accepted quantities of rip rap will be paid for at the Contract unit price per ton, and measured as set out above, complete in place.

Payment will be made under:

<u>Description</u>	<u>Unit</u>
Rip Rap Class I	Tons
Rip Rap Class II	Tons
Rip Rap Class III	Tons
Rip Rap Class IV	Tons



TECHNICAL SPECIFICATIONS
FOR
TOPSOIL

1. Description

Topsoil shall consist of a soil conforming to the requirements of these Specifications, obtained from locations indicated on the Plans or approved by the Engineer, and placed in conformity with the provisions and at locations specified.

Suitable topsoil which has been stripped off of excavation and embankment areas of roadway construction projects shall be stockpiled as directed by the Engineer and later used before additional topsoil is hauled on to the work site. Unsuitable material shall not be included in these stockpiles and shall be wasted as directed by the Engineer.

2. Materials

- (a) Topsoil shall consist of the natural loam, sandy loam, silt loam, or clay loam humus-bearing soils adapted to the sustenance of plant life, and such topsoil shall be neither excessively acid or alkaline.
- (b) Topsoil shall be free from foreign material such as hard pan, stones larger than one inch diameter, concrete, cinders, brick asphalt, or other undesirable materials. It shall also be reasonably free from weeds and objectionable plant material.

3. Construction Requirements

- (a) All areas designated to be covered with topsoil shall be undercut or underfilled to such a degree so that when covered to the required depth with topsoil the finished work will be in accordance with the required lines, grades, slopes, and cross sections.

Such work in fill areas shall be considered subsidiary to the item of Topsoil and no additional compensation will be made, nor will allowance be made in the final measurement for the quantities of Grading. (See Standard Specifications for Grading Subsections 4(a) and 4(d).)

- (b) All areas from which topsoil is procured shall be cleared, if necessary, by means of mowing weeds or other vegetation to a height of approximately 6 inches and freed from any litter such as brush, rock, or foreign material of objectionable size or quantity.
- (c) The available humus-bearing soil shall then be stripped off to such depth as available, or as necessary to produce sufficient volumes to cover the designated areas to the required depths, taking all practicable care to avoid incorporation of any of the underlying sterile soil therewith.

The topsoil thus stripped from these areas may be stockpiled on any convenient place on the right-of-way so that it can be reclaimed and spread on the areas designated, or it may be placed directly on the designated areas provided they have been prepared to receive the same.

- (d) After the areas upon which the topsoil is to be placed have been prepared and finished to the required lines, grades, slopes, and cross section, the topsoil shall be placed and spread thereon to a uniform depth as shown on the Plans or required in the Contract, or if none is so shown, to a depth of 3 inches.
- (e) All clods and lumps shall be broken down by means of harrows, discs or other appropriate equipment to provide a uniformly textured soil.
Rocks, twigs, large clods that will not break down, and other foreign material shall be removed and the entire surface shall be dressed to present a uniform appearance. Rolling will not be required.
- (f) If the quantity of topsoil available in the right-of-way is insufficient, the Contractor shall make up the deficiency with topsoil from a source outside the right-of-way.

4. Method of Measurement

- (a) Topsoil will be measured for payment by the cubic yard.
- (b) The volume of topsoil, in cubic yards, for which payment shall be made shall be computed by multiplying the area of ground actually covered by the nominal depth of topsoil as indicated on the Plans or as directed by the Engineer. No payment shall be made for any area where the average depth in place measured in the field is significantly less than the nominal depth indicated on the Plans or as directed by the Engineer. Payment shall be made only for that yardage actually used and required in accordance with the requirements and provisions set out in these Specifications or as directed by the Engineer.
- (c) Topsoil not required, will not be measured for payment.

5. Basis of Payment

This item will be paid for at the Contract unit price per cubic yard for topsoil, complete in place, which price shall be full compensation for all work, materials, labor, maintenance and other incidentals necessary to complete the item, in accordance with the Plans and Specifications.



TECHNICAL SPECIFICATIONS
FOR
EROSION PREVENTION AND SEDIMENT CONTROL

1. Description

This work shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of the Contract to control soil erosion and water pollution. Such measures shall include, but are not limited to, the use of silt barriers, fiber mats, netting, mulches, grasses, slope drains, and other control devices. Erosion prevention and sediment control (EPSC) measures as described herein shall be applied to any erodible material exposed by any activity within the project limits.

2. Materials

- (a) Seeding – Seed, mulches, fertilizer, agricultural limestone and other materials for seeding shall conform to ES-08 of the City of Knoxville’s BMP Manual.
- (b) Sodding – Sod, fertilizer, agricultural limestone and other materials for sodding shall conform to the ES-09 of the City of Knoxville’s BMP Manual.
- (c) Temporary Slope Drains – Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, sod or other materials acceptable to the Engineer that will adequately deter erosion. Must be installed and maintained as per ES-21 of the City of Knoxville’s BMP Manual.
- (d) Silt Barriers
 - 1) Silt barriers may be brush or rock filter berms, baled straw barriers, or silt fences.
 - a. Brush or rock filter berms shall consist of brush, trees and trimmings, shrubs, plants and other approved refuse from the clearing and grubbing operation. Must be installed and maintained as per ES-17 of the City of Knoxville’s BMP Manual.
 - b. Baled straw barriers shall consist of two rows of tightly baled straw, plastic or wire binding preferred to twine, firmly anchored to the ground with steel drift pins or wooden stakes. Must be installed and maintained as per ES-15 of the City of Knoxville’s BMP Manual.

- c. Silt fences shall consist of an approved fabric filter, Mirafi 140 or equivalent, suitable supported by a woven wire fence. Must be installed and maintained as per ES-14 of the City of Knoxville's BMP Manual.

3. Construction Methods

(a) General

- 1) Prior to or simultaneously with the clearing and grubbing operations, the Contractor shall install EPSC devices in accordance with the approved erosion control plan. Such work may involve the construction of temporary berms, dikes, dams, silt fences, sediment basins, lined channels, permanent cut-off ditches, slope drains or other control devices as necessary to prevent erosion and control sediment. Water from cofferdams is not to be pumped directly into streams, but is to be pumped into sediment ponds or traps. No grading shall be performed until the EPSC devices are in place to the satisfaction of the Engineer. Areas to be graded shall not be cleared and grubbed more than 14 calendar days prior to beginning grading operations in such areas, without temporary stabilization. Areas to be graded that are steeper than 3:1 shall not be cleared and grubbed more than 7 calendar days prior to beginning grading operations in such areas, without temporary stabilization. Stockpiled topsoil or fill material is to be treated so the sediment runoff will not contaminate surrounding areas or enter nearby streams. In order to reduce sediment in runoff, EPSC measures shall be installed promptly during all construction phases.

The Contractor's operations shall be staged so that graded or otherwise disturbed erodible surfaces are protected as the work progresses. Once the Contractor begins grading for a roadway cut or embankment, he shall maintain a continuous, viable operation to complete the cut or embankment to subgrade elevation, unless otherwise approved in writing by the Engineer. Exposed erodible cut or embankment slopes shall be final dressed, topsoiled and protected with permanent seeding or sodding in vertical increments not exceeding 25 feet as the work progresses; and no portion of these slopes shall remain unprotected for more than 14 calendar days (7 days when slopes are steeper than 3:1). Temporary erosion control measures shall be implemented as required in the SWPPP or other EPSC plan or as directed by the Engineer.

Seeding or sodding operations shall be initiated within 48 hours after any one of the following conditions occurs:

- a. Each 25 foot vertical increment is graded, or
- b. Upon suspension or completion of grading operations in a specific area.

The above requirements for progressive EPSC also apply to graded areas off

the rights-of-way such as waste area, borrow areas and haul roads.

The Contractor shall incorporate all permanent EPSC measures into the project at the earliest practicable time. Temporary EPSC measures shall be used to control erosive conditions that warrant protection prior to installation of permanent control features or that are needed to temporarily control erosion or siltation that develops during construction but which is not associated with permanent control features on the Project.

- 2) In the event of conflict between these requirements and EPSC laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules or regulations shall apply.
 - 3) The temporary EPSC measures installed by the Contractor shall be appropriately maintained by the Contractor until the completion of the Project, and he shall remove such installation if ordered by the Engineer. Any materials removed shall become the property of the Contractor.
 - 4) In case of repeated failure on the part of the Contractor to control erosion, pollution and siltation, the Engineer reserves the right to employ outside assistance or to use his own forces to provide the necessary corrective measures. Such incurred direct costs plus project engineering costs will be charged to the Contractor and appropriated deductions made from the Contractor's monthly progress estimate.
- (b) Seeding – Temporary seeding shall conform to the standard Specifications for Seeding except agricultural limestone need not be applied.
- (c) Sodding – Sodding shall conform to the Standard Specifications for Sodding. Care must be taken to properly anchor the sod to prevent any washouts. Seeding – Temporary seeding shall conform to the standard Specifications for Seeding except agricultural limestone need not be applied.
- (d) Temporary Slope Drains

Temporary slope drains shall consist of metal pipe, plastic pipe, flexible rubber pipe, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to installation of permanent facilities or growth of adequate ground cover on the slopes.

All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base for temporary slope drain shall be compacted and concavely formed to channel the water or hold the slope drain in place. The inlet end shall be properly constructed to channel water into the temporary slope drain. Energy dissipaters, sediment basins or other approved devices shall be constructed at the outlet end of the slope drains to reduce erosion downstream. An ideal dissipater would be dumped rock or a small sediment basin which would slow the water as well as pick up some sediment. All temporary

slope drains shall be removed when no longer necessary and the site restored to match the surroundings.

(e) Silt Barriers – Silt barriers shall be constructed by one of the methods listed below. It shall be the Contractor's choice of which barrier to use unless the silt barrier type is specified in the plans.

- 1) Brush or rock filter berms shall consist of brush, trees and trimmings, shrubs, plants and other approved refuse from the clearing and grubbing operations. The brush barriers shall be constructed approximately parallel to original ground contour, placed at the bottom of fill slopes to trap and retain sediment. The top of the brush barrier shall be at least five (5) feet below finished roadway grade. The brush barrier shall be compressed to an approximate height of three (3) to five (5) feet and an approximate width of five (5) to ten (10) feet. The embankment shall not be supported by the construction of brush barriers.
- 2) Baled Hay or Straw Erosion Checks – Hay or straw erosion checks shall be embedded in the ground a minimum of 4 inches to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales can remain in place until they rot, or be removed after they have served their purpose, as determined by the Engineer. The Contractor shall keep the checks in good condition by replacing broken or damage bales immediately after damage occurs. Normal debris clean-out will be considered routine maintenance.
- 3) Silt fences shall consist of an approved fabric filter, Mirafi 140 or equivalent, suitable supported by a woven wire fence, and are located at the bottom of fill slopes to trap and retain sediment. Fence posts may be wood or metal securely anchored to the ground on centers not to exceed twelve (12) feet. The woven wire fence shall be from two (2) to four (4) feet in height as required, and the mesh openings shall be 4" x 4".

The Contractor shall be required to maintain the silt fence and filter barriers in a satisfactory condition for the duration of the Project or until its removal is requested by the Engineer. The silt accumulation at the fence may be left in place and seeded, removed, etc. as directed by the Engineer. Unless otherwise directed by the Engineer, all silt fence or filter barrier shall be removed prior to completion of the Project and shall become the property of the Contractor.

The Contractor shall install and maintain all temporary EPSC measures until no longer needed or permanent control measures are installed. Any materials removed shall become the property of the Contractor. In order to insure EPSC measures work properly, it is imperative the sediment be removed; therefore, inspection and maintenance of EPSC measures is to be performed on a regular basis. During sediment removal, the Contractor shall take care to insure that structural components of EPSC measures are not damaged and

thus made ineffective. If damage does occur, the Contractor shall repair the EPSC measure at his own expense. Upon complete removal of sediment traps, special ditches, etc., the area where they were constructed is to be topsoiled, seeded and mulched.

In the event that temporary EPSC measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of work as scheduled, and are ordered by the Engineer, such work shall be performed by the Contractor at his own expense.

(f) Sediment Structures

- 1) Sediment structures can be utilized in many locations to control sediment; at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; in the ditch lines on borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures must be installed and maintained as per the City of Knoxville's BMP Manual.
- 2) When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, all excavation backfilled and properly compacted and the existing ground restored to its natural or intended conditions.

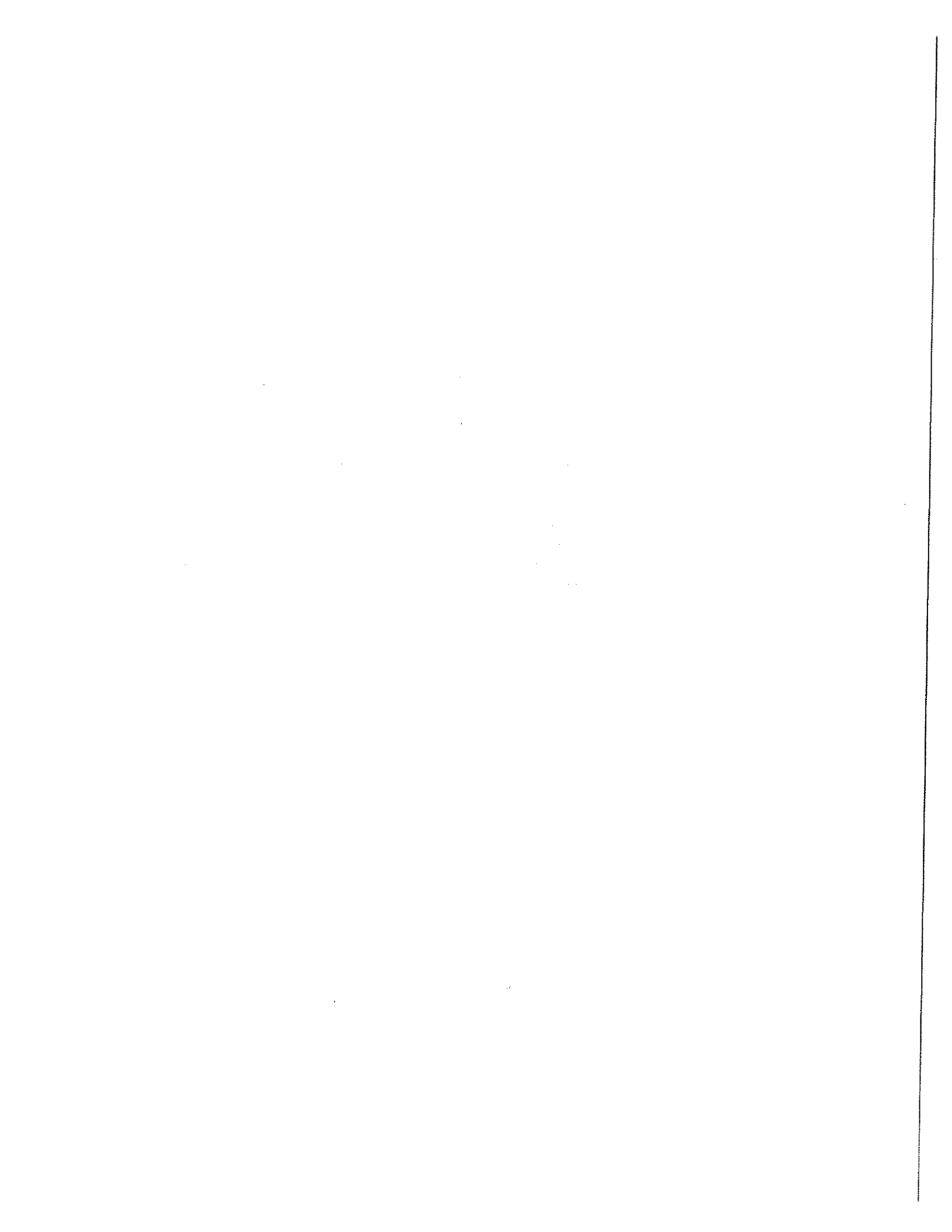
4. Method of Measurement

EPSC will be measured by the unit for the completion of the work as described above, and payment will be made on a lump sum basis.

<u>% of Total Contract Amount on Estimate</u>	<u>% Allowed This Item</u>
Not Less Than	
10%	50%
50%	75%
100%	100%

5. Basis of Payment

Partial payments for EPSC measures will be made on the basis of a percentage of the lump sum payment line item for EPSC as indicated above. Full payment for EPSC will be made in accordance with the provisions set out in the payment schedule above, which price shall be full compensation for the installation, maintenance, repair of EPSC measures as per the SWPPP, and any and all additional EPSC measures necessary to comply with all City of Knoxville and TDEC water quality and EPSC regulations, regardless of the number of times such items need to be installed, maintained, or repaired.





TECHNICAL SPECIFICATIONS
FOR
PAVEMENT MARKINGS AND TEMPORARY PAINT

1. Description

This work shall consist of furnishing and supplying pavement markings to be applied on asphaltic concrete surfaces at the direction of the Engineer. This work will be accomplished after the entire paving has been completed. All work shall be in accordance with the Manual on Uniform Traffic Control Devices. Temporary pavement marking will be paid under this item.

2. Materials

Reference for material specification is made to the TDOTSS, March 1, 2006, and any applicable special provision thereto. Specific reference is made to Section 716, Pavement Markings.

3. Equipment

All equipment necessary for the placing of pavement markings shall meet the above-mentioned TDOTSS, March 1, 2006.

4. Measurement

- (a) Pavement Marking (Line) - The mileage of line complete in place and accepted, shall be measured along the center of each line. Where double solid barrier lines are used, each solid barrier line will be measured separately for payment. Where broken lane lines are used, only the marked line will be measured for payment. For quantities of Pavement Marking (Line) less than one mile, the accepted method of measurement shall be linear feet.
- (b) Pavement Marking (Crosswalk Striping) and Pavement Marking (Stop Bar) - The length of each striping complete in place and accepted will be measured in linear feet to the nearest foot along the center line of each pavement marking.
- (c) Pavement Marking (Channelization Striping) - The area of channelization striping including the boundary lines complete in place and accepted shall be measured and computed in square yards to the nearest square yard.
- (d) Pavement Marking (Designs) - Designs or lettering will be measured for payment by the unit (each) complete in place or as stipulated in the Contract and on the Plans.
- (e) Pavement Marking (Raised Reflective) and Pavement Marking (Snowplowable Reflective) - The number of each type of pavement markers installed as directed and accepted will be counted separately for payment.
- (f) Removal of Existing Painted Line- The removal of broken lane line and solid barrier line will be measured along the center of each line. Only the painted line will be measured for payment.

5. Basis of Payment

- (a) The Contractor shall be required to establish and locate all non-passing zones as well as provide the layout of all pavement markings for approval of the Engineer prior to placement of markings.
- (b) Payment will be made under the following bid items as set forth in the Bid Schedule:

<u>Pay Item</u>	<u>Unit</u>
Pavement Marking (Line)	Lin. Mi.
Pavement Marking (Line)	Lin. Ft.
Pavement Marking (Cross-walk Striping)	Lin. Ft.
Pavement Marking (Stop Line)	Lin. Ft.
Pavement Marking (Channelization Striping)	Sq. Yd.
Pavement Marking (Designs)	Ea.
Pavement Marking (Raised Reflective)	Ea.
Pavement Marking (Snowplowable Reflective)	Ea.
Removal of Existing Painted Line	Lin. Ft.



TECHNICAL SPECIFICATIONS
FOR
PAINTED PAVEMENT MARKING

1. Description

This work shall consist of furnishing and installing a multiple component, retroreflective traffic marking system in accordance with this provision and in reasonably close conformity to the lines, dimensions, patterns, locations, and details shown on the plans or established by the Engineer. This specification describes the system which consists of an acrylic, high build, fast drying, white and yellow waterborne traffic marking paint; bonded core elements; and glass beads that can be used on bituminous and Portland cement concrete pavements. The waterborne traffic marking paint shall be applied by spray method onto asphalt cement concrete and Portland cement concrete surfaces and immediately followed by the application of bonded core reflective elements and glass beads. Upon drying, the resulting traffic marking shall be adherently reflectorized and capable of resisting deformation by traffic. This work will be accomplished after all paving has been completed. All work shall be in accordance with the Manual on Uniform Traffic Control Devices. Temporary pavement marking will not be paid for under this item.

2. Materials

a. General- The markings shall be comprised of a durable, low VOC, fast drying, white and yellow waterborne traffic paint with an acrylic polymer emulsion and with reflective media adhered to the paint. The reflective media shall consist of glass beads as well as bonded core reflective elements.

b. Composition

i. Waterborne Traffic Marking Paint- The finished paint shall be formulated and manufactured from first-grade materials and shall be a fast drying, water based, acrylic resin type paint capable of withstanding air and roadway temperatures without bleeding, staining, discoloring, or deforming.

1. Condition in the Container - The paint, as received, shall show no evidence of; biological growth, corrosion of the container, livering or hard settling. The paint shall be returned to a smooth and homogeneous consistency, which is free from; gel structures, persistent foam or air bubbles, using only hand mixing.

2. Shelf life - When stored in a three-quarters filled can for a period of thirty days, the paint shall be in a homogeneous state with no skinning, curdling, hard settling or caking that cannot be readily remixed.

3. Degree of Settling, minimum, ASTM D869

<u>White</u>	<u>Yellow</u>
7	7

A 500 ml (1 pint) paint can is filled with a well-mixed sample. The can is capped and allowed to set undisturbed at 23±2°C and 50±5% relative humidity for 14 days. The settling is then determined as specified in ASTM D869. The 1-quart laboratory samples of each batch, as received, shall also pass this test.

4. Nonvolatile Content, Weight %, ASTM D2369

<u>White</u>	<u>Yellow</u>
77	76
±2.0	±2.0

5. Pigment Content, Weight %, ASTM D3723

<u>White</u>	<u>Yellow</u>
60	58
±2.0	±2.0

6. % Nonvolatile in Vehicle (%NVV), Weight %, minimum

<u>White</u>	<u>Yellow</u>
42	42

Calculated as; % NVV = $\frac{\% \text{ Nonvolatile Content} - \% \text{ Pigment}}{100 - \% \text{ Pigment}} \times 100$

7. Density, g/ml at 25°C, ASTM D1475

<u>White</u>	<u>Yellow</u>
1.68± 0.04	1.63± 0.04
(14.0 lbs/gallon)	(13.6 lbs/gallon)

8. Consistency, K.U. at 25±1°C, ASTM D562A

<u>White</u>	<u>Yellow</u>
80-95	80-95

9. Fineness of Dispersion, Hegman, minimum, ASTM D1210

<u>White</u>	<u>Yellow</u>
3.0	3.0

10. Dry to No Pick-Up Time, without beads, minutes, maximum, ASTM D1640

<u>White</u>	<u>Yellow</u>
10	10

11. Dry Through, at 90% Relative Humidity, minutes, maximum, ASTM D1640

<u>White</u>	<u>Yellow</u>
120	120

A 15 mil wet film of the candidate paint placed immediately in a humidity chamber maintained at 72.5°F±2.5°F and 90%±3% relative humidity shall have a "dry-through" time less than, equal to, or up to 15 minutes longer than the specifier's laboratory reference paint when run at or close to the same time.

Alternatively, 120 minutes maximum dry through can be used. The dry through time must be tested in accordance with ASTM D1640, except that the pressure exerted will be the minimum needed to maintain contact between the thumb and film.

12. Volatile Organic Compounds (VOC), grams per liter of paint, excluding water, maximum

<u>White</u>	<u>Yellow</u>
150	150

Use ASTM D3960 or other approved method in effect at the time of paint manufacture to determine the VOC level and water content of the paint.

13. Flashpoint, °C, minimum, ASTM D93 Method A

<u>White</u>	<u>Yellow</u>
60	60

14. Flexibility, ASTM D522 Method B

<u>White</u>	<u>Yellow</u>
Pass	Pass

Use 100x150 mm tin-plated steel panels 250µm thick. Prepare the panel by lightly buffing one side with Grade 0 (medium-fine) steel wool, followed by cleaning with toluene and drying. Draw down the paint on the buffed side of the panel to a wet film thickness of 130µm. Air dry the panels for 24 hours at standard conditions, then bake for 5 hours at 105±2°C and finally condition the panel for 30 minutes at standard conditions. Bend the panel 180° over a 13 mm mandrel in 1 second, then examine under a magnification of 10 diameters. The paint film shall not; crack, chip, or flake when the panel is bent around the mandrel.

15. Appearance

<u>White</u>	<u>Yellow</u>
Pass	Pass

Draw down a 330µm thick wet film of the paint on a glass plate and allow to dry for 24 hours at standard conditions. The paint shall produce a film, which is smooth, uniform, and free from; grit, undispersed particles, craters, pinholes and cracking.

16. Dry Opacity, minimum

<u>White</u>	<u>Yellow</u>
0.93	0.87

On a black-white Leneta chart, Form 2C-Opacity, draw down a uniform 130µm (±5µm) thick wet film of paint covering both the black and white portions of the chart. Measure the wet film thickness with an appropriate gauge. Dry for 24 hours at standard conditions. Use a BYK-Gardner "Color-Guide" Spectrophotometer

to measure the opacity according to the manufacturer's instructions. Calibrate the spectrophotometer according to the manufacturer's instructions using; 2° Observer/Illuminant "C" measurement conditions, and the (Y, x, y) color system.

17. Yellowness Index, maximum

<u>White</u>	<u>Yellow</u>
8	-

Draw down a 330µm thick wet film of the white paint on two-75x150 mm chromate treated aluminum panels (i.e.: Q Panel Co., type AL). Dry for 24 hours at standard conditions. Save one panel for the Accelerated Weathering test (section 2.b.1.t). Using a BYK-Gardner "Color-Guide" Spectrophotometer, follow the manufacturer's instructions, and measure the Yellowness Index of the white paint film using the ASTM E313 mode.

18. Daylight Luminous Reflectance

<u>White</u>	<u>Yellow</u>
≥87	47-60

Using the draw down panels prepared in the Dry Opacity test, measure the reflectance of the white and yellow paint films using the BYK-Gardner "Color-Guide" Spectrophotometer. Follow the manufacturer's instructions to obtain the Reflectance or "Y" value.

19. Yellow Color

Draw down the yellow paint on two chromate treated aluminum panels as described in the Yellowness Index test. One panel should be used for the Accelerated Weathering test. Retain the other yellow panel as a control and for the Reflectance test. The yellow color shall match Federal Standard 595b, color #33538.

20. Accelerated Weathering Test, Ultraviolet Light and Condensate Exposure, 300 hours total, ASTM; G154 and G151

Prepare samples of the white and yellow paints as described in the Yellowness Index and Yellow Color tests. Alternately expose the samples to; eight hours of UV exposure at 60°C, followed by four hours condensate exposure at 50°C in a QUV Accelerated Weathering Tester. Type UVA-340 bulbs are used at an irradiance level of 0.77 watts per square meter per nm at 340 nm, as measured at the sample surface during the UV cycle. After 300 hours total exposure the paint samples shall meet the requirements below.

White – Yellowness Index after weathering, maximum, 12

Yellow – Must pass Yellow Color test after weathering

21. Scrub Resistance, cycles, minimum

<u>White</u>	<u>Yellow</u>
800	800

Follow the procedure in ASTM D2486. Prepare a panel using an appropriate bird doctor blade that will produce a uniform dry film thickness of paint between 80 and 100µm. Dry the panel for 7 days at standard conditions. The panel shall require more than 800 cycles to remove the paint film in one continuous line across the width of the shimmed area.

22. Lead, mg/kg in dried paint, maximum, ASTM D3335

<u>White</u>	<u>Yellow</u>
20	20

The white & yellow paints shall be free of lead, mercury, cadmium, hexavalent chromium and other toxic heavy metals as defined by the United States Environmental Protection Agency.

23. Chromium, mg/kg in dried paint, maximum, ASTM D3718

<u>White</u>	<u>Yellow</u>
5	5

24. Thick Application Cracking Resistance

<u>White</u>	<u>Yellow</u>
Pass	Pass

On a black-white Leneta chart, Form 2C-Opacity, draw down a stripe of the paint 75 mm wide and at least 150 mm long and having a $1530 \pm 130 \mu\text{m}$ wet film thickness. Allow the paint to dry for 48 hrs. at standard conditions on a horizontal surface. After 48 hrs. the paint film shall not contain any cracks.

25. pH, minimum, ASTM E70

<u>White</u>	<u>Yellow</u>
9.9	9.9

- ii. Acrylic Polymer Emulsion- The paint shall consist of a commercial high-build acrylic polymer emulsion.
- iii. Reflective Media- The reflective media shall be made up of reflective bonded core elements and glass beads for drop-on application and shall conform to the following requirements:
 - I. Bonded Core Reflective Elements- The bonded core reflective elements shall contain either clear or yellow tinted microcrystalline ceramic beads bonded to the outer surface.
 - a. Index of Refraction- All microcrystalline ceramic beads bonded to reflective elements shall have a minimum index of refraction of 1.8 when tested using the liquid oil immersion method.
 - b. Testing Procedure for Refractive Index of beads by liquid immersion

Equipment Required:

- Microscope (minimum 100X magnification)
- Light Source- preferably sodium light or other monochromatic source, but not absolutely essential
- Refractive Index Liquids (available from R.P. Cargille Laboratories, Inc., Cedar Grove, NJ)
- Microscope Slide and Slide Cover
- Mortar and Pestle

Procedure:

- Using the mortar and pestle, crush a few representative beads and place a few of these crushed particles on a microscope slide.
- Place a drop of a refractive index liquid, with an index as close to that of the crushed particles as can be estimated, on the particles.
- Cover the slide with a microscope slide cover and view the crushed particles by transmitted light normal to the slight surface (illuminated from the bottom).
- Adjust the microscope mirror to allow a minimum light intensity for viewing. This is particularly important if sodium light is not used.
- Bring a relatively flat and transparent particle into focus.

Testing Criteria:

By slightly raising and lowering the objective (microscope tube), look for one or both of the following:

Becke Line- This light line will appear to move either into the particle or away from it. In general, if the objective is raised, the line will move toward the material of higher refractive index; if the objective is lowered, the line will move toward the material of lower index.

- c. Variation in Particle Brightness- When raising the objective from a sharp focus, the particle will appear to get brighter or darker than the surrounding field. If it becomes brighter, the particles have a higher refractive index than the liquid. If it becomes darker, the glass has a lower refractive index than the liquid. In both cases, the opposite will be true if the objective is lowered. This test can be used to confirm that the beads are above or below a specified index. It can also be used to give an accurate determination of the index (+ or - 0.001). This is done by using several refractive index liquids until a match or near match of indices occurs.

The index of the glass will equal that of the liquid when no Becke line and no variation in bead brightness are observed. The size and quality of the beads shall be such that the performance requirements for the retroreflective material shall be met.

- d. Acid Resistance- A sample of microcrystalline ceramic reflective elements supplied by the manufacturer, shall show resistance to corrosion of their surface after exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7cc of concentrated acid into 1000cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse. Place 10g of the beads into a 100ml beaker and cover with 30-40 ml of the 1% sulfuric acid solution. Cover the beaker to prevent evaporation and allow the sample to be exposed for 24 hours under these conditions. Then decant the acid solution and rinse the sample with fresh DI water followed by drying the sample in a 150°F (66°C) oven for approximately 15 minutes or until the sample is dry. Microscopic examination (20X) shall show not more than 15% of the beads having the formation of a very distinct opaque white (corroded) layer on their entire surface to be classified as passing the acid resistance test.

2. Glass Beads- The required glass beads shall have an index of refraction of 1.5 when tested by the immersion method at 25°C (77°F). The glass beads shall be surface treated for optimal performance with waterborne traffic marking paint. The glass beads shall have a minimum of 70% Rounds as measured according to ASTM D1155. The surface of the glass beads shall be free of pits and scratches. The glass beads retained on the #40 U.S. Mesh Sieve (425 microns) shall have minimum crush strength of 30 pounds in accordance with ASTM D1213. The glass beads shall conform to either of the following gradation specifications:

P40 or equivalent

U.S. Standard Sieve Number	Size in Microns	% Passing By Weight
20	850	90 - 97
30	600	50 - 75
40	425	15 - 45
50	300	0 - 15
80	180	0 - 5

AASHTO M247 Type 1 or equivalent

U.S. Standard Sieve Number	Size in Microns	% Passing By Weight
20	850	100
30	600	75 - 95
40	425	-
50	300	15 - 35
80	180	-
100	150	0 - 5

- c. Characteristics of Finished Traffic Marking- Because of normal variances in road surfaces, application processes, and measurement, the properties of markings made from the materials specified herein will vary from one installation to the next. When the materials are applied according to these specifications, they shall be capable of forming markings with the following reproducibility of properties:

- i. Skid Resistance- The average initial skid resistance shall be 45 BPN or greater when tested according to ASTM E303.
- ii. Retro-Reflectance- The initial retro-reflectance averaged over many installations shall be at least the values in the following table:

Retroreflectivity (mcd(ft²)(fc⁻¹)) {metric equivalent mcd(m²)(lux⁻¹)}

	White	Yellow
Dry	350	275
Wet recovery (ASTM 2177)	350	275
Wet continuous (ASTM 2176)	100	75

The initial retroreflectance of a single installation shall be the average value determined according to the measurement and sampling procedures outlined in ASTM D6359, using a 30-meter (98.4 feet) retroreflectometer. The 30-meter retroreflectometer shall measure the coefficient of retroreflected luminance, R_L , at an observation angle of 1.05 degrees and an entrance angle of 88.76 degrees. R_L shall be expressed in units of millicandelas per square foot per foot-candle [mcd(ft²)(fc⁻¹)]. The metric equivalent shall be expressed in units of millicandelas per square meter per lux [mcd(m²)(lux⁻¹)].

Initial performance of pavement markings shall be measured within 7 days after application.

- iii. On-the-road Track-Free Time- When installed at 77°F and at a wet film thickness of 25±2 mils, the markings shall reach a no-track condition in less than 5 minutes. Track-free shall be considered as the condition where no visual deposition of the traffic paint marking to the pavement surface is observed when viewed from a distance of 50 feet, after a free-rolling traveling vehicle's tires have passed over the line. The track-free time shall not increase

substantially with decreasing temperature.

- iv. Color after Application- The color of the applied white and yellow stripes and markings (with beads) shall conform to the daytime and nighttime color requirements in ASTM D6628.

3. Equipment & Construction Requirements

The Contractor shall furnish equipment and apply the materials according to the following specifications:

- a. Equipment- The equipment shall be capable of producing markings that meet the specifications contained herein using the materials specified in Section 2 Materials.
 - i. The equipment shall be a mobile, truck mounted and self-contained pavement marking machine.
 - ii. The equipment shall be designed to maintain a uniform rate of speed at increasing or decreasing road grades.
 - iii. The equipment shall be capable of air blasting the pavement, spraying the traffic marking paint, and immediately dropping the reflective elements and glass beads in a single pass at speeds up to 8 mph.
 - iv. If using equipment containing a heat exchanger it shall be capable of heating and maintaining the heated temperature of the liquid not exceeding 100°F in the heat exchanger and 100°F at the spray nozzle to enable proper spraying of the traffic marking paint.
 - v. At any time throughout the duration of the project, the Contractor shall provide free access to his application equipment by the Engineer, his authorized representative, or a materials representative.

b. Construction Requirements

- i. Moisture- The markings shall only be applied during conditions of dry weather and when the pavement surface is dry and free of moisture.
- ii. Air Temperature and Humidity- The markings shall only be applied when road and air temperatures are above 50°F under humidity conditions of 85% or less.
- iii. Surface Preparation- Marking operations shall not begin until applicable surface preparation work is completed and approved by the Engineer.
 - 1. Prior to applying the markings, the contractor shall remove any remaining existing markings showing obvious signs of degradation and/or lack of adhesion.
 - 2. Prior to applying the markings, the contractor shall remove all curing compounds on new Portland cement concrete surfaces.
 - 3. Prior to applying the markings, the contractor shall remove all dirt, sand, dust, oil, grease and any other contaminants from the road surface.
- iv. Dimensions- The reflectorized pavement markings shall be placed only on properly prepared surfaces and at the widths and patterns as designated on the

contract plans. The markings shall be applied in accordance with the Manual on Uniform Traffic Control Devices and in accordance with the Engineer's plans.

- v. Other Restrictions- The Engineer and/or contractor shall determine further restrictions and requirements of weather and pavement conditions necessary to meet all other application specifications and produce markings that perform to the satisfaction of the Engineer. If the pavement surface contains heavy tines or very large aggregate used in open grade friction course or stone matrix asphalt mixes it may require additional surface preparation prior to application of liquid traffic marking system.
- vi. Liquid Thickness- The liquid paint shall be applied at 25 mil \pm 2 mil wet film thickness.
- vii. Reflective Media Application- The specified reflective media shall be dropped at rates to achieve the following coating weights:

Units	Glass Beads	Composite Reflective Elements
Pounds per 4-inch linear foot	0.026 lbs/4 -inch lf	0.011 lbs/4-inch lf
Grams per 4-inch linear foot	12 grams per 4-inch lf	5 grams per 4-inch lf
Pounds per gallon- 25 mils, 190 theoretical feet per gallon (4" line width)	5.3 lbs/gal	2.1 lbs/gal

- viii. Overspray- The contractor shall ensure the traffic paint does not exhibit excessive overspray.
- ix. Adhesion- The contractor shall ensure that the traffic paint is well adhered to the road surface, and that the beads and elements are well adhered to the binder.
- x. Marking Performance- The typical average initial retroreflectance of the markings shall be those in the table that follows:

Condition	White	Yellow
Dry	350	275
Wet recover (ASTM 2177)	350	275
Wet continuous (ASTM 2176)	100	75

The average initial retroreflectance shall be determined according to the measurement and sampling procedures outlined in ASTM D6359, using a 30-meter retroreflectometer. The 30-meter retroreflectometer shall measure the coefficient of retroreflected luminance, R_L , at an observation angle of 1.05 degrees and an entrance angle of 88.76 degrees. R_L shall be expressed in units of millicandelas per square foot per foot-candle $[(\text{mcd}(\text{ft}^{-2})(\text{fc}^{-1}))]$. The metric

equivalent shall be expressed in units of millicandelas per square meter per lux [$\text{mcd}(\text{m}^{-2})(\text{lux}^{-1})$].

Initial performance of pavement markings shall be measured within 7 days after application.

4. Inspection and Testing

During the application of the traffic paint, the Engineer may request the following tests to verify application to the parameters required in this specification.

- a. Liquid thickness- During the appropriate locations along the alignment of the project site, the Engineer may obtain a sample of the wet traffic paint applied onto a test panel of aluminum for the purposes of checking for proper wet traffic paint film thickness. The traffic paint shall be applied without reflective elements or glass beads. Upon drying of the liquid material, the dry thickness shall be verified by the Engineer to meet the requirements of Section "Construction Requirements- Liquid Thickness" in this specification. The contractor shall provide to the Engineer the application speed of the equipment during the time of the sample.
- b. Reflective Media- When required by the Engineer, the Contractor shall demonstrate to the Engineer the proper calibration of reflective elements and glass beads compared with the manufacturer's requirement. The calibration shall be conducted with a graduated cylinder or other similar device. Reflective elements or glass beads shall be collected from the reflective element and glass bead guns for a timed period. The volume of the reflective elements and glass beads collected shall be measured and compared with the manufacturer's requirements.
- c. Application Panel- The Contractor shall provide to the Engineer at least one dry sample coated on aluminum, with typical dried liquid paint and reflective media applied onto the surface. This sample will serve as a record of the project application conditions and settings.

Method of Measurement

- d. Painted Pavement Marking (Line) - The mileage of line complete in place and accepted, shall be measured along the center of each line. Where double solid barrier lines are used, each solid barrier line will be measured separately for payment. Where broken lane lines are used, only the marked line will be measured for payment. For quantities of Pavement Marking (Line) less than one mile, the accepted method of measurement shall be linear feet.
- e. Painted Pavement Marking (Crosswalk Striping) and Pavement Marking (Stop Bar) - The length of each striping complete in place and accepted will be measured in linear feet to the nearest foot along the center line of each pavement marking.
- f. Painted Pavement Marking (Channelization Striping) - The area of channelization striping including the boundary lines complete in place and accepted shall be measured and computed in square yards to the nearest square yard.
- g. Painted Pavement Marking (Designs) - Designs or lettering will be measured for payment by the unit (each) complete in place or as stipulated in the Contract and on the Plans.

5. Basis of Payment

- a. The Contractor shall be required to establish and locate all non-passing zones as well as provide the layout of all pavement markings for approval of the Engineer prior to placement of markings.
- b. Retroreflective markings will be paid for at the contract unit price, which shall be full compensation for cleaning and preparing the pavement surface, for furnishing and placing all materials, and for all materials, labor, equipment and incidentals necessary to complete the work.
- c. Payment will be made under the following bid items as set forth in the Bid Schedule:

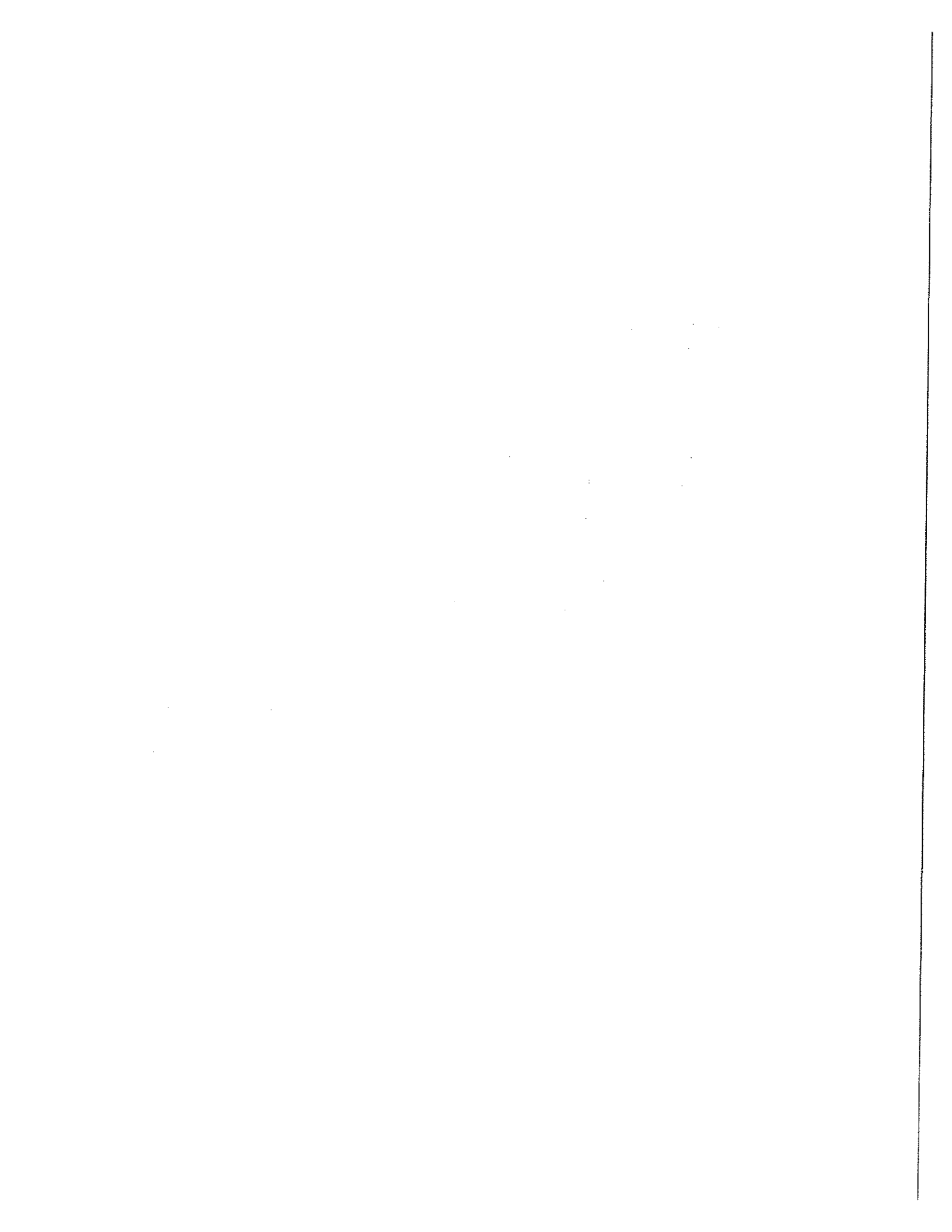
<u>Pay Item</u>	<u>Unit</u>
Painted Pavement Marking (Line)	Lin. Mi.
Painted Pavement Marking (Line)	Lin. Ft.
Painted Pavement Marking (Cross-walk Striping)	Lin. Ft.
Painted Pavement Marking (Stop Line)	Lin. Ft.
Painted Pavement Marking (Channelization Striping)	Sq. Yd.
Painted Pavement Marking (Designs)	Ea.

- d. When materials are found to be non-conforming under Sections 2(a) and 2(b), the material supplier shall provide replacement materials at no cost.
- e. When markings are found to be non-conforming under Section 2(c), the contractor shall bear full responsibility for all repair work and associated costs, including purchase of replacement materials.
- f. When the fault of non-conformance with the specification is indeterminate or in dispute, the materials supplier shall provide replacement materials and the contractor shall repair the markings, both at no cost to the Engineer and/or Agency.



TECHNICAL SPECIFICATIONS
FOR
BOLLARDS

1. Description
This work shall consist of the installation of bollards as specified by the Plans and Specifications.
2. Materials
Materials shall meet the requirements as specified on the project Plans.
3. Construction Requirements
The installation of the bollards as detailed on the Plans shall conform to the Engineer's direction. Placement of the bollards shall be as detailed on the Plans or as directed by the Engineer.
4. Method of Measurement
 - (a) Bollards with cable shall be measured per linear foot of bollard and cable complete in place.
 - (b) Bollards shall be measured per each bollard complete in place.
5. Basis of Payment
 - (a) Bollards with cable will be paid for at the contract unit price per linear foot, complete in place, which price shall fully compensate for all work, materials, labor, maintenance and other incidentals necessary to complete the item, in accordance with the Plans and Specifications.
 - (b) Bollards will be paid for at the Contract unit price per each bollard, complete in place, which price shall fully compensate for all work, materials, labor, maintenance and other incidentals necessary to complete the item, in accordance with Plans and Specifications.





TECHNICAL SPECIFICATIONS
FOR
SIGNAGE

1. Description

Provide all products, equipment, transportation, protection and labor required to construct and install the warning, regulatory, directional, entrance and information signage as shown on the drawings.

2. Quality Assurance

Comply with applicable city, state, and federal requirements regarding material, method of work, and installation standards.

3. Materials

Materials used in the installation of signs and posts, in addition to the requirements of these Specifications, shall conform to the applicable requirements of Section 916, Highway Signing Materials, of TDOTSS, March 1, 2006, and any applicable Special Provision thereto.

Specific material requirements are summarized in the following:

<u>Item</u>	<u>Specification</u>
Posts (U-Channel)	Steel: ASTM A-499, Fy=50,000 psi, Grade 50 Galvanizing: ASTM A-123 Weight: Bikeway Posts-2.5 lbs/ft Roadway Posts-2.0 lbs/ft
Sign Blade	Aluminum: 0.080 inch thick sheet ASTM B-209, Alloy 6061-T6 or 5052-H38
Reflective Sheeting	Material Type III from TDOTSS, March 1, 2006, Subsection 916.06
Legends and Borders	TDOTSS, March 1, 2006, Subsection 916.07
Bolts, Nuts, and Washers	Steel: ASTM A307 Galvanizing: ASTM A153 Alternative Hardware - Stainless Steel

4. Preparation

Examine proposed sign location, mark with stake and seek Contracting Officer's approval before installation.

5. Fabrication, Equipment, and Construction Requirements

- (a) Fabrication of all signs, posts and attachment hardware shall be in accordance with the applicable portions of TDOTSS, March 1, 2006, Subsection 916.05.
- (b) Equipment required for the satisfactory performance of the work shall be on hand and approved by the Engineer before construction will be permitted to begin.
- (c) Construction Methods and Requirements shall conform to the applicable portions of TDOTSS, March 1, 2006, Subsection 713.04. The following installation specifics shall also be conformed with:
 - 1) All sign faces shall be fully attached to post at top and bottom, in accordance with the connection detail shown on T.D.O.T. Standard Roadway and Structure Drawing T-S-16.
 - 2) Post installations in asphalt and concrete surfaces shall include drilling through to subgrade prior to setting posts. Drilled holes shall have neat edges, and shall be no larger than necessary for post insertion.
 - 3) The top of sign posts shall not extend above the top of the uppermost sign face on an assembly.

6. Method of Payment

Signage will be paid for at the lump sum price bid, which price shall be full compensation for providing all signage shown in the Plans. This compensation shall include all labor, materials, equipment and incidentals necessary to complete the work. The signage to be installed includes warning, regulatory, directional, entrance and information types.

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Section includes cast-in-place concrete work indicated in the Contract Documents or otherwise required for proper completion of the work.

1.02 RELATED SECTIONS

- A. Section 013310 - Structural Submittals.
- B. Section 014010 - Structural Testing/Inspection Agency Services.
- C. Section 031000 - Concrete Formwork.
- D. Section 032000 - Concrete Reinforcement.
- E. Section 036000 - Non-Shrink Grout.

1.03 REFERENCES

- A. ACI 214 - Recommended Practice for Evaluation of Strength Test Results of Concrete.
- B. ACI 301 - Specifications for Structural Concrete for Buildings.
- C. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
- D. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.
- E. ACI 305 - Hot Weather Concreting.
- F. ACI 306 - Cold Weather Concreting.
- G. ACI 308 - Standard Practice for Curing Concrete.
- H. ACI 309 - Guide for Consolidation of Concrete.
- I. ACI 318 - Building Code Requirements for Structural Concrete.
- J. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- K. ASTM C33 - Standard Specification for Concrete Aggregates.
- L. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- M. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
- N. ASTM C138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
- O. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
- P. ASTM C150 - Standard Specification for Portland Cement.
- Q. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
- R. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

- S. ASTM C230 - Standard Specification for Flow Table or Use in Tests of Hydraulic Cement.
- T. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
- U. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
- V. ASTM C618 - Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- W. ASTM E1155 - Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System.
- X. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.04 NOTICE

- A. Notify Architect/Structural Engineer and Structural Testing/Inspection Agency not less than 48 hours prior to placing concrete.

1.05 QUALITY ASSURANCE

- A. Structural Testing/Inspection Agency shall perform the following quality related items:
 1. Examine concrete in truck to verify that concrete appears properly mixed.
 2. Perform a slump test as deemed necessary for each concrete load. Record if water or admixtures are added to the concrete at the job site. Perform additional slump tests after job site adjustments.
 3. Mold four specimens per set for compressive strength testing; one set for each 75 cubic yards of each mix design placed in any one day. For each set molded, record:
 - a. Slump
 - b. Air content
 - c. Unit weight
 - d. Temperature, ambient and concrete
 - e. Location of placement
 - f. Any pertinent information, such as addition of water, addition of admixtures, etc.
 - 1) Perform one 7-day and two 28-day compressive strength tests. (Use one as a spare to be broken as directed by the Structural Engineer if compressive strengths do not appear adequate.)
 4. Test concrete slabs for specified flatness and levelness in accordance with ASTM E1155. As a minimum, test three placements: the first placement and two additional placements as directed by the Structural Engineer. If the tested placement does not meet the specified overall values, test the next placement.
- B. The ready-mixed concrete plant shall be certified for conformance with the requirements of the National Ready Mix Concrete Association.
- C. The Structural Testing / Inspection Agency shall provide special inspections as required by Chapter 17 of the building code as required in Table 033000-1.

1.06 ENVIRONMENT DEFINITION

- A. Concrete elements considered to be in an aggressive environment include exterior balconies.

1.07 CONCRETE MIX DESIGN

- A. Establish concrete mix design proportions in accordance with ACI 318, Chapter 5.
- B. Submit concrete mix designs. Include the following:
 - 1. Type and quantities of materials.
 - 2. Slump.
 - 3. Air content.
 - 4. Fresh unit weight.
 - 5. Aggregates sieve analysis.
 - 6. Design compressive strength.
 - 7. Location of placement in structure.
 - 8. Method of placement.
 - 9. Method of curing.
 - 10. Seven-day and 28-day compressive strengths.
- C. Concrete supplier shall submit certifications that the materials used meet applicable ASTM Specifications. Mix designs not conforming to the above will be rejected.

1.08 SLUMP

- A. Design concrete with a maximum slump of five inches.
- B. If a slump greater than five inches is desired it shall be achieved with a high-range water reducer. Design the concrete mix with a high range water reducer slump of two and one-half inches plus or minus one and one-half inches. The maximum slump after high-range water reducers are added shall be eight inches.

1.09 FRESH UNIT WEIGHT

- A. Normal weight concrete shall have a fresh unit weight of 140 to 152 pcf.

1.10 AIR CONTENT

- A. No entrained air content is required in concrete placed in the foundation.
- B. For normal weight concrete, entrained air content shall be five percent plus or minus one and one-half percent, unless specified otherwise.
- C. For normal weight concrete with required compressive strength equal to or greater than 5000 psi, entrained air content shall be three percent plus or minus one percent.

1.11 WATER/CEMENT RATIO

- A. Concrete elements shall have a maximum water cement ratio of 0.45, unless noted otherwise.
- B. Concrete elements within an aggressive environment shall have a maximum water/cement ratio of 0.40.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials designated by specific manufacturer's trade names are approved, subject to compliance with the quality and performance indicated by the manufacturer. Instructions and specifications, published by the manufacturer of such materials are included in and are a part of these specifications. Upon request, provide certification from manufacturer or supplier that materials designated by reference to ASTM and ACI standards meet the requirements of these standards.

2.02 CONCRETE STRENGTH

- A. Provide concrete strengths indicated on the Structural Drawings.

2.03 CEMENT

- A. Portland cement shall conform to ASTM C150, Type I, unless noted otherwise. Use one brand only.

2.04 AGGREGATE

- A. Fine aggregate shall conform to ASTM C33.
- B. Coarse aggregate of gravel or crushed stone shall conform to ASTM C33. Size coarse aggregate in accordance with ACI 318.

2.05 WATER

- A. Water shall be potable and free of deleterious substances in accordance with ACI 318.

2.06 AIR ENTRAINING AGENT

- A. Air entraining agent shall conform to ASTM C260.

2.07 WATER REDUCER

- A. Water reducing agent shall conform to ASTM C494.

2.08 HIGH-RANGE WATER REDUCER

- A. High-range water reducers (super-plasticizers) shall conform to ASTM C494.

2.09 CHLORIDE

- A. Use no chlorides of any form in concrete.

2.10 CURING COMPOUND

- A. An acrylic curing compound meeting the requirements of ASTM C1315 and all local, state and federal Volatile Organic Carbon regulations may be used at the Contractor's option.

2.11 FLY ASH

- A. Fly ash shall be Class F fly ash with a loss on ignition of less than five percent or Class C fly ash with a loss on ignition of less than one percent in accordance with ASTM C618.

2.12 ACCELERATORS

- A. Non-chloride accelerators shall conform to ASTM C494.

2.13 RETARDERS

- A. Retarders shall conform to ASTM C494.

PART 3 EXECUTION

3.01 HIGH-RANGE WATER REDUCERS

- A. High-range water reducers are to be added at dosage recommended by the manufacturer. The slump of the concrete shall be one to four inches at the time the high-range water reducers are added. Do not permit fresh concrete containing super-plasticizers to come in contact with fresh concrete not containing super-plasticizers.

3.02 ADDITION OF WATER AT JOB SITE

- A. Water may be added to the batch only if neither the maximum permissible water/cement ratio nor the maximum slump is exceeded.

3.03 PLACEMENT OF CONCRETE

- A. Deposit concrete as near as practical to final position to prevent segregation of concrete.
- B. Do no flowing of concrete with vibrators.
- C. Place floors and slabs in accordance with ACI 302.
- D. Do not use aluminum equipment in placing and finishing concrete.
- E. Place thickened slabs for partitions integral with floor slabs.
- F. Prepare place of deposit, mix, convey, place, and cure concrete in accordance with ACI 301, ACI 304, and ACI 318. Wet forms before placing concrete.

3.04 TIME LIMIT

- A. Deposit concrete within one and one-half hours after batching.

3.05 VIBRATION

- A. Consolidate concrete in accordance with ACI 301 and ACI 309.

3.06 CURING

- A. Begin curing procedures immediately following the commencement of the finishing operation.
- B. Cure concrete in accordance with ACI 308. Keep the concrete surface moist. If an acrylic curing compound is used, apply in accordance with manufacturer's recommendations to surfaces of concrete not protected for five days by formwork. Do not use curing compounds in areas to receive material that does not adhere to concrete cured with a curing compound unless the curing compound is water soluble.
- C. Moist cure concrete elements within aggressive environments as follows:
 1. Place burlap and polyethylene curing blankets on the surface and keep them continuously moist with sprinklers for seven days.
 2. In hot weather or wind conditions, prevent rapid mix water evaporation and possible plastic shrinkage cracking by using evaporation retarders or fog sprays.
 3. In cold weather, follow recommended procedures in ACI 306 and ACI 308.
 4. After the curing blankets are removed, if a sealer is not specified to be applied, spray on a two-coat application of liquid membrane curing compound. If a sealer is to be applied a curing

compound is not required.

3.07 ENVIRONMENTAL PROVISIONS

- A. Perform cold weather concreting in accordance with ACI 306.
- B. Perform hot weather concreting in accordance with ACI 305.
- C. Protect concrete from drying and excessive temperature for the first seven days.
- D. Protect fresh concrete from wind.

3.08 CONTRACTION JOINTS

- A. Obtain Architect/Structural Engineer's approval for location of contraction joints.
- B. Do not place contraction joints in framed floors, composite slabs, or shear walls.
- C. Place contraction joints in slabs-on-grade as indicated on the Drawings.

3.09 CUTTING CONCRETE

- A. Obtain Architect/Structural Engineer's written approval prior to cutting concrete for installation of other work.

3.10 PATCHWORK AND REPAIRS

- A. Notify Architect/Structural Engineer of any defective areas in concrete to be patched or repaired. Repair and patch defective areas with non-shrink grout. Cut out defective areas over two inches in diameter to solid concrete, but not less than a depth of one inch. Make edges of cuts perpendicular to the concrete surface.
- B. For concrete elements within an aggressive environment, cracks shall be repaired by routing and filling the crack with a polyurethane sealant suitable for vehicular traffic, unless specified or directed otherwise by the Structural Engineer.

3.11 CONCRETE FINISHES

- A. Finish concrete in accordance with ACI 301.
- B. Finish concrete slabs to flatness and levelness tolerances which correspond to FF 25/FL 20 minimum overall for composite of all measured values and FF 17/FL 12 minimum for any individual floor section.
- C. For concrete slabs to receive wood flooring, finish to flatness and levelness tolerances which correspond to FF 45/FL 30 minimum overall for composite of all measured values and FF 30/FL 20 minimum for any individual floor section.
- D. For shored construction, FL values do not apply if slab is tested after shoring is removed.

TABLE 033000-1

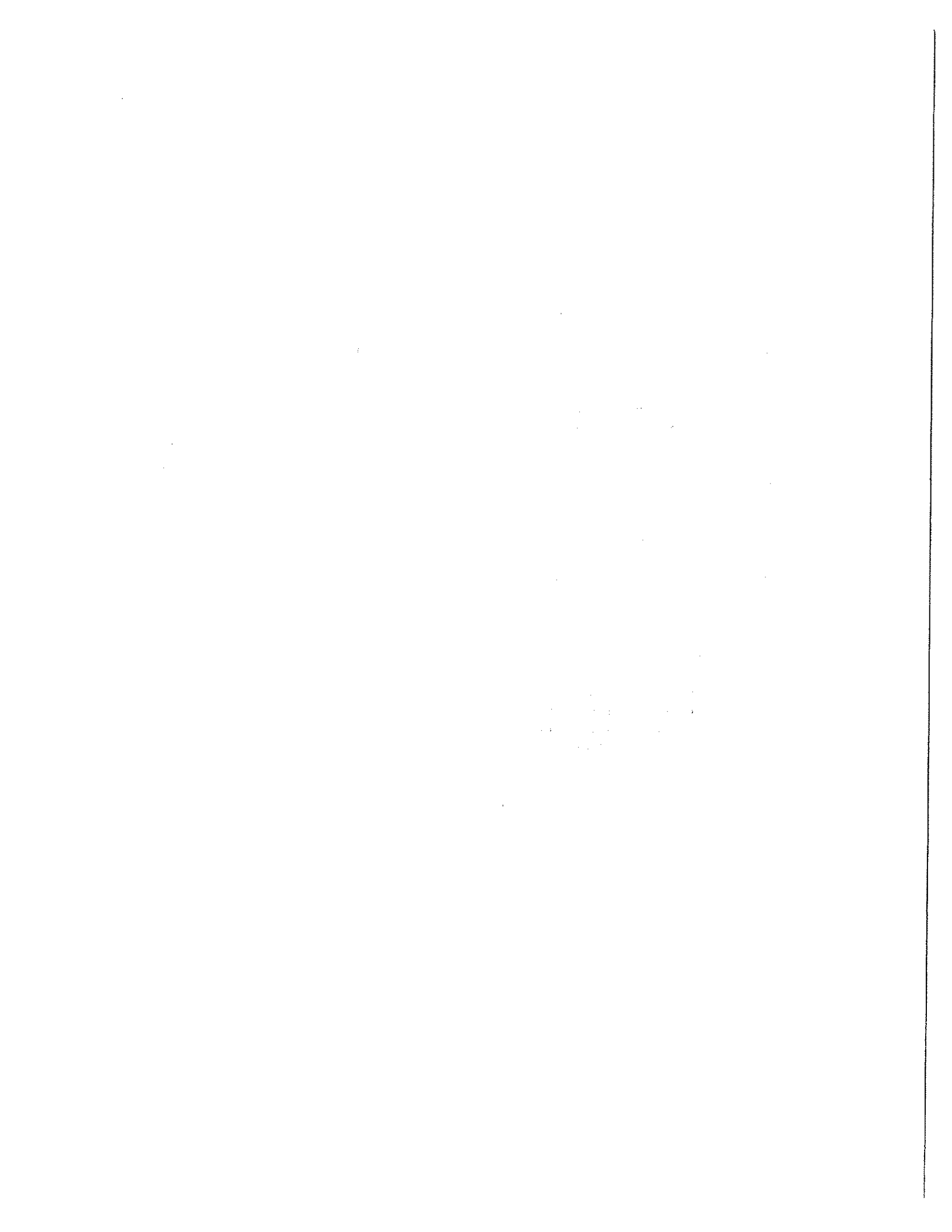
REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION

<u>VERIFICATION AND INSPECTION</u> <u>CODE REF.</u>	<u>CONTINUOUS PERIOD</u>	<u>REFERENCED</u>
--	--------------------------	-------------------

- A. Inspect bolts to be installed in concrete prior to and during placement of concrete where

allocable loads have been increased.	X	_____	_____	1912.5
B. Verifying use of required design:	_____	X	ACI 318: Ch. 4,	1904, 1905.2, 5.2 - 5.4 1905.4, 1914.2 1914.3
C. Sampling fresh concrete and performing slump, air content and determining the temperature of fresh concrete at the time of making specimens for strength tests:	X	_____	ASTM C172 ASTM C 31 ASTM 318: 5.6 ASTM 318: 5.8	1905.6 1914.10
D. Inspection of concrete and shot Crete placement for proper application technique.	X	_____	ACI 318:5.9, 10	1905.9 1905.10 1914.6, 7 & 8
E. Inspection for maintenance of specified curing temperature and techniques:				1905.13,1914.9
F. Inspection of pre-stressed concrete:				
a. Application of pre-stressing forces.	X		ACI318: 18.18	
b. Grouting of bonded pre-stressing tendons in the seismic force-resisting system.	X	_____	ACI 318:18.16.4	
G. Erection of precast concrete members:	_____	X	ACI 318: Ch. 16	
H. Verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs:	_____	X	ACI 318: 6.2	1906.2

END OF SECTION



SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

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 the following:

1. Precast architectural concrete benches.

- B. Related Sections include the following:

1. Site furnishings are specified under Section 12 93 00.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide precast architectural concrete units and connections capable of withstanding design loads within limits and under conditions indicated.

- B. Structural Performance: Provide precast architectural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Dead Load: 20 psf
2. Live Load: 200 psf
3. Wind Load: 30 psf.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Design Mixes: For each concrete mix.

- C. Shop Drawings:

1. Detail fabrication and installation of precast architectural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish, and types of reinforcement, including special reinforcement.

- D. Samples: For each type of finish indicated on exposed surfaces of precast architectural concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
- E. Material Test Reports: For aggregates.
- F. Material Certificates: For the following items, signed by manufacturer:
 - 1. Concrete materials.
 - 2. Reinforcing materials.
 - 3. Admixtures.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast architectural concrete units similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Assumes responsibility for engineering precast architectural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast architectural concrete that are similar to those indicated for this Project in material, design, and extent.
 - 3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group A, Category A1--Architectural Cladding and Load Bearing Units or in APA's Plant Certification Program for Production of Architectural Precast Concrete Products and is designated an APA-certified plant.
 - 4. Has sufficient production capacity to produce required units without delaying the Work.
 - 5. Is registered with and approved by authorities having jurisdiction.
- B. Testing Agency Qualifications: An independent testing agency acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."
- D. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver precast architectural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

- B. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

PART 2- PRODUCTS

2.1 MOLD MATERIALS

- A. Molds: Provide molds and, where required, form-facing materials of metal, plastic, wood, or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes
- B. Form Liners: Units of face design, texture, arrangement, and configuration indicated.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82.
- C. Deformed-Steel Wire: ASTM A 496.
- D. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- F. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 117.
- G. Steel to contain minimum 95% recycled content.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, white, of same type, brand, and source.
 - 1. Standard gray portland cement may be used for nonexposed backup concrete.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class SS.
 - 1. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining.
 - 2. Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise approved by Architect.

- C. Lightweight Aggregates: ASTM C 330.
- D. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.
- E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Water-Reducing Admixture: ASTM C 494, Type A.
- H. Retarding Admixture: ASTM C 494, Type B.
- I. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- J. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- K. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
- L. Plasticizing Admixture: ASTM C 1017.
- M. Fly Ash Admixture: ASTM C 618, Class C or F.
- N. Metakaolin Admixture: ASTM C 618, Class N.
- O. Silica Fume Admixture: ASTM C 1240.

2.4 CONCRETE MIXES

- A. Prepare design mixes for each type of concrete required.
 - 1. Maximize use of fly ash and silica fume not to exceed, in aggregate, 25 percent of cementitious material by weight.
- B. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast architectural concrete fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318.
- D. Normal-Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.

- F. Lightweight Concrete Backup Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:
1. Compressive Strength (28 Days): 5000 psi.
 2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft., plus or minus 3 lb/cu. ft., according to ASTM C 567.
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
- H. instructions.

2.5 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing operations.
1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concreting. Coat form liner with form-release agent.
- B. Maintain molds to provide completed precast architectural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

2.6 FABRICATION

- A. Cast-in conduit and hardware for light fixtures and electrical work as indicated.
- B. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.
1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 3. Place reinforcement to maintain at least 3/4-inch minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- C. Reinforce precast architectural concrete units to resist handling, transportation, and erection stresses.
- D. Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.

- E. Place face mix to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover.
- F. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for measuring, mixing, transporting, and placing concrete.
 - 1. Place backup concrete to ensure bond with face mix concrete.
- G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.
- H. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- I. Comply with ACI 305R recommendations for hot-weather concrete placement.
- J. Identify pickup points of precast architectural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.
- K. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
- L. Discard precast architectural concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Architect.

2.7 FABRICATION TOLERANCES

- A. Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.
- B. Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with the following product tolerances:
 - 1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:
 - a. 10 feet or under, plus or minus 1/8 inch.
 - b. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch.
 - 2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:
 - a. 10 feet or under, plus or minus 1/4 inch.
 - b. 10 to 20 feet, plus 1/4 inch, minus 3/8 inch.

2.8 FINISHES

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Project No. 14T-G-0566
Suttree Landing Park; Phase 1B Project
Proposed Park Improvements

- A. Finish exposed-face surfaces of precast architectural concrete units to match approved sample panels and as follows:
 - 1. PCI and APA's "Architectural Precast Concrete--Color and Texture Selection Guide," of plate numbers indicated.
 - 2. Smooth-Surface Finish: Provide surfaces free of pockets, sand streaks, and honeycombs, with uniform color and texture.
- B. Finish exposed surfaces of precast architectural concrete units to match face-surface finish.

2.9 SOURCE QUALITY CONTROL

- A. Owner will employ an independent testing agency to evaluate precast architectural concrete fabricator's quality-control and testing methods.
 - 1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.
- C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 requirements.
- D. Defective Work: Precast architectural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

PART 3- EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Do not install precast concrete units until supporting concrete has attained minimum design compressive strength.

3.2 INSTALLATION

- A. Install miscellaneous structural steel, angles, clips, hangers, and other accessories required for connecting precast architectural concrete units to primary structural frame.

- B. Install precast architectural concrete. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
 - 1. Install bearing pads as precast concrete units are being erected.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting hoisting devices and use sand-cement grout to fill voids within recessed hoisting devices flush with surface of concrete.
- C. Anchor precast architectural concrete units in position by bolting, welding, grouting, or as otherwise indicated. Remove temporary shims, wedges, and spacers as soon as possible after anchoring and grouting are completed.
- D. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.
 - 1. Protect precast architectural concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
 - 2. Repair damaged steel surfaces by cleaning and applying a coat of galvanizing repair paint to galvanized surfaces.
 - 3. Repair damaged steel surfaces by cleaning and repriming damaged painted surfaces.
- E. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.
- F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

3.3 ERECTION TOLERANCES

- A. Install precast architectural concrete units level, plumb, square, and true. Units shall not rock or wobble when set in place.

3.4 REPAIRS

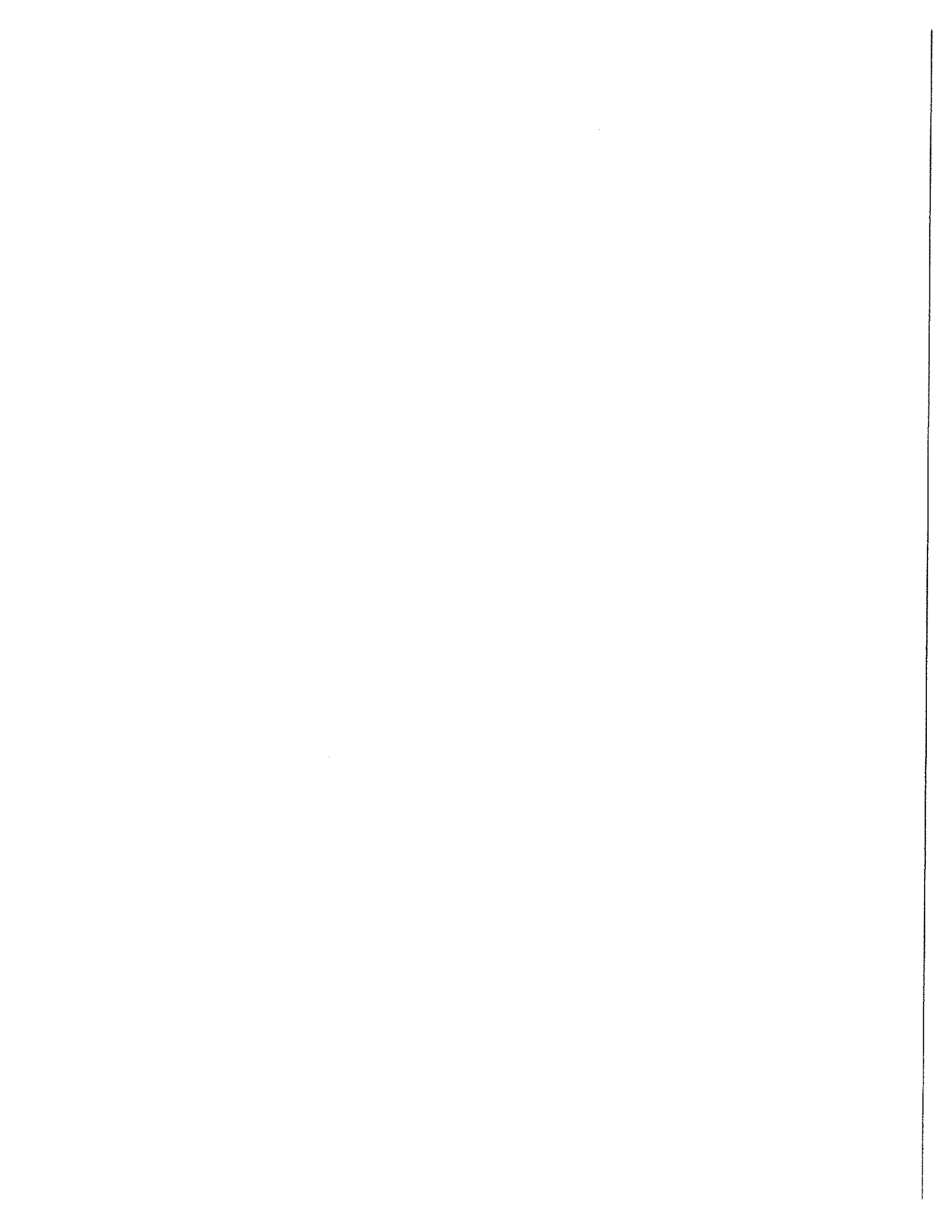
- A. Repair exposed exterior surfaces of precast architectural concrete units to match color, texture, and uniformity of surrounding precast architectural concrete if permitted by Architect.
- B. Remove and replace damaged precast architectural concrete units if repairs do not comply with requirements.

3.5 CLEANING

- A. Clean exposed surfaces of precast concrete units after erection to remove markings, dirt, and stains.
 - 1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

END OF SECTION



SECTION 05 52 00
ALUMINUM HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The work specified in this Section includes, but shall not be limited to, the following:
 - 1. Aluminum handrails.
 - 2. Aluminum guardrails.

1.02 REFERENCES

- A. ESR-3269 ICC-ES Evaluation Report, International Code Council Standards for Glass Balustrade Guard Rail Applications
- B. General: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.
- C. Aluminum Association, Inc. (AA):
 - 1. AA SAS-30, "Specifications for Aluminum Structures."
- D. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611, "Voluntary Specifications for Anodized Architectural Aluminum (Revised)."
 - 2. AAMA 2604, "Voluntary Specification, Performance Requirements, and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels."
 - 3. AAMA 2605, "Voluntary Specification, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels."
 - 4. AAMA Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."
- E. American Iron and Steel Institute (AISI):
 - 1. AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."
- F. American Welding Society (AWS):
 - 1. AWS D1.2, "Structural Welding Code – Aluminum."
- G. ASTM (ASTM):
 - 1. ASTM B26/B26M, "Standard Specification for Aluminum-Alloy Sand Castings."
 - 2. ASTM B209/B209M, "Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate."
 - 3. ASTM B210/B210M, "Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes."
 - 4. ASTM B221/B221M, "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes."

5. ASTM B247/B247M, "Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings."
6. ASTM B429/B429M, "Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube."
7. ASTM C1048, "Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass."
8. ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-Shrink)."
9. ASTM E488, "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements."
10. ASTM E985, "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings."

H. Code of Federal Regulation (CFR):

1. 16 CFR Part 1201, "Safety Standard for Architectural Glazing Material" (Consumer Products Safety Commission).

I. National Association of Architectural Metal Manufacturers (NAAMM):

1. NAAMM MFM, "Metal Finishes Manual."

1.03 DEFINITIONS

- A. See definitions in ASTM E985 for railing-related terms that apply to this Section.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Handrails and railings shall withstand structural loading as determined by allowable design working stresses of materials based on the following standards.
1. Aluminum: AA SAS-30.
 2. Cold-Formed Structural Steel: AISI SG-673, Part I.
 3. Glass: Fully tempered glass in glass-supported handrails and railings require a design with a safety factor of three applied to the applicable modulus of rupture listed in "Mechanical Properties" in AAMA Aluminum Curtain Wall Series No. 12.
- B. Structural Performance: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
1. Top Rail: Shall withstand the following loads:
 - a. Concentrated load of 200 lbf (0.89 kN) applied at any point and in any direction.
 - b. Uniform load of 50 lbf-ft. (0.07 kN-m) applied horizontally and concurrently with uniform load of 100 lbf-ft. (0.14 kN-m) applied vertically downward.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 2. Handrails Not Serving As Top Rails: Shall withstanding the following loads:
 - a. Concentrated load of 200 lbf (0.89 kN) applied at any point and in any direction.
 - b. Uniform load of 50 lbf-ft. (0.07 kN-m) applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 3. Guard Infill Area: Shall withstand the following loads:

- a. Concentrated horizontal load of 200 lbf (0.89 kN) applied to 1 square foot (0.09 m²) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Loads need not be assumed to act concurrently with loads on top rails in determining stress on guard.
- C. Thermal Movements: Handrails and railings shall allow for movements resulting from 120 deg F (49 deg C) changes in ambient and 180 deg F (82 deg C) surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- D. Corrosion Resistance: Separate incompatible materials to prevent galvanic corrosion.

1.05 SUBMITTALS

- A. General: Submit under provisions of Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including, but not limited to, the following:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Product Data: Submit product data for manufacturers product lines of handrails and railings assembled from standard components, including, but not limited to, the following:
 - 1. Grout, anchoring cements and paint products.
- D. Shop Drawings: Submit shop drawings showing fabrication and installation of handrails and railings.
Include plans, elevations, sections, details, and attachments to other work.
- E. Samples:
 - 1. Color Selection: Submit manufacturer's color charts showing the full range of colors available for products with factory-applied color finishes.
 - 2. Finish Selection: Provide sections of railing or flat sheet metal which depict available mechanical surface finishes.
 - 3. Verification Samples: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - a. 6 inch (152 mm) long sections of each different linear railing member, including handrails and top rails.
- F. Quality Control Submittals:
 - 1. Design Data: For installed handrails and railing systems indicated to comply with certain design loadings, include structural analysis data signed and sealed by the professional engineer who was responsible for their preparation.
 - 2. Certificates: Submit certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. **Manufacturer Qualifications:** Manufacturer shall be a firm engaged in the manufacture of aluminum handrails and railings of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 10 years.
- B. **Regulatory Requirements:** Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.
- C. **Welding Standards:** Comply with applicable provisions of AWS D1.2.
- D. Supply sample submittals to demonstrate aesthetic effects as well as qualities of materials and execution.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 PROJECT CONDITIONS

- A. **Environmental Requirements:** Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

- A. **General:** See Section 01 77 00 - Closeout Procedures.
- B. **Special Warranty:** Provide manufacturer's standard form outlining the terms and conditions of their standard Limited Warranty:
 - 1. **Surface Finish Warranty:** Five year limited warranty.
 - 2. **Material Integrity Warranty:** One year.
- C. **Additional Owner Rights:** The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.10 EXTRA MATERIALS

- A. All supplemental materials not expressly specified in this section shall be approved by the Architect prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. **Basis of Design:** The basis of design is the existing rails installed along the Knoxville waterfront at "Volunteer Landing", this city standard design. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect will be the sole judge of the basis of what is equivalent.
- B. **Metals:** Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
1. **Aluminum:** Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy and temper designated below for each aluminum form required.
 - a. Extruded Bar and Tube: ASTM B221/B221M, Alloy 6063-T5/T52.
 - b. Extruded Structural Pipe and Tube: ASTM B429/B429M, Alloy 6063-T832.
 - c. Drawn Seamless Tube: ASTM B210/B210M, Alloy 6063-T832.
 - d. Plate and Sheet: ASTM B209/B209M, Alloy 6061-T6.
 - e. Die and Hand Forgings: ASTM B247/B247M, Alloy 6061-T6.
 - f. Castings: ASTM B26/B26M, Alloy A356-T6.
 2. **Brackets, Flanges, and Anchors:** Provide cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
 - a. Provide cast brackets with flange tapped for concealed anchorage to threaded hanger bolt.
 - b. Provide formed or cast brackets with predrilled hole for exposed bolt anchorage.
 - c. Provide formed steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
 - d. Provide brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.
- C. **Railing Components:**
1. **Extruded Aluminum Components:** Provide manufacturer's standard extruded aluminum components in sized as shown on the drawings and thicknesses as required to meet the load requirements of this specification and the applicable building codes.
- D. **Fasteners:**
- 1 **Handrail Anchors:** Select fasteners of type, grade and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
 - 2 **Handrail and Railing Component Anchors:** Use fasteners fabricated from same basic metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - a. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are standard fastening method for handrail and railing indicated.
 - 3 **Cast-in-Place and Post Installed Anchors:** Provide anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four items the load imposed when installed in concrete, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- E. **Grout and Anchoring Cement:**

- 1 Non-Shrink, Non-Metallic Grout: Provide premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- 2 Interior Anchoring Cement: Provide factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching and grouting compound. Use for interior applications only.

2.02 FABRICATION

- A. Assemble handrails and railings in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Form changes in direction of railing members as shown on the Drawings.
- C. Fabricate handrails and railings by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- D. Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.
- E. Provide inserts and other anchorage devices to connect handrails and railings to concrete or masonry. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- F. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- G. Cut, reinforce, drill, and tap components as indicated on the Drawings to receive finish hardware, screws, and similar items.
- H. Close exposed ends of railing members with prefabricated end fittings.
- I. Provide mounted handrail wall returns at wall ends unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

2.03 FINISHES

- A. General: Comply with NAAMM MFM for recommendations for applying and designating finishes.
 - 1 Appearance of Finished Work:
 - a. Variations in appearance of abutting or adjacent units are acceptable if they are within one-half of the range of final samples. Noticeable variations in the same unit are not acceptable.
 - b. Variations in appearance of other components are acceptable if they are within the range of final samples and are assembled or installed to minimize contrast.
- B. Aluminum Finish: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

- 1 Class I Clear Anodized Finish: AA-M12-C22-A41 (Mechanical Finish: as fabricated, non-specular; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear film thicker than 0.7 mil [0.018 mm]) complying with AAMA 611.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
 - 1 Examine substrates to receive anchors verifying that locations of concealed reinforcements have been clearly marked for the Installer. Locate reinforcements and mark locations if not already done.
 - 2 Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.02 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchors, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the Project site.

3.03 INSTALLATION

- A. General:
 - 1 Fitting: Fit exposed connections together to form tight, hairline joints.
 - 2 Cutting and Placement: Set handrails and railings accurately in location, alignment, and elevation measured from established lines and levels and free from rack.
 - a. Do not weld, cut, or abrade coated or finished surfaces of railing components that are intended for field connection by mechanical or other means without further cutting or fitting.
 - b. Align rails so variations from level or parallel alignment do not exceed 1/4 inch in 12 feet (1.6 mm per m).
 - c. Provide manufacturer's proprietary system to evacuate entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources, in order to prevent water from entering the concrete slab. In lieu of the manufacturer's proprietary system, if acceptable to the Architect, provide another means to evacuate the entrapped water, i.e., a weep hole and epoxy fill system ("drill-and-fill").
 - d. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with non-metallic, non-shrink grout, mixed and placed to comply with anchoring material manufacturer's directions.
 - e. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

- f. **Adjusting:** Adjust handrails and railings before anchoring to ensure alignment at abutting joint's space posts at interval indicated, but not less than required to achieve structural loads.
 - g. **Fastening to In-Place Construction:** Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.
- B. **Non-Welded Railings Connections:** Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings.

3.04 ADJUSTING AND CLEANING

- A. **Touch-Up Painting:** Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and appoint exposed areas with same material.
- B. **Cleaning:** Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

3.05 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to the Installer that shall ensure that the aluminum handrails and railings shall be without damage at time of Substantial Completion.
- B. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

END OF SECTION

**SECTION 11 68 13
PLAYGROUND EQUIPMENT**

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 the following:

1. Playground Equipment.

- B. Related Sections include the following:

1. Division 3 for poured in place Concrete.
2. Section 12 93 00 - Site Furnishings.
3. Section 32 18 16.13 - Playground Protective Surfacing.

1.3 PERFORMANCE REQUIREMENTS

- A. Accessibility: American Disabilities Act - Design Guidelines, 2010.
- B. Layout: CPSC Public Playground Safety Handbook.
- C. IPEMA Equipment Certification

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, and anchoring and supporting systems. Include details of foundation system for ground-set flagpoles. Indicate Use Zone for each piece of equipment.
- C. Certifications: IPEMA Product Certification for each product supplied.

1.5 QUALITY ASSURANCE

- A. Manufacturer: A firm experience in the manufacture of the playground equipment complying with the requirements of this specification.
- B. Installer: Approved and trained by the manufacture of the playground equipment and having successful experience with other projects of similar scope and scale of the Work described herein.

1.6 WARRANTY

- A. Manufacture's stand form in which Manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period:
 - 1. Support Posts: Lifetime
 - 2. Steel decks, pipes, rails, loops and rungs: 15 years
 - 3. Rotomolded polyethylene components: 15 years
 - 4. Powerlocks and Hardware: Lifetime

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design of Playground Equipment is based on Gametime, Inc. products. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. GameTime, A PlayCore Company
 - 2. Landscape Structures, Inc.
 - 3. Miracle Recreation
 - 4. Playworld Systems, Inc.
 - 5. Approved Equal

2.2 PRODUCTS

- A. Schedule: see Drawings for identification of specific playground equipment. Equipment listed are Basis-of-Design, equal products by other manufacturer's are acceptable.

PART 3- EXECUTION

3.1 PREPARATION

- A. Inspect subgrade for compliance with manufacturer's requirements and compatibility with equipment to be installed. Do not proceed with work until unsatisfactory conditions have been addressed.
- B. Layout:

1. Layout equipment, including demarking Use Zone for each piece of equipment. Review layout with Owner's Representative prior to beginning installation
2. Verify finish surface elevation and coordinate with depth of piers for supports.

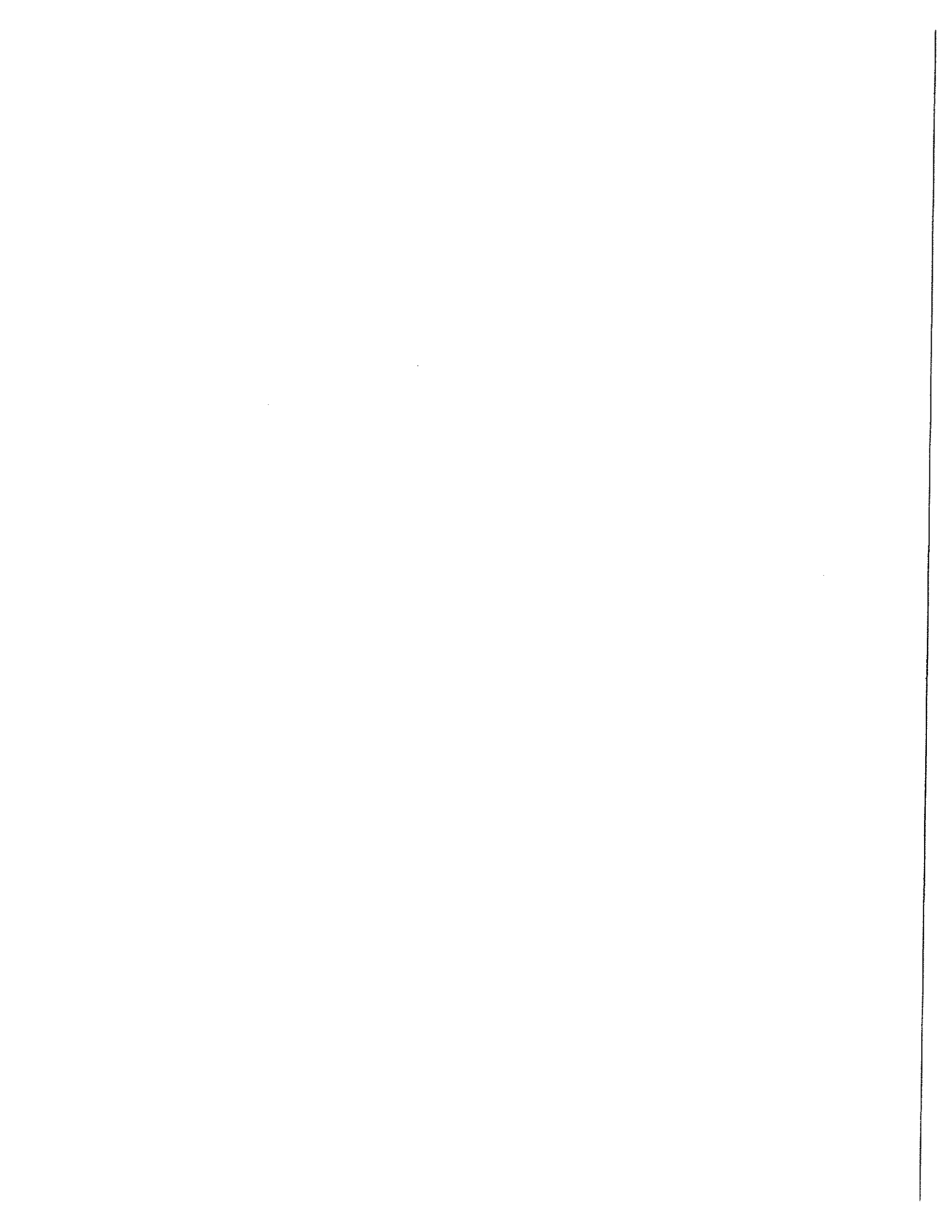
3.2 INSTALLATION

- A. General: Install equipment in accordance with manufacturer's written instructions.
- B. Set pier bases as necessary to align equipment with finished surface as indicated by manufacturer.
- C. Set vertical supports true and plumb and pour concrete pier.
- D. After concrete piers set, assemble play structure equipment, assuring elements are true and plumb. Verify proper heights off finish surface and clearances as required to meet ADA and CPSC requirements.

3.3 CLEANING AND PROTECTION

- A. Protect equipment and finishes from damage during construction activities.
- B. Inspect equipment for damage. Replace elements as necessary.
- C. Repair damage to finishes in accordance with manufacturer's written recommendations for particular finish involved.

END OF SECTION



**SECTION 12 93 00
SITE FURNISHINGS**

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 the following:

1. Park Benches
2. Picnic Tables
3. Trash Receptacles (installation only)

- B. Related Sections include the following:

1. Section 03 45 00 - Pre-Cast Concrete
2. Section 11 68 13 - Playground Equipment.

1.3 PERFORMANCE REQUIREMENTS

- A. Accessibility: American Disabilities Act - Design Guidelines, 2010.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

- B. Shop Drawings: Include plan details for layout, spacing, and anchoring of furnishings.

1.5 WARRANTY

- A. Warranty Information

1. Products shall be free from defects in material and/or workmanship for a period of 3 years from the date of installation.
2. Products found defective within the warranty period shall be replaced in full, including installation, at no cost to the Owner.

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design of Playground Equipment is based on Gametime, Inc. products. Subject to compliance with requirements, provide the named product or a comparable product by one of the following

2.2 SITE FURNITURE

- A. Schedule: see Drawings for identification of specific playground equipment. Equipment listed are Basis-of-Design, equal products by other manufacturers are acceptable.

PART 3- EXECUTION

3.1 EXAMINATION

- A. Examine location to receive site furnishings. Notify Owner's Representative of any condition that would adversely affect installation or subsequent use.
- B. Do not begin installation until conditions are acceptable.

3.2 PREPARATION

- A. Layout: demark locations of furnishings in accordance with Drawings. Pay special attention to requirements of ADA for accommodating needs of disabled. Verify layout with Owner's Representative prior to beginning installation.

3.3 INSTALLATION

A. Benches & Picnic Tables

- 1. Surface mount installation in accordance with manufacturer's instructions.
- 2. Install level and anchor securely in place. Furnishings shall not rock or wobble.

B. Trash Receptacles

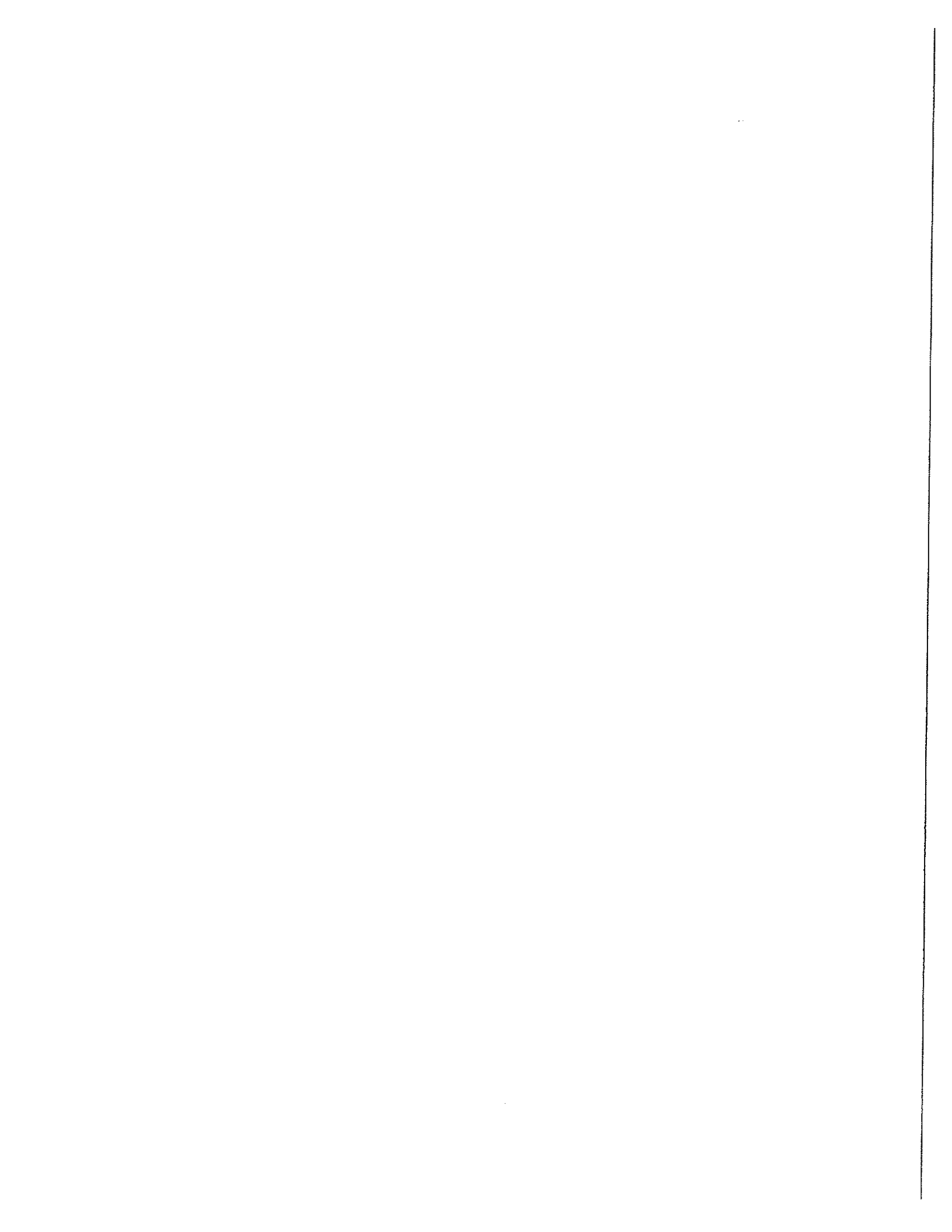
- 1. Receptacles to be provided by Owner. Coordinate delivery with Owner's Representative.
- 2. Surface mount installation in accordance with manufacturer's instructions.
- 3. Install level and anchor securely in place. Furnishings shall not rock or wobble.

3.4 ADJUSTMENT AND CLEANING

- A. Repair minor damage to finishes in accordance with manufacturer's instructions

- B. Remove and replace damaged components as determined by Owner's Representative.
- C. Protect installed site furnishings so that they will be without damage or deterioration at substantial completion.

END OF SECTION



SECTION 26 05 00
ELECTRICAL GENERAL PROVISIONS

GENERAL

1.01 WORK INCLUDED

- A. Provide all materials, labor, and equipment required to furnish and install a complete electrical system as indicated on the Drawings and as specified herein.
- B. Electrical work includes, but is not limited to, the following:
 - 1. Complete distribution system for lighting and power including the electrical service and necessary feeders, panelboards, branch circuits, conduit, lighting fixtures, control switches, and receptacles.
 - 2. Excavation, trenching, and backfilling for conduit and/or cable.
 - 3. Grounding.

1.02 RELATED WORK

- A. The following work shall be furnished under other Divisions of these Specifications, but shall be coordinated with said Divisions by Division 26 tradesman prior to bid.
 - 1. Painting.
 - 2. Cutting and patching.
 - 3. Heating, ventilating, air conditioning, and plumbing equipment.

1.03 DEFINITIONS

- A. Provide: Shall mean "furnish, install, connect, and put in good working order."
- B. Wiring: Shall mean "wire and cable, installed in raceway with all required boxes, fittings, connectors, etc. completely installed."
- C. Engineer: Shall mean "Engineer of Record" whose seal is affixed to the contract specifications and drawings of Division 26.

1.04 CODES AND STANDARDS

- A. Comply with applicable local, state, and federal codes.
- B. Electrical work shall be installed in accordance with the Drawings and Specifications, the 2008 NEC, 20012 IBC and applicable accessibility code.
- C. In event of conflict between Drawings, Specifications and such codes, Engineer shall be notified in writing prior to bid. A ruling will then be made by the Engineer in writing. All work shall be installed in strict accordance with applicable codes without additional

cost to Owner.

- D. Contractor shall submit and/or file all necessary specifications and drawings as required by governing authorities.

1.05 SUBMITTALS

- A. Provide submittals on materials and equipment identified in the Specifications and Drawings prior to manufacturer, order, or installation in accordance with Shop Drawings, Product Data, and Samples.
- B. Submittals shall include but not be limited to the following:

Lighting fixtures Panelboards

1.06 OPERATING AND MAINTENANCE MANUALS

- A. Furnish, to the Owner, three bound and indexed sets of operation and maintenance instructions on the electrical equipment. Instructions shall also include recommended spare parts lists.
- B. A minimum of 4 hours of training on the operation and maintenance of the electrical equipment shall be provided for the Owner's representative.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment and materials to job site in original, unopened, labeled containers.
- B. Store ferrous materials to prevent rusting. Store finished materials and equipment to prevent staining and discoloring.

PRODUCTS (Not used)

EXECUTION

3.01 SITE VISIT

- A. Visit job site prior to bid date to determine actual conditions under which work shall be done, to become familiar with project, and to verify total scope of work required. Failure to do so shall not constitute a reason for an extra charge.

END OF SECTION

SECTION 26 05 01
BASIC ELECTRICAL MATERIALS AND METHODS

GENERAL

1.01 QUALITY ASSURANCE

- A. **Qualifications of Manufacturer:** All materials and equipment used in work of Division 26 shall be produced by manufacturers regularly engaged in manufacture of similar items and with history of successful production acceptable to the Engineer. They shall be new and be UL listed and labeled or listed and labeled by other recognized testing laboratory where such label is available.
- B. **Qualifications of Installers:** Use adequate numbers of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work of this Section.

PRODUCTS

2.01 SUBSTITUTIONS

- A. Reference in Specifications to any article, device, product, material, fixture, form and type of construction, by name, make, or catalog number shall be interpreted as established standard of quality and shall not be construed as limiting competition unless noted otherwise. Any article, device, product, material, fixture, form and type of construction which in the judgment of Engineer, expressed in writing, is equal to that specified, may be used.
- B. Substitution shall be approved by Engineer before purchase and/or installation. If unapproved materials are installed, work required to remove and replace unapproved items shall be done at the Contractor's expense.

EXECUTION

3.01 INSTALLATION

- A. Electrical drawings are diagrammatic and shall not be scaled for exact sizes or locations. They are not intended to disclose absolute or unconditional knowledge of actual field conditions. This Division shall be prepared to relocate any outlet or device 6' in any direction without additional charge to the Owner.
- B. Equipment shall be installed according to manufacturer's recommendations.
- C. Protect work and materials from damage by weather, entrance of water, and dirt. Cap conduit during installation. Avoid damage to materials and equipment in place.

- D. Satisfactorily repair or remove and replace damaged work with new materials.
- E. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available space in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring services shall be readily accessible.
- F. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 - 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.
 - 8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, whether exposed or concealed.
 - 9. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 - 10. Install access panels or doors where units are concealed behind finished surfaces.
 - 11. Insulate dissimilar metals so they are not installed in direct contact.
- G. Conduits which pass through floor slabs (except ground floor) shall be sealed with Fire Stop Sealant. Seal around conduits or other wiring materials passing through partitions, floors, and fire rated walls. Use UL approved Fire Stop Sealant as detailed on the drawings.
- H. Coordinate electrical power connection requirements with all equipment suppliers. Where power requirements differ from drawing design requirements, Engineer shall be notified for clarification and installation requirements prior to installing that portion of work. Cost for equipment and labor for improperly installed electrical connections not coordinated and approved by other trades and the Engineer shall be incurred by the Electrical Contractor and shall not constitute a reason for an extra charge because of rework.

3.02 CUTTING AND PATCHING

- A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

3.03 TESTING AND EQUIPMENT SERVICING

- A. Entire installation shall be free from improper grounds and short or open circuits. Conductors shall be tested before energizing circuit. Test to insure that entire system is in proper operating condition, and that adjustments and settings of circuit breakers, fuses, control equipment, and apparatus have been made. Correct defects discovered during tests.
- B. Equipment shall be turned over to Owner in lubricated condition with instructions on further lubrication included in operating instructions.

3.04 REMOVAL OF DEBRIS

- A. Remove surplus materials and debris caused by, or incidental to electrical work. Remove such debris at frequent intervals. Keep job site clean during construction.

3.05 IDENTIFICATION OF EQUIPMENT

- A. Equipment shall be identified in accordance with Section 260553, "Electrical Identification."

3.06 AS-BUILT DRAWINGS

- A. Maintain one set of blue line electrical prints on site, marked to show as-built conditions and installations, prints to be turned over to Owner after job is complete.

3.07 OTHER MATERIALS

- A. Work of this Division shall also include those items not specifically mentioned or described, but which are obviously necessary to conform to the design intent, applicable codes and to produce complete electrical system that functions properly. These materials shall be as selected by Contractor but subject to approval of the Engineer.

3.08 OTHER COORDINATION

- A. Contractor shall obtain and pay for all necessary permits and inspection fees required for the electrical installation.

3.09 GUARANTEE-WARRANTY

- A. Guarantee work to be free of material and workmanship defects for a period of one year, from date of final acceptance for the project. Repair and replace defective work and other work damaged thereby which becomes defective during term of Guarantee-Warranty. Furnish Owner with three written copies of Guarantee-Warranty.

END OF SECTION

**SECTION 26 05 19
WIRE AND CABLE**

GENERAL

1.01 WORK INCLUDED

- A. Wire and cable for all service, feeders, branch circuits, and instrument and control wiring rated 600 volts and below.

1.02 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wire and cable that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Wire and cable and its installation shall comply with requirements of the National Electrical Code.

PRODUCTS

2.01 MATERIALS

- A. Wires and cables shall meet applicable requirements of the National Electrical Code and UL for the type of insulation, jacket, and conductor specified or indicated.
- B. All conductors shall be copper with 600 volt insulation unless otherwise indicated.
- C. Wire and cable shall be manufactured by Belden, General Cable, Essex, Encore, Rome Cable, Southwire, or approved equal.
- D. Use solid copper type THHN/THWN for branch circuit wiring #10 AWG and smaller. No conductor for branch circuit wiring shall be smaller than #12 AWG.
- E. Use stranded copper, type THHN/THWN for feeder and power circuits #8 AWG and larger.
- F. Provide color coded wire and with a different color for each phase and neutral and ground as follows: 240/120 volt circuits - phases A and B: black and red, respectively; neutral: white; ground: green. 208/120 volt circuits - phases A B and C: black red and blue, respectively; neutral: white; ground: green. Approved color tape is acceptable for feeders. Also provide color coded wire for control circuits.

EXECUTION

3.01 INSTALLATION

- A. Complete conduit system before pulling any wire or cable. Use cable lubricants recommended by cable manufacturer as necessary.
- B. Conductors shall be continuous from outlet to outlet or to branch circuit over-current devices. Make splices only in junction boxes. Splices shall not be made in panelboards. Control wiring shall be continuous between components and/or terminal boards.
- C. A minimum of eight (8") inches of slack conductor shall be left in every outlet or junction box. There should also be enough slack so three (3") inches extends outside the outlet or junction box.
- D. Make splices in conductors #10 AWG and smaller diameter with insulated, pressure-type connector. Use Scotchlok, Ideal, or equal wire connectors.
- E. Make splices in conductors #8 AWG and larger diameter with solderless connectors and cover with insulation material equivalent to conductor insulation. Use Burndy compression connectors with crimpit cover, type CC, or equal.
- F. Where branch circuits homeruns exceed 70' in length for 120 volt and 150' in length for 208, 240, or 277 volt circuits, #10 AWG wire shall be the minimum size used to the first outlet.

3.02 TESTING

- A. After completion of the installation and splicing and prior to energizing the conductors, wire and cable shall be given continuity and insulation tests as herein specified.
- B. Test wiring to verify that no short circuits, open circuits, or accidental grounds exist. Continuity tests shall be conducted using a dc device with bell or buzzer.
- C. Perform insulation resistance tests on wiring #6 AWG and larger diameter using an insulation test set which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

GENERAL

1.01 WORK INCLUDED

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.02 PERFORMANCE REQUIREMENTS

- A. The grounding system to earth resistance shall be less than 5 ohms.

1.03 QUALITY ASSURANCE

- A. Listing and Labeling: Provide grounding and bonding materials that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Components and installation shall comply with the requirements of the 2 National Electrical Code (NEC).
- C. Materials shall comply with UL 467, "Grounding and Bonding Equipment."

PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers shall be Burndy, T&B, or approved equal.

2.02 GROUNDING ELECTRODES

- A. Ground rods shall be copper clad steel with minimum dimensions of $\frac{3}{4}$ inch diameter by 10 feet long.

2.03 CONNECTORS

- A. Exothermic welded connections shall be provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
- B. Pressure connectors shall be high-conductivity-plated units.
- C. Bolted clamps shall be heavy-duty units listed for the application.

2.04 WIRE AND CABLE

- A. All grounding conductors shall be copper.
- B. The grounding electrode conductor shall be stranded.
- C. Equipment grounding conductors shall have green insulation.
- D. Bare copper conductors shall conform to the following:
 - 1. Solid conductors: ASTM B-3
 - 2. Assembly of stranded conductors: ASTM B-8
 - 3. Tinned Conductors: ASTM B-33

2.05 MISCELLANEOUS CONDUCTORS

- A. Ground bus shall be bare annealed copper bars.
- B. Braided bonding jumpers shall be copper tape, braided number 30 gauge bare copper wire, and terminated with copper ferrules.
- C. Bonding strap conductor/connectors shall be soft copper, 0.05 inch thick and two (2") inches wide, unless otherwise noted.

EXECUTION

3.01 INSTALLATION

- A. Grounding system shall be in accordance with Article 250 of the 2008 NEC except where the Drawings or Specifications exceed NEC requirements.
- B. Install code size green grounding conductors in all feeder and branch circuits. Bond conductors to chassis or fixed equipment.
- C. All grounding conductors shall be bonded to multi-terminal ground bus at panelboard or other distribution equipment. Grouping of grounding conductors under a single lug is not acceptable.
- D. Bond support steel of service entrance equipment.
- E. Install a triad of ground rods, 15' apart at both service locations. All grounding electrode

connections shall be made by minimum #2/0.

- G. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.

3.02 CONNECTIONS

- A. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
 - 2. Make connections with clean bare metal at points of contact.
 - 3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
 - 4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. Use exothermic welded connections for connections to structural steel and for underground connections. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. For compression-type connections, use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- D. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.
- E. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- F. Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.
- G. Do not use flexible metal conduit and fittings as a grounding means. Pull a green wire in each piece of flexible conduit, and screw to conduit system with lugs at both ends.

3.03 FIELD QUALITY CONTROL

- A. Use the fall-of-potential method as described in IEEE Standard 81 to measure the resistance of the following. Record the measurements and provide to the Engineer.
1. The resistance between earth and each ground rod prior to interconnection with other ground rods.
 2. The resistance between earth and the counterpoise.
 3. The resistance of the grounding system at the grounding electrode connection to earth.
Measure the ground resistance when there has been no precipitation for 5 days, without the soil being moistened by any means other than natural precipitation or natural drainage or seepage, and without chemical treatment or other artificial means of reducing natural ground resistance.
 4. Resistance shall be less than 5 ohms.
- B. Perform continuity tests at all power receptacles to ensure the ground terminals are properly grounded to the facility ground network.

END OF SECTION

SECTION 26 05 29
SUPPORTING DEVICES

GENERAL

1.01 WORK INCLUDED

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fasteners.

1.02 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with the National Electrical Code.

PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, Slotted Metal Angle and U-Channel Systems shall be provided by Allied Tube & Conduit, American Electric, B-Line Systems, Inc., Unistrut Diversified Products, or approved equal.
- B. Subject to compliance with requirements, Conduit Sealing Bushings shall be provided by Bridgeport Fittings, Inc., Cooper Industries, Inc., Killark Electric Mfg. Co., O-Z/Gedney, Raco, Inc., Spring City Electrical Mfg. Co., Thomas & Betts Corp., or approved equal.

2.02 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be aluminum or hot-dip galvanized.

2.03 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Raceways shall be supported with clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:
 - 1. Expansion Anchors: Carbon steel wedge or sleeve type.
 - 2. Toggle Bolts: All steel springhead type.

3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
- E. U-Channel Systems: 16-gauge steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

2.04 FABRICATED SUPPORTING DEVICES

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
 - a. 3-inch and smaller: 20-gauge.
 - b. 4-inch to 6-inch: 16-gauge.
 - c. over 6-inch: 14-gauge.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
 3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

EXECUTION

3.01 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.

- C. Raceway Supports: Comply with the NEC and the following requirements:
1. Conform to manufacturer's recommendations for selection and installation of supports.
 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs., provide additional strength until there is a minimum of 200 lbs. safety allowance in the strength of each support.
 3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
 5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
 6. Space supports for raceway types not covered by the above in accordance with NEC.
 7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- G. Sleeves: Install in concrete slabs and walls and all other fire rated floors and walls for raceways and cable installations. For sleeves through fire rated wall or floor construction, apply UL listed firestopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with manufacturer's recommendations.
- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

- I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
 2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
 3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

END OF SECTION

SECTION 26 05 34 CONDUIT

GENERAL

1.01 WORK INCLUDED

- A. Provide a complete conduit system to support all electrical equipment and systems. Conduit system includes conduit, couplers, connectors, fittings, boxes, covers and supports.
- B. No conduit for branch circuit wiring shall be installed in or below concrete slabs unless shown underground on the drawings, required for branch circuits serving loads located in the center of a room or extending to fixtures/devices exterior to the building.

1.02 QUALITY ASSURANCE

- A. Listing and Labeling: Provide conduit that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Conduit and its installation shall comply with requirements of the National Electrical Code.

PRODUCTS

2.01 CONDUIT

- A. Electric Metallic Tubing (EMT): Allied, Wheatland, LTV Copperweld, or approved equal.
- B. Rigid Metal Conduit (RMC): Allied, Wheatland, Republic, or approved equal.
- C. Flexible Steel Conduit (Greenfield): Alfex, Electroflex, or approved equal.
- D. Rigid Non-Metallic Conduit (PVC): Carlon Schedule 40, Cantex, Southern Pipe, Schedule 80 or approved equal.
- E. Liquidtight Flexible Nonmetallic Conduit (LFNC): Aflex, Electroflex, or approved equal.

2.02 CONDUIT FITTINGS

- A. Couplings and connectors: Appleton, T&B, Arlington, or O.Z. Gedney.

- B. Bushings: Appleton, T&B, O.Z., or Gedney
- C. Straps and Hangers: Appleton, T&B, Steel City, or Minerallac.
- D. Group Pipe supports: Unistrut, Kindorf, B-Line, or approved equal.
- E. Expansion Fittings: O.Z. Gedney Type AX, or equal by Appleton, or approved equal.
- F. Exposed Conduit Fittings: Appleton, Crouse-Hinds, or O.Z. Gedney.

EXECUTION

3.01 CONDUIT

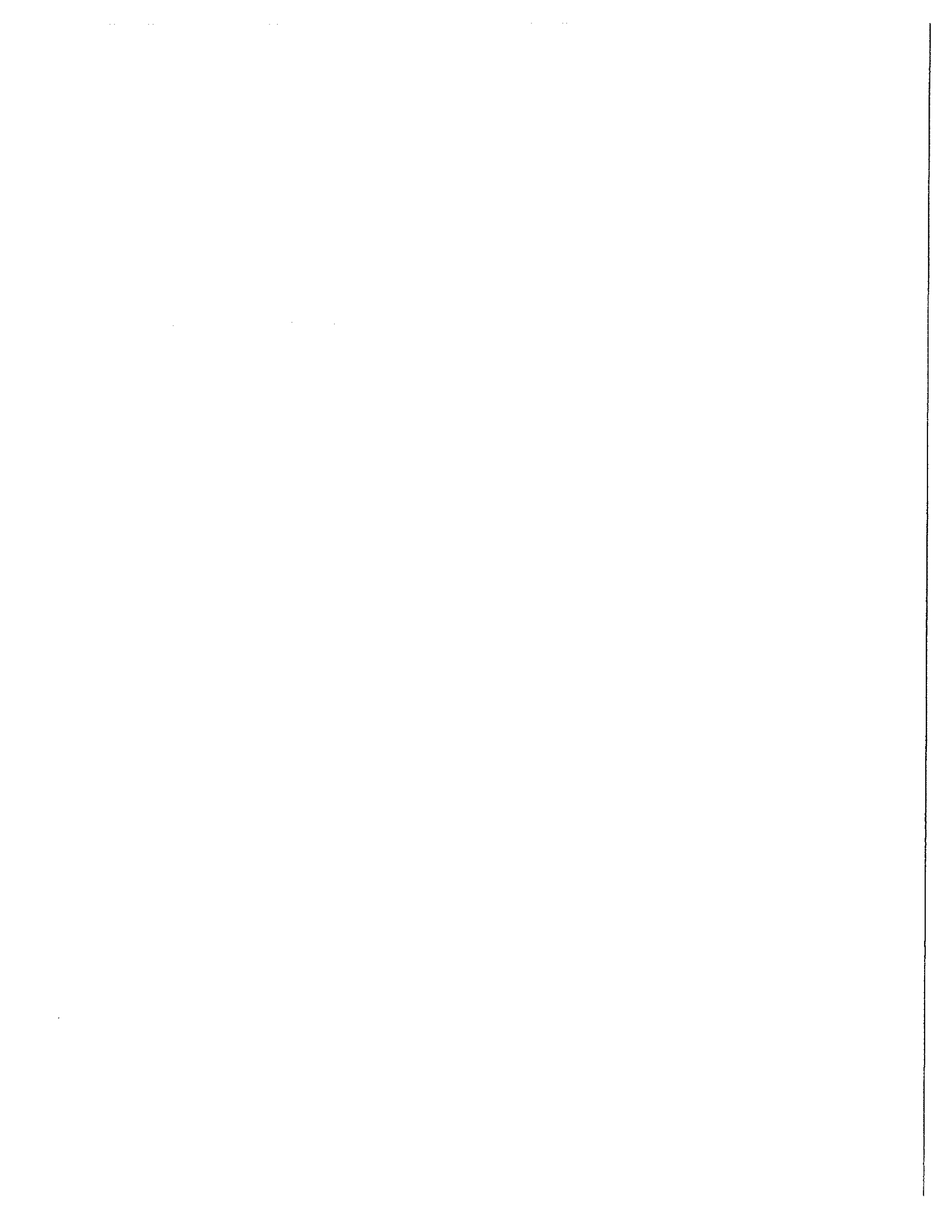
- A. In general, conduit installation shall follow layout shown on drawings. However, this layout is diagrammatic only and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without cost to Owner. Offsets in conduits are not indicated and must be furnished as required.
- B. Conduit shall be installed in accordance with the 2008 National Electrical Code.
- C. Provide bushings on the open ends of conduit containing conductors. Insulated bushings shall be provided for conduits containing conductors #4 AWG or larger with an insulating ring an integral part of the bushing.
- D. Use EMT where Drawings call for conduit to be concealed in walls or above ceilings. Do not use EMT exposed in wet locations or in exterior applications.
- E. In exterior locations, use Schedule 40 PVC encased in concrete or when run underground. Use Schedule 80 PVC when exposed.
- F. When conduit is turned up, penetration of the slab shall be vertical. The entire radius of the conduit shall be below slab.
- G. Support conduit and secure to forms when cast in concrete so that conduit will not be displaced during pouring of concrete. Stuff boxes and cork fittings to prevent entrance of water during concrete pouring and at other times during construction, prior to completion of conduit installation.
- H. Route all conduit at right angles or parallel to walls of building.
- I. Use proper sized tools for bending. Do not heat metal conduit. Dents and flat spots will be rejected. Cut and thread conduit so ends will butt in couplings. Make threads no longer than necessary and ream pipe free of burrs.
- J. Leave one #10 AWG or equivalent nylon pull wire in empty conduits.
- K. Use short pieces, approximately five (5') feet of flexible conduit to connect motors and other devices subject to motion and vibration. Use liquid tight flexible conduit where outside or subject to water spray.

- L. Minimum conduit size shall be 1/2".

3.02 CONDUIT FITTINGS

- A. When EMT is installed concealed in walls or above ceilings, for sizes one (1") inch and smaller use set screw connectors and steel couplings with two set screws. For sizes larger than one (1") use steel double set screw connectors and steel couplings with four set screws. All connectors shall have throated insulating bushing.
- B. Support conduit vertically and horizontally by straps or hangers. Do not exceed intervals as described in the National Electrical Code.
- C. Use expansion fittings, properly bonded to assure ground continuity, across expansion joints in floors and ceilings. Use double lock nuts and bushings on panel feeders at panel cans.
- D. When connections are made to motors or other equipment, not near walls or columns, provide a vertical conduit, minimum 3/4", attached to floor with a floor flange, bring wiring out of this conduit by means of a conduit and flexible conduit extending to equipment junction box.

END OF SECTION



**SECTION 32 13 16.23
STAMPED CONCRETE PAVING**

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:

1. Dry-shake colored hardener.
2. Release agent.
3. Curing compound.
4. Stamping tool.

- B. Related Sections include the following:

1. Cast-in-Place concrete is specified under Division 03.
2. Joint Sealants are specified under Division 07.

1.3 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts showing full range of colors and finishes available.
- C. Qualification Data: For manufacturer and installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has successfully completed concrete work similar in material, design, and extent to that indicated for this Project.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

- D. Comply with ACI 301, "Specification for Structural Concrete."
- E. Mock-Up: Prior to beginning finished work, build mockup to verify selections made under sample submittals and to demo
 - 1. Build approximate 10 foot x 10 foot mock-up at location selected by Owner's Representative.
 - 2. Build mock-up to demonstrate color, pattern, finish, curing, sealing, and cleaning.
 - 3. Approved mockup will be used as the standard for quality of work to be performed.
 - 4. Approved mockup may become part of the completed work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original factory package, unopened and undamaged, bearing identifying label.
- B. Store and handle products according to manufacturer's printed instructions.

1.6 PRE -INSTALLATION CONFERENCE

- A. Seven calendar days prior to scheduled date of concrete placement, conduct a meeting at Project site to discuss requirements, including application methods. Attendees to include Architect, Owner, Contractor, Installer, concrete supplier, and manufacturer's authorized field representative.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Basis-of-Design Product: BrickForm "Concrete Hardener" and "Antique Release"
- B. Manufacturers: Subject to compliance with requirements provide the following or a comparable product by one of the following:
 - 1. BrickForm
 - 2. H&C Concrete
 - 3. L.M. Scofield

2.2 MATERIALS

- A. Concrete Hardener
 - 1. Abrasion and impact resistant
 - 2. Color: BrickForm #700 Terra Cotta
 - 3. Application Rate: 60 pounds per 100 square feet.
- B. Release Agent

1. Colored powder that forms a waterproof barrier and reduces concrete buildup on printing forms.
 2. Color: To match hardener.
 3. Texture: Antique.
- C. Curing Compound
1. Evaporation Retarder: Clear, non-yellowing, acrylic polymer solution.
 2. Minimum 25% solids.
 3. ASTM C 309, Type 1, Class A & B.
 4. ASTM C 1315, Type 1, Class A.
- D. Stamping Tool
1. Pattern: Herringbone Brick, equal to Lithotex Pavecrafters No. 2050.
 2. Brick shall be 3 5/8" x 7 5/8"
 3. Joints shall be 3/8" wide and 1/8" deep, with the appearance of raked, rough, sandy grout.

PART 3- EXECUTION

3.1 PREPARATION

- A. Subgrade: Uniformly graded, compacted and moistened, but free of standing water.
- B. Concrete:
 1. Slump: 4 inches, minimum.
 2. Admixtures: no calcium chloride.
 3. Aggregates: non-reactive and free of deleterious materials.

3.2 APPLICATION OF HARDENER

- A. Install in accordance with manufacturer's written instructions.
- B. Protect surrounding areas indicated not to receive color hardener.
- C. Mix multiple containers of material.
- D. Place hardener after concrete surface has been placed, screed, floated, and excess bleed water has disappeared from surface.
- E. Apply hardener using broadcast method, in two stages.
 1. First stage shall use at least 40 pounds per square foot. Float surface after application.
 2. Second stage shall complete uniform coverage.
 3. Application Rate: 60 pounds square foot total.

3.3 RELEASE AGENT

- A. Install in accordance with manufacturer's written instructions.
- B. Temperature shall be between 55 and 80 degrees Farenheit.
- C. Broadcast material
 - 1. Application Rate: 3.5 pounds per square foot minimum as required to achieve standard established by the mockup
 - 2. Do not trowel material into concrete.
- D. Apply texturing mats as soon as the release agent has been applied.
- E. Remove excess material only after it can be performed without damage to concrete surface.

3.4 STAMPED PATTERN

- A. Apply in accordance with manufacturer's written instructions and with approved mockup.
- B. Pattern: herringbone brick.
- C. Center pattern such that opposite edge conditions are of equal size, and that any fraction of pattern is no less than 1/2 an increment of a brick.

3.5 TOLERANCES

- A. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

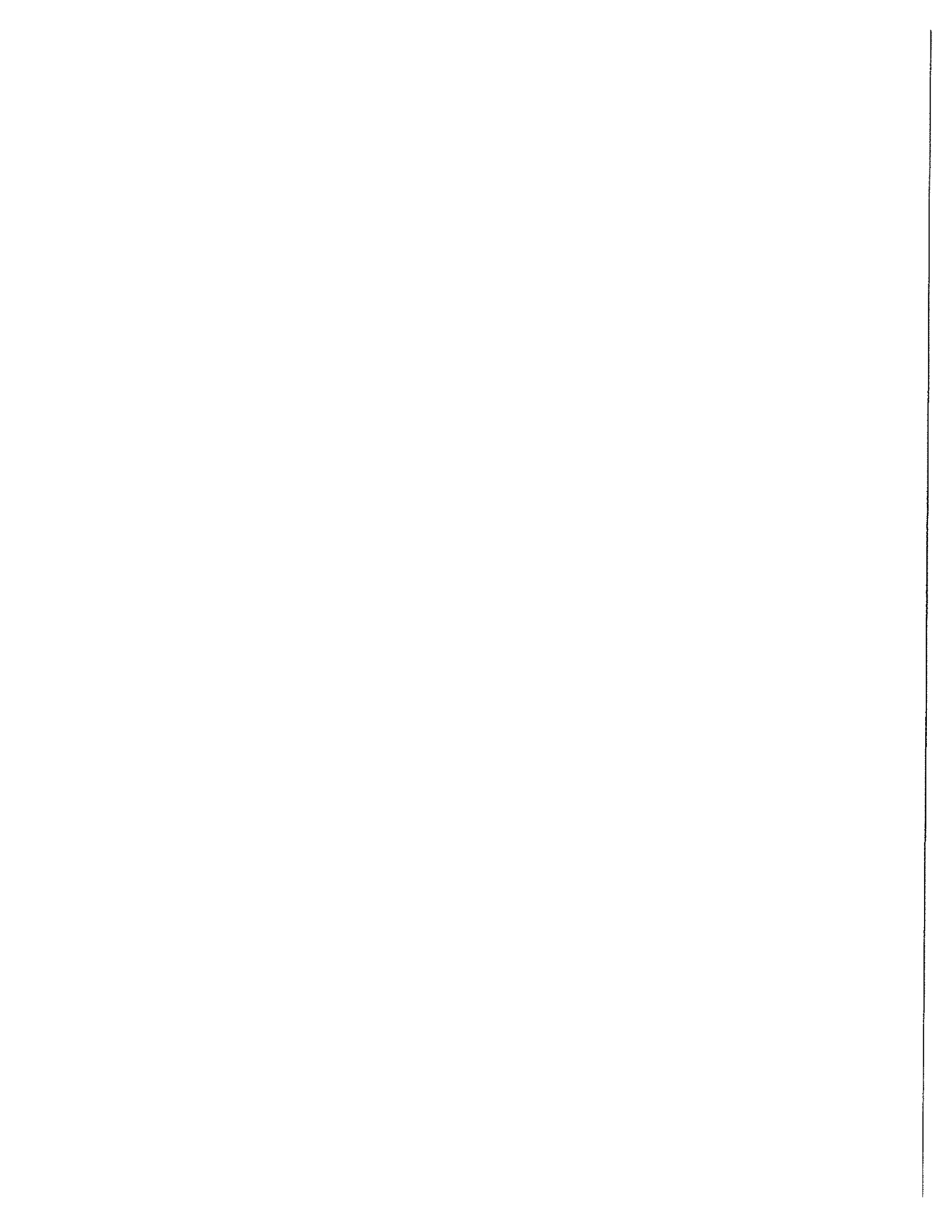
3.6 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection, and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- C. Curing Methods: Cure formed and unformed concrete for at least seven days by curing compound, as follows:
 - 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Tests will be performed according to ACI 301.
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
- 3.8 REPAIRS
- A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION



**SECTION 32 18 16.13
PLAYGROUND PROTECTIVE SURFACING**

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 the following:

1. Poured-in-place rubber surface system

- B. Related Sections include the following:

1. Division 03 for Cast-in-Place Concrete.

1.3 PERFORMANCE REQUIREMENTS

- A. Accessibility: American Disabilities Act - Design Guidelines, 2010.

- B. CPSC Public Playground Safety Handbook.

- C. Surfacing Characteristics:

1. Tensile Strength, ASTM D 412: 60psi
2. Tear Resistance, ASTM D 624: 140%
3. Water Permeability: 0.4gal/square yard/second
4. Fall Protection, ASTM F 1292
 - a. Gmax: less than 200.
 - b. Head Injury Criteria: less than 1000.
5. IPEMA Certification

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

- B. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, and anchoring and supporting systems. Include details of foundation system for ground-set flagpoles.

- C. Sample: Provide 12" x 12"
- D. Testing: ASTM F 1292 Fall test data.
- E. Certification:
 - 1. Manufacturer's system IPEMA certification.
 - 2. Manufacturer's Certification of installer as an approved applicator or surfacing system.

1.5 QUALITY ASSURANCE

- A. Manufacturer: A firm experience in the manufacture of the playground surfacing material complying with the requirements of this specification.
- B. Installer: Approved and trained by the manufacture of the playground surfacing material and having successful experience with other projects of similar scope and scale of the Work described herein.
- C. System: IPEMA Certification.

1.6 WARRANTY

- A. Provide manufacturer's standard 10 year warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design of Playground Equipment is based on Gametime, Inc. products. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. GameTime, A PlayCore Company
 - 2. Landscape Structures
 - 3. SafeDek Systems
 - 4. Surface America
- B. Protective Surfacing: Continuous poured-in-place (PIP) rubber surface consisting of a two-layer system. System shall be IPEMA certified product.
 - 1. Base Course: MDI polyurethane and SBR rubber buffings mixed 12% binder to rubber ratio.
 - a. Thickness: as required to meet ASTM F 1292 requirements for critical fall height noted on Drawings, minimum 4" thick.
 - 2. Wear Course: MDI polyurethane and EPDM rubber granules ½ inch in thickness, mixed 22% binder to rubber ratio.
 - a. Thickness: 1/2" minimum.

- b. Color: allow for multiple colors in pattern as indicated on Drawings. Colors as selected by Owner's representative from manufacturer's standard palette.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Inspect subsurface preparation to ensure that acceptable base for protection system exists.
 - 1. Upon completion of subsurface, contractor shall flood test entire surface to ensure proper drainage. If standing water exists deep enough to cover a flat nickel, corrective action shall be taken to eliminate this condition.
 - 2. Concrete subsurface shall be cured no less than 7 days prior to beginning PIR base course.
- B. Inspect curb and edging installation to ensure that acceptable edge conditions exist.
- C. Do not begin work until subsurface is acceptable. Commencement of Work indicates acceptance of base and edge conditions.

3.2 INSTALLATION

- A. Prime: as recommended by the manufacturer's installation instructions.
- B. Base Course
 - 1. Install thickness as required by manufacturer to achieve required fall protection, but not less than 4".
 - 2. Allow base to cure; do not allow foot traffic or use of surface until sufficiently cured.
- C. Finish Course:
 - 1. Layout surface color pattern as indicated on Drawings. Confirm with Owner's Representative before proceeding with finish course.
 - 2. Install finish course per manufacturer's instructions, 1/2 inch thickness.
 - 3. Allow top course to cure minimum 48 hours or as recommended by manufacturer. Verify that top course is dry and firm before allowing any foot traffic.

3.3 TESTING

- A. Drainage: Upon completion of finish surface, contractor shall flood test entire surface to ensure proper drainage. If standing water exists deep enough to cover a flat nickel, corrective action shall be taken to eliminate this condition.
- B. Impact test: provide independent laboratory validation of fall height protection through IPEMA Third Party Certification Service within 30 days of completion of installation.

3.4 PROTECTION

January 22, 2015

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Project No. 14T-G-0566
Suttree Landing Park; Phase 1B Project
Proposed Park Improvements

- A. Protect and cover surface from damage by construction activity on site. Put protective fence around surface area and post prohibiting use.

END OF SECTION

SECTION 32 80 00
IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

- A. General Description Includes:
1. Underground irrigation system.
 2. Pump station.
 3. Pipe and fittings, valves, sprinkler heads, and accessories.
 4. Automatic two-wire control system.
 5. Excavation and backfilling for installation of underground system.
 6. All necessary permits, licenses and fees.

1.2 SYSTEM DESCRIPTION

- A. Layout design:
1. Full and complete coverage is a requirement. Contractor shall, at no additional costs to the Owner, modify layout, make necessary adjustments, as needed to obtain a full coverage areas without overthrow on roadways, pavements, structures, furniture, fountains or buildings and to protect trees and shrubs from close high spray velocity.
 2. Provide irrigation layout with separate plant type zones:
 - a. Lawn (seed and sod)
 - b. Plant beds containing Groundcover, Perennials, Shrubs and/or Trees
 3. Provide flow velocities that do not exceed 5.0 ft. per second.
 4. Provide irrigation of lawn areas with no overspray into planting beds or pavements, unless so designed on the drawings.
 5. Provide independent irrigation of individual bed zones or planters.
- B. Only similar types of heads with matched precipitation rates may run on same zone.
- C. Piping Design: Do not mix different heads for each line. Provide main size as needed for proper flow, but not less than specified on plan.
- D. Provide electric solenoid controlled underground irrigation system manufactured especially for control of automatic circuit valves of underground irrigation system. Provide unit of capacity to suit number of circuits indicated.
1. Source Power: 120 volts
 2. Low Voltage Controls: 24 volts AC.
- E. Provide controller to control all zones.
- F. The extent of the irrigation system is shown on the Drawings.

1.3 SUBMITTALS - REVIEW

- A. Product Data: Submit manufacturer's technical data and installation instructions for all components and equipment used.
- B. Shop Drawings:
1. Indicate piping layout to water source.
 2. Include piping layout and details illustrating location and types of sprinkler heads, valves, control system and wiring diagram showing routes, wire sizes, wiring details and source of current and connections, and schedule of fittings.
 3. Indicate location of sleeves under pavements and conflicts with existing utilities.

C. Samples

1. Submit the following material samples:
 - (a) Piping and fittings.
 - (b) Wire connectors and sealer.
 - (c) Control wire.
2. Submit the following equipment samples:
 - (a) Sprinkler heads, one of each type, complete with housing.
 - (b) Valves and access boxes.
 - (c) Controller.
3. Approved equipment samples will be returned to the Contractor and may be used in the work before final approval.

1.4 SUBMITTALS - CLOSE-OUT

A. Comply with the requirements of the General Conditions.

B. Record Drawings:

1. Prepare a map diagram showing location of all valves, lateral lines, and route of the control wires. Identify all valves as to size, station, number and type of irrigation. "As-built" drawings must be approved before charts are prepared.
2. Provide one chart per controller showing the area covered by each satellite controller. The chart shall be a reduced drawing of the actual "as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door. A second full-sized copy of each chart is to be given to the Landscape Architect.
3. The chart shall be a photographically reproduced print with a different color used to show coverage for each station. When completed and approved, the chart shall be hermetically sealed between two pieces of clear plastic. Charts must be completed and approved prior to final inspection of the irrigation system.
4. At the time of the irrigation mainline test, provide a preliminary set of "Record" drawings to the Owner.

C. Operation and Maintenance Data:

1. Provide schedule indicating length of time each valve is required to be run to provide a determined amount of water.
2. Include complete parts list with manufacturer's designations for each component.

D. Loose Equipment to Furnish: Loose irrigation equipment, operating keys and spare parts will be furnished by the Irrigation Contractor in quantities below:

1. Two (2) quick coupler keys and matching swivel hose ells for 3/4" garden hose.
2. Two (2) valve keys for gate valves.
3. Two (2) keys for each controller.
4. Two (2) of each type of sprinkler used on project, complete with housings.

1.5 QUALITY ASSURANCE

A. Installer's Qualifications: Single firm specializing in irrigation work with a minimum of five (5) years experience properly installing irrigation systems of comparable size. Crew leader is to hold a certification of competence in irrigation design or installation.

1. Provide references of your last five- (5) consecutive systems, and five systems of comparable size with bid proposal.

- B. Multiple units: when two or more units of the same type or class of materials or equipment are required, these units are products of one manufacturer.
- C. Materials, equipment, and methods of installation shall comply with the following codes and standards:
 - 1. State of Tennessee Building Codes.
 - 2. American Society for Testing and Materials (ASTM).
 - 3. National Sanitation Foundation (NSF).
- D. Nameplates: Nameplate bearing manufacturer's name or identification trademark securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- E. Requirements of Regulatory Agencies:
 - 1. All work and materials shall be in full accordance with the latest rules and regulations of safety orders of Division of Industrial Safety; the Uniform Building Code and other applicable laws or regulations, including any local Plumbing Codes.
 - 2. Should the Contract documents be at variance with the aforementioned rules and regulations, notify the Owner for instructions before proceeding with work affected.
- F. Testing:
 - 1. Preliminary review of completed main line and wire installation will be made prior to back-filling of trenches and hydrostatic testing.
 - 2. Final review and testing shall be made in conjunction with the final review of lawn, shrub and tree planting. The irrigation system must be operational for 14 days prior to this final inspection. Any failures are to be corrected and the testing cycle is to be repeated.
 - 3. Contractor is to notify Landscape Architect three (3) days prior to testing.
- G. Permits and Inspections:
 - 1. Any permits for the installation or construction of any work included under this contract, which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the contractor, each at the proper time.
 - 2. The Contractor shall also arrange for and pay all costs in connection with any inspection and examination required by these authorities.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver irrigation system components in manufacturer's original, undamaged and unopened containers, with labels intact and legible.
- B. Deliver plastic pipe in bundles, packaged to provide adequate protection of pipe ends.
- C. Store and handle materials to prevent damage and deterioration.
- D. Provide secure, locked storage for valves, sprinkler heads and similar components that cannot be immediately replaced to prevent installation delays.
- E. Contractor is responsible for materials through final acceptance.

1.7 PROJECT CONDITIONS

- A. Protect existing trees, plants, and lawns and other features designated to remain as part of the final landscape.
- B. The Contractor shall carefully coordinate with the landscape work and other site developments, including all new and existing utilities.

- C. The Contractor shall verify the correctness of all finish grades within the work area to ensure the proper soil coverage of the irrigation pipes.
- D. Irrigation system layout is diagrammatic. Exact location of piping, sprinkler heads, valves, and other components shall be established by Contractor in the field at time of installation.
- E. Where possible sprinkler head layout should match drawings as closely as possible; field stake line and head locations for coordination with landscape contractor and approval by Landscape Architect prior to installation. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown. Lines are to be common trenched wherever possible.
- F. Space sprinkler components as indicated. Do not exceed sprinkler spacing shown on Drawings.
- G. Locate existing utilities in areas of work. If utilities are to remain, provide adequate means of protection during the system installation. Repair utilities damaged during the work to the satisfaction of the Utility Owner and at the Contractor's expense. Notify local Utilities Protection Service 48 hours before start of construction.
- H. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, notify the Owner immediately for direction as to procedure. Cooperate with the Owner and Utility companies in keeping active services and facilities in operation.
- I. Minor adjustments in system layout will be permitted to clear existing field obstruction. Final system layout shall be acceptable to the Landscape Architect.

1.8 WARRANTY

- A. Warranties are subject to the General Conditions and Supplementary Agreements.
- B. Irrigation Contractor is responsible to insure complete coverage as specified herein of the areas to be irrigated. During the warranty period the Irrigation Contractor shall make any adjustments as necessary to maintain proper coverage.
- C. The Contractor shall guarantee all parts and labor for a period of one year from the date of final inspection. If within that period settlement occurs, and adjustments in pipes, valves and sprinkler heads, lawn areas or paving are necessary to bring the system, grade or paving to the proper level of the permanent grades, the Contractor, as part of the work under his Contract, shall make all adjustments without extra cost to the Owner, including the restoration of all damaged planting, paving or other improvements of any kind.

1.9 OPERATION & MAINTENANCE — IRRIGATION SYSTEM

- A. It is the Landscape Contractor's responsibility to determine water application rates and controller cycling. The Irrigation Contractor will coordinate system installation with planting soil placement and planting activities. The Irrigation Contractor will also instruct the Landscape Contractor on the operation and programming of the controller and will assist the Landscape Contractor as necessary in such operations throughout the one-year maintenance period. Any adjustments, repairs, etc., other than programming, are the total responsibility of the Irrigation Contractor.
- B. As part of this contract, the Irrigation Contractor shall winterize the system the first year, and provide written instructions to the Owner for future service and maintenance. The Irrigation Contractor shall return to the site during the subsequent spring season and demonstrate to the Owner the proper procedures for the system start-up, operation and maintenance.

PART 2 - PRODUCTS

2.1 UNAUTHORIZED MATERIALS

- A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyl (PCB) or other hazardous materials identified by the Owner.

2.2 IRRIGATION SYSTEM MANUFACTURERS

- A. All irrigation system components shall be supplied by regionally authorized distributors to provide single source responsibility for warranty service and operations to conform to specifications in all aspects.

2.3 MATERIALS

- A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of this system.

B. Plastic Pipe

1. All piping shall be from virgin parent material. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles and dents. All pipe shall be National Sanitation Foundation (NSF) approved.
2. For all mainline piping 3" and over, use SDR 21, Class 200 gasketed PVC bell and spigot pipe.
3. For all other irrigation piping, use polyvinyl chloride (PVC) 1120 with a minimum class rating of 200, sized to maintain a maximum flow velocity of less than 5 ft. per second (FPS).
4. Outside diameter of pipe shall be the same as iron pipe.
5. Pipe shall be marked at intervals (not to exceed 5') with the following information: Manufacturer's name or trademark, nominal pipe size, schedule, PVC type and grade (i.e. PVC 1120), SDR rating class, working pressure at 73 degrees F. and NSF approval.
6. Caution should be utilized in handling Type I pipe due to the possibility of cracking or splitting when dropped or handled carelessly.
7. When connection is plastic to metal, male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench.
8. Comply with pipe sizes indicated on drawings. No substitution of smaller pipe will be permitted. Larger sizes may be used subject to acceptance of the Landscape Architect. Remove damaged and defective pipe from site.
9. All PVC pipe to be furnished in 20' lengths.
10. Acceptable Manufacturer:
 - (a) Silverline Plastics or approved equivalent

C. Piping for Sleeving

1. For sleeves less than six inches (6") in size, use high impact type, polyvinyl chloride (PVC) 1120, minimum Schedule 40.
2. Sleeves six inches (6") and above in size shall be Polyvinyl Chloride (PVC) 1120 Class 200.
3. Irrigation Contractor shall be responsible for the coordination of sleeves for all piping passing through concrete curbing, under paved areas, concrete or masonry walls and floors while the same are under construction.
4. Acceptable Manufacturer:
 - (a) Silverline Plastics or approved equivalent

D. PVC Fittings

1. Schedule 40 or 80, polyvinyl chloride (PVC), Type I injection molded fittings suitable for solvent weld or threaded connections. Fittings made of other materials are not permitted.

2. Threaded PVC nipples shall be Schedule 80. Use high quality grade of Teflon tape for threaded fittings.
 - (a) Saddle fittings are not permitted.
 - (b) Use high quality grade of Teflon tape for sprinkler head and electric remote control valve connections.
 3. Acceptable Manufacturer:
 - (a) Spears Manufacturing or approved equivalent
- E. Isolation Valves
1. Gate valves under 3" shall be 200 PSI rated W.O.G. 200 domestically manufactured with bronze bodies. Valves shall be equipped with tee handles.
 2. The valve shall have a 100% urethane coated wedge insuring a bubble-tight seal up to 200 PSI. The valve shall be fusion-bonded epoxy coated with PVC push-on, threaded or mechanical connections and a two-inch (2") square nut for vertical valve stem key.
 3. Acceptable Manufacturer:
 - (a) Watts Regulator or approved equivalent
- F. Quick Coupling Valves
1. Valve shall be of two-piece construction with a one-inch (1") female top thread with vinyl cover.
 2. Furnish one (1) valve key fitted with one-inch (1") swivel hose ends.
 3. All quick coupling valve keys and hose swivels shall be of the same manufacturer as the quick coupler.
 4. Acceptable Product:
 - (a) Rain Bird model 5RC or approved equivalent
- G. Valve Boxes
1. Tapered rib reinforcement enclosure of rigid tensile strength plastic material components chemically inert and unaffected by moisture, ultra violet light, corrosion and temperature changes. Lid and base shall withstand normal loads exerted by turf equipment without collapsing. Box and lid to be black.
 2. For remote control valves use rectangular standard turf box, 16" x 11".
 3. For Isolation valves and quick coupler valves use 9" circular turf box.
 4. Acceptable Manufacturer:
 - (a) Rain Bird PVB series or approved equivalent
- H. Spray Heads
1. Full or part circle pop-up fixed spray sprinkler.
 2. The sprinkler body, stem, nozzle and screen shall be constructed of heavy-duty, ultra-violet resistant plastic. It shall have a heavy-duty stainless steel retract spring for positive pop-down and a ratcheting system for easy alignment of the pattern. The sprinkler shall have a soft elastic pressure-activated co-molded wiper seal for cleaning debris from the pop-up stem as it retracts into the case to prevent the sprinkler from sticking up to minimize "flow-by." The sprinkler shall have a matched precipitation rate (MPR) plastic nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall be capable of housing under the nozzle; protective, non-clogging filter screens or pressure compensating screens. The screen shall be used in conjunction with the regulating screw for regulating.
 3. The sprinkler shall have a flush plug reinstalled. The plug shall prevent debris from clogging the sprinkler during installation and allow for system to be flushed before nozzling. The plug shall be bright orange in color and constructed of polypropylene material.
 4. The 4", 6" or 12" high pop-up spray sprinklers shall also include an integral check valve such as a Seal-A-Matic (SAM) and an integral pressure-regulating device (PRS). These units shall be identifiable from the top with markings such as "SAM-PRS" on top.

5. The check valve shall prevent low-head drainage of up to 8 feet of head. The pressure regulating device shall prevent high pressure fogging of the nozzle stream by regulating the nozzle pressure to 30 PSI for inlet pressure from 35 to 70 PSI
6. Pop-up heights: 4 inches, 6 inches and 12 inches (see drawings).
7. Spray nozzles for sprinkler heads shall be of the same manufacturer as the sprayhead.
8. Acceptable Product:
 - (a) Rain Bird model 1800SAM-PRS series or approved equivalent

I. Rotator Nozzles

1. The rotary nozzle shall have an adjustable arc of between 90 and 210 degrees and shall be capable of covering a 10-30' radius at 30 PSI.
2. The rotary nozzle shall have multiple arced streams and have a matched precipitation rate of 0.60 in/hr.
3. The rotary nozzle shall be constructed of UV-resistant plastic. The radius adjustment screw shall be of stainless steel and shall include a removable mesh screen to protect the nozzle against clogging.
4. Acceptable Products:
 - (a) Rain Bird R series or approved equivalent.

J. Short-Range Turf Rotors

1. The full or part circle rotor sprinkler shall be a single stream, water lubricated, gear drive.
2. The sprinkler shall have adjustable arc coverage from 40 to 360 degrees in one unit.
3. The sprinkler shall have a pressure-activated multi-function wiper seal that positively seals against the nozzle flange to keep debris out of the rotor and to clean debris from the pop-up stem as it retracts. The wiper seal shall prevent sprinkler from sticking up, and be capable of sealing the sprinkler cap to sprinkler body under normal operating pressures.
4. The sprinkler shall be fully adjustable from the top using only a flat-blade screwdriver.
5. The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system. It shall have a 3/4" (FNTF) bottom inlet.
6. The sprinkler shall have a stainless steel adjusting screw capable of reducing the radius up to 25%.
7. The sprinkler shall have a strong stainless steel retract spring for positive pop down. It shall have a check valve to check 7 feet of elevation change (if specified on the Drawing).
8. Acceptable Product:
 - (a) Rain Bird model 3504PC or 3504FC or approved equivalent

K. Mid-Range Turf Rotors

1. The full or part circle rotor sprinkler shall be a single stream, water lubricated, gear drive.
2. The part circle sprinkler shall have adjustable arc coverage from 30 to 350 degrees.
3. The sprinkler shall have a thread-on nozzle assembly whose installation shall not require any tools. The arc adjustment shall not require any tools.
4. The sprinkler shall have a pressure-activated multi-function wiper seal that positively seals against the nozzle flange to keep debris out of the rotor and to clean debris from the pop-up stem as it retracts. The wiper seal shall prevent sprinkler from sticking up, and be capable of sealing the sprinkler cap to sprinkler body under normal operating pressures.
5. The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system. It shall have a 3/4" bottom inlet.
6. The sprinkler shall have a stainless steel retract spring for positive pop down.
7. The sprinkler shall have an adjusting screw capable of reducing the radius by up to 25%.

8. sprinklers shall also include an integral check valve such as a Seal-A-Matic (SAM). The check valve shall prevent low-head drainage of up to 8 feet of head.
9. Pop-up heights: 4 inches and 12 inches (see drawings).
10. Acceptable Products:
 - (a) Rain Bird 5000-Plus series rotor model or approved equivalent

L. Long-Range Turf Rotors

1. The part or full circle sprinkler shall be a single stream, water lubricated, gear drive type.
2. Arc adjustment can be performed with or without the rotor in operation and shall require only a flat blade screwdriver.
3. The sprinkler shall have a rotating nozzle turret independent of the riser stem. The portion of the riser stem that is in contact with the wiper seal shall be non-rotating.
4. The sprinkler shall have a pressure activated, multi-function, wiper seal that will clean debris from the pop-up stem as it retracts. This wiper seal shall prevent the sprinkler from sticking in the up position, and be capable of sealing the sprinkler riser stem to the sprinkler cap under normal operating pressures.
5. The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system.
6. The sprinkler shall have a standard rubber cover. *Exposed surface diameter shall not exceed 2"*.
7. The sprinkler shall have a front-loading nozzle assembly, which will allow the nozzle to be installed without a stator bushing change.
8. The sprinkler shall have a stainless steel adjusting screw capable of reducing the radius up to 25%.
9. The sprinkler shall have a standard Seal-A-Matic (SAM) device capable of holding up to ten feet (10') of head.
10. Acceptable Products:
 - (a) Rain Bird 6504 series rotor model or approved equivalent.

M. Automatic Controller, 2-Wire

1. The controller shall be of a hybrid type that combines electro-mechanical and microelectronic
2. circuitry capable of fully automatic or manual operation. The controller shall be housed in a wall-mountable, weather-resistant plastic cabinet with a key-locking cabinet door suitable for either indoor or outdoor installation.
3. The controller shall have a base station capacity of 50 stations with two additional expansion slots capable of receiving modules to create a controller capacity of up to 200 stations. All stations shall have the capability of independently obeying or ignoring any weather sensor as well as using or not using the master valves. Station timing shall be from 0 minutes to 12 hours.
4. The controller shall have a Seasonal Adjustment by program which adjusts the station run time from 0 to 300% in 1% increments. The controller shall also have a Monthly Seasonal Adjustment of 0 to 300% by month. Station timing with Seasonal Adjustment shall be from 1 second to 16 hours.
5. The controller shall have 4 separate and independent programs which can have different start times, start day cycles, and station run times. Each program shall have up to 8 start
6. times per day for a total of 32 possible start times per day. The 4 programs shall be allowed to overlap operation based on user defined settings which control the number of simultaneous stations per program and total for the controller. The controller shall allow up to 8 valves to operate simultaneously per program and total for the controller including the master valves.

7. The controller shall have a 365-day calendar with Permanent Day Off feature that allows a day(s) of the week to be turned off on any user selected program day cycle. (Custom, Even, Odd, Odd31, & Cyclical). Days set to Permanent Day Off shall override the normal repeating
8. schedule and not water on the specified day(s) of the week. The controller shall also have a Calendar Day Off feature allowing the user to select up to 5 dates up to 365-days in the future when the controller shall not start programs.
9. The controller shall incorporate a Rain Delay feature allowing the user to set the number of days the controller should remain off before automatically returning to the auto mode.
10. The controller shall have Cycle+Soak water management software which is capable of operating each station for a maximum cycle time and a minimum soak time to reduce water runoff. The maximum cycle time shall not extended by Seasonal Adjustment.
11. The controller shall incorporate a FloManager feature providing real-time flow, power, and station management. FloManager shall manage the number of stations operating at any point in time based on water source capacity, station flow rate, number of valves per station; user-defined simultaneous stations per program and for the controller. FloManager shall incorporate the ability to provide station priorities to determine the order in which stations shall operate. The controller shall ignore the station number and instead operate the highest priority stations first and the lower priority stations last when FloManager is enabled. FloManager shall be an option that is disabled by default and the controller shall operate zones in order of station number, started with the lowest numbered zone set to irrigate and ending with the highest number zone.
12. The controller shall offer Water Windows for each program. This function sets the allowed start and stop time where watering is allowed. If the watering cannot be completed by the time the Water Window closes, the stations with remaining run time are paused and watering automatically resumes when the Water Window opens the next time.
13. The controller shall include an integrated Flow Smart Module with flow sensing functionality. The Flow Smart Module shall accept sensor decoder input from 1 - 5 flow sensors with no flow scaling device required. A FloWatch Learn Flow Utility which learns the normal flow rate of each station shall be included. Each time a station runs FloWatch compares the current real-time flow rate to the learned rate and takes user-defined actions if high flow, low flow, or no flow is detected. FloWatch shall automatically determine the location of the flow problem and isolate the problem by turning off the affected station(s) or master valve(s).
14. Acceptable Product:
 - (a) Rain Bird ESP-LXD series or approved equivalent

N. Line Decoders

1. The factory pre-coded decoders shall be fully waterproof and have a working range shall be 0 degrees C to 50 degrees C at up to 100% humidity.
2. Decoders shall be capable of operating from one to six solenoids depending on the model specified on the Drawings
3. Four and six address decoders shall have integral surge protection.
4. Acceptable Product:
 - (a) Rain Bird LD series or compatible with approved controller

O. Control Wire

1. Two conductors of single strand solid copper wire type, with PVC jacket. UF 600-volt AWG #14 minimum size, approved for direct burial. For runs over 2,000 L.F. use AWG #12. Contractor is to verify that wire sizes are within recommended wire run lengths for proper solenoid operation.

P. Rain Shutoff

1. One device shall be provided for each controller. Install per manufacturer's latest printed instructions.
2. Verify with Landscape Architect as to final location of rain shutoff.
3. Acceptable Product:
 - (a) Rain Bird RSD or approved equivalent

Q. Remote Control Valves

1. The electric remote control valve shall be a normally closed 24 VAC 50/60 Hz (cycles/sec) solenoid actuated globe/angle pattern design. The valve pressure rating shall not be less than 150 PSI.
2. The valve body and bonnet shall be constructed of high-impact, water-resistant PVC for the
3. body and glass-filled nylon for the bonnet with stainless steel screws.
4. The valve shall have manual open/close control (internal bleed) for manual opening and closing of valve without electrically energizing the solenoid. The valve's internal bleed shall prevent flooding of the valve box.
5. The valve shall house a fully-encapsulated, one-piece solenoid. The solenoid shall have a captured plunger with a removable retainer for easy servicing, and a leverage handle for easy turning. This 24 VAC 50/60 Hz solenoid shall open with 19.6 VAC minimum at 150 PSI. At 24 VAC, average inrush current shall not exceed 0.41 amps. Average holding current shall not exceed 0.28 amps.
6. The valve shall have a flow control stem for accurate manual regulation and/or shut off of outlet flow. The valve must open or close in less than 1 minute at 150PSI and less than 30 seconds at 20 PSI.
7. The valve construction shall provide for all internal parts to be removable from the top of the valve without disturbing the valve installation. The body shall have a removable O-ringed plug for installation in either globe or angle configuration.
8. Acceptable Product:
 - (a) Rain Bird model PGA or approved equivalent

R. Pump Station

1. Pump shall be a complete station consisting of a pump, variable frequency drive motor, controls, and inlet & outlet piping. Features are to include the following: powder coated steel enclosure with exhaust fan, touchscreen operator interface, circuit breaker motor protection, individual pump silent check and isolation valves, stainless steel pressure transducer, flow switch, suction and discharge pressure gauges.
2. The control system shall feature automatic ramp-up capability, VFD fault shutdown, an automatic diagnostic utility, high and low pressure alarms, dry run protection, main power/phase monitoring and motor overload & thermal protection.
3. Motor shall be 230-volt single phase.
4. The pump shall be capable of producing 15-85 GPM at 70 PSI.

S. Accessory materials

1. Drainage fill at valve boxes:
 - (a) Provide 1" washed pea gravel in each valve box.
2. Suitable excavated materials removed to accommodate the irrigation system work shall be used as fill materials provided it conforms to the requirements of fill as noted above.

T. PVC Solvent Cement:

1. Provide professional grade cement, Whitlam #PR32 or approved equivalent for PVC pipe and fittings.

U. PVC Primer/Cleaner

- I. Provide professional grade primer/cleaner, Whitlam #PP32 or approved equivalent (purple) primer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Lay out work as accurately as possible to Drawings. Drawings are diagrammatic to the extent that swing joints, offsets, and fittings are not shown.
- B. The Irrigation Contractor shall carefully schedule his work with the Landscape Contractor and all other site developments.
- C. Sleeves are required wherever piping or electrical wires are placed under paved surfaces. (Installed as part of other sections and Contract). Irrigation Contractor is responsible for coordination of all sleeves.
- D. Full and completed coverage is required. Contractor shall make any necessary minor adjustments to layout as required to achieve full coverage of irrigated areas at no additional cost to the Owner.
- E. Where piping is shown on drawings to be under paved areas but running parallel and adjacent to planted areas, the intent is to install piping in planted areas. Do not install directly over another line in the same trench.
- F. It shall be the Contractor's responsibility to establish the location of all sprinkler heads in order to assure proper coverage of all areas. In no case shall spacing of sprinkler heads exceed distances shown on the drawings and/or those specified. Pipe sizes shall conform to those shown on drawings. No substitution of smaller pipe sizes will be permitted, but substitutions of larger sizes may be approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection.
- G. Install irrigation system after completion of site grading, the irrigation system shall be installed and completely operational three days prior to the installation of any planting operations.

3.2 POINT OF CONNECTION

- A. Provide irrigation system complete from point of connection. See Drawings for Point of Connection (POC).

3.3 EXCAVATING

- A. All piping is to be trenched, other than one inch (1"), which may be pulled.
- B. Excavate to depths required to provide six inches (6") of Granular Fill bedding material under paved surfaces.
- C. Should utilities not shown on the plans be found during excavations, the Contractor shall promptly notify the Owner for instructions as to further actions required. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities. Indicate such utility crossings on the record drawings promptly.
- D. Install main line irrigation lines with a minimum cover of eighteen inches (18") and a maximum cover of twenty-four inches (24") based on finished grades.
- E. Install lateral irrigation lines with a minimum cover of twelve inches (12") and a maximum cover of twenty-four inches (24") based on finished grades.

- F. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations, to their original condition.
- G. Trenches shall be open, vertical sided construction wide enough to provide free working space around work installed and to provide adequate space for backfilling and compacting.
- H. When two (2) pipes are to be placed in the same trench, a six-inch (6") space is to be maintained between the pipes. The Contractor shall not install two pipes with one directly above the other.
- I. The Contractor shall cut trenches for pipe to required grade lines and compact trench bottom to provide accurate grade and uniform bearing for the full length of the line.
- J. The Contractor shall be held responsible for damages caused by these operations and shall immediately repair or replace damaged parts.

3.4 PIPE LINE ASSEMBLY

- A. General
 - 1. Install pipes and fittings in accordance with manufacturer's latest printed instructions.
 - 2. Clean all pipes and fittings of dirt, scales and moistures before assembly.
 - 3. All pipe, fittings and valves, etc., shall be carefully placed in the trenches. Interior of pipes shall be kept free from dirt and debris and when laying is not in progress, open ends of pipe shall be closed by approved means.
 - 4. All lateral connections to the main line as well as all other connections shall be made to the side of the main line pipe. No connections to the top of the line shall be allowed.
- B. Solvent-Welded Joints for PVC Pipe
 - 1. Use solvents and methods approved by solvent and pipe manufacturers.
 - 2. Cure joint a minimum of one hour before applying any external stress on the piping and at least twenty four (24) hours before placing the joint under water pressure, unless otherwise specified by the manufacturer. Cut all pipe with square ends and remove burrs, ridges and dirt. Check dry fit pipe and fitting. Clean pipe and fitting with purple primer and apply thin coat of cement to fitting with a liberal coat to pipe. Quickly push pipe fully into fitting using a ¼ turning motion. Hold pipe and fitting together a minimum of 30 seconds, wipe off excess with cloth.
- C. Threaded Joints for PVC Pipe
 - 1. Use Teflon tape on all threaded PVC fittings.
 - 2. Use strap-style friction wrench only. Do not use metal-jawed wrench.
- D. Laying of Pipe
 - 1. Pipes shall be bedded in at least in at least two inches (2") of finely divided material with no rocks or clods over one inch (1") diameter to provide a uniform bearing.
 - 2. Pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction. One additional foot per 100 feet of pipe is the minimum allowance for snaking.
 - 3. Do not lay PVC pipe when there is water in the trench.
 - 4. Plastic pipe shall be cut with PVC pipe cutters or hacksaw, or in a manner so as to ensure that a square cut. Burrs at end cuts shall be removed prior to installation so that a smooth unobstructed flow will be obtained.
 - 5. All plastic-to-plastic joints will be solvent-weld joints or slip seal joints. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.

3.5 PVC SLEEVES AND ELECTRICAL CONDUIT

- A. Provide all sleeves indicated and as otherwise required for the successful completion of the irrigation system. Coordinate sleeving efforts with General Contractor and the Owner.
- B. All PVC sleeves shall be a minimum of twice (2x) the diameter of pipe to be sleeved.
- C. All PVC control wire conduit shall be of sufficient size to hold the required quantity of control and common wires. Electrical wires are not to be placed in the same trench with water pipes.

3.6 ISOLATION VALVES

- A. Shall be located in the following locations:
 - 1. After backflow preventer and prior to main supply loop.
 - 2. Between main line and each quick coupler valve.
 - 3. As located on irrigation system drawings within lawn areas.
- B. Install each isolation valve in an individual valve box with a six-inch (6") (deep) layer of washed gravel below the bottom of the valve.
- C. Seal threaded connections with Teflon tape.

3.7 IRRIGATION CONTROL VALVES

- A. Coordinate location of all valve boxes with Landscape Architect. Do not proceed in uncertainty.
- B. All irrigation control valves shall be installed with ductile iron service tees.
- C. Install line size bronze gate valve on pressure side of each control valve. Locate in valve box with control valve.
- D. Install each electric control valve in an individual valve box with a six-inch (6") (deep) layer of washed gravel below the bottom of the valve.
- E. Seal threaded connections with Teflon tape.
- F. Valves shall be installed as shown in details and in accordance with manufacturer's instructions and specifications.

3.8 QUICK COUPLING VALVES

- A. Shall be set a minimum of twelve inches (12") from walks, curbs, or paved areas where applicable or as otherwise noted. Quick coupling valves shall be housed in standard size valve boxes.
- B. All quick coupler valves shall be installed on to ductile iron service tee.
- C. Install one inch (1") bronze gate valve on pressure side of each quick coupler valve. Locate in valve box with quick coupler valve.
- D. Valves shall be installed on a three- (3) elbow PVC Schedule 80 swing joint assembly.
- E. Provide six-inch (6") (deep) layer of washed gravel below the bottom of the valve. Top of quick coupler valves shall be as close to the top of the valve box as possible. Top of gravel layer shall be three inches (3") below the top of the valve.
- F. Quick coupling valves shall be set perpendicular to finished grade unless otherwise designated on the plans.
- G. Quick coupler locations are to be staked in the field by installer for approval by Landscape Architect prior to installation.

3.9 VALVE BOXES

- A. Valve boxes shall be set flush with grade in lawn areas and one half inch (1/2") above finish grade in ground cover and shrub bed areas.
- B. Install valve access boxes on a suitable base of gravel to provide a level foundation at proper grade and to provide drainage of the valve box.

3.10 SPRAY HEADS AND TURF ROTORS

- A. All sprinkler heads shall be pop-up type heads. Permanent shrub risers are not permitted.
- B. All sprinkler heads within a zone shall have matched precipitation rates.
- C. Install plumb to within 1/16", unless otherwise noted (see detail for heads on sloped areas on detail sheet). Top of collar (not nozzle) should be flush with finish grade.
- D. Place part-circle pop-up sprinkler heads at least two inches (2") and no more than six inches (6") from edge of adjacent walks, curbs and mowing bands, or paved areas at time of installation.
- E. Install pop-up sprinkler heads, and accessories in accordance with manufacturer's latest printed instructions, except as otherwise noted.
- F. All sprinkler nozzles shall be adjusted for the proper radius and direction of spray pattern. Make adjustments where possible to prevent overspraying onto walks, pavement or buildings.
- G. Tighten nozzles on spray type sprinklers after installation. Adjust sprinkler adjusting screw as required for proper radius.
- H. Install pop-up sprayheads with approved flexible thick wall polyethylene swing pipe with spiral barb fittings. Do not install to side inlet of sprinkler head.
- I. Install pop-up mid-range turf rotors with approved flexible thick wall polyethylene swing pipe with spiral barb fittings.
- J. Install pop-up long-range turf rotors with PVC unitized swing joints with one-piece riser assembly. Swing joints to be factory assembled with 360 degree O-ring seals as manufactured by Lasco. All connections to be threaded, no glued connections shall be allowed on the swing joints.
- K. Polyethylene swing joints are not to be used to extend head more than eighteen inches (18") from lateral.
- L. Heads to be installed at the top of a slope shall be tilted toward the toe of the slope. They shall also be installed slightly down from the top edge of the slope to decrease wind drift.
- M. Mid-slope sprinkler heads shall be installed at an angle halfway between vertical and perpendicular to the slope. For example, a 2:1 or 50% slope has an angle of 26 degrees, so tilt the heads 13 degrees into the slope from the perpendicular.
- N. Heads installed at the toe of the slope shall be tilted slightly away from the slope to avoid driving water into the slope directly in front of the sprinkler.
- O. Do not mix different types of heads within a zone.

3.11 CONTROLLER

- A. Mount the controller flush with the mounting surface. Controller should be level with the surface of the floor or concrete mounting pad. Install controller with display at eye-level if at all possible.
- B. Mount the controller pedestal with the mounting hardware and template supplied.

- C. The automatic controller shall be installed at the approximate location shown on the Drawings. (Suitable power supply will be supplied as part of other sections and Contract).
- D. All local and other applicable codes shall take precedence in connecting the 110-volt electrical service to the controller.
- E. Install per local code, manufacturer's latest printed instructions, and as detailed.
- F. Valve control wires shall be numbered at the terminal strip.

3.12 CONTROLLER POWER SUPPLY

- A. Power to the controller(s) shall be supplied from a dedicated circuit. (Installed as part of work of other sections and Contract).
- B. The Irrigation Contractor shall be responsible for all wiring and associated equipment to connect power supply to the controller.
- C. All wiring is to be in accordance with local codes. Refer to and comply with Electrical work requirements specified in Division 16.

3.13 CONTROL WIRING

- A. All electrical equipment and wiring shall comply with local and state codes and be installed by those skilled and licensed in the trade.
- B. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines whenever possible, and shall have a minimum of twelve inches (12") cover.
- C. Control wires shall be installed to the side of the main line whenever possible. Placement over pipes is not permitted.
- D. Where more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of twenty feet (20').
- E. An expansion curl shall be provided within three feet (3') of each wire connection and at least every one hundred feet (100') of wire length on runs of more than one hundred feet (100') in length. Expansion curls shall be formed by wrapping at least five (5) turns of wire around a one-inch (1") diameter pipe, then withdrawing pipe.
- F. Control wire splices at remote control valves to be crimped and sealed with specified splicing materials. Line splices will be allowed only on runs of more than five hundred (500') and they must be located in ten inch (10") round splice boxes that are green in color. The connector shall be 3M DBY splice kit by 3M Corporation, or accepted Substitute. Use one splice per connector sealing pack.

3.14 CLOSING OF PIPE AND FLUSHING OF LINES

- A. All testing shall be done under the supervision of the Landscape Architect and Owner. Submit written requests for inspections to the Owner at least three (3) days prior to the anticipated inspection date.
 1. Thoroughly flush out all water lines under a full head of water before installing heads, valves, quick coupler assemblies, etc. Maintain flushing for a minimum of three (3) minutes at the valve located furthest from water supply.
 2. After flushing, cap or plug all openings to prevent entrance of materials that would obstruct the pipe or clog heads. Leave in place until removal is necessary for completion of installation.
 3. Test as specified below.
 4. Upon completion of testing complete assembly and adjust sprinklers for proper distribution.

3.15 TESTING

- A. Make hydrostatic when welded PVC joints have cured as per manufacturer's instructions.
 - 1. Pressurized mainlines:
 - (a) Completely install water meter, mains, isolation valves and control valves. Do not open laterals.
 - (b) Open all isolation valves.
 - (c) Fill all lines with water and shut off at meter.
 - (d) Test piping at hydraulic pressure of 70 PSIG for one-half (1/2) hour. Maximum loss shall be five (5) PSI. Locate pump at low point in line and apply pressure gradually.
 - (e) Install pressure gage shut-off valve and safety blow-off valve between pressure source and piping. Inspect each joint and repair leaks.
 - (f) Leaks resulting from tests shall be repaired and tests repeated until the system passes.
- B. Non-pressurized laterals:
 - (a) Test piping after laterals are installed and system is fully operational.

3.16 INSPECTIONS

- A. The contractor shall maintain proper facilities and provide safe access for inspection to all parts of the work.
- B. Irrigation inspection shall consist of a minimum of:
 - 1. Mainline pressure test.
 - 2. Coverage test.
 - 3. Final irrigation inspection.
- C. If the specifications, the Owner's and/or Landscape Architect's instructions, laws, ordinances or any public authority require any work to be tested or approved, the contractor shall give the Owner three (3) days notice of its readiness for inspection.
- D. The contractor shall be solely responsible for notifying the Owner and Landscape Architect where and when such work is in readiness or testing.
- E. If any work should be covered up without the approval of the Owner and Landscape Architect it must be uncovered, if required, for examination at the contractor's expense.
- F. No inspection will commence without "Record" drawings and without completing previously corrections, or without preparing the system for inspection.

3.17 BACKFILLING AND COMPACTING

- A. After system is operating and required tests and inspections have been made, backfill excavations and trenches.
 - 1. Restore all surfaces to match adjacent surfaces. Meet grades flush. Create smooth blends and transitions.
- B. Granular fill corresponding with Section Earthwork shall be placed initially on all lines with a minimum of three inches (3") cover. No foreign matter larger than one-half inch (1/2") in size shall be permitted in the initial backfill.
 - 1. Trenches located under paving shall be backfilled with Granular Fill corresponding with the requirements of Section Planting Soil System (three inches (3") above the pipe) compacted in layers.
 - 2. Backfill in lawns and planting beds shall be planting soils corresponding with the requirements of Section Planting Soil System. Coordinate backfilling of planting soils with the Landscape Contractor. Care should be taken to restore the planting soil profile in accordance with the Contract Documents. Planting soils damaged during trenching shall be discarded.

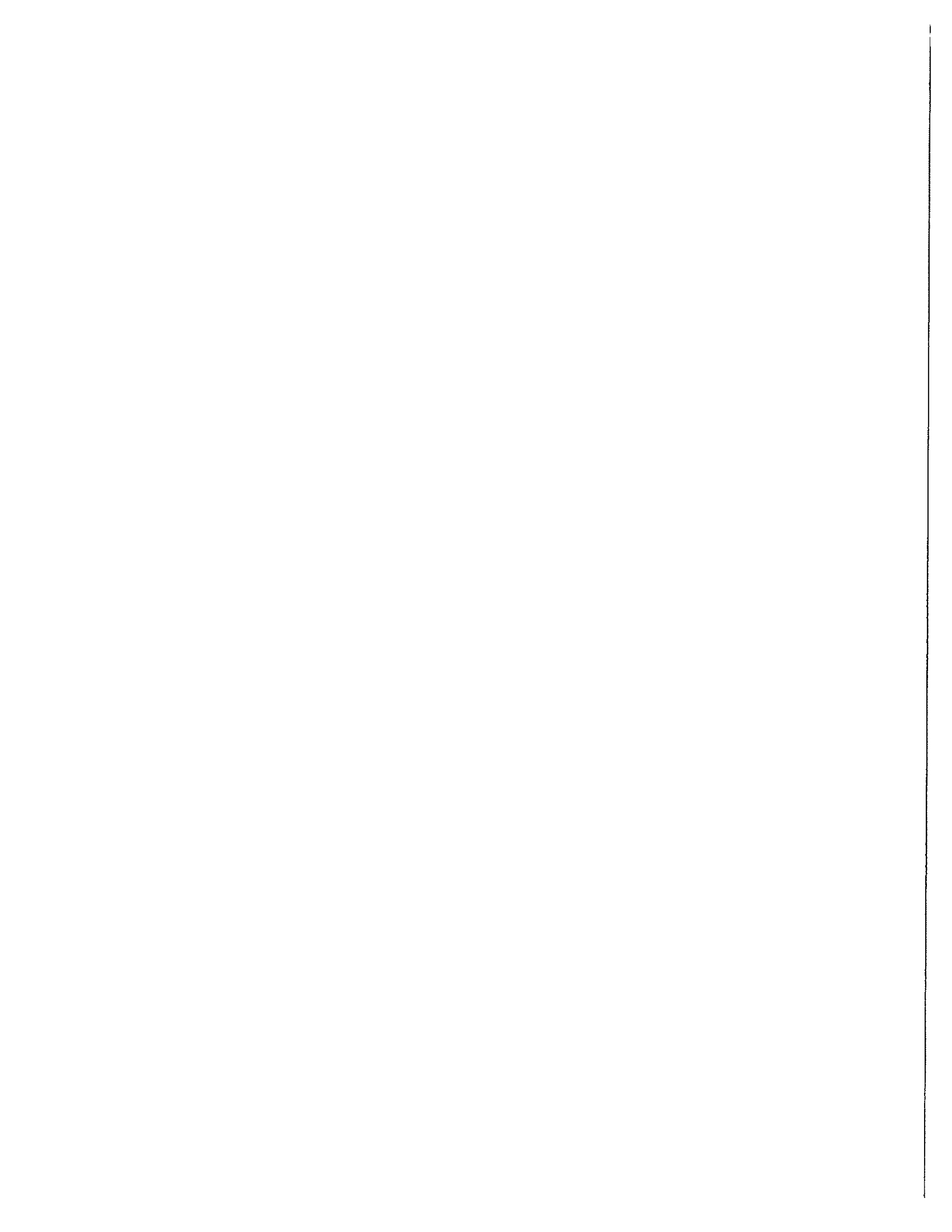
The Landscape Architect shall be the sole judge as to the suitability of the planting soils for reuse.

3. Surplus subgrade and planting soils remaining after backfilling shall be legally disposed of off-site by the contractor.

3.18 CLEANING AND DISPOSAL OF WASTE MATERIAL

- A. Perform clean up during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment as fast as it accumulates.
- B. Stockpile, haul from site, and legally dispose of waste materials, including unsuitable excavated materials, rock, trash, and debris.

END OF SECTION



**SECTION 32 91 19
LANDSCAPE GRADING**

PART 1 - GENERAL

1.01 DESCRIPTION

A. SECTION INCLUDES:

1. Substrate Preparation.
2. Topsoil.
3. Placing Topsoil.

1.02 RELATED SECTIONS

- A. Earthwork: Section 31 22 00
- B. Landscape Irrigation System: 32 80 00
- C. Seeding: Section 32 92 19
- D. Native Seeding: Section 32 92 20
- E. Sodding: Section 32 92 23
- F. Trees, Shrubs & Groundcovers: 32 93 00

1.03 SUBMITTALS

- A. Soil Test Reports - Provide and pay for materials testing. Testing agency shall be acceptable to the Landscape Architect. Provide documentation that includes the following data:
- B. Topsoil:
 1. Water pH factor.
 2. Mechanical analysis.
 3. Percentage of organic content.
 4. Soil test ratings for Phosphorus, Calcium, Magnesium, Zinc, Iron, and Manganese.
 5. Soluble salt concentration.
 6. Recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to satisfactory level for planting.
- C. Topsoil Sample
 1. Submit one cubic foot of topsoil proposed for use. If topsoil source changes, submit sample from new source.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

January 22, 2015

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Project No. 14T-G-0566
Suttree Landing Park; Phase 1B Project
Proposed Park Improvements

A. Topsoil:

1. Natural friable, fertile, fine loamy soil possessing the characteristics of representative topsoils in the vicinity which are capable of sustaining vigorous plant growth.
2. Free from subsoil, plants, weeds, litter, sods, stiff clay, stones larger than one (1") inch in diameter, gravel, stumps, roots, toxic substances, or any other material which may be harmful to plant growth or hinder planting operations.
3. A minimum PH of 6.5
4. Obtained from naturally well-drained areas which have never been stripped before.
5. Topsoil shall not be delivered in a frozen or muddy condition.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify building and trench backfilling has been completed.
- B. Verify substrate base has been contoured and compacted to the approximate depths required for the work.
- C. Beginning landscape grading means existing conditions are acceptable.

3.02 SUBSTRATE PREPARATION

- A. Prepare substrate to eliminate uneven areas and low spots. Maintain lines, levels, profile, and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove subsoil contaminated with petroleum products.
- C. Scarify subgrade to depth of 3 inches where topsoil or compost is to be placed. Repeat scarifying in areas where equipment, used for hauling and spreading topsoil/compost, has compacted subsoil.

3.03 PLACING TOPSOIL

- A. Place topsoil in landscaped beds (areas of groundcover and/or shrubs) shown on Drawings to a nominal 8-inch depth.
- B. Place topsoil beneath sodded areas shown on Drawings to a nominal 3-inch depth.
- C. Place topsoil on seeded areas shown on Drawings (or referenced as 'Areas disturbed during construction to be seeded) to a nominal 4-inch depth.
- D. Place topsoil during dry weather and on dry, unfrozen subgrade.
- E. Fine grade topsoil eliminating rough or low areas. Maintain profiles and contours of subgrade.
- F. Remove roots, weeds, rocks, and foreign material while spreading.

- G. Manually spread topsoil close to buildings, sidewalks, and curbs to prevent damage.
- H. Lightly compact placed topsoil.
- I. Remove surplus subsoil and topsoil from site.
- J. Leave stockpile area and site clean and raked, ready to receive seeding.

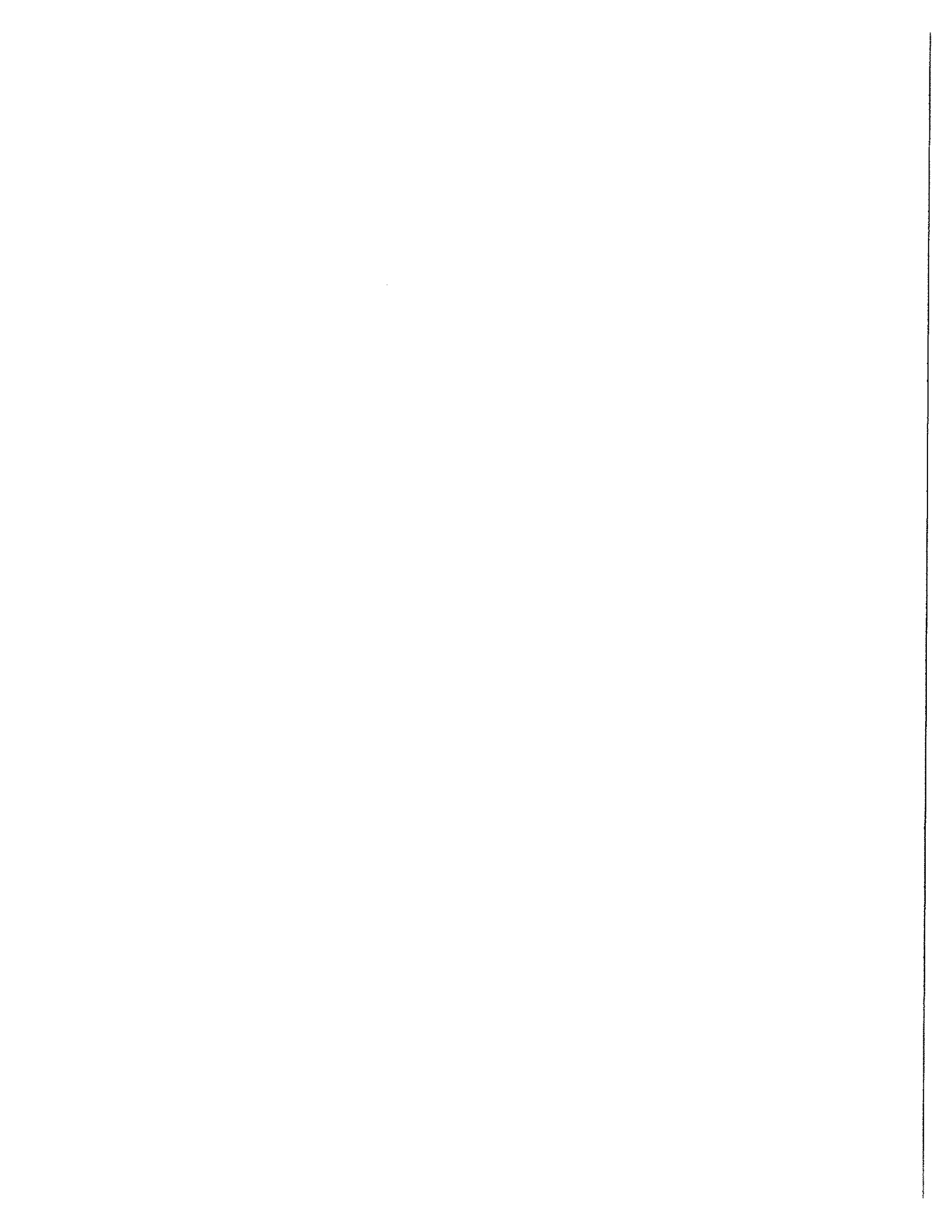
3.04 TOLERANCES

- A. Top of Subsoil: Plus or minus 1 inch.
- B. Top of Topsoil: Plus or minus 1/2 inch.

3.05 PROTECTION

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

END OF SECTION



SECTION 32 92 19
SEEDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide seeded areas as shown and specified. The work includes:

1. Soil preparation.
2. Seeding lawns and other indicated areas.
3. Mulching.
4. Maintenance.

B. Related Work:

1. Section 32 80 00: Irrigation
2. Section 32 91 19: Landscape Grading
3. Section 32 92 20: Native Seeding
4. Section 32 92 23: Sodding
5. Section 32 93 00: Trees, Shrubs and Groundcovers

1.02 QUALITY ASSURANCE

A. Testing agency shall be acceptable to the Architect. Provide the following data:

1. Test representative material samples proposed for use.
2. Test soil material samples proposed for use in accordance with Section 32 91 19 - Landscape Grading:

B. Conduct a meeting at least thirty (30) days prior to start of fine grading work to review detailed requirements for compost spreading, fine grading, seeding, geotextile installation, irrigation and planting. Review status of submittals, samples and availability of materials. Establish and/or confirm work schedule. Establish procedures for coordinating work of related trade contractors for compost spreading, fine grading, irrigation installation, seeding, geotextile installation and planting. Request that representatives of each entity directly concerned with the above mentioned trades attend meeting including, but not limited to, the following:

1. Contractor's superintendent
2. Earthwork trade contractor
3. Topsoil supplier
4. Seeding trade contractor
5. Geotextile trade contractor
6. Compost supplier
7. Irrigation trade contractor
8. Planting trade contractor
9. Landscape Architect and Consultants
10. Owner's Representative

1.03 SUBMITTALS

- A. Submit seed vendor's certification for required grass seed mixture, indicating percentage by weight, and percentages of purity, germination, and weed seed for each grass species.
- B. Submit the following material samples:
 - 1. Seed
 - 2. Hydromulch
- C. Submit the following material certification:
 - 1. Fertilizer analysis.
 - 2. Tackifier
 - 3. Asphaltic emulsion
- D. Submit materials test report.
- E. Upon seeding, submit written maintenance instruction recommending procedures for maintenance of seeded areas.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

1.05 PROJECT CONDITIONS

- A. Work notification:
- B. Notify Architect at least 7 working days prior to start of seeding operations.
- C. Protect existing utilities, paving and other facilities from damage caused by seeding operations.
- D. Perform seeding work only after planting and other work affecting ground surface has been completed.
- E. Restrict traffic from seeded areas until seed is established. Erect signs and barriers as required.
- F. Provide hose and watering equipment as required.
- G. Furnishing and placement of topsoil shall be limited to locations shown on the drawings and shall be by earthwork contractor and is not a part of the seeding work.
- H. Irrigation System: The irrigation system will be installed prior to seeding. Coordinate all work with irrigation subcontractor as required. Locate, protect, and maintain the irrigation system during seeding operation.

1.06 WARRANTY

- A. Warrant all seeding for a period of one year after the date of acceptance against defects including death and unsatisfactory growth in the opinion of the Landscape Architect.

- B. Replace in accordance with the drawings and specifications, all seeding that is dead or, as determined by the Landscape Architect, is in an unhealthy or unsightly condition. The cost of such replacement or repair is at Contractor's expense. Warrant all replacement seeding for 1 year after installation.
- C. Warranty shall not include damage or loss of seeding caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, winter kill caused by extreme, cold and severe winter conditions not typical of planting area; acts of vandalism or negligence on the part of the Owner.
- D. Replacements:
 - 1. Replacements are subject to all requirements stated in this specification and subject to inspection by the Landscape Architect.
- E. Repair grades, lawn areas, paving and any other damage resulting from replacement seeding operations, at no additional cost to the Owner.
- F. Inspect job site monthly during warranty period to determine what changes, if any, should be made in the maintenance program. Submit all recommended changes in writing to the Landscape Architect and the Owner. In the absence of monthly written reports from the Contractor it shall be assumed that the Contractor is satisfied with the Owner's maintenance operations and procedures and waives any and all claims for damages against the Owner with respect to the warranty requirements of this specification.
- G. At the close of warranty period, one year after acceptance of the work, notify the Owner and Landscape Architect in writing of the date for warranty inspection. Make any repairs or replacements identified by the Landscape Architect in the Warranty Inspection.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Seeds shall meet the requirements of applicable seed laws and shall be tested in accordance with the most current edition of the U.S. Department of Agriculture Handbook No. 30, Testing Agricultural and Vegetable Seed. Seeds shall be from the last preceding crop and comply with the requirements outlined below for purity and germination. Each variety of seed shall be furnished in separate, strong bags with each bag being fully tagged or labeled to show the variety, weight, purity, germination, and test data prescribed by law. All test results shall be fully certified by the vendor or by a recognized seed testing agency. Seeds found not to comply with specification requirements shall be subject to rejection.
- B. When mixing or forming seed mixture, the seeds shall be carefully and uniformly mixed. Seeds shall not be mixed until each variety of seed to be used in the mix has been inspected and/or tested separately and approved.

Seed Varieties	Purity	Germination
	Minimum %	Minimum %
Kentucky Bluegrass (variety to be determined) <i>Poa pratensis</i>	95	90
Jasper II Creeping Red Fescue <i>Festuca rubra</i> 'Jasper II'	95	90
Padre Fescue <i>Festuca arundinacea</i> 'Padre'	95	85
Biltmore Fescue <i>Festuca arundinacea</i> 'Biltmore'	95	85
Stetson Fescue <i>Festuca arundinacea</i> 'Stetson'	95	85

- C. Seeding materials shall be free from seeds or bulbets of Wild Onion (*Allium vineale*), Canada Thistle (*Cirsium arvense*), and Johnson Grass (*Sorghum halepense*).
- D. Seed species shall not contain more than six seeds per ounce of the seed of any of the following noxious weeds or the seeds of any other weed specifically listed as noxious including Bindweed (*Convolvulus arvensis*), Oxydaisy (*Chrysanthemum leucanthemum*), Buckhorn (*Plantago lanceolata*), Corncockle (*Agrostemma githago*), Quackgrass (*Agropyron repens*), Dodder (*Cuscuta species*), Sorrel (*Rumex acetosella*).
- E. Seed species shall not contain an excess of 2 percent by weight of weed seeds, noxious or otherwise.
- F. Seed Mixtures, Rates and Seasons: Seeding mixtures, rates, and seasons shall be those specified herein. The types to be used for each area are specified by the drawings. Seeding shall be planted during the season and between the dates specified. Temporary cover shall be planted when it is required during seasons not suitable for planting the seed specified by the drawings.
1. Lawn (LWN): Spring or fall seeding.
 - a. Dates: Plant between March 15 and May 1 or between August 15 and October 15.
 - b. Seed Mix:
 - 1) 33.3% Biltmore Fescue, 33.3% Stetson Fescue and 33.3% Padre Fescue blend at 6 lbs. per 1000 sq. ft.

2. Turf Mix I: 3:1 or steeper Slopes.
 - a. Dates: Plant between August 15 and October 15.
 - b. Seed Mix:
 - 1) 33.3% Biltmore Fescue, 33.3% Stetson Fescue and 33.3% Padre Fescue blend at 3 lbs. per 1,000 sq. ft.
 - 2) Kentucky Bluegrass at 2 lbs. per 1,000 sq. ft.
 - 3) Jasper II Creeping Red Fescue at 2 lbs. per 1,000 sq. ft.
 3. Temporary Winter Seeding.
 - a. Dates: Plant between October 15 and March 15.
 - b. Seed Mix:
 - 1) Annual Ryegrass 2 lbs. per 1000 sq. ft.
 - 2) White Clover 0.50 lb. per 1000 sq. ft.
 4. Temporary Summer Seeding.
 - a. Dates: Plant between May 1 and August 15.
 - b. Seed Mix:
 - 1) Red Clover 1 lb. per 1000 sq. ft.
 - 2) Weeping Lovegrass 0.50 lb. per 1000 sq. ft.
- G. Compost – Seeded areas shall receive a minimum of compost as indicated on the drawings and as specified in section 02029- Landscape Grading.
- H. Fertilizers - Fertilizers shall be those readily available commercially. The application of fertilizer shall be at a rate of 200 pounds Ureaform (38-0-0) per acre with either 400 pounds of 15-15-15 per acre or 600 pounds of 6-12-12. Fertilizer rates shall be modified by the recommendations of the soil test and shall be approved by the Architect in writing.
- I. Limestone - Limestone shall contain no less than 85 percent calcium carbonate by weight. It shall be crushed so that at least 85 percent will pass a no. 10 sieve. The application of limestone shall be at the rate of 2 tons per acre. Hydrated lime may be substituted at a rate of 1 ton per acre. Limestone rates shall be modified by the recommendations of the soil test and shall be approved by the Architect in writing.
- J. Straw Mulch - Clean oat or wheat straw well seasoned before bailing, free from mature seed bearing stalks or roots of prohibited or noxious weeds. Use straw on slopes no steeper than 4:1 unless a tackifier/binder is applied. Omit straw if hydromulching procedure is used.
- K. Wood cellulose fiber mulch - Degradable green dyed wood cellulose fiber of 100% recycled long fiber pulp, free from weeds or other foreign matter toxic to seed germination and suitable for hydromulching. Use for hydromulching in lieu of straw on erosion prone slopes greater than 4:1 or drainage swales.
1. Available manufacturers and types:
 - a. Conwed Hydromulch: Conwed Corp., St. Paul, MN
 - b. Cellin Hydromulch: Cellin Mfg. Inc., Lorton, VA
 - c. Superior Turf Fiber: Cellin Mfg. Inc., Lorton, VA
- L. Tackifier - Liquid concentrate diluted with water forming a transparent 3--dimensional film like crust permeable to water and air and containing no agents toxic to seed germination. Use tackifier on erosion prone slopes to hold either wood cellulose fiber mulch or straw.
1. Available Manufacturers and types:

- a. Polybind DLR: Celtite, Inc., Cleveland, OH
 - b. Curasol AK: American Hoechst Corp., Elk Grove, IL
- M. Water - Free of substances harmful to seed growth. Hoses or other methods of transportation shall be furnished by the Contractor.
- N. Geotextiles: As specified in Section 02205.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine finish surfaces, grades, compost quality, and depth. Do not start seeding work until unsatisfactory conditions are corrected and acceptable for seeding.

3.02 PREPARATION

- A. Limit preparation to areas which will be immediately seeded.
- B. Loosen soil and topsoil of seeded areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish and extraneous matter. It is strongly recommended that scarifying and preparation of seedbeds on cut and fill slopes be accomplished with tools or equipment specially designed for this purpose. Small furrows or grooves formed in the slopes shall be horizontal or as nearly horizontal as practical. The work shall be performed only when the ground is in a workable and tillable condition as determined by good farming practices.
- C. Grade seeded areas to a smooth, free drainage even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.
- D. Apply compost at depth determined on the drawings.
- E. Apply limestone, at rate determined by the soil test, to adjust pH of topsoil. Distribute evenly by machine and incorporate thoroughly into topsoil.
- F. Apply fertilizer to all seeded areas at the approved rates as determined by the soil test.
- G. Apply fertilizers by mechanical rotary to drop type distributor, thoroughly and evenly incorporated with soil to a depth of 3" by discing or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.
- H. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to seeding.

3.03 INSTALLATION

- A. Seeding:
 - 1. Seed immediately after preparation of bed. See 2.01 G - Seed Mixtures, Rates and Seasons.

2. Seed all areas within and adjoining project limits disturbed as a result of construction operations.
3. Perform seeding operations when the soil is dry and when winds do not exceed 5 miles per hour velocity.
4. Apply seed with a rotary or drop type distributor. Installed seed evenly by sowing equal quantities in 2 directions, at right angles to each other.

B. Hydromulching:

1. Hydromulching is acceptable in areas of greater than 4:1 slopes.
2. Use a hydromulcher (sprayer) and apply mixtures at the following rates. Mix in accordance with manufacturer's recommendations.
3. Apply hydromulch slurry to indicated areas.
 - a. Tackifier: 60 gals/acre.
 - b. Wood cellulose fiber mulch:
 - 1) 2,000 lbs./acre on slopes greater than 4:1.
 - 2) 1,500 lbs./acre on slopes less than 4:1.

C. Mulching:

1. Place straw mulch on seeded areas within 24 hours after seeding. Omit straw mulch if hydroseeding procedure is used.
2. Place straw mulch uniformly in a continuous blanket at the rate of 2-1/2 tons per acre, or two 50 lb. bales per 1,000 sq. ft. of area. A mechanical blower may be used for straw mulch application when acceptable to the Architect.
3. Anchor straw mulch with liquid tackifier applied uniformly at a rate of 60 gal. per acre on slopes greater than 4:1.
4. Protect structures, walls, paving, plantings, and all nonseeded areas from liquid tackifier over-spray.

D. Geotextiles:

1. Place geotextile on seeded areas the same day of seeding.
2. Place geotextile with minimum lap recommended by the manufacturer for the specific type of installation.
3. Place geotextile in direct contact with surface of soil.
4. Anchor geotextile with pins or staples in accordance with Section 31 32 19.
5. Anchor toe and top of geotextile installation with manufacturer's recommendations for the specific type of installation.

- E. Provide straw bale checking at intervals as shown on the drawings and as required to adequately slow water velocity and impede soil loss

3.04 MAINTENANCE

- A. Maintain seeded areas until completion and acceptance of the entire project or not less than 30 days after completion and acceptance of seeding operations.
- B. Maintain seeded areas, including watering, spot weeding, mowing, applications of herbicides, fungicides, insecticides, and re-seeding until a full, uniform stand of grass free of weeds, undesirable grass species, disease, and insects is achieved and accepted by the Architect.

1. Water periodically to maintain adequate surface soil moisture for proper seed germination. Continue watering for not less than 30 days. Thereafter apply water as required until provisional acceptance.
2. Repair, rework, and re-seed all areas that have washed out, are eroded, or do not catch.
3. Mow lawn (LWN) and Turf Mix I areas as soon as lawn top growth reaches a 4" height. Cut back to 3" in height. Repeat mowing as required to maintain specified height. Following mowing limit as directed by the Architect.

3.05 CLEAN UP AND PROTECTION:

- A. During seeding work, keep pavements clean and work area in an orderly condition.
- B. Upon completion of work, clear grounds of debris, superfluous materials and all equipment. Remove from site to satisfaction of the Architect.
- C. Protect seeding work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged seeding as directed, at no additional cost to the Owner.

3.06 INSPECTION AND ACCEPTANCE

- A. Upon completion of work, notify the Architect at least ten (10) days prior to requested date of inspection for acceptance. Where inspected work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by the Architect and found to be acceptable.
 1. Seeded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of the specified mixture is established free of weeds, undesirable species, disease, and insects.
 2. No individual seeded areas shall have bare spots or unacceptable cover totaling more than 2% of the individual areas, in areas requested to be inspected.
- B. Upon satisfactory completion of repairs and, or replacements, the Architect certifies, in writing, the acceptance of the work in total.

END OF SECTION

**SECTION 32 92 20
NATIVE SEEDING**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide seeded areas as shown and specified. The work includes:
 - 1. Soil preparation.
 - 2. Seeding native grasses and forbs.
 - 3. Mulching.
 - 4. Maintenance.

- B. Related Work:
 - 1. Division 1
 - 2. Section 32 80 00: Irrigation
 - 3. Section 32 91 19: Landscape Grading
 - 4. Section 32 19 19: Seeding
 - 5. Section 32 92 23: Sodding
 - 6. Section 32 93 00: Trees, Shrubs and Ground Covers

1.02 QUALITY ASSURANCE

- A. Testing agency shall be acceptable to the Architect. Provide the following data:
 - 1. Test representative material samples proposed for use.
 - 2. Test soil material samples proposed for use in accordance with Section 32 91 19 - Landscape Grading.

- B. Conduct a meeting at least thirty (30) days prior to start of fine grading work to review detailed requirements for topsoil spreading, fine grading, seeding, geotextile installation, irrigation and planting. Review status of submittals, samples and availability of materials. Establish and/or confirm work schedule. Establish procedures for coordinating work of related trade contractors for compost spreading, fine grading, irrigation installation, seeding, geotextile installation and planting. Request that representatives of each entity directly concerned with the above mentioned trades attend meeting including, but not limited to, the following:
 - 1. Contractor's superintendent
 - 2. Earthwork trade contractor
 - 3. Topsoil supplier
 - 4. Seeding trade contractor
 - 5. Geotextile trade contractor
 - 6. Compost supplier
 - 7. Irrigation trade contractor
 - 8. Planting trade contractor
 - 9. Landscape Architect and Consultants
 - 10. Owner's Representative

1.03 SUBMITTALS

- A. Submit seed vendor's certification for required seed mixtures, indicating percentage by weight, and percentages of purity, germination, Purity of Live Seed (PLS) and weed seed for each species.

- B. Submit the following material samples:

1. Seed Mix(es)
 2. Erosion control blanket
 3. Photodegradable Mesh
- C. Submit anticipated planting dates.
- D. Submit information on method of sowing seed.
- E. Submit recommended maintenance procedures to be established by Owner for maintenance of native seeding areas during calendar year. Submit before expiration of required maintenance periods.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Seed shall be delivered to the site in its original, unopened container, labeled as to weight, analysis, and manufacturer.
- B. Store any seed delivered prior to use in a manner safe from damage from heat, moisture, rodents, or other causes.
- C. Any seed damaged after acceptance shall be replaced by the Contractor.

1.05 EQUIPMENT

- A. All equipment brought into project site shall be clean and free of weed seed or seed from previous applications. The intent is reducing the spread of noxious and invasive plants and weeds within the State of Tennessee.

1.06 PLANTING SEASON

- A. The Spring Planting Season is considered April 15 to June 30. Spring Planting requires a Companion Crop (Nurse Crop) of Oats at a rate of 25-30 lbs/acre. **A Spring Planting is required for Suttree Landing Park.** Prior to Spring Planting, a Cover Crop of Oats at a rate of 100-125 lbs/acre shall be established to control erosion and provide a planting bed for the native seeds.
- B. The Summer Planting Season is considered July 1 to August 31. Summer Planting requires a Companion Crop (Nurse Crop) of Brown Top Millet at a rate of 5 lbs/acre. Prior to Summer Planting, a Cover Crop of Oats at a rate of 100-125 lbs/acre shall be established to control erosion and provide a planting bed for the native seeds.
- C. The Dormant Planting Season is October 30 to February 28. Dormant Season Plantings require 25% more seed and Companion Crop (Nurse Crop) of Oats at a rate of 25-30 lbs/acre. Prior to Dormant Season Planting, a Cover Crop of Oats at a rate of 100-125 lbs/acre shall be established to control erosion and provide a planting bed for the native seeds.

1.07 PROJECT CONDITIONS

- A. Pre-construction planning: Arrange for an approved native seeding consultant to visit the site, review planting conditions and provide recommendations regarding installation, establishment and maintenance procedures. The Contractor shall encumber the native seed consultant's fees and travel expenses.
- B. Work notification: Notify Architect at least 7 working days prior to start of seeding operations.
- C. Protect existing utilities, paving and other facilities from damage caused by seeding operations.

- D. Perform seeding work only after planting and other work affecting ground surface has been completed.
- E. Restrict traffic from seeded areas until seed is established. Erect signs and barriers as required.
- F. Provide hose and watering equipment as required.
- G. Furnishing and placement of topsoil shall be limited to locations shown on the drawings and shall be by earthwork contractor and is not a part of the seeding work.
- H. Irrigation System: The irrigation system will be installed prior to seeding. Coordinate all work with irrigation subcontractor as required. Locate, protect, and maintain the irrigation system during seeding operation.

1.08 WARRANTY

- A. Warrant all seeding for a period of one year after the date of acceptance against defects including death and unsatisfactory growth in the opinion of the Landscape Architect.
- B. Replace in accordance with the drawings and specifications, all seeding that is dead or, as determined by the Landscape Architect, is in an unhealthy or unsightly condition. The cost of such replacement or repair is at Contractor's expense. **Warrant all replacement seeding for 1 year after installation.**
- C. Warranty shall not include damage or loss of seeding caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, winter kill caused by extreme, cold and severe winter conditions not typical of planting area; acts of vandalism or negligence on the part of the Owner.
- D. Replacements:
 - 1. Replacements are subject to all requirements stated in this specification and subject to inspection by the Landscape Architect.
- E. Repair grades, lawn areas, paving and any other damage resulting from replacement seeding operations, at no additional cost to the Owner.
- F. Inspect job site monthly during warranty period to determine what changes, if any, should be made in the maintenance program. Submit all recommended changes in writing to the Landscape Architect and the Owner. In the absence of monthly written reports from the Contractor it shall be assumed that the Contractor is satisfied with the Owner's maintenance operations and procedures and waives any and all claims for damages against the Owner with respect to the warranty requirements of this specification.
- G. At the close of warranty period, one year after acceptance of the work, notify the Owner and Landscape Architect in writing of the date for warranty inspection. Make any repairs or replacements identified by the Landscape Architect in the Warranty Inspection.

PART 2 - PRODUCTS

2.01 MATERIALS

A. NATIVE SEED

- 1. Seeds shall meet the requirements of applicable seed laws and shall be tested in accordance with the most current edition of the U.S. Department of Agriculture

Handbook No. 30, Testing Agricultural and Vegetable Seed. Seeds shall be tested with a current valid test in compliance with state and federal laws and shall comply with the requirements outlined below for purity and germination. Seed mixes shall be furnished in separate, strong bags with each bag being fully tagged or labeled to show the variety, weight, purity, germination, and test data prescribed by law. All test results shall be fully certified by the vendor or by a recognized seed testing agency. Seeds found not to comply with specification requirements shall be subject to rejection.

2. Test forb and grass seed according to the methods and procedure used for sampling and analyzing seed for purity, germination, and noxious weed seed content specified in the current edition of Rules for Testing Seed, Published by the Association of Official Seed Analysts.
3. Use seed within one year of the test date appearing on the label.
4. Inoculate legume seed unless it has been pre-inoculated by the vendor. Follow the inoculation instructions that come with the culture purchases. Avoid exposure of the culture or inoculated seed to the sunlight, and in no case shall any exposure exceed ½ hour.
5. Store any seed delivered before use in a manner that protects it from damage by heat, moisture, rodents, or other causes. Discard and replace any previously tested and accepted seed that becomes damaged.
6. Seed carrier (only when hand broadcasting) shall be inert material, pelletized lime or clay Bentonite mixed with seed at a ratio of not less than two parts seed carrier to one part seed.

B. NATIVE SEED MIX

1. Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination and maximum percentage of weed seed as indicated below.
2. Species composed of pure live seed (PLS) shall contain no named or improved varieties. Seed shall be from Tennessee, Kentucky, North Carolina, or Virginia nurseries specializing in growing native species from Tennessee genotypes or from local ecotypes from as close as available.
3. Grasses classified as "native" shall be PLS as specified. Other seed shall be "clean" according to high quality industry standards. All seed shall be cold, dry stratified; legumes shall be inoculated with proper rhizobia immediately prior to planting (three hours or less). Legumes shall be kept out of the forb mixture until after inoculation. Seed mixture shall be blended by the vendor and ratios of various species shall be guaranteed by the vendor in writing as specified. Minimum percent purity for native species is 70 percent. Any substitutions of species due to availability must be approved by project architect or engineer.
4. Seed Mixtures, Rates and Seasons: Seeding mixtures, rates, and seasons shall be those specified herein. The types to be used for each area are specified by the drawings. Seeding shall be planted during the season and between the dates specified. Temporary cover shall be planted when it is required during seasons not suitable for planting the seed specified by the drawings.

- a. Temporary Winter seeding (Cover Crop):

- 1) Dates: Plant between August 16 to February 29.
 - 2) Seed Mix:
 - a) Oats @ 100-125 lbs/acre
- b. Shade-Tolerant Riparian Mix (G3): Spring seeding.
- 1) Dates: Plant between April 15 and June 30.
 - 2) Mix of riparian native grasses & forbs:
 - a) Sow native seed mix at rate of 9.85 PLS lbs/acre
 - b) Custom mix available at:
 - c) Roundstone Native Seed, LLC.
9764 Raider Hollow Lane
Upton, KY 42784
888-531-2353
 - 3) Seed Mix G3 consist of:

Kind	Botanical Name	PLS oz/ac	PLS lbs/ac	PLS lbs
Virginia Wild Rye	<i>Elymus virginicus</i>		2.500	2.500
Canada Wild Rye	<i>Elymus canadensis</i>		1.500	1.500
Deer Tongue Grass	<i>Panicum clandestinum</i>		1.000	1.000
Fall Panicum	<i>Panicum anceps</i>		1.500	1.500
Switchgrass	<i>Panicum virgatum</i>		1.500	1.500
River Oats	<i>Chasmanthium latifolium</i>		1.000	1.000
Little Bluestem	<i>Schizachyrium scoparium</i>		2.500	2.500
Bottlebrush Grass	<i>Elymus hystrix</i>		0.500	0.500
Fox Sedge	<i>Carex vulpinoidea</i>		1.000	1.000
Bergamot	<i>Monarda fistulosa</i>	3.00	0.188	0.188
Swamp Milkweed	<i>Asclepias incarnata</i>	4.00	0.250	0.250
Wild Senna	<i>Senna marilandica</i>	3.00	0.188	0.188
White Snakeroot	<i>Eupatorium rugosum</i>	2.00	0.125	0.125
Lance-Leaved Goldenrod	<i>Euthamia graminifolia</i>	3.00	0.188	0.188
Showy Tickseed	<i>Bidens aristosa</i>	7.00	0.438	0.438
False Sunflower	<i>Heliopsis helianthoides</i>	4.00	0.250	0.250
New England Aster	<i>Aster novae-angliae</i>	3.00	0.188	0.188
Sneezeweed	<i>Helenium autumnale</i>	2.00	0.125	0.125
Browneyed Susan	<i>Rudbeckia triloba</i>	3.00	0.188	0.188
Lance Leaved Coreopsis	<i>Coreopsis lanceolata</i>	3.00	0.188	0.188
Gray Goldenrod	<i>Solidago nemoralis</i>	2.00	0.125	0.125
Purple Coneflower	<i>Echinacea purpurea</i>	2.00	0.125	0.125
Lupine	<i>Lupinus perennis</i>	4.00	0.250	0.250
Blue False Indigo	<i>Baptisia australis</i>	1.00	0.063	0.063
Boneset	<i>Eupatorium perfoliatum</i>	2.00	0.125	0.125

Slender Mountain Mint	<i>Pycnanthemum tenuifolium</i>	2.00	0.125	0.125
Butterfly Milkweed	<i>Asclepias tuberosa</i>	1.00	0.063	0.063
Spring Oats	<i>Avena sativa</i>	1.00	0.063	25.000
			Lbs/acre	41.19

- 4) Sow companion crop concurrently with native seed mix.
- 5) Sow companion crop of Oats at rate of 25-30 lbs/acre.

c. Upland Mix (G1): Spring seeding.

- 1) Dates: Plant between April 15 and June 30.
- 2) Mix of short native grasses & forbs:
 - a) Sow native seed mix at rate of 9.00 PLS lbs/acre
 - b) Custom mix available at:
 - c) Roundstone Native Seed, LLC.
9765 Raider Hollow Lane
Upton, KY 42784
888-531-2353
- 3) Seed Mix G1 shall contain:

Kind	Botanical Name	PLS oz/ac	PLS lbs/ac	PLS lbs
Little Bluestem	<i>Schizachyrium scoparium</i>		3.000	3.000
Side Oats Grama	<i>Bouteloua curtipendula</i>		2.500	2.500
Tall Dropseed	<i>Sporobolus compositus</i>		1.250	1.250
Virginia Wild Rye	<i>Elymus virginicus</i>		3.000	3.000
Lace Grass	<i>Eragrostis capillaris</i>		0.500	0.500
Purple Top	<i>Tridens flavus</i>		2.000	2.000
Blackeyed Susan	<i>Rudbeckia hirta</i>	4.00	0.250	0.250
Bergamot	<i>Monarda fistulosa</i>	3.00	0.188	0.188
Greyheaded Coneflower	<i>Ratibida pinnata</i>	4.00	0.250	0.250
Purple Coneflower	<i>Echinacea purpurea</i>	5.00	0.313	0.313
False Sunflower	<i>Heliopsis helianthoides</i>	3.00	0.188	0.188
Butterfly Milkweed	<i>Asclepias tuberosa</i>	3.00	0.188	0.188
Gray Goldenrod	<i>Solidago nemoralis</i>	1.00	0.063	0.063
Slender Mountain Mint	<i>Pycnanthemum tenuifolium</i>	1.50	0.094	0.094
Lance Leaved Coreopsis	<i>Coreopsis lanceolata</i>	4.50	0.281	0.281
Lemon Mint	<i>Monarda citriodora</i>	2.00	0.125	0.125
Lupine	<i>Lupinus perennis</i>	4.00	0.250	0.250
New England Aster	<i>Aster novae-angliae</i>	2.50	0.156	0.156
Ohio Spiderwort	<i>Tradescantia ohiensis</i>	2.00	0.125	0.125
Partridge Pea	<i>Cassia fasciculata</i>	3.50	0.219	0.219
Spiked Blazing Star	<i>Liatris spicata</i>	4.00	0.250	0.250

Spring Oats	Avena sativa		0.000	25.000
			Lbs/acre	40.19

- 4) Sow companion crop concurrently with native seed mix.
 - 5) Sow companion crop of Oats at rate of 25-30 lbs/acre
- d. Temporary Summer Seeding:
- 1) Dates: Plant between July 1 and October 29.
 - 2) Seed Mix:
 - a) Oats at 25-30 lbs/acre
- C. Topsoil – Seeded areas shall receive a minimum of topsoil as indicated on the drawings and as specified in Section 32 91 19 - Landscape Grading.
- D. Fertilizer – Do not apply fertilizers during the establishment process.
- E. Limestone - Limestone shall contain no less than 85 percent calcium carbonate by weight. It shall be crushed so that at least 85 percent will pass a no. 10 sieve.
- F. The application of limestone shall be at the rate recommended by the soil test.
- G. Hydrated lime may be substituted at a rate of 1 ton per acre.
- H. Limestone rates shall be modified by the recommendations of the soil test and shall be approved by the Architect in writing.
- I. Straw Mulch - Clean oat or wheat straw well seasoned before bailing, free from mature seed bearing stalks or roots of prohibited or noxious weeds. Use straw on slopes no steeper than 4:1 unless a tackifier/binder is applied. Omit straw if hydromulching procedure is used.
- J. Erosion Control Blanket – 100% biodegradable weed free wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable mesh, (photodegradable within 12 months of installation) or net free. Include manufacturer's recommended steel wire staples, 6" (150 mm) long or biodegradable anchoring staples, T shaped with barbed head and shoulders, 6" (150 mm).
- K. Erosion Control Fiber Mesh – 100% biodegradable twisted jute mesh. Include manufacturer's recommended steel wire staples, 6" (150 mm) long or biodegradable anchoring staples, T shaped with barbed head and shoulders, 6" (150 mm).
- L. Nonselective Herbicides – EPA registered and approved glyphosate-based herbicide (broad spectrum, non-persistent) intended for vegetation removal while preparing seed beds and for maintenance during establishment period and recommended surfactants and adjuvants.
- M. Selective Herbicides – EPA registered and approved selective herbicides such as 2,4-D or Crossbow or approved equivalents to combat broadleaf weeds or to combat woody-stemmed broadleaf weeds.
- N. Water - Free of substances harmful to seed growth. Hoses or other methods of transportation shall be furnished by the Contractor.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine finish surfaces, grades, compost quality, and depth. Do not start seeding work until unsatisfactory conditions are corrected and acceptable for seeding.

3.02 WEED CONTROL

- A. On a daily basis, prior to entering the project site all equipment to be used at the project shall be sprayed clean of all dirt, sod, or foreign matter with high-pressure water in an upland location outside of the project site that does not drain to the site or in Contractor's shop. Equipment cleaned shall include, but is not limited to, all dozers, scrapers, backhoes, trucks, shovels, picks, and hand tools that enter the project site. Special care shall be taken to cleanse the underbody, suspension, tracks, wheels, tires, and wheel wells of all motorized equipment. If necessary, hand tools, brushes, or scrapers may be required to remove heavy accumulations of debris from any item. After a thorough cleaning and inspection, each item of equipment shall be allowed to enter and be used on the project site. If it is necessary for the equipment to leave and reenter the project site, each item shall be cleaned and inspected.

3.03 PREPARATION

- A. Limit preparation to areas which will be immediately seeded.
- B. Loosen sub-soil of seeded areas to minimum depth of 6". Remove stones over 1" in any dimension and sticks, roots, rubbish and extraneous matter. It is strongly recommended that scarifying and preparation of seedbeds on cut and fill slopes be accomplished with tools or equipment specially designed for this purpose. Small furrows or grooves formed in the slopes shall be horizontal or as nearly horizontal as practical. The work shall be performed only when the ground is in a workable and tillable condition as determined by good farming practices.
- C. Grade seeded areas to a smooth, free drainage even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.
- D. Apply topsoil at depth determined on the drawings.
- E. Apply limestone, at rate determined by the soil test, to adjust pH of topsoil. Distribute evenly by machine and incorporate thoroughly into topsoil.
- F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to seeding.
- G. Complete grading, shouldering, topsoiling before permanent seeding. Just before seeding, work the area with discs, harrows or other appropriate equipment to obtain a reasonably even and loose seedbed.
- H. No seeding shall occur on frozen ground or at temperatures lower than 32° F (0° C).
- I. For spring or summer planting:
 - 1. When oats and emerging weeds start actively growing, apply non-selective herbicide to chemically 'burn-down' cover crop and emerging weeds.
 - a. Non-selective herbicide mix shall contain:
 - 1) An approved glyphosate-based herbicide at a rate of 2 quarts per acre.
 - 2) Clean water at a rate of 10 gal. per acre.
 - 3) Ammonium Sulfate (AMS) at a rate of 1 quart per 100 gal. of water.
 - 2. Re-apply non-selective herbicide mix 4-6 weeks after initial application while emerging weeds are 4" +/- tall are actively growing.

3. For summer plantings, apply a third treatment of non-selective herbicide mix as directed by Owner.
 4. Seeding or planting should occur after time period specified by herbicide manufacturer; typically 7 days minimum.
- J. For dormant season planting:
1. Increase the specified application rate of PLS by 25%.
 2. Plant nurse crop of oats at 25-30 lbs per acre.

3.04 INSTALLATION

A. Planting:

1. Plant or drill the selected seed mixture with a rangeland type drill such as a Truax with one or more seed boxes that includes a native warm-season grass box, equipped with area-mounted press wheel for each seed drop tube or by scattering it uniformly over the areas to be seeded.
2. If seeding into existing vegetation, use a rangeland type drill with a no-till attachment that can cut through the thatch in front of the V disc and seed drop tube.
3. Seeds shall not be planted deeper than $\frac{1}{4}$ ". Approximately $\frac{1}{3}$ of the seed will be visible within the trench.
4. If the configuration of the area to be seeded allows, apply at $\frac{1}{2}$ the specified seed rate and apply the second $\frac{1}{2}$ in a perpendicular direction.
5. For hand broadcast seeding:
 - a. Lightly rake or drag to cover the seed with approximately $\frac{1}{4}$ inch of soil.
 - b. Lightly roll or compact the areas using suitable equipment, preferably the cultipacker type. The contractor shall not roll slopes steeper than 3:1.

B. Seeding Rates:

1. Plant in accordance with the specified rates for each Seed Mix.

C. Mulching and Erosion Control:

1. A covering of 1-2 inches of weed-free wheat straw after seeding holds moisture and increases germination. This is particularly important on dry sandy soils and heavy clay soils.
2. Straw should completely cover the soil surface.
3. Chop and blow straw onto the area. Elevate straw blower and utilize arching motion during application to avoid blowing the light, fluffy native seeds away.
4. On slopes and windy sites, hold the straw in place by staking down a jute mesh netting over it or apply a light erosion control blanket instead of straw mulch.
5. Erosion control blanket or mat shall be installed on slopes of 3:1 or greater and other locations where indicated.

3.05 MAINTENANCE

- A. **Maintain seeded areas until completion and acceptance of the entire project and not less than one year after completion and acceptance of seeding operations.**
- B. As native mixtures are difficult to assess during the first year of growth, satisfactory establishment of the cover crop and general erosion control in these mixes shall constitute baseline establishment. Development of native seeds will be assessed as noted below:
 - 1. Begin maintenance immediately after each area is planted and continue until acceptable Native Seeding is established.
 - 2. Maintain Native Seeding for the first growing season following initial acceptance. Submit proposal to maintain native seeding through the third growing season.
 - 3. Maintain by mowing the planting when the companion (nurse) cover or weed vegetation reaches a height of 10"-12".
 - a. Mow (or utilize string trimmers) to a height of 6", except for first mowing which shall be to a 4" height.
 - b. Mowing can be expected approximately every 3-4 weeks the first season depending on the weed species present. Raking and removal of clippings shall occur when greater than 50% of the plant height is removed.
 - 4. Water just enough to keep the soil moist, every other day for 15 minutes to half an hour to maintain adequate surface soil moisture for proper seed germination.
 - 5. Watering shall continue for not less than 30 days following seeding.
 - 6. After the first eight weeks, water only if it does not rain for one week, continue watering throughout the first growing season.
 - 7. During the second and third growing seasons, one mowing is required in early June:
 - a. Mow to a 6" height.
 - b. Mow using a flail type mower, which will finely chop and not smother the new seedlings.
 - 8. Selectively treat with a broad spectrum, non-persistent glyphosate-based herbicide aggressive weeds such as Canada Thistle and Horsenettle.
 - a. Treat only on cool windless days preferably by gloved hand wiping method.
- C. Prior to Initial Acceptance and during the Warranty period beginning with the Initial Acceptance:
 - 1. Weeding Inspection: Inspect the seeded areas at a sufficient frequency to ensure that weeds do not re-seed themselves.
 - a. Minimum inspection frequency shall include a spring, summer and fall inspection.
 - 2. Notify the Owner and Architect/Engineer of the inspection no less than 48 hours prior to an inspection. The inspections shall be performed with Owner and Architect/Engineer in attendance. A report of the findings will be sent to the Contractor including agreed upon maintenance required.
 - 3. Implement the appropriate weed control approach(es) within 7 calendar days of the inspection, as conditions allow. Options include wicking, spot-spraying, hand-rouging, mowing, string trimming.

- a. If weather and/or site conditions would cause unnecessary damage to the site, notify the Owner and Architect/Engineer and provide a schedule for implementing the maintenance protocols.
4. Maintain the weed coverage at less than 10 percent of the seeded area. Weed control methods shall be approved by Owner and the Architect/Engineer.
5. Track maintenance activities performed (including herbiciding, weeding, seeding, and watering) and provide a written report to the Owner and Architect/Engineer at the end of the first full growing season documenting the completed activities.
6. Other maintenance activities may be completed at the Contractor's discretion to meet the Warranty performance criteria. Notify the Owner and Architect/Engineer of planned additional maintenance activities prior to implementation.

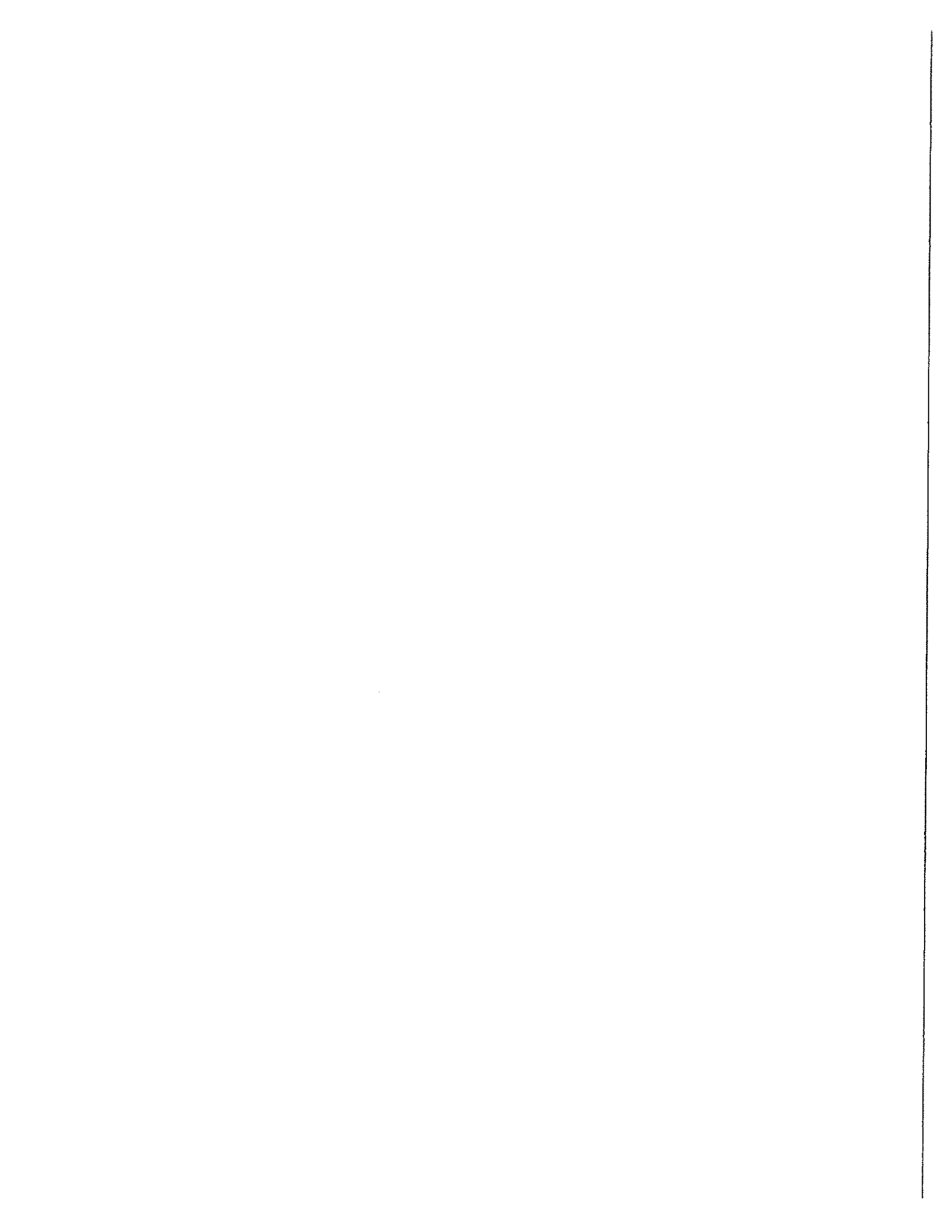
3.06 CLEAN UP AND PROTECTION:

- A. During seeding work, keep pavements clean and work area in an orderly condition.
- B. Upon completion of work, clear grounds of debris, superfluous materials and all equipment. Remove from site to satisfaction of the Architect.
- C. Protect seeding work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged seeding as directed, at no additional cost to the Owner.

3.07 INSPECTION AND ACCEPTANCE

- A. Upon completion of work, notify the Architect at least ten (10) days prior to requested date of inspection for acceptance. Where inspected work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by the Architect and found to be acceptable.
 1. Seeded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of the specified mixture is established free of weeds, undesirable species, disease, and insects.
 2. No individual seeded areas shall have bare spots or unacceptable cover totaling more than 2% of the individual areas, in areas requested to be inspected.
- B. Upon satisfactory completion of repairs and, or replacements, the Architect certifies, in writing, the acceptance of the work in total.

END OF SECTION



**SECTION 32 92 23
SODDING**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide sodded lawns as shown and specified. The work includes:
1. Soil preparation.
 2. Sodding lawns and other indicated areas.
 3. Maintenance

1.02 RELATED WORK:

- A. Irrigation: Section 32 80 00
- B. Landscape Grading: Section 32 91 19
- C. Seeding: Section 32 92 19
- D. Native Seeding: Section 32 92 20
- E. Trees, Shrubs and Ground Covers: Section 32 93 00

1.03 QUALITY ASSURANCE

- A. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.
- B. Provide and pay for materials testing. Testing agency shall be acceptable to the Landscape Architect. Provide the following data:
 1. Test representative materials samples proposed for use.
 - a. Topsoil:
 - 1) Water pH factor.
 - 2) Mechanical analysis.
 - 3) Percentage of organic content.
 - 4) Soil test ratings for Phosphorus, Potassium, Calcium, Magnesium, Zinc, Iron, and Manganese.
 - 5) Soluble salt concentration.
 - 6) Recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

1.04 SUBMITTALS

- A. Submit sod growers certification of grass species. Identify source location.
- B. Submit the following materials certification:
 1. Fertilizer analysis.
 2. Limestone analysis.
- C. Submit topsoil test report.

- D. Upon sodded lawn acceptance, submit written maintenance instructions recommending procedures for maintenance of sodded lawns.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Cut, deliver, and install sod within 24-hour period.
- B. Do not harvest or transport sod when moisture content may adversely affect sod survival.
- C. Protect sod from sun, wind and dehydration prior to installation.
- D. Do not tear, stretch or drop sod during handling and installation.

1.06 PROJECT CONDITIONS

- A. Work notification: Notify Landscape Architect at least 7 working days prior to start of sodding operations.
- B. Protect existing utilities, paving, and other facilities from damage caused by sodding operations.
- C. Perform sodding work only after planting and other work affecting ground surface has been completed.
- D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.
- E. Provide hose and lawn watering equipment as required.
- F. The irrigation system will be installed prior to sodding. Coordinate all work with irrigation contractor as required. Locate, protect and maintain the irrigation system during sodding operations. Repair irrigation system components damaged during sodding operations.

1.07 WARRANTY

- A. Warrant all sodding for a period of one year after the date of acceptance against defects including death and unsatisfactory growth in the opinion of the Landscape Architect.
- B. Replace in accordance with the drawings and specifications, all sod that is dead or, as determined by the Landscape Architect, is in an unhealthy or unsightly condition. The cost of such replacement (s) is at Contractor's expense. Warrant all replacement sod for 1 year after installation.
- C. Warranty shall not include damage or loss of sodding caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, winter kill caused by extreme, cold and sever winter conditions not typical of planting area; acts of vandalism or negligence on the part of the Owner.
- D. Replacements:
 - 1. Replacements are subject to all requirements stated in this specification and subject to inspection by the Landscape Architect.

- E. Repair grades, lawn areas, paving and any other damage resulting from replacement sodding operations, at no additional cost to the Owner.
- F. Inspect job site monthly during warranty period to determine what changes, if any, should be made in the maintenance program. Submit all recommended changes in writing to the Landscape Architect and the Owner.
- G. At the close of warranty period, one year after acceptance of the work, notify the Owner and Landscape Architect in writing of the date for warranty inspection.
- H. Make any repairs or replacements identified by the Landscape Architect in the Warranty Inspection.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Sod:
 - 1. Sod shall be nursery grown sod composed of a blend of turf-type fescues plus 5% Kentucky Bluegrass.
 - 2. Sod containing Common Bermudagrass, Quackgrass, Johnsongrass, Poison Ivy, Nutsedge, Nimblewill, Canada Thistle, Timothy, Bentgrass, Wild Garlic, Ground Ivy, perennial Sorrel, or Bromegrass weeds will not be acceptable.
 - 3. Provide sod free of grassy or broadleaf weeds.
 - 4. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.
 - 5. Furnish sod machine stripped in square pads or strips not more than 3'-0" long; uniformly 1" to 1-1/2" thick with clean cut edges. Mow sod before stripping.
- B. Fertilizer - Fertilizers shall be those readily available commercially. The application of fertilizer shall be at a rate of 200 pounds Ureaform (38-0-0) per acre with either 400 pounds of 15-15-15 per acre or 600 pounds of 6-12-12. Fertilizer rates shall be modified by the recommendation of the soil test and shall be approved by the Landscape Architect in writing.
- C. Limestone - Limestone shall contain no less than 85 percent calcium carbonate by weight. It shall be crushed so that at least 85 percent will pass an no. 10 sieve.
 - 1. The application of limestone shall be at the rate of 2 tons per acre.
 - 2. Hydrated lime may be substituted at a rate of 1 ton per acre.
 - 3. Limestone rates shall be modified by the recommendations of the soil test and shall be approved by the Landscape Architect in writing.
- D. Stakes - Use where sod slopes greater than 3:1 or in drainage swales.
 - 1. Softwood, 3/4" dia. x 8" long or,
 - 2. Steel, tee shaped pins, 4" head x 8" leg.
- E. Water:

1. Free of substance harmful to sod growth.
2. Hoses or other methods of transportation furnished by Contractor.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine finish surfaces, grades, topsoil quality and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Limit preparation to areas which will be immediately sodded.
- B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish and extraneous matter.
- C. For reinforced lawns, integrate approved fiber reinforcement material into topsoil prior to placement of sod. See Drawings for fiber material, application rate and depth.
- D. Grade lawn areas to smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake; remove ridges and fill depressions as required to drain.
- E. Apply limestone at rate determined by the soil test, to adjust pH of topsoil. Distribute evenly by machine and incorporate thoroughly into topsoil.
- F. Apply fertilizer at the approved rates. Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with the soil to a depth of 3" by discing or other approved methods. Fertilize areas inaccessible to power equipment with hand tools and incorporate it into soil.
- G. Dampen dry soil prior to sodding.
- H. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.03 INSTALLATION

- A. Sodding:
 1. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass.
 2. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.
 3. Do not lay dormant sod or install sod on saturated or frozen soil.
 4. Install initial row off sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.
 5. Peg sod on slopes greater than 3 to 1 to prevent slippage at a minimum rate of 2 stakes per yd. of sod but no less than 2 stakes per individual piece of sod.
 6. Water sod thoroughly with a fine spray immediately after laying.

7. Roll with light lawn roller to ensure contact with sub-grade.

3.04 MAINTENANCE

- A. Maintain sodded lawns until completion and acceptance of the entire project or not less than 30 days after completion and acceptance of sodding operations.
- B. Maintain sodded lawn areas, including water, spot weeding, mowing, application of herbicides, fungicides, insecticides and resodding until a full, uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Landscape Architect.
- C. Water sod thoroughly every 2 to 3 days, as required to establish proper rooting.
- D. Repair, rework and resod all areas that have washed out or are eroded.
- E. Replace undesirable or dead areas with new sod.
- F. Mow lawn areas as soon as lawn top growth reaches a 4" height. Cut back to 3" height. Repeat mowing as required to maintain specified height.
- G. Not more than 40% of grass leaf shall be removed at any single mowing.
- H. Apply herbicides as required to control weed growth or undesirable grass species.
- I. Apply fungicides and insecticides as required to control diseases and insects.
- J. Remove sod pegs.

3.05 CLEAN UP AND PROTECTION:

- A. During sodding work, keep pavements clean and work area in an orderly condition.
- B. Upon completion of work, clear grounds of debris, superfluous materials and all equipment. Remove from site to satisfaction of Landscape Architect.
- C. Protect sodding work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged sodding work as directed, at no additional cost to the Owner.

3.06 INSPECTION AND ACCEPTANCE

- A. Upon completion of work, notify Landscape Architect at least ten (10) days prior to requested date of inspection for acceptance. Where inspected work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Landscape Architect and found to be acceptable. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even colored viable lawn is established, free of weeds, undesirable grass species, disease, and insects.

- B. Upon satisfactory completion of repairs and/or replacements, the Landscape Architect certifies, in writing, the acceptance of the work in total.
- C. The one-year warranty period begins on the date of the acceptance of the work in total.

END OF SECTION

SECTION 32 93 00
TREES, SHRUBS AND GROUND COVERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Provide and furnish all trees, shrubs and ground covers, labor, miscellaneous materials and equipment required or inferred from drawings and specifications to complete the work of this section.

1.02 RELATED REQUIREMENTS

1. Earthwork: Section 31 22 00
2. Landscape Irrigation System: Section 32 80 00
3. Landscape Grading: Section 32 91 19
4. Seeding: Section 32 92 19
5. Native Seeding: 32 92 20
6. Sodding: Section 32 92 23

1.03 QUALITY ASSURANCE

A. Installers Qualifications:

1. The Contractor shall have a minimum of seven (7) years specialized experience in the installation of planting projects of comparable size and quality.
2. The Contractor shall have completed one planting project whose contract sum was no less than the value of the planting work of this project within the last three (3) years.
3. The firm shall be a contractor licensed by the State in which the project is located.
4. The Contractor shall hold the specialty classifications on their contractor's license that relate to the work of this section in accordance with the requirements of authorities having jurisdiction.
5. The Contractor's license shall have a monetary limit that is not exceeded by the value of the planting work of this project.
6. The Contractor shall have a satisfactory record for installation and warranty performance on said projects. Workmanship shall be of the highest quality.

B. Applicable Standards:

1. Plant names indicated comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names

of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

2. Provide stock true to botanical name and legibly tagged. Characteristics of individual plant species shall be as described in "Hortus Third". The character of individual plant varieties not listed shall be as defined in current horticultural literature and practice.
 3. Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock." A plant shall be dimensioned as it stands in its natural position.
- C. General: All plants shall be grown in a recognized nursery in accordance with good horticultural practice. Provide healthy stock free of disease, insects, eggs, larvae and defects such as knots, sun scald injuries abrasions or disfigurement.
- D. Substitutions: Do not make substitutions. If specified plant material is not obtainable, submit to Landscape Architect proof of non-availability and proposal for use of equivalent material. For proof of non-availability submit a written statement from a minimum of 6 reliable nursery sources (American Nurserymen's Association Members) that the plant in question is not obtainable in the Eastern United States.

Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

Topsoil: Before delivery of topsoil, furnish Landscape Architect with written statement giving location of properties from which topsoil is to be obtained, depth to be stripped, and, if applicable, crops grown during past 2 years.

Soil Test Report: Contractor shall engage a reputable laboratory to include testing and analysis of soils representative of planting areas on site and new topsoil with reference to specified plant materials. The soil test report should provide the following data: Water pH; soil test ratings for Phosphorus, Potassium, Calcium, Magnesium, Zinc, Iron and Manganese; percentage of organic matter; soluble salts; recommendations on type and quantity of additives required to establish satisfactory pH factor and supply nutrients to bring nutrients to satisfactory level for planting specified plant materials.

Approval and Selection of Materials and Work: The selection of all materials and the execution of all operations required under the specifications and drawings is subject to the approval of the Landscape Architect. The Landscape Architect has the right to reject any and all materials and any and all work which, in the opinion of the Landscape Architect does not meet the requirements of the Contract Documents at any stage of the operations. The Contractor shall promptly remove rejected work and or materials from job site. The Contractor shall replace rejected work and or materials promptly.

1.04 SUBMITTALS

A. Unit Pricing:

1. Submit unit prices for each plant species specified on the drawings and for landscape materials including, but not limited to:

- a. Seeding
 - b. Sod
 - c. Topsoil
 - d. Mulch
 - e. Bed Edging
 - f. Geosynthetics (if applicable)
 - g. Root Barrier (if applicable)
2. Unit pricing may be denoted with both "add" and "deduct" units for materials which are time sensitive or which are non-refundable. The "add" units, however, must concur with the bid and/or approved proposal.

B. Certification:

1. Submit certificates of inspection for all plant materials with project close-out documents and as required by governmental authorities.
2. Submit manufacturer's or vendor's certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.

Notice of Sources: Within 15 days following the award of Contract, the Landscape Architect shall be notified in writing of the sources of all plant materials for this project. This notification shall include an itemized list of all plant materials and the complete address and telephone number of the supplier of each plant. Any requests for plant material substitution shall be included with this notification. Requests for substitution will not be considered before or after this notification.

Specimen Plant Material Photography:

3. Contractor must locate, photograph or videotape from both sides with a scale figure, and tag at the source each individual plant material labeled "Specimen" in the Plant List.
4. The Contractor must furnish photographs of each individual plant and inform Landscape Architect in writing of the source/location at least ten (10) days prior to digging.
5. Subsequently the Landscape Architect may, at his discretion, inspect and seal specimen plant materials before digging. In the event plant material is found to be unacceptable, the Contractor will pursue other sources until acceptable plant material is found, at no additional cost to the owner.

The contractor will reimburse the owner for time and travel costs incurred by the Landscape Architect (\$500.00 per day plus travel costs) because of requested inspections of unacceptable specimen plant materials.

Approval at the plant source does not impair the right of inspection and rejection during the progress of the work.

Planting Schedule: Submit planting schedule showing scheduled dates for each type of planting work in each area of site. Submit planting schedule prior to beginning of the work. Planting schedule shall demonstrate a thorough understanding of the overall project schedule in accordance with the requirements of this specification section and good horticultural practices of the area in which the project is located.

Maintenance Instructions: Upon completion of the installation, submit typewritten recommendations for maintenance of any portion of the landscape which, in the opinion of the Contractor, requires special attention.

Topsoil Sample: Submit one cubic foot of topsoil proposed for use, two (2) weeks prior to beginning work. If topsoil source changes submit sample from new source.

- C. **Soil Test Report:** Submit results of laboratory soil tests two (2) weeks prior to beginning of the work. If topsoil source changes submit soil test report from new source.
- D. **Approval:** Obtain approval from Landscape Architect in writing for all submittals including miscellaneous materials prior to beginning of work.
- E. **Miscellaneous Materials:** Submit product literature and samples of all miscellaneous materials required to complete the work of this section.
- F. **Provide plant material record drawings:**
- G. **Legibly mark drawings to record actual construction.**
- H. **Identify field changes of dimension and detail and changes made by Change Order referenced to permanent surface improvements.**

1.05 **DELIVERY, STORAGE AND HANDLING:**

- A. **Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.**
- B. **Shipment and Delivery:**
 - 1. **Promptly notify the Landscape Architect in advance, when the plant material is to be delivered and the manner of shipment.**
 - 2. **Furnish therewith an itemized list of the actual quantity and sizes**
 - 3. **Deliver the necessary inspection certificates to accompany each plant or shipment prior to acceptance and planting.**
 - 4. **When shipment is made by truck, pack all plant material to provide adequate protection against climate and breakage during transit and tie to prevent whipping.**
 - 5. **Cover the tops with tarpaulin to minimize wind whipping and drying, or spray adequately with anti-transparent.**
 - 6. **Exercise care at all times during the handling operations to prevent damage to bark, branches, and root system.**

7. Employ a suitable method of handling to insure the careful workmanlike delivery of heavy balled plants to preclude cracked plant balls. No balled plant shall be planted if the ball is cracked or broken either before or during the planting operation.
- C. Protection After Delivery: The balls of "B & B" plants which cannot be planted immediately on delivery shall be covered with moist soil or mulch, or other protection from drying winds, sun, and freezing temperatures. Rooted plants shall be planted or heeled in immediately upon delivery. All plants shall be watered as necessary until planted.
- D. Do not remove container-grown stock from containers until planting time.
- E. Label at least one tree and one shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.
- F. Do not remove labels attached to plant material until directed by the Landscape Architect to do so.

1.06 PROJECT CONDITIONS

- A. Work notification: Notify Landscape Architect at least 7 working days prior to installation of plant material.
- B. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations.
- C. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required. Schedule delivery of plant materials to closely coincide with installation and to minimize stored plant materials. All stored plant materials shall be protected, maintained and subject to all provisions of this specification.
- D. Existing Utilities: The Contractor shall--at his own expense--locate, excavate and verify the alignment and depth of all underground utilities as shown on the drawings. Perform work in a manner which will avoid possible damage. Maintain grade stakes set by others unless removal is mutually agreed upon by parties concerned. All damage to utilities resulting from work covered in these specifications will be repaired at the Contractor's expense.
- E. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, adverse soil conditions or obstructions, notify Landscape Architect in writing before planting.
- F. Planting Time:
 1. Plant or install materials during suitable weather conditions.
 2. A dormant season planting is required.
- G. Planting Schedule: Submit proposed planting schedule to Landscape Architect. Schedule dates for each type of landscape work during contract period.

- H. Out-of-Season Planting: Out-of Season planting shall not be permitted. If an out-of-season planting would otherwise be required in order to complete the work, submit in writing a proposed date during the dormant season for completing required planting or plant replacement work and obtain Landscape Architect's approval in writing.

1.07 WARRANTY

- A. Warrant all trees, shrubs and ground covers against defects including death and unsatisfactory growth in the opinion of the Landscape Architect. Warrant trees shrubs and groundcovers for one (1) year from the date of Substantial Completion of the entire project.
- B. Replace in accordance with the drawings and specifications, all plants that are dead or, as determined by the Landscape Architect, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes. The cost of such replacement(s) is at Contractor's expense. Warrant all replacement plants for one (1) year after installation.
- C. Warranty shall not include damage or loss of trees, plants, or ground covers caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area; acts of vandalism or negligence on the part of the Owner.
- D. Remove and immediately replace all plants, as determined by the Landscape Architect, to be unsatisfactory during the initial planting installation and one year warranty period.
- E. Replacements: Match adjacent specimens of same species. Replacements are subject to all requirements stated in this specification and subject to inspection by the Landscape Architect.
- F. Repair grades, paving and any other damage resulting from replacement planting operations, at no additional cost to the Owner.
- G. Inspect job site monthly during warranty period to determine what changes, if any, should be made in the maintenance program. Submit all recommended changes in writing to the Landscape Architect and the Owner. In the absence of monthly written reports from the Contractor it shall be assumed that the Contractor is satisfied with the Owner's maintenance operations and procedures and waives any and all claims for damages against the Owner with respect to the warranty requirements of this specification.
- H. At the close of the warranty period, one (1) year after Substantial Completion of Trees, Shrubs, and Groundcovers work, notify the Owner and Landscape Architect in writing of the date for warranty inspection. Make any repairs or replacements identified by the Landscape Architect in the Warranty Inspection.
- I. Upon satisfactory completion of repairs and/or replacements the Landscape Architect certifies, in writing, the final acceptance of the work.
- J. Existing trees shown to remain shall be protected during construction in accordance with the drawings.

PART 2 - PRODUCTS

2.01 TOPSOIL

January 22, 2015

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Project No. 14T-G-0566
Suttree Landing Park; Phase 1B Project
Proposed Park Improvements

- A. New topsoil shall be fertile, friable, natural surface soil of fine to medium textured loamy character.
- B. Topsoil should be representative of the dark brown surface soils in the vicinity which produce heavy growth.
- C. The topsoil shall be reasonably free from subsoil, objectionable weeds, litter, sod, stiff clay, stones larger than one inch in any dimension, stumps, roots, weeds, toxic substances, or any other material which may be harmful to plant growth or hinder planting operations.
- D. Topsoil shall exhibit the following characteristics as evidenced by the soil test report:
 - 1. Water pH 6.5 minimum -7.0 maximum.
 - 2. Phosphorus 9-30 pounds per acre
 - 3. Potassium 45-160 pounds per acre
 - 4. Organic matter 4.0% minimum
 - 5. Soluble salts 0-1060 parts per million.
- E. Obtain topsoil only from naturally, well drained sites where topsoil occurs in a depth of not less than four inches.
- F. Topsoil shall not be delivered in a frozen or muddy condition.
- G. The furnishing of all topsoil needed for planting and soil mix will be considered a subsidiary portion of this specification and covered in the cost of trees, shrubs, and ground covers.

2.02 SOIL AMENDMENTS

- A. Fertilizer shall be a mixed commercial fertilizer, of Grade 10-10-10 or as recommended by the Soil Report with guaranteed chemical analysis of contents marked on containers or sacks.
- B. Lime:
 - 1. Ground or pulverized of horticultural grade capable of neutralizing soil acidity and containing not less than 85% of total carbonates.
 - 2. Containers or sacks shall be labeled to show chemical and mechanical analysis.

2.03 PLANTING SOIL MIXES

- A. Planting soil mix shall be provided amended as per soils test report recommendations.

Basic soil mix is as follows:

- 1. 100% Topsoil (as specified)
- 2. Fertilizer as recommended

3. Lime as recommended
- B. Potting soil mix for use in freestanding containers. Thoroughly mix the following:
1. 1/3 Peat or Coir
 2. 1/3 Bark fines
 3. 1/6 Vermiculite
 4. 1/6 Coarse (builder's) sand
- C. Bio-Retention Soil Mix:
1. "Bio-Retention Mix" by Hines Fine Soils (865-689-3413) or approved equivalent.

2.04 PLANT MATERIALS

General:

1. A complete list of plants including a schedule of sizes, quantities, and other requirements is shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.
2. Specific requirements concerning plant material and the manner in which it is to be supplied are shown on the drawings and plant list.
3. Acclimatization: Plants must have grown under climatic conditions and temperature extremes similar to those of the locality of the project site for a minimum of two years immediately prior to being planted on the job.

B. Quality and Size:

1. Plants shall have a habit of growth that is normal for a well maintained sample of the species and shall be sound, healthy, vigorous and free from insect pests, plant diseases, and injuries. Plants to be selected for specific branching habit where a range of habit occurs within a species shall be furnished thickly branched as noted on the plant list. All plants shall equal or exceed the measurements specified in the plant list, which are minimum acceptable sizes. They shall be measured before pruning with branches in normal position. Pruning shall be done at the discretion of or as directed by the Landscape Architect, but in no case shall the plants supplied under this contract be pruned back to such an extent that they no longer meet specifications. Requirements of plants in the plant list generally follow the code of standards currently recommended by the American Association of Nurserymen, Inc., in the American Standard of Nursery Stock.
2. Collected Plant Material. (Plants which are not nursery grown). Plant material shall be collected only if specifically authorized in writing by the Landscape Architect. Any collected plant material which is authorized shall be dug with a ball of earth which has a diameter at least 1/3 greater than that specified for nursery-grown stock and burlapped.

3. Plants furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional cost, and providing that the larger plants will not be cut back to size indicated. Provide plants indicated by two measurements so that only a maximum of 25% are of the minimum size indicated and 75% are of the maximum size indicated.
4. Specimen Plant Material: Plants labeled "Specimen" in the plant list shall be outstanding plants of the species and shall be of the highest quality possessing all the characteristics shown in the plant materials list.
5. Furnish plants to match as closely as possible whenever symmetry is called for.
6. Balled and Burlapped Plants: All plants designated "B &B" on the plant list shall have firm natural balls of soil in sizes as set forth in the "American Standard for Nursery Stock" and shall be:
 - a. Wrapped firmly with burlap or approved material.
 - b. Bound carefully with twine, cord or wire mesh, in a manner so as not to damage the bark, break branches, or destroy natural shape.
 - c. Covered with moist soil, mulch, or other protection from drying if not planted immediately. Cracked or mushroomed balls are not acceptable.
7. Bare Root Plants: Plants designated "BR" in the list of plants to be furnished shall be dug with substantially all of the root system intact, and with the earth carefully removed from the roots. Cover all roots with a thick coating of mud by puddling, or otherwise protect from drying after they are dug.
8. Container grown plants in cans or plastic containers will be acceptable in lieu of balled and burlapped plants provided that they are of specified quality. The container must be removed prior to planting, care being exercised as to not injure the plant.

C. Trees

1. Provide trees of height and caliper listed or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.
2. Determining dimensions for trees are caliper, height and spread. Caliper taken 6" above ground for trees up to and including 4" caliper. Trees over 4" caliper measure 12" above ground. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to tip. Take measurements with branches in normal position.
3. Evergreen trees shall be branched to the ground unless noted otherwise on the drawings.
4. No pruning wounds shall be present with a diameter of more than 1" and such wounds must show vigorous bark on all edges.

D. Shrubs

1. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.

2. Single stemmed or thin plants will not be accepted.
3. Side branches shall be generous, well-twiggged, and the plant as a whole well-bushed to the ground.
4. Plants shall be in a moist, vigorous condition, free from dead wood, bruises, or other root or branch injuries.

E. Ground Cover

1. Provide good ground cover plants established and well-rooted in removable containers or integral peat pots and with not less than minimum number and length of runners by ANSI Z60.1 for the pot size shown and as listed in plant list.

F. Perennials

1. Provide perennial bulbs, corns and tubers which are fleshy and free of rot and not less than the grade and size recommended by ANSI Z60.1 for the size shown or listed.
2. Provide good perennials in either a dormant condition or actively growing. Actively growing perennials shall be furnished rooted in removable containers or field dug. Field dug perennials shall be in a moist, vigorous condition with no sign of desiccation.

2.05 MISCELLANEOUS LANDSCAPE MATERIALS

- A. Burlap for wrapping earthball to be biodegradable jute mesh not less than 7.2 oz. per square yard.
- B. Stakes: screw-in steel anchors in various lengths from 15" to 48" capable of holding from 200 to 6000 pounds as distributed by DeepRoot Green Infrastructure, LLC (1-800-458-7668), A.M. Leonard Co. (1-800-543-8955) and Ben Meadows Co. (1-800-241-6401), 2 x 2 or better uniform grade pressure treated pine, or sound new hardwood or redwood free of knot holes and other defects.
- C. Guy tie material shall be flat, woven polypropylene with break strength of 900 lbs. Color shall be green.
- D. Soil Separator: Rot resistant polypropylene filter fabric, water permeable, and unaffected by freeze-thaw.
- E. Drainage Gravel: Clean 3/4" crushed stone.
- F. Water transportation is the sole responsibility of the Contractor.
- G. Mulch: Mulch shall be temperature stabilized hardwood or recycled greenwaste material and shall not exceed 4" in length and 1/2" in width. No recycled woodwaste, fine composted or dyed mulches shall be used.
- H. Anti-Desiccant: Protective film emulsion providing a protective film over plant surfaces; permeable to permit transpiration. Mixed and applied in accordance with manufacturer's instructions.

- I. Pre-Emergence Herbicide for general use shall be "Ronstar", "Casaron", or approved equal. Apply at the rates, times and manner recommended by the manufacturer.
- J. Metal Bed Edging: Steel Bed Edging, 3/16" thick X 4" height with compatible Steel Stakes, 3/16" thick X 15" length, color: Black, as manufactured by Border Concepts, Inc., P.O. Box 471185, Charlotte, NC 28247, TEL: 704.541.5509, FAX: 704.541.5610, www.borderconcepts.com, or approved equivalent.

PART 3 - EXECUTION

3.01 PREPARATION

A. General

- 1. Contractor must examine conditions under which planting is to be installed. Review applicable architectural and engineering drawings, and be familiar with alignment of underground utilities before digging.
- 2. Planting Time: Planting operations are to be performed at such times of the year as the job may require, with the stipulation that the Contractor guarantees the plant material as specified herein. Plant only during periods when weather conditions are suitable.
- 3. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure Landscape Architect's acceptance before start of excavation for planting work. Make adjustments as may be requested.
- 4. Notify Landscape Architect before planting in writing of adverse sub-surface drainage or soil conditions. State conditions and submit a proposal for correction including costs. Obtain approval for method of correction prior to continuing work in the affected area. In the event that alternate locations are selected, the Contractor will prepare such areas at no additional expense to the Owner.
- 5. Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.

3.02 EXCAVATION

A. Preparation of Tree and Shrub Pits:

- 1. Excavate pits with vertical sides, as specified and as shown on the drawings. For balled and burlapped (B & B) trees and shrubs, make excavations at least three times as wide as the ball diameter and equal to the ball depth, plus an allowance for setting of ball on a layer of compacted backfill. Allow for 6" minimum setting layer of planting soil mixture.
- 2. Loosen hardpan and moisture barrier to a depth of 2' minimum below the bottom of the tree pit or until hardpan has been broken and moisture is allowed to drain freely. For shrub pits, loosen hardpan 8" minimum below bottom of excavation or until hardpan has been broken and moisture is allowed to drain freely.

3. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth.
4. Conduct drainage tests.
5. During planting process fill planting pit excavation to final grade using the soil removed during excavation of the planting pit.

B. Test Drainage:

1. Acceptable Drainage Rate: Minimum acceptable percolation rate for tree pits, shrub pits and shrub/ground cover beds shall be 0.10 inch per hour.
2. Tree and Shrub Pits: Fill each pit with water. If percolation is less than 0.10 inch per hour in a 24 hour period, drill a 12" auger to a depth of four feet below the bottom of the pit. Fill auger hole with 3/4" stone and cover with soil separator. Re-test pit. In case drainage is still unsatisfactory, notify Landscape Architect, in writing, of the condition before planting in such questionable areas. If not, Contractor is fully responsible for warranty of trees.

3.03 PREPARATION OF PLANTING SOIL MIX

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.
- B. Mix specified soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.
- C. For pit and bed type backfill, mix planting soil prior to backfilling.

3.04 PLANTING TREES AND SHRUBS

- A. Set plants on 6" of compacted backfill soil mix to such depth that the finished grade level at the plant after settlement will be the same as that at which the plant has grown. The topmost structural root shall be at, or slightly above finished grade. They shall be planted upright and faced to give the best appearance or relationship to adjacent structures. No burlap shall be pulled out from under balls.
- B. After putting ¼ of the backfill soil in the hole, Platforms, wire and surplus binding from top and sides of the balls shall be removed at least 8" to 10" below the topmost structural root.
- C. Roots shall be spread in their normal position and shall not be circling or girdling. All broken or frayed roots shall be cut off cleanly.
- D. The hole shall be backfilled with the same soil removed from the hole. Soil shall be tamped lightly to pack rootball firmly within the planting hole. Soil shall be placed and compacted carefully to avoid injury to roots and to fill voids.
- E. When the hole is 2/3 full, add water as necessary and allow it to soak away to eliminate air pockets. Tamping of the soil shall not occur once the soil has been watered.

- F. Fill the hole to finish grade. No soil shall be placed above the topmost structural root. **If excess soil is not necessary for the backfill of the rootball, it shall be removed from the site by the Contractor. Excess soil shall not be used to create a planting berm.**
- G. If deciduous trees or shrubs are moved in full leaf, spray with anti-desiccant at nursery before moving and again after planting as per manufacturer's recommendations.
- H. Mulching: Immediately after planting work has been completed, mulch pits, trenches and planting beds. Provide not less than 3" thickness of hardwood bark mulch as shown on drawings. Apply/incorporate pre-emergence herbicide per manufacturer's instructions. Finish edges according to detail.
- I. Water: Soak all plants immediately after planting, continue watering thereafter as necessary until acceptance of the work in total.
- J. Smooth planting areas to conform to specified grades after full settlement has occurred and mulch has been applied.

3.05 STAKING, GUYING AND PRUNING:

- A. Staking: Trees/shrubs should not be staked unless necessary. If staking, plants shall be plumb before and after staking or guying. Do not use staking and guying to force trees into alignment. Maintain stakes and guys until acceptance of the work in total. Remove stakes and guys at the end of the warranty period.
- B. Staking trees of 1" caliper to 3" caliper:
 - 1. Drive stakes securely into ground and utilize approved screw anchors.
 - 2. Fasten stakes/anchors to tree with approved tie material. Knot in accordance with manufacturer's recommendation.
 - 3. Provide three (3) stakes and guys, equal spaced, per tree.
 - 4. Adhere to staking details unless alternate detail has been approved by Landscape Architect prior to beginning of planting operation.
- C. Staking trees of 1" and under or 4' height:
 - 1. Use single stake with approved tie material looped around trunk.
 - 2. Guy deciduous trees over 3" to 5" caliper and evergreen trees 4'-8' all as described and detailed.
 - 3. Position guys around trunk at approximately two-fifths the height of the tree.
 - 4. Anchor guys in ground either to steel rods driven securely into ground with top end 3" below finish grade or steel anchors securely screwed into ground with top end at or below finished grade.
- D. Guy deciduous trees over 5" caliper and evergreen trees over 8' tall as described and detailed.

1. Install 3 screw anchors minimum equally spaced around the tree at approximately two-fifths the height of the tree.
2. Securely anchor cable to screw anchors.
3. Use hose around cable so cable is not in contact with plant.
4. Secure cable around tree trunk.
5. Securely attach ends of cable to turnbuckle so that cable is taut before adjusting turnbuckle.
6. Flag all guy cables as required.

E. Pruning:

1. Unless otherwise directed by the Landscape Architect do not cut tree leaders, and remove only injured or dead branches from trees, if any.
2. Prune shrubs at the direction of the Landscape Architect.
3. Remove and replace promptly any plants pruned or misformed resulting improper pruning.
4. Paint wounds and cuts over 3/4" in diameter with approved tree paint designed for this purpose.

3.06 MAINTENANCE:

- A. Begin maintenance immediately after planting.
- B. Maintain trees, shrubs and other plants until Substantial Completion of the entire project and for not less than one (1) year after Substantial Completion of the entire project.
- C. Maintain trees, shrubs and other plants by watering, pruning, cultivating, weeding, and re-mulching as required for healthy growth.
 1. Restore planting saucers.
 2. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required.
 3. Restore or replace damaged wrappings.
 4. Spray as required to keep trees and shrubs free of insects and disease.

3.07 CLEAN UP AND PROTECTION:

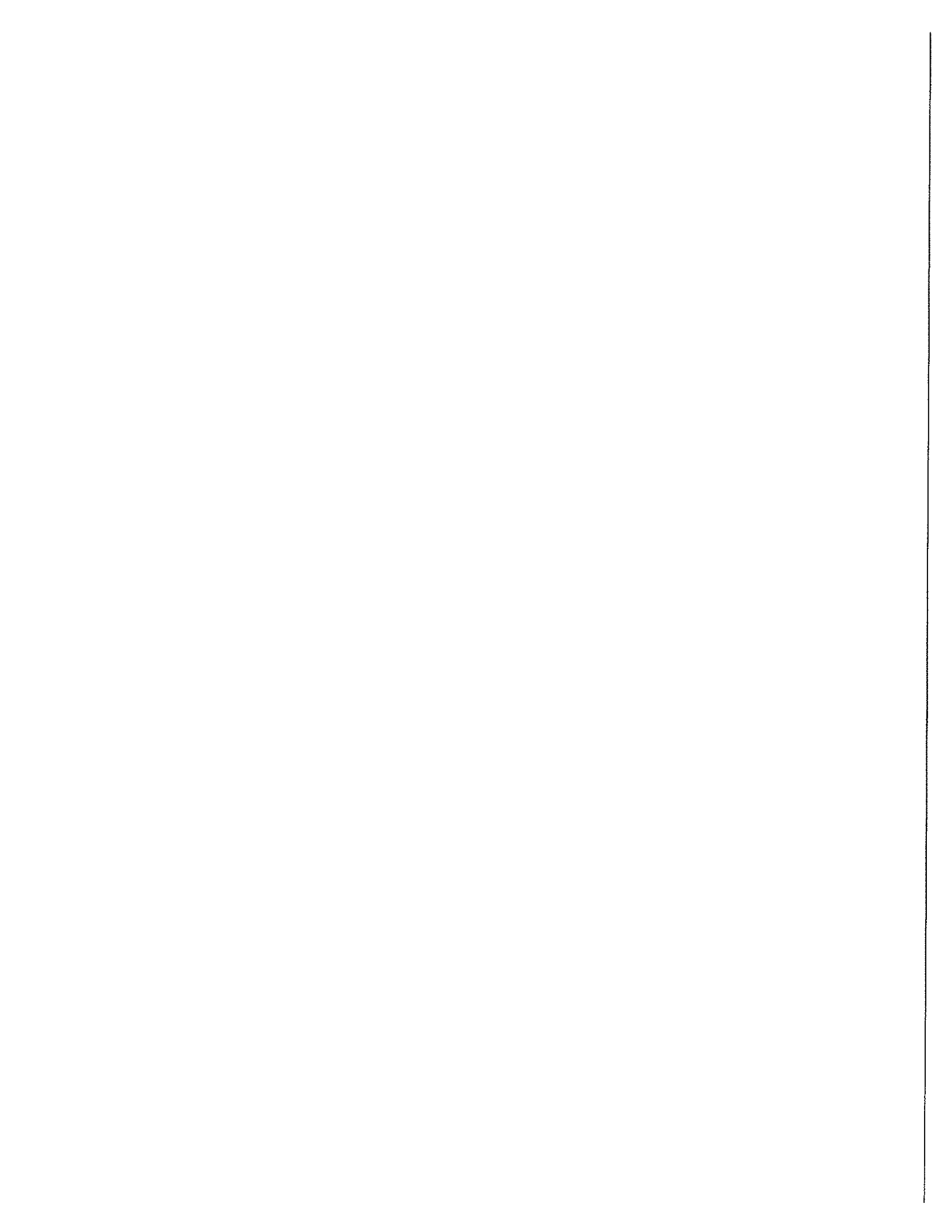
- A. During landscape work, keep pavements clean and work area in an orderly condition.
- B. Upon completion of work, clear grounds of debris, superfluous materials and all equipment. Remove from site to satisfaction of Landscape Architect.

- C. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers.
 - 1. Maintain protection during installation and maintenance periods.
 - 2. Treat, repair or replace damaged landscape work as directed, at no additional cost to Owner.

3.08 SUBSTANTIAL COMPLETION AND FINAL COMPLETION

- A. Upon completion of work, notify Landscape Architect at least ten (10) days prior to requested date of inspection for Substantial Completion. Remove rejected plants and materials promptly from project site.
- B. Landscape Architect will review the work and document incomplete or incorrect work in an inspection report or list. If trees, Shrubs, and Groundcovers work is found to be substantially complete a Certificate of Substantial Completion will be issued that establishes a date of substantial completion. The list of incomplete or incorrect work will be attached to the Certificate.
- C. Complete or correct Trees Shrubs and Groundcovers work identified on the list within the number of days established in the Certificate of Substantial Completion.
- D. Upon satisfactory completion of repairs and/or replacements, the Landscape Architect certifies, in writing, the Final Completion of the work.

END OF SECTION



SECTION 35 15 13.26
PLASTIC FLOATING DOCK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Section includes cast-in-place concrete work indicated in the Contract Documents or otherwise required for proper completion of the work.

1.02 RELATED SECTIONS

- A. Section 013310 - Structural Submittals.
- B. Section 014010 - Structural Testing/Inspection Agency Services.

1.03 SUMMARY

- A. Section Includes:
 - 1. Floating dock system.
 - 2. Kayak and canoe launch with accessible transfer system.
 - 3. Gangway.

1.04 SUBMITTALS

- A. Submit the following in accordance with Conditions of the Contract and necessary product specifications.
 - 1. Product Data: For each listed component and component accessory.
 - 2. Shop Drawing: Show the layout of the floating dock system, kayak and canoe launch with Gangway, and attachments to other work.
 - a. Include details of each component and component accessory including connections.
 - 3. Samples: For each exposed finish and profile.
 - 4. Material Certifications.
 - 5. Product Test Reports.
 - 6. Maintenance Data.
 - 7. Submit concrete mix designs. Include the following:

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
 - 1. Installer's responsibilities include fabricating and installing and providing professional engineering services needed to assume engineering responsibility.
 - 2. The dock system, anchorage, and connections shall be designed according to the recommendations of the American Society of Civil Engineers Manual and Report on Engineering Practice Number 50, "Planning and Design Guidelines for Small Craft Harbors", the revised edition.

1.06 WARRANTY

- A. Floatation (8 Years) – Modular dock units and lifts are warranted against cracks, breakage, leaks, and ultraviolet deterioration caused by defects in material and manufacturing workmanship for a period of eight (8) years from the date of final acceptance by the owner.

- B. Hardware and Accessories (1 Year) – Hardware and accessories are warranted against defects in material and manufacturing workmanship for a period of one (1) year from the date of final acceptance by the owner.

PART 2 PRODUCTS

2.01 FLOATING DOCK SYSTEM

A. Float and Deck Design

1. The docking surface and float structure shall be constructed as a single, integrated component. Each section shall support the dead load plus a live load of 62.5 lbs. /sqft.
2. Individual dock stations shall consist of a specified number of interior, air filled pylons. Each pylon shall support the dead load plus a live load of 55 pounds and have a volume of no less than 1540 cubic inches (in³).
3. Individual dock sections shall be constructed of Virgin Polymers, Thermoplastic, and Rotational Molding Grade Linear Low Density Polyethylene (LLDPE) with an ultraviolet inhibitor system (UV-16) or better spectrometer specifications.
 - a. Standard color: Beige
 - b. The density of the section shall be approximately .932 grams per cubic centimeter (g/cm³) or .0338 pounds per cubic inch (lbs. /in³), per ASTM 792-00.
 - c. The dock section shall have a cold brittleness temperature equal to, or less than, -130 Fahrenheit (F), per ASTM D-746
4. Dock section exterior wall thickness properties:
 - a. The mean exterior material thickness shall be no less than .310 inches (in).
 - b. The corners shall be no less than .650 inches (in).
 - c. The exterior edge thickness shall be no less than 0.50 inches (in) at any particular point.
 - d. The walls of the dock sections shall resist a shear of no less than 1900 pounds per square inch (lb. /in²) per ASTM D-732, as well as having the capability of resisting a mean minimum impact of no less than 207 foot pounds (ft-lb), per ASTM D5420.
 - e. The tensile strength at average failure shall be no less than 2550 pounds per square inch (lb. /in²) width 14% elongation at yield, per ASTM D-638-03.
5. The decking surface shall be composed of a textured surface with a grid pattern. The decking surface shall have 0.5 inch (in.) wide by 0.5 inch (in) deep drainage troughs positioned at intervals no less than 4.5 inches and no greater than 6.5 inches over the entire length of the dock.
 - a. The deck shall have coefficient of friction equal to 0.35 during dry conditions and 0.61 during wet conditions per ASTM D2394
 - b. The mean deck thickness shall be no less than 0.315 inches (in).
 - c. The deck thickness shall be no less than 0.290 inches (in) at any particular point.
 - d. The deck shall resist a punching shear no less than 1900 pounds per square inch (lb. /in²), per ASTM D-732.
 - e. The deck shall resist a minimum impact of no less than 120 foot pounds (ft-lb) near the center, or at the point where the deck is thinnest, per ASTM D-3029.
 - f. The deck shall resist a minimum impact of no less than 150 foot pounds (ft-lb) within 16 inches (in) of the outside of the dock, per ASTM D-3029.

B. Floating Dock Structure

1. The dock structure, as a whole shall consist of the individual sections, which are to be coupled together in the configuration on the Architectural drawings. Any material used in

the dock structure shall provide for resistance to rust, corrosion, and the effects of any fuel or gasoline.

2. The dock structure shall act as one unit when assembled, so that wave and/or wind action shall produce a minimum amount of motion. The structure shall be secured with piles, securing shall allow the structure to rise and fall freely with any water level changes and allow the structure to span waves from crest to crest.

C. Connections of Dock Sections

1. Each dock section shall have molded-in female-type pockets spaced symmetrically along the top and bottom edges, around the entire perimeter of the dock section. Pockets shall be spaced at 19.5 inch (in) intervals, center line to center line, from each other. All unused pockets are to be filled with the manufacturer's pocket filler.
2. The molded-in female-type pockets shall accept a male-type coupler which shall be secured into the female pocket with the use of a 0.5 inch (in) x 13 (in) coupler bolt and nut.
3. Each connection point shall allow for some slippage that will allow for disconnection without causing damage either to the male-type couplers of the female-type pockets.
4. The dock sections shall be connected at increments of 19.5 inches (in), in relation to each other. These connections may be made from any one side of any dock section to any other side of another dock section.
5. The male-type coupler shall be constructed of recycled post/pre-consumer recycled tire rubber, and shall withstand a pullout force of no less than 2500 pounds (lb.) before failure of coupler occurs.
6. Each of the molded in female connection pockets shall provide for a pullout strength of no less than 3500 pounds (lb.), before damage is caused to the dock station.
7. The accessories shall be connected to the dock system through the use of molded in coupler pockets around the perimeter of the dock sections by the use of either male or female type half-couplers. The male-type half-coupler shall have a 3.625 inch "T"-bolt embedded within it. The female type half-coupler shall have a 3.625 inch "T"-nut embedded within it. Both types of half-coupler shall withstand a pullout force of no less than 2600 pounds (lb.) before failure occurs.

D. Anchorage

1. The dock system shall be designed to allow for the use of proper anchorage based on the environmental and water conditions at the installation site.

E. Security Curbing

1. Security curbing shall be provided around the perimeter of floating dock.
2. Color: Brown.

F. Load Design

1. Dead Load
 - a. The dead load shall consist of the entire dock system plus any additional attachments to the dock system.
 - b. Each dock section, without additional attachments, shall provide a freeboard of approximately 12.75" inches (in).
 - c. The surfaces of adjacent deck surfaces shall have an elevation difference of no more than 0.125 inches (in).
 - d. The deck surface of each 80 inch (in) X 10 foot (ft.) dock section shall not slope more than 0.35 inches (in) over the width of dock section.
2. Live Load Due to Vertical Loads

- a. Under dead load conditions plus an additional 30 pounds per square foot (lb. /ft.2) of uniform live load, flotation shall provide for a minimum of 7 inches (in) of freeboard.
 - b. The dock structure shall support a concentrated vertical load of up to 400 pounds (lb.) at any particular point on the surface of the deck. The structure shall accomplish this while maintaining flotation.
3. Live Load Due to Horizontal Loads
- a. The dock system shall sustain the stated design loads applied by normal current and/or debris which are normal to a particular location.
 - b. The dock system shall be capable of sustaining continuous wave action of up to 1 foot and occasional wave action not in excess of 3 feet during storm conditions.
 - c. The dock sections shall sustain any loads applied by non-moving ice without damage.
 - d. The dock system shall be compatible for the use of any boat or vessel size with a properly designed anchorage/mooring system.
 - e. The dock system and anchorage shall be capable of withstanding sustained wind loads of 77 miles per hour (mph), or 15 pounds per square foot (lb. /in²), at 100% boat occupancy, unless otherwise specified.

2.02 KAYAK AND CANOE LAUNCH ACCESSIBLE TRANSFER SYSTEM

A. Entry Launch

- 1. The body of the entry launch shall be constructed of the same material as the floating dock system. See Section 2.1, A for all applicable material properties.
- 2. The entry launch shall have rollers to allow for water soft movement.
- 3. The entry launch shall have anodized aluminum side rails mounted on each side.
- 4. All hardware shall be stainless steel or anodized aluminum rated for marine grade.
- 5. Provide a stainless steel connection kit compatible with the launch and dock systems.

B. Accessible Transfer Bench and Grab Rail

- 1. The accessible transfer bench and its components shall be constructed of marine grade anodized aluminum.
- 2. The accessible transfer bench shall provide two vertical heights.
- 3. The accessible transfer bench shall provide two projecting transfer slide boards that lands securely on the grab bar.
- 4. The grab bar shall be constructed of marine grade anodized aluminum and mounted to the entry launch.

2.03 GANGWAY

A. Gangway Design

- 1. All construction is to be accordance with the minimum provisions of States Organizations for Boating Access (SOBA) and the guidelines stated by, "Marines and Small Craft Harbors".
- 2. Gangway shall be constructed of marine grade 6061-T6 aluminum. All welds shall conform to the American Welding Society Structural Welding Code for aluminum.
- 3. All non-self- drilling fasteners shall be 300. Series stainless steel.
- 4. Gangways shall be designed to support 90 pounds per linear foot (lbs. /film). The deck and structural components shall be designed to support a concentrated load of 400 pounds

applied to any 12 inch X 12 inch square. Lateral designed wind loads shall not exceed 77MPH.

5. Handrails shall be continuous along both sides of the walking surface and shall extend 12 inches past the walking surface on both ends. The top rail portion shall not be less than 34 inches no more than 38 inches above the walking surface. The ends of the handrails shall be returned into the handrail body or terminate with no sharp or catching edges. The mounting and components of the handrails shall be capable of withstanding a lateral load of 50 pounds per linear foot.
6. Gangway decking to be non-slip aluminum plank.

PART 3 EXECUTION

3.01 EXPERIENCE

- A. The contractor of the floating dock system, kayak launch, and gangway shall have evidence of satisfactory experience for a minimum of five years in design, manufacturing, and installation of all components herein specified.
- B. To demonstrate competence, the Contractor shall be required to submit to the Owner, a listing of a minimum of three projects for which he has furnished the components specified herein.

3.02 FABRICATION

- A. All components specified herein shall be manufacture red at a facility adequately equipped to accomplish the manufacturing process and delivered ready for assembly at the site.

3.03 SHIPPING

- A. Shoring for transit shall be provided. Contractor shall incur all costs for the replacement of all damaged components.

3.04 INSTALLATION

- A. All components specified herein shall be carefully unloaded and kept in orderly piles or stacks until installed.
- B. All components specified herein shall be securely tied to avoid wind damage until permanent connections are made.
- C. Wherever possible, parts shall be mounted so that they can be removed and replaced without interference from, injury to, or removal of other parts.

3.05 CONTRACTOR'S SUPERVISION

- A. The contractor shall provide a qualified representative at the job site during the assembly, installation, and anchorage of all components specified herein.

3.06 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as the floating dock, kayak launch, and gangway are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, clean finished surfaces as recommended by the manufacturer. Maintain in a clean condition during constructions.

END OF SECTION

