

EAST TENNESSEE STATE UNIVERSITY
D.P. CULP EXPANSION AND RENOVATION
RELEASE PACKAGE 2 MAIN BUILDING PACKAGE
412 JL SEEHORN JR ROAD
JOHNSON CITY, TENNESSEE

BEESON, LUSK & STREET, INC.
207 EAST MAIN STREET, SUITE 3C
JOHNSON CITY, TN 37604
423-928-1175

MOODY NOLAN
1625 BROADWAY, FOURTH FLOOR
NASHVILLE, TN 37203
615-386-9690



March 20, 2020

ADDENDUM NO. 15

NOTE:

This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents, "D.P. Culp Expansion & Renovation: Release Package 2: Main Building Package" dated March 1, 2018, and all addendums to the project (Addendum 1 thru Addendum 14) issued as a part of the construction documents.

Terms used which are defined in the General Conditions of the Contract for Construction (AIA A201-2017) have the meanings assigned to them in the General Conditions.

Copies of the sets of original Bidding Documents can be obtained by contacting the Designer's office, BLS Thompson & Litton, contact: Jerry Sartain, AIA. Phone (423) 928-1175 and the Construction Manager/General Contractor, Burwil Construction, contact: Chris Broglio, Phone (423)968-4158.

Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Architect assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

Owner and Architect, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

In submitting a Bid for this Addendum, BIDDER represents, as more fully set forth in the Agreement, that:

1. BIDDER has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, and studies which pertain to the subsurface or physical conditions at the site or otherwise may affect the cost, progress,

performance, or furnishing of the Work as BIDDER considers necessary for the performance or furnishing of the Work at the Contract time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 3.2 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, or similar information or data are or will be required by BIDDER for such purposes.

2. BIDDER has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing utilities at or contiguous to the site and assumes responsibility for the accurate location of said utilities. No additional examinations, investigations, explorations, tests, reports or similar information or data in respect of said utilities are or will be required by BIDDER in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 3.3 of the General Conditions.
3. BIDDER has correlated the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents.

Summary of Work Included:

Furnish and Install all materials required to renovate the ballroom on the Upper Level of the existing D.P. Culp Student Center, the existing exterior amphitheater and construct a pedestrian way along South Dossett drive from the D.P. Culp Center to John Robert Bell Drive.

Demolition work will include removal of existing concrete, asphalt, site utilities and miscellaneous electrical along the pedestrian way, removal of existing finishes, renovation of mechanical and electrical as required in the ballroom.

New construction will include new concrete work, site utility work and electrical work for the pedestrian way. For the ballroom new work will include gypsum board on metal studs, doors, hardware, acoustical ceilings, lighting, electrical and mechanical updates as required in the contract documents. Work for the amphitheater will include a new entablature and exterior electrical as required in the contract documents.

The revisions to the construction documents for the Bid Package 5 Ballroom Renovation and Pedestrian Boulevard additional scope of work is shown in the following revised drawings and specifications.

Revised/New drawings as noted on plans

Name	Date
G001 Drawing Index	3/20/2020
L001 Existing Site Plan	3/20/2020
L002 Site Demolition Plan	3/20/2020
L003 Site Utilities Plan	3/20/2020

L004	SWPPP Phase 1 Plan	3/20/2020
L005	SWPPP Phase 2 Plan	3/20/2020
L006	SWPPP Details	3/20/2020
L007	Amphitheater Plan	3/20/2020
L008	Amphitheater Demolition Elevations	3/20/2020
L009	Amphitheater Elevations, Details	3/20/2020
L100	Overall Boulevard Site Plan	3/20/2020
L101	Partial Enlarged Site Plan	3/20/2020
L102	Partial Enlarged Site Plan	3/20/2020
L103	Partial Enlarged Site Plan	3/20/2020
L104	Concrete Paving Plan	3/20/2020
L200	Elevations	3/20/2020
L201	Elevations	3/20/2020
L202	Sections and Details	3/20/2020
L203	Sections and Details	3/20/2020
L300	Site Details	3/20/2020
L301	Site Details	3/20/2020
L401	Enlarged Layout Plan	3/20/2020
L402	Enlarged Layout Plan	3/20/2020
L403	Enlarged Layout Plan	3/20/2020
L500	Overall Planting Plan	3/20/2020
L501	Planting Details	3/20/2020
L502	Planting Details	3/20/2020
L600	Overall Irrigation Plan	3/20/2020
AD132	Upper Level Plan Area 'B' Demolition Plan	3/20/2020
A132	Upper Level Floor Plan Area 'B'	3/20/2020
A232	Upper Level Reflected Ceiling Plan Area 'B'	3/20/2020
A402	Ballroom Building Sections	3/20/2020
A525	Ballroom Wall Sections	3/20/2020
A701	Door Schedule	3/20/2020
A900	Interior Finishes	3/20/2020
A932	Upper Level Finish Plan Area 'B'	3/20/2020
M132	Upper Level HVAC Plan Area 'B'	3/20/2020
E005	Partial Power Riser Diagram	3/20/2020
E009	Lighting Fixture Schedule	3/20/2020
E012	Electrical Panelboard Schedules	3/20/2020
E013	Electrical Panelboard Schedules	3/20/2020
E014	Electrical Panelboard Schedules	3/20/2020
E018	Electrical Panelboard Schedules	3/20/2020
E020	Electrical Panelboard Schedules	3/20/2020
E132	Upper Level Lighting Plan – Area 'B'	3/20/2020

E232	Upper Level Power Plan – Area ‘B’	3/20/2020
FA432	Upper Level Fire Alarm Plan – Area ‘B’	3/20/2020
T009	Data Cable Schedules	3/20/2020
T132	Upper Level Communications Plan – Area ‘B’	3/20/2020
SE104	Amphitheater Lighting Plan	3/20/2020
SE105	Amphitheater Power Plan	3/20/2020
SE106	Pedestrian Walk Lighting and Communications Plan	3/20/2020
SE107	Pedestrian Walk Power Plan	3/20/2020

See attached list of changes to Drawing Sheets.

See Attached Specification Table of Contents for referenced and new as noted.

End of Addendum No. 15

Addendum Number 15 – Drawing Summary

ETSU D.P. Culp Center
 Release Package 5
 Johnson City, Tennessee
 March 20, 2020
 SBC# 166/005-01-2014CM

<u>Name</u>	<u>Summary of Changes</u>	
G001	Drawing Index	Updated drawing list
L001	Existing Site Plan	Existing Pedestrian Boulevard Site Plan
L002	Site Demolition Plan	Pedestrian Boulevard Demo Site Plan and notes
L003	Site Utilities Plan	Pedestrian Boulevard Site Utilities Plan and notes
L004	SWPPP Phase 1 Plan	Pedestrian Boulevard SWPPP Phase 1 and notes
L005	SWPPP Phase 2 Plan	Pedestrian Boulevard SWPPP Phase 2 and notes
L006	SWPPP Details	Pedestrian Boulevard Site Utilities Plan and notes
L007	Amphitheater Plan	Amphitheater Plan and notes
L008	Amphitheater Demolition Elev	Amp. Demo Plan, Elev and notes
L009	Amphitheater Elevations, Det	Amp. New Plan, Elev and notes
L100	Overall New Boulevard Site Plan	Overall New Boulevard Site Plan
L101	Partial Enlarged Site Plan	New Boulevard Partial Site Plan
L102	Partial Enlarged Site Plan	New Boulevard Partial Site Plan
L103	Partial Enlarged Site Plan	New Boulevard Partial Site Plan
L104	Concrete Paving Plan	New Boulevard Paving Plan
L200	Elevations	New retaining wall elevations
L201	Elevations	New retaining wall elevations
L202	Sections and Details	New retaining wall sections
L203	Sections and Details	New retaining wall sections
L300	Site Details	New boulevard site details
L301	Site Details	New boulevard site details
L401	Enlarged Layout Plan	New boulevard Layout plan
L402	Enlarged Layout Plan	New boulevard Layout plan
L403	Enlarged Layout Plan	New boulevard Layout plan

Name	Summary of Changes	
L500	Overall Planting Plan	New boulevard planting plan
L501	Planting Details	New boulevard planting details
L502	Planting Details	New boulevard planting details
L600	Overall Irrigation Plan	New boulevard irrigation plan
AD132	Upper Level Plan Area 'B' Demo Plan	Ballroom demo plan notes
A132	Upper Level Floor Plan Area 'B'	Ballroom floor plan notes
A232	Upper Level Ref Ceil Plan Area 'B'	Ballroom Ref Ceil Plan and notes
A402	Ballroom Building Sections	Ballroom Building Sections and notes
A525	Ballroom Wall Sections	Ballroom Wall Sections and notes
A701	Door Schedule	Revised with ballroom doors added
A900	Interior Finishes	Revised with ballroom finishes
A932	Upper Level Finish Plan Area 'B'	Revised with ballroom finishes
M132	Upper Level HVAC Plan Area 'B'	Revised with ballroom HVAC
E005	Partial Power Riser Diagram	Revised for ballroom work
E009	Lighting Fixture Schedule	Revised for ballroom work
E012	Electrical Panelboard Schedules	Revised for ballroom work
E013	Electrical Panelboard Schedules	Revised for ballroom work
E014	Electrical Panelboard Schedules	Revised for ballroom work
E018	Electrical Panelboard Schedules	Revised for ballroom work
E020	Electrical Panelboard Schedules	Revised for ballroom work
E132	Upper Level Lighting Plan – Area 'B'	Revised for ballroom work
E232	Upper Level Power Plan – Area 'B'	Revised for ballroom work
FA432	Upper Level Fire Alarm Plan – Area 'B'	Revised for ballroom work
T009	Data Cable Schedules	Revised for ballroom work
T132	Upper Level Communications Plan – Area 'B'	Revised for ballroom work
SE104	Amphitheater Lighting Plan	Amphitheater area lighting
SE105	Amphitheater Power Plan	Amphitheater area power
SE106	Pedestrian Walk Lighting and Communications Plan	Boulevard Walk lighting and communication and notes
SE107	Pedestrian Walk Power Plan	Boulevard Walk power plan and notes

**Addendum Number 15
Specification Addition Summary**

ETSU D.P. Culp Center
Release Package 5
Johnson City, Tennessee
March 20, 2020
SBC# 166/005-01-2014CM

<u>Section Name</u>	<u>Added as Part of Bid Package 5</u>
04 21 00 Brick Masonry	Added
05 73 10 Decorative Steel Railings	Added
12 93 00 Site Furnishings	Added
32 14 13 Clay Brick Pavers	Added
32 14 43 Permeable Concrete Unit Pavers	Added
32 84 00 Performance Irrigation Specification	Added

NOTE:

See attached table of contents for existing specifications to be referenced as needed.

REQUEST FOR GMP

For Project: D.P. Culp Addition and Renovations
 East Tennessee State University, D.P. Culp Center
 TBR SBC No. 166/005-01-2014 CM

A. A Guaranteed Maximum Price (GMP) is requested for the Work described in this Project Manual and the associated drawings and addenda. You are to obtain bids for trade subcontracts, and develop the ~~proposal~~ GMP in accordance with the CM/GC Master Contract.

B. The GMP shall be for:

a new Contract.

an amendment to an existing Contract.

C. The GMP shall offer alternates as specified. In addition, voluntary alternates:

may be proposed, up to _____ in number.

may not be proposed.

D. Contract Bond, in the amount of 100% of the Contract Sum, on the Owners standard form is required. If this proposal is for an amendment, a rider to the existing bond acknowledging the amendment and the revised Contract Sum is required. A Three-Year Roof Bond is:

required, for _____

X not required.

E. Substantial completion of this Work shall be achieved in the number of calendar days Contract Time allotted each Phase below, from and including the Commencement of each, and accepting the conditions for Liquidated Damages, per day, in the amount set forth for each, wholly and severally for each Phase:

Phase	Commencement	Contract Time	Liquidated Damages
5	<i>Release Package 5: Ballroom Upgrades, Boulevard Renovation</i>	180 days	\$500

END OF SECTION

INSTRUCTIONS TO CM/GC FOR PRODUCING THE GMP

- A.** Subcontractors that have been disqualified from participating in State Building Commission projects may not be recommended for any part of this Work, and shall not be allowed to perform any part of this Work. The CM/GC and its subcontractors shall not knowingly utilize the services of an illegal immigrant in the performance of this Work, and shall not knowingly utilize the services of any subcontractor, sub-subcontractor, or consultant who utilizes the services of an illegal immigrant in the performance of this Work.
- B.** The CM/GC shall present the GMP with an acknowledgement of all addenda.
- C.** If the GMP includes work of a subcontract trade regulated by state licensing laws, the CM/GC shall identify the subcontractor's license information called for by licensing law.
- D.** The CM/GC shall provide the following information explaining the derivation of costs:
1. Standard forms provided for documenting the GMP are recommended for the convenience of the Owner, to provide the CM/GC with a basic format most easily evaluated and accepted by the Owner. These forms are reproduced in this project manual, and are available as Excel spreadsheets in the Designers' Manual posted on the Owner's website. Standard forms include:
Section 00 42 23 GMP Summary
Section 00 42 71 GMP List of Trade Subcontracts
Section 00 42 75 GMP Disclosure of General Conditions
Section 01 26 55 Form for Price of Work
 2. Provide a Cumulative Summary when adding scope or phases to an existing GMP Contract, and show the history of the current GMP, and the effect of the amending the new GMP to the existing GMP. No standard form is provided, but a format similar to the GMP Summary is preferred.
 3. GMP Summary shall show the cost elements of trade subcontracts, general conditions, self-performance, CM/GC contingency, fee, and a total of these, with percentages for self-performance, contingency, and fee. If alternates are required and/or volunteered, these shall be shown distinct from the cost of the base work, and the cost elements named above provided for each. The standard form accommodates this information as if there are three required and three volunteered alternates; however, it is not intended to infer a required number of alternates for a particular project. The Owner normally expects quality pre-construction services to produce no alternates.
 4. GMP List of Trade Subcontracts shall show hard bids distinct from allowances and estimates. If there are alternates, these shall be shown distinct from the cost of the base work, similar to the GMP Summary. The standard form accommodates this information. List only those allowances that are specified. If an allowance is part of a trade subcontract, show the allowance portion as an allowance, and show the remainder of the trade in the Estimates or Hard Bids, as applicable. Trades may only be so designated to the extent that they are being procured through bidding, either before or after the GMP agreement or amendment, in accordance with the Master Contract. Portions of the Work that the CM/GC will procure through direct purchase without bidding cannot be Trades, and must be a part of Self-Performance. An exception to the requirement of bidding a trade can be in accordance with specification section 01 29 16 paragraph 1.03.F.
 5. Bid Tabulation of Trade Subcontracts shall show the various trade bids in a manner that facilitates easy comparison and determination of the low bidder, with notations explaining post-bid adjustments and rejections. Copies of the bids shall also be provided, to allow the Designer and Owner the opportunity to correlate the Bid Tabulation to the bids. No standard format is provided.

6. The Self-Performance portion of the GMP shall be itemized using the Form for Price of Work, showing the costs, overhead, and profit in a manner similar to that required for change order price itemization. The standard form accommodates this information.
 7. GMP Disclosure of General Conditions shall list the line items included in the original proposal by which the CM/GC was selected, and the comparable costs included in the specific GMP being presented, identifying and explaining deviations. The standard form accommodates this information based on commonly used line items, but is not necessarily all-inclusive of line items applicable in this instance.
- E. The proposal is to be submitted to the Owner and copied simultaneously to the Designer.
- F. Once submitted, the proposal must be firm for thirty (30) days for the Owner to evaluate and complete the award or amendment, including five (5) days allowed for the proposer to sign and return award or amendment documents, once provided by the Owner, plus all required bonds and insurance documents.

END OF SECTION

GMP SUMMARY

Project: give SBC project number and name

Presented by CM/GC: fill in name of CM/GC

date	Base Work	Specified Alternates			Volunteered Alternates			Total if all accepted
		#1	#2	#3	#4	#5	#6	
fixed fee percentage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
contingency percentage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Allowances	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Estimates	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hard Bids	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade Subcontracts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Self Performance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
General Conditions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CM/GC Contingency	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed Fee	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMP Totals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

self-performance (% of GMP):

ctgcy (% of trades,GCs,Self):

fee (% of GMP):

GMP LIST OF TRADE SUBCONTRACTS

Project: give SBC project number and name

Presented by CM/GC: fill in name of CM/GC

date	Base Work	Specified Alternates			Volunteered Alternates			Total if all accepted
		#1	#2	#3	#4	#5	#6	
what allowance, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what allowance, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what allowance, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade allowances subtotals:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what estimate, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what estimate, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what estimate, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade estimates subtotals:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
what hard bid, by whom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade bid subtotals:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trades totals:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GMP DISCLOSURE OF GENERAL CONDITIONS

SBC Project Number
TBR Institution
Project Name

Owner:
Tennessee Board of Regents
 CM/GC:

CM/GC Name

General Conditions Costs

date	Original Proposal	This GMP	Deviation	
	monthly	monthly	monthly	Reason
Photographs			-	
Superintendent			-	
Clerk			-	
Asst Superintendent			-	
Project Manager			-	
Project Director			-	
Project Engineer / Safety			-	
Layout Instruments			-	
Temporary Office Trailer			-	
Temporary Storage Trailer			-	
Portable Toilets			-	
Temporary Utilities			-	
Employee Parking			-	
Phones & Beeper			-	
Safety Measures			-	
Trash Collection & Disposal			-	
Pick-up Truck			-	
Auto			-	
Fuel			-	
Office Furniture & Equipment			-	
Misc Supplies & Expenses			-	
monthly subtotal	-	-	-	
months Contract Time			-	
monthlies x months	-	-	-	
	lump sum	lump sum	lump sum	
Permits			-	
GL, auto, empl Insurance			-	
Builder's Risk Insurance			-	
Other Insurance (explain)			-	
Bond			-	
Gross Receipts Tax			-	
Signs			-	
Other Temporary stuff			-	
Misc Printing			-	
lump sums subtotal	-	-	-	
Total	-	-	-	

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Red indicates new specification sections.

Green indicates existing specifications to be reused as needed

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Obtain Bid Forms and requirements from TBR

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00 21 19	<i>Instructions to GMP Proposer</i>	<i>[TBR]</i>	2
00 42 23	<i>Proposal Summary</i>	<i>[TBR]</i>	1
00 42 71	<i>Proposal of Trade Subcontracts</i>	<i>[TBR]</i>	1
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03 20 00	Concrete Reinforcing	[RBA]	2
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07 92 00	Sealants		7
07 95 13	Expansion Joint Cover Assemblies		3

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08 31 13	Access Doors	2
08 41 13	Aluminum-Framed Entrances and Storefronts	8
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09 51 13	Acoustical Panel Ceilings	5
09 65 00	Resilient Flooring	7
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23 05 93	Testing, Adjusting & Balancing for HVAC	15
23 07 13	Duct Insulation	4
23 31 13	Sheet Metal Ductwork – Low Pressure	7
23 37 13	Sheet Metal Specialties	6
23 41 00	Air Filters	2
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26 05 29	Supporting Devices	4

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26 05 53	Electrical Identification		3
26 05 73	Overcurrent Protective Devices		4
26 08 00	Commissioning of Electrical Systems		4
26 08 06	Panelboard Check Sheet	[TBR]	1
26 08 13	Power Circuit Check Sheet	[TBR]	1
26 08 30	Generator Testing Procedures Form	[TBR]	10
26 08 32	Generator Testing Findings Form	[TBR]	1
26 08 50	Lighting Check Sheet	[TBR]	1
26 24 16	Panelboards		5
26 27 01	Electrical Service Entrance		1
26 27 26	Wiring Devices & Plates		3
26 28 13	Disconnect Switches		2
26 43 13	Transient Voltage Surge Suppressors		3
26 51 00	Interior Lighting		4
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32 14 00	Permeable Clay Brick Pavers	[R / F]	7
32 16 00	Concrete Curbs and Walks		
32 14 13	Clay Brick Pavers		6
32 14 43	Permeable Concrete Unit Paving		3
32 84 23	Performance Irrigation		13
32 91 19	Topsoiling and Finish Grading		3
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BRICK MASONRY

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Work Specified Elsewhere:
 - 1. Mortar: Section 04 10 00
 - 2. Concrete Unit Masonry: Section 04 22 00
 - 3. Architectural Precast Concrete: Section 03 45 11
 - 3. Sealants: Section 07 92 00.

- B. Work Installed by Contractor
 - 1. Pre-cast concrete.
 - 2. Bolts and anchors.

1.02 QUALITY ASSURANCE

- A. Allowable Tolerances: Comply with requirements of Section 04 22 00.

1.03 SUBMITTALS

- A. Samples:
 - 1. Submit five individual samples of face brick.
 - 2. Show extreme variations in color and texture.

1.04 JOB MOCKUP

- A. Mockups: Before masonry work is begun; build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Build mockups for each type of stone veneer assembly in sizes approximately 48 inches long by 48 inches high by full thickness, including face brick and backup.
 - a. Include limestone stone into mockup.
 - b. Include a sealant-filled joint at least 16 inches long in mockup.
 - c. Include through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view.
 - d. Include anchors, flashing, and weep holes.
 - 2. Protect accepted mockups from the elements with weather-resistant membrane. In place mockups shall be identified for future reference through out the life of the project.
 - 3. Approval of mockups is for color, texture, and blending of stone; relationship of mortar and sealant colors to stone colors; tooling of joints; and aesthetic qualities of workmanship.

- a. Approval of mockups is also for other material and construction qualities Architect specifically approves in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Store brick off the ground to prevent contamination by mud, dust, or materials likely to cause staining or other defects.
- B. Cover materials as necessary to protect from elements.

1.06 JOB CONDITION

- A. Environmental Requirements: Comply with requirements of Section 04 22 00.
- B. Protection:
 1. Cover top of walls with non-staining waterproof coverings at end of each day or shut-down.
 2. Cover partially completed walls with nonstaining waterproof membrane when work is not in progress.
 3. Provide minimum 2'-0" overhang of protective covering on each side of wall, securely anchored.
 4. Do not apply uniform floor or roof loading for at least 12 hours after completing masonry columns or walls.
 5. Do not apply concentrated loads for at least three days after completing masonry columns or walls.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Face Brick:
 1. Brick shall match campus standard face brick, provide samples for verification.
 2. As approved by Landscape Architect.
- B. Mortar shall contain river sand. Do not use manufactured sand. Mortar shall match campus standard, provide samples for verification.
- C. Cleaning Agent: Recommended by manufacturer of face brick.
- D. Provide cotton sash weeps at locations shown on drawings and in no case less than 32" O.C.

2.02 HORIZONTAL REINFORCING

- A. At site walls, provide horizontal reinforcing which may include:
 - 1. Masonry veneer ties of corrugated metal, not less than 7/8" wide x 7" long, size to extend within 3/4" of masonry veneer face.
 - 2. Ladder type reinforcing.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Condition of Surfaces: Inspect foundations to assure surfaces to support brick work are as follows:
 - 1. To proper grades and elevations.
 - 2. Free of all dirt and other deleterious material.
 - 3. All surfaces not properly prepared have been satisfactorily corrected.
- B. Verify initial absorption rate of brick is within acceptable limits.

3.02 PREPARATION

- A. Reduce initial absorption of brick exceeding 0.025 oz. per sq. in. per minute, per ASTM C67, by thoroughly wetting bricks with clean water 24 hours prior to placement.

3.03 INSTALLATION

- A. General:
 - 1. Do not install cracked, broken, or chipped masonry units exceeding ASTM allowances.
 - 2. Use masonry saws to cut and fit exposed units.
 - 3. Lay brick plumb, true to line, and with level courses accurately spaced within allowable tolerances.
 - 4. Do not furrow bed joints.
 - 5. Stop off horizontal run by racking back in each course; toothing is not permitted.
 - 6. Adjust units to final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar, and relay with fresh mortar.
 - 7. When joining fresh masonry to set or partially set masonry:
 - a. Remove loose brick and mortar.
 - b. Clean and lightly wet exposed surface of set masonry prior to laying fresh masonry.
 - 8. Install masonry veneer ties into concrete masonry so as to fully embed in mortar of veneer and maintain a minimum cover of 5/8" from face of wall.
 - 9. Joints shall be concave tooled joints.
- B. Pattern: Installation of brick shall be as follows:
 - 1. The brick pattern shall be running bond.

3.04 POINTING AND CLEANING

- A. Cut out any defective joints and holes in exposed masonry and repoint with mortar.
- B. Dry brush masonry surface after mortar has set at end of each day's work and after final pointing.
- C. Clean exposed masonry with stiff brush and clear water.
- D. Apply cleaning agent to sample wall area of 20 sq. ft. in location acceptable to the Architect, if cleaning by water does not produce satisfactory results.
 - 1. Do not proceed with cleaning until sample area is acceptable to Architect.
 - 2. Follow manufacturer's recommendations.
 - 3. Thoroughly wet surface of masonry on which no green efflorescence appears before cleaning agent.
 - 4. Scrub with acceptable cleaning agent.
 - 5. Immediately rinse with clear water.
 - 6. Work small sections at a time.
 - 7. Work from top to bottom.
 - 8. Protect sash, metal lintels, and other materials which may corrode when masonry is cleaned with acid solution.
 - 9. Remove green efflorescence in accordance with brick manufacturer's recommendations.
- E. Leave work area and surrounding surfaces clean and free of mortar spots, droppings and broken masonry.

END OF SECTION 04 21 00

SECTION 05 73 10

DECORATIVE STEEL RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Steel and iron ornamental railings.
- B. See Division 05 Section "Pipe and Tube Railings" for railings fabricated from pipe and tube components.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - A.Handrails:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - B. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - C. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b.Infill load and other loads need not be assumed to act concurrently.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.03 SUBMITTALS

- A. Product Data: For railings assembled from standard components, grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

.C. Samples: For each exposed finish required.

1.04 QUALITY ASSURANCE

- A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel and Iron Ornamental Railings:
 - a. Architectural Iron Designs, Inc.
 - b. Artezzi.
 - c. Blum, Julius & Co., Inc.
 - d. Braun, J. G., Company; a division of the Wagner Companies.
 - e. Indital USA.
 - f. Lawler Foundry Corporation.
 - g. Livers Bronze Co.
 - h. Olin Wrought Iron.
 - i. Regency Railings.
 - j. TT Triebenbacher - Bavarian Iron Works Co.
 - k. Wagner, R & B, Inc.; a division of the Wagner Companies.
 - l. Equivalent as approved by Architect

2.02 METALS

- A. Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.
- B. Steel and Iron:
 - 1. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
 - 2. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
 - 3. Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 4. Castings: Either gray or malleable iron, unless otherwise indicated.
 - a. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
 - b. Malleable Iron: ASTM A 47/A 47M.

1. Expanded Metal: ASTM F 1267, Type I (expanded) II (expanded and flattened), Class 1 (uncoated).
2. Woven-Wire Mesh: Intermediate-crimp, 2-inch (50-mm) woven-wire mesh, made from 0.135-inch (3.5-mm) nominal diameter wire complying with ASTM A 510 (ASTM A 510M).

2.03 MISCELLANEOUS MATERIALS

- A. Fasteners: Provide concealed fasteners, unless otherwise indicated exposed fasteners are unavoidable exposed fasteners are standard for railings indicated.
 1. Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 2. Dissimilar Metals: Type 316 stainless-steel fasteners.
- B. Anchors: Provide cast-in-place or torque-controlled expansion anchors, 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 times the load imposed when installed in concrete, as determined by testing per ASTM E 488.
- C. Shop Primers: Provide primers that comply with industry standards
- D. Grout and Anchoring Cement: Factory-packaged, non-shrink, nonmetallic grout complying with ASTM C 1107, or water-resistant, non-shrink, anchoring cement; recommended by manufacturer for exterior use.

2.1 FABRICATION

- A. General: Fabricate railings to comply with design, dimensions, and details indicated, but not less than that required to support structural loads.
- B. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
- C. Form changes in direction by bending or by inserting prefabricated elbow fittings.
- D. Form curves by bending in jigs to produce uniform curvature; maintain cross section of member throughout bend without cracking or otherwise deforming exposed surfaces.
- E. Close exposed ends of hollow railing members with prefabricated end fittings.

2.2 FINISHES

- A. Steel and Iron:
 1. Shop-Primed Steel Finish: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" SPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning".
 2. Apply shop primer to uncoated surfaces of metal fabrications to comply with SSPC-PA 1.
 3. Finishing

- A. Hot-Dip Galvanized Base Coat
 - 1. Galvanize steel members and components to ensure product encapsulation to ASTM 123
- B. Commercial Brush Blast
 - 1. Brush Blast all steel members and components to ensure inter-coat adhesion to SSPC-SP7
- C. Electro-Static Powder Top Coat
 - 1. Apply Thermo-Set Polyester Powder at 3-5 mils (DFT) at 400 Degree Fahrenheit for 20-25 minutes to ASTM B117 and ASTM D822
- D. Color: Black.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. General: Perform cutting, drilling, and fitting required for installing of railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

3.02 INSTALLATION

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 1. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. 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.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.

3.04 ANCHORING POSTS

- A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material attached to post with set screws.
- C. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.
- D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.05 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

3.06 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.07 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 73 10

SECTION 12 93 00
SITE FURNISHINGS

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes the following:
 - 1. Fixed Bollard
 - 2. Removable Bollard
- B. Products furnished but not installed under this Section include pipe sleeves, anchor bolts to be cast in concrete footings and installed in concrete paving.

1.02 DESCRIPTION

- A. Provide site furnishings and equipment as shown on the Drawings and specified herein.
- B. Related requirements specified elsewhere:
 - 1. General Requirements: Division 1 Sections.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Obtain site furnishings through one source from a single manufacturer.
- B. Acceptable Manufacturers:
 - 1. Columbia Cascade
 - 2. Permaloc Corporation
 - 3. Vicars Recreation, Inc.
 - 4. Forms+Surfaces
 - 5. Col-Met
 - 6. Dura Art Stone
 - 7. Victor Stanley
 - 8. Canterbury International
 - 9. Modern Pre-cast
 - 10. Urban Accessories
 - 11. Equivalent product as approved by the Landscape Architect.

1.04 SUBMITTALS

- A. Submit the following in accordance with Division 1 requirements:
 - 1. Manufacturer's Literature: Catalog cuts, materials and installation instructions for each item.
 - 2. Samples for Verification: If requested by the Landscape Architect provide full size representative samples of each item for verification.
 - 3. Maintenance Data: For site furnishing to include in maintenance manuals.

PART 2 PRODUCTS

2.01 SITE FURNISHINGS

- A. Fixed Bollard:
 - 1. Fixed Bollard: Model 2190 by Columbia Cascade Company, 1300 SW Sixth Avenue, Suite 310, Portland OR 97201-3464
 - a. Material: SCH 40 Steel
 - b. Color: Black powder coated finish
- B. Removable Bollard:
 - 1. Removable Bollard: Model 2190 RH by Columbia Cascade Company, 1300 SW Sixth Avenue, Suite 310, Portland OR 97201-3464
 - a. Material: SCH 40 steel
 - b. Provide each removable bollard with locking removable embedded mounting system with hinged hole cover.
 - c. Color: Black powder coated finish

PART 3 EXECUTION

3.01 INSTALLATION

- A. Examine areas and conditions, to receive site equipment, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- C. Install site furnishings in conjunction and coordinated with paving.
- D. Landscape Architect will approve staked locations of all site furnishings prior to installation.
- E. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- F. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- G. Removable Bollard: Embed sleeve with No. 4 rebar anchors encased in concrete in accordance with manufacturer's recommendations. Provide one padlock for each removable bollard keyed as directed by the Owner's Representative.

3.02

CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 12 93 00

SECTION 32 14 00
CLAY BRICK PAVERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Clay brick pavers
2. Polymeric sand jointing material
3. Natural sand bedding material
4. Geotextile fabric

1.02 REFERENCES

A. American Society for Testing and Materials

1. ASTM C67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
2. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
3. ASTM C1272 Standard Specification for Traffic Loaded Paving Brick
4. ASTM C33 Standard Specification for Fine Aggregate

1.03 SUBMITTALS

A. In accordance with General Conditions of the Contract and Division 1 Submittal Procedures Section

B. Clay Brick Pavers

1. Subject to requirements provide clay brick pavers manufactured by Whitacre Greer 1400 S. Mahoning Ave., Alliance, OH; Phone: 330-823-6548, basis of design.
2. Submit manufacturer's product literature and material safety data sheets.
3. Submit sample units of each paver type representative of size, shape, color and finish, indicating color variation expected in finished installation. Color or blend of colors will be selected by Landscape Architect from manufacturer's standard color palette.
 - a. Colors within a given shipment of clay pavers will vary slightly due to clay composition and kiln firing temperatures. Such color variations are a natural desirable feature that gives the pavement greater character and depth.
4. Submit test results from approved independent testing laboratory indicating ASTM C1272 Type R Application PS compliance.
5. Submit manufacturer's certification of compliance to appropriate ASTM standard.

- C. Bedding material, natural sand.
 - 1. Submit sieve analysis results in accordance with ASTM C136 for sand bedding material.
 - 2. Provide supplier name, source and types of material used for sand bedding.
 - 3. Provide sample of natural sand proposed for use as bedding material.
- D. Jointing material, polymeric sand.
 - 1. Submit sieve analysis results in accordance with [ASTM C136] for sand bedding material.
 - 2. Provide supplier name, source and types of material used for sand bedding.
- E. Geotextile Fabric
 - 1. Submit manufacturer's product literature and material safety data sheets.
- F. Paving Installer
 - 1. Job references from projects similar in size and design to this project. Provide Owner names, postal address, phone, fax and email address.

1.04 QUALITY ASSURANCE

- A. Paving Installer Qualifications
 - 1. Three years experience with at least 10,000 feet of clay brick pavers installed.
 - 2. Successful completion of three clay paver installations similar in design, material and extent indicated on this project. Installer shall have experience setting clay/brick pavers.
- B. Regulatory Requirements
 - 1. Installer shall be able to provide bonds required for the work if required by the Owner.
- C. Mock-Ups
 - 1. Install a 5 ft by 5 ft area of pavers on a prepared substrate including detail to illustrate component application including pattern, installation of joint material and edge details.
 - 2. Provide a separate mock-up for each paver type and bonding pattern.
 - 3. Use mock-up to determine pre-compaction setting bed level, joint sizes, lines, laying patterns and product color.
 - 4. Do not start work until mock-up has been approved by Landscape Architect.
 - 5. Approved mock-up is the standard by which appearance, workmanship, substrate preparation and material application will be judged.
 - 6. Approved field sample may be retained as part of finished work. Remove mock-up and dispose of materials when directed by Landscape Architect.

D. Pre-Installation Meetings

1. Conduct pre-installation meeting a minimum of two weeks prior to commencing work of this section to verify project requirements, substrate condition and coordination with other trades, installation instructions and warranty requirements.

1.05 DELIVERY, STORAGE AND HANDLING

A. Procurement

1. Allow adequate time for the production and delivery of specified paver. Consult local distributor for lead-time and delivery options.

B. Delivery

1. Deliver materials in manufacturer's original, unopened, undamaged packaging with identification labels intact. Unload pavers with proper equipment so no damage occurs to pavers.

C. Storage

1. Store materials so they are protected from contamination by foreign substances and excessive moisture.
2. Store pavers to prevent damage and staining.

1.06 PROJECT CONDITIONS

A. Environmental Requirements

1. Do not install in rain or snow.
2. Do not install frozen bedding material.

1.07 MAINTENANCE

A. Extra Materials

1. Furnish ten square feet of additional pavers to owner for future maintenance and repair.
2. Pavers shall be from the same production run as the installed materials.

PART 2 PRODUCTS

2.01 CLAY BRICK PAVERS

A. Clay Paver Type

1. 4x8x2-3/4 Straight Edge
 - a. Manufactured by Whitacre Greer, 1400 S. Mahoning Ave., Alliance, OH 44601 Telephone: (800) WG PAVER

- b. Band: To be selected
- c. Field: To be selected
- 2. Material standard in accordance with ASTM C1272.
- 3. Classification:
 - a. Class: SX
 - b. Type: R
 - c. Application: PS

2.02 AGGREGATE MATERIALS

A. Bedding Course:

- 1. Natural sand conforming to ASTM C33.

2.03 JOINT MATERIAL

A. Polymeric Sand:

- 1. Polymeric sand: Techniseal HP Nextgel- High Performance Polymeric Sand for heavy duty applications, basis of design.

2.04 ACCESSORIES

A. Edge Restraints

- 1. Aluminum angle edge restraint as shown on the drawings.
- 2. Install restraint edge as shown on the drawings.

B. Geotextiles

- 1. Geotextile.
 - a. Mirafi 140N Non-woven, polypropylene
- 2. Physical properties:

a. Grab Tensile Strength	ASTM D4632	120 lbs.
b. Grab Tensile Elongation	ASTM D4632	50%
c. Trapezoid Tear Strength	ASTM D4533	50 lbs.
d. CBR Puncture Strength	ASTM D6241	310 lbs.
- 3. Manufacturer: Tencate Geosynthetics

PART 3 EXECUTION

3.01 ACCEPTABLE INSTALLER

- A. Acceptable paving installer shall have the qualifications listed in these specifications.

3.02 EXAMINATION

A. Verify Site Conditions

1. Examine surfaces indicated to receive clay pavers, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
2. Proceed with bedding course and paver installation only after unsatisfactory conditions have been corrected. .
3. Verify that the area is free from standing water and certified by general contractor as meeting material, installation and grade specifications.

3.03 PREPARATION

A. Edge Restraint Preparation

1. Install as per drawings at indicated elevations.

B. Bedding material

1. Stockpile sand bedding material such that it is free from standing water, uniformly graded, free of organic mater or sediment, debris, and ready for placement.

3.04 INSTALLATION

A. General

1. Keep area where pavement is to be constructed free from sediment during entire job. Contaminated bedding material shall be removed and replaced with clean material.
2. Do not damage existing conditions, adjacent pavements and the work of other trades during installation.

B. Geotextiles

1. Install where shown on the drawings.
2. Place on bottom and sides of soil sub grade. Secure in place to prevent wrinkling from vehicle tires and tracks.
3. Overlap a minimum of 24 inches in the direction of drainage.

C.. Bedding Sand

1. Spread and screed moistened sand bedding material.
2. Fill voids left by removing screed rails with bedding sand.
3. Surface tolerance of sand bedding course shall be +/-1/8 inch over a 10-foot straightedge.
4. Do not compact bedding course.
5. Keep pedestrian and vehicular traffic off screeded bedding course until paver installation begins.

D. Clay Pavers

1. Install paving units in pattern(s) indicated on drawings. Maintain straight pattern lines using string and/or chalk lines.
 - a. Maximum bond line variation shall be $\pm 3/8$ inch over a 50-foot string line.
2. Fill gaps at the edges of the paved area with cut units. Cut pavers subject to vehicular traffic shall be no smaller than $1/3$ of a whole unit.

E. Joint Material

1. Fill openings and joints between paver units with polymeric sand.
2. Sweep excess joint material from paved area.
3. Compact pavers into bedding course using low-amplitude plate compactor capable of at least 5,000 lbs centrifugal compaction force. Make at least two passes with the plate compactor.
 - a. Protect paver surface with mat attached to tamper or other approved method.
4. Do not compact within 6 feet of an unrestrained edge.
5. Apply additional polymeric sand to joints as required to fill them completely.
6. Pavers within 6 feet of the laying face shall be left fully compacted at the completion of each day.
7. Surface tolerance of finished pavement shall be not more than $\pm 1/8$ inch over a 10-foot straight edge.

3.05 FIELD QUALITY CONTROL

- A. Sweep surface clean and verify conformance with drawings.
- B. Verify that adjacent pavers have not more than $1/8$ inch difference in height.
- C. Verify that final elevation of pavers have not more than $1/8$ inch difference in height to adjacent pavement.
- D. Verify straightness of bond lines.

3.06 PROTECTION

- A. After work in this section is complete, General Contractor shall protect work from damage due to subsequent construction activity on site.

END OF SECTION

SECTION 32 14 43

PERMEABLE CONCRETE UNIT PAVING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Solid concrete pavers with openings between pavers filled with aggregate.
 - 2. Aggregate setting bed for pavers.
 - 3. Edge restraints.

1.02 ACTION SUBMITTALS

- A. Product Data: For materials other than aggregates.
- B. Sieve Analyses: For aggregate materials, according to ASTM C 136.
- C. Samples:
 - 1. Full-size units of each type of unit paver indicated
 - 2. Exposed edge restraints.
 - 3. Aggregate fill.
 - 4. Aggregate setting bed materials.

1.02 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.01 CONCRETE UNIT PAVERS

- A. Solid Concrete Pavers for Porous Paving: Solid interlocking paving units of shapes that provide openings between units, complying with ASTM C 936/C 936M, resistant to freezing and thawing when tested according to ASTM C 67, and made from normal-weight aggregates.
 - 1. Belgard Aqua Brick paver.
 - 2. Thickness: 3-1/8" (80mm)
 - 3. Face Size and Shape: 5"x9"
 - 4. Color: TBD for the paver field; and TBD for the darker contrasting banding. Colors will be selected by Owner from the manufacturer's full range of colors.

2.02 ACCESSORIES

- A. Steel Edge Restraints: Painted steel edging, 3/16 inch thick by 4 inches, with loops pressed from or welded to face to receive stakes at 36 inches o.c., and with steel stakes 15 inches long for each loop.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Collier Metal Specialties, Inc.
 - b. Sure-loc Edging Corporation.
2. Color: Black.

2.03 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Base Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 57, ASTM D 2940, base-course material requirements in Section 310000 "Earthwork" for base-course material.
- B. Graded Aggregate for Leveling Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 9.
- C. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured according to test methods referenced:
 1. Survivability: Class 2; AASHTO M 288.
 2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
 3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
 4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.04 FILL MATERIALS

- A. Aggregate Fill for Porous Paving: Graded, sound, crushed stone or gravel complying with ASTM D 448 for Size No. 9.
 1. Color: Match Architect's sample.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be structurally unsound or visible in finished work.
- B. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- C. Tolerances:
 1. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/16-inch unit-to-unit offset from flush.
 2. Variation from Level or Indicated Slope: Do not exceed 1/8 inch in 24 inches and 1/4 inch in 10 feet or a maximum of 1/2 inch.
- D. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.02 SETTING-BED INSTALLATION

- A. Retain first paragraph below if compaction is not specified in Section 312000 "Earth Moving." Coordinate with that Section to ensure that compaction for subgrade under concrete pavers is correctly specified. Paragraph below is an example only; revise to suit Project.
- B. Compact subgrade uniformly to at least 95 percent of ASTM D 698 laboratory density.
- C. Place drainage geotextile over prepared subgrade, overlapping ends and edges at least 12 inches.
- D. Place aggregate sub base and base, compact by tamping with plate vibrator, and screed to depth indicated.
- E. Place aggregate sub base and base, compact to 100 percent of ASTM D 1557 maximum laboratory density, and screed to depth indicated.
- F. Place drainage geotextile over compacted sub base, overlapping ends and edges at least 12 inches.
- G. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.
- H. Place leveling course, and screed to a thickness 2 inches, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

3.03 PAVER INSTALLATION

- A. Set unit pavers on leveling course, being careful not to disturb leveling base. If pavers have lugs or spacer bars to control spacing, place pavers hand tight against lugs or spacer bars. If pavers do not have lugs or spacer bars, place pavers with a 1/16-inch-minimum and 1/8-inch maximum joint width
- B. Compact pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz.
- C. Place graded aggregate fill immediately after vibrating pavers into leveling course. Spread and screed aggregate fill level with tops of pavers.
- D. As work progresses, remove and replace pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

END OF SECTION 32 14 43

SECTION 32 84 00

IRRIGATION SYSTEM

PART 1 GENERAL

1.01 GENERAL

- A. The underground sprinkler irrigation system shall be designed by the Contractor and be constructed using the sprinkler heads, valves, piping, fittings, controller, wiring, etc. of sizes and types consistent with a TWO-WIRE type irrigation system as shown on the approved Drawings and as called for in these Specifications. The system shall be constructed to grades and conform to areas and locations as shown on the approved Shop Drawings and be in compliance with applicable institution design standards.
- B. The term "Contractor" as used in this Specification section shall refer to the Underground Sprinkler System Contractor.
- C. Prior to final acceptance of the Irrigation System, the Contractor shall cooperate with the Landscape Contractor in providing the Owner's Representative with a written "watering schedule" to ensure adequate watering of all plant materials during the Guarantee Period of this Contract.
- D. Prior to beginning construction, the Contractor and Landscape Architect shall meet on site to document the working order of the existing irrigation system. The Contractor must provide three working days written notice to the Landscape Architect prior to the meeting on site.
- E. The Contractor shall coordinate existing underground sprinkler irrigation with new irrigation. Repair all damage to existing irrigation system caused by construction, and return existing irrigation system to a fully operational pre-construction condition at no additional cost to Owner. Portions of existing irrigation system shall be abandoned (capped) where required by new construction. Existing irrigation "As-Built" Drawings are available from Owner.
- F. The Contractor shall not be responsible for watering existing grass lawn areas outside limit of work during construction.

1.02 SCOPE OF WORK

- A. Furnish and install a complete underground sprinkler irrigation system to provide efficient and even irrigation (WITH MINIMUM OVERSPRAY ONTO SIGNS, PAVED OR NON-PLANTED AREAS AND NO OVERSPRAY ONTO BUILDINGS) of all planting areas shown on the Drawings and as specified in the Specifications, complete and ready for operation. The work included in this Specification (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the installation and operation of the irrigation system.
- B. Irrigation equipment shall be coordinated with above ground improvements and utility locations to avoid overspray onto or spray blockage from above grade utilities, such as electric transformers, light standards, etc.

- C. Any item of labor, material or equipment not specified or shown in detail, but incidental to or necessary for the complete installation and proper operation of the system, shall be furnished by the Contractor without additional cost to the Owner.
- D. All sleeving required for the execution of the work is to be provided under this Section.

1.03 RELATED WORK DESCRIBED ELSEWHERE

- A. Related work in other sections of these Specifications includes but is not limited to:
 - 1. Landscaping
 - 2. Grading, Embankment, and Backfill
 - 3. Demolition

1.04 QUALIFICATIONS OF INSTALLER

- A. Contractor must be a licensed and bonded sprinkler irrigation contractor. The sprinkler irrigation system must be installed by an experienced sprinkler irrigation mechanic or journeyman plumber. All electrical service connection work must be done by a licensed Electrical Contractor.

1.05 VERIFICATION

- A. Before proceeding with any work, the Contractor shall inspect the site, carefully check all grades and verify all dimensions and conditions affecting the work in order to proceed safely.
- B. Contractor shall report to the Landscape Architect all deviation and/or conflicts between Drawings, Specifications and site conditions. Extra work arising from failure to do so shall be done at the Contractor's expense.
- C. Prior to the start of any work, the Contractor shall verify available static water pressure (PSI) and gallons per minute (GPM) at point of connection to water service. Any replacement, relocation or additional materials required as a failure to check (PSI) and (GPM) shall be done at the Contractor's expense.

1.06 CHANGE ORDERS AND SUBSTITUTIONS

- A. The Contractor shall do no work for extra compensation without prior written approval of the Owner's Representative in the form of a Change Order.
- B. The intent of the Drawings and Specifications is to provide a totally integrated irrigation system. Substitutions will be accepted only if they are proven to be wholly compatible with this system. If standardization of products is requested by the Owner's Representative, NO SUBSTITUTIONS will be permitted.

1.07 PERMITS, CODES AND REGULATIONS

- A. The Contractor shall apply for and pay for all necessary permits and fees as required by Local Authority and prevailing ordinances and/or codes.

- B. The Contractor shall keep fully informed and shall comply with all existing laws, codes, ordinances, and regulations which in any way affect the conduct of the work.

1.08 INTERPRETATION OF DRAWINGS

- A. Irrigation Shop Drawings are diagrammatic and are not intended to show exact location of piping, or valves. Locate these items as closely as possible or as per related details to curbs, header boards, fences or edges of paving. Locate mainline and valves inside property line.
- B. Pipe lines shown parallel on the approved Shop Drawings may be placed in a common trench. Sprinkler heads are shown accurately and shall be installed as indicated by center of symbol.
- C. Trenching that may potentially disturb root systems of existing trees is to be brought to the attention of the Landscape Architect before proceeding.

1.09 PROTECTION OF WORK, PROPERTY AND PERSONS

- A. Take all necessary precautions to protect work in progress, all property, persons, utilities, walks, curbs, pavement and buildings from any damage that might be incurred arising from this Contract. Repair to the satisfaction of the Owner's Representative, at Contractor's expense, any damage to the above and existing landscape.

1.10 CONDUCT OF WORK

- A. The Contractor shall continuously maintain a competent superintendent or foreman during progress of the work, with the authority to act in all matters pertaining to the work. The Contractor shall give personal attention to the fulfillment of the contract and shall keep the work under control.
- B. The Contractor shall confine operations to the working areas allotted by the Owner's Representative, including material and equipment storage.
- C. The Contractor shall progressively clean the work site of debris and rubbish as the work proceeds.
- D. The Contractor shall repair to the satisfaction of the Owner's Representative any damage to existing utilities. Existing known utilities have been shown on the Architectural/Engineering and Survey Drawings and will be made available from the Owner's Representative or Utility Companies. It will be the Contractor's responsibility to verify these locations on the ground with a pipe-finder or by other means. The Contractor shall be responsible for the protection of existing known utilities. Should the ditching intercept and damage any existing utilities, all further work within said area shall stop until the Owner's Representative is advised and the Owner's Representative can review a repair method and schedule.
- E. The Contractor shall be responsible for the provisions of barricades and safety guards, and any other structures or improvements necessary for the complete protection of the public.

- F. Any of the Owner's property, including existing buildings, equipment, piping, pipe covering, sewers, sidewalks, landscaping, etc., damaged by Contractor shall be replaced or repaired by Contractor in a manner satisfactory to the Owner's Representative at the Contractor's expense before Final Payment is made.
- G. Contractor is responsible for all damages to the grounds, walks, roads, buildings, piping systems, electrical systems and their equipment and contents caused by leaks in the piping systems being installed or having been installed by him. The Contractor shall repair all damages at his expense and in a manner satisfactory to the Owner's Representative at the Contractor's expense before Final Payment is made.

1.11 SYSTEM PROTECTION

- A. As a part of the guarantee under this contract, the Contractor shall be responsible for the deactivating and draining of the system prior to the onset of the freezing season and for reactivating the system at the onset of the spring growing season; each task must be accomplished once during the one (1) year guarantee. In the event the system is completed in a season when the system will not be in use, the Contractor will winterize the system upon completion of testing (and approval by the Landscape Architect) and reactivate the system in the spring. The Contractor shall, upon completion of the winterizing phase, submit a letter to the Owner's Representative and the Landscape Architect certifying that the system was winterized and drained and indicate the date that such action was accomplished. The Contractor shall be liable for any damage resulting from failure to comply. The Contractor shall notify both the Owner's Representative and the Landscape Architect twenty-four (24) hours prior to the work so that a Landscape Architect can be present during the winterizing and reactivating phases of work.

1.12 GUARANTEE

- A. The system shall be guaranteed for all workmanship and material for a period of one (1) year from the date of acceptance of the system. Repair and/or replace defective irrigation equipment as determined by the Owner's Representative for the duration of the guarantee period. Repairs and/or replacements shall be made in the same manner as specified for the original irrigation system and shall be done at no cost to the Owner.
- B. It is expressly understood the Owner will be responsible during the Guarantee Period for normal maintenance of the project, as defined in the Contractor's Operation and Maintenance Manual and Watering Schedule Submittals.

1.13 TESTS

- A. Where indicated on the approved Shop Drawings and/or as specified in the Specifications, tests are to be witnessed by the Owner's Representative. The Contractor shall give advance notice of at least twenty-four (24) Hours in writing to the Owner's Representative and the Landscape Architect before proceeding with tests.
 - 1. Pressure Test: All system joints, connections, couplings, valves and all other junction points shall be left exposed until completion and acceptance of the pressure test. All leaks, however minor, shall be repaired and corrected. The Owner's Representative shall be present during the test. The total sprinkler irrigation system shall be pressure tested for acceptance.

2. Performance Coverage Tests: Upon completion of the system installation and after the flushing and pressure tests are completed, the Contractor shall operate the system in the presence of the Owner's Representative and the Landscape Architect. The automatic system shall be cycled to the satisfaction of the Owner's Representative and the Landscape Architect. The Owner's Representative and/or the Landscape Architect may request that up to ten(10) percent of the total nozzles and ten (10) percent of the heads may also be relocated at no extra cost to the Owner.
- B. The Contractor shall PRE-TEST for Pressure and Performance Coverage prior to the review of said tests by the Owner's Representative and the Landscape Architect to confirm that the sprinkler irrigation system will meet the requirements of the specified tests. SHOULD ADDITIONAL TEST REVIEWS BE REQUIRED DUE TO THE FAILURE OF THE CONTRACTOR TO PERFORM SAID TESTS, THE CONTRACTOR SHALL PAY TO THE LANDSCAPE ARCHITECT THE SUM OF ONE HUNDRED FIFTY DOLLARS (\$150.00) PER HOUR AND ACTUAL COST OF EXPENSES FOR EACH ADDITIONAL TEST.

1.14 SUBMITTALS

- A. Contractor shall submit four (4) sets of irrigation Shop Drawings complete with associated details, notes and legends for review and secure Landscape Architect approval prior to proceeding with the work.
- B. Contractor shall submit four (4) sets of samples and/or manufacturer's "Catalog Cuts" of all material as noted in Specifications. Failure to do so may result in non-acceptance of materials already used or hauled to the site. Any removal or delays incurred will be at the expense of the Contractor. All samples submitted for approval must be unaltered and of quantity sufficient to allow for proper inspection and review.
- C. Contractor shall submit such items as: As-Built Drawings; Keys; Tools; Permits; Water Schedule; Instructions; Maintenance/Operation Manuals; etc.; as required per these Specifications.

1.15 AS BUILT DRAWINGS

- A. The Contractor shall maintain a current record of all pipe, head and other equipment placement and shall record any variations of the original Drawings approved by the Landscape Architect. Upon completion of the irrigation system and prior to release of the final payment, the Contractor shall provide the Landscape Architect with a neat and legible reproducible Mylar "As Built Drawing(s)" of the complete irrigation system. Any pipe not installed in accordance with the Drawings, as originally contracted, shall be dimensioned to a permanent structure sufficient for location after burial.

1.16 PIPE SLEEVES

- A. Provided and installed by the Contractor as shown on the Drawings and as specified in these Specifications. CONTRACTOR SHALL COORDINATE LOCATION AND INSTALLATION OF PIPE SLEEVING WITH GENERAL CONTRACTOR PRIOR TO PAVING OPERATIONS.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials and equipment shall be new and of the best quality. All items of equipment or material shall be as specified or approved equal.

2.02 PLASTIC PIPE

- A. PVC pipe upstream of the control valves shall be Schedule 40 and conform to all requirements of ASTM D2241.
- B. PVC pipe (zone lines) downstream of the control valves shall be Schedule 40 (pressure rated for 200 psi), and conform to all requirements of ASTM D1784 and D1785.
- C. PVC Pipe sleeving shall be Schedule 80 and conform to all requirements of ASTM D1784 and D1785 unless otherwise noted on the Drawings.
- D. All pipe shall be marked with manufacturer's name, class of pipe and NSF seal. Pipe shall bear no evidence of interior or exterior extrusion marks. Pipe walls shall be uniform, smooth and glossy. Pipe may be pre-belled or with individual solvent-weld couplings.
- E. All fittings for lateral lines shall conform to the requirements of ASTM D2466 SCHEDULE 40 PVC with exception to stream rotor head riser assembly nipples which shall be ASTM D2464 SCHEDULE 80 PVC. All lateral line fittings shall be of the solvent weld type except where risers, valves, etc. require threaded transition fittings.
- F. All threaded fittings for mainlines shall conform to requirements of ASTM D2464, SCHEDULE 80 PVC. All glued fittings for mainlines shall conform to the requirements of ASTM D2466, Schedule 40 PVC.
- G. All pipe must be delivered in at least twenty (20) foot lengths.
- H. All PVC pipe and fittings shall conform to the following minimums:
 - 1. Tensile strength 78F 5,000 psi
 - 2. Izod impact strength (notched) 15 ft. lb./in.
 - 3. Modulus of elasticity 300,000 psi
 - 4. Compressive strength 8,500 psi
 - 5. Flexural strength 10,000 psi

2.03 SPRINKLER HEADS

- A. Shall be of the type, manufacturer and size shown on the Drawings or approved equal.

2.04 AUTOMATIC VALVE/REMOTE CONTROL VALVES

- A. Shall be of the type, manufacturer and size shown on the Drawings or approved equal and come complete with decoder connection.

2.05 CONTROL WIRE FOR AUTOMATIC VALVE OPERATIONS

- A. Control wire must be insulated two wire copper cable designed for twenty (20) to fifty (50) volts and UL approved as Type U.F. (Underground Feeder).
- B. Copper conductor must meet or exceed ASTM B-3 requirements.
- C. Red and white colors shall be available for common and lead-in wires.
- D. Yellow color shall be provided for spare wires (if spare wire(s) are existing).

2.06 QUICK COUPLING VALVES

- A. Shall be of type, manufacturer and size shown on the Drawings. ONE (1) INCH VALVE AND SWING JOINT SHALL BE USED AT "AIR-BLOW" CONNECTION TO REDUCE AIR FRICTION.
- B. Provide two (2) matching valve keys, two (2) cap keys and two (2) hose swivels as shown on the Drawings or approved equal.

2.07 MANUAL GATE VALVES

- A. Shall be of the type, manufacturer and size shown on the Drawings or approved equal.

2.08 MANUAL DRAIN VALVE

- A. Shall be of the type, manufacturer and size shown on the Drawings or approved equal. AUTOMATIC DRAIN VALVES WILL NOT BE ACCEPTED.

2.09 VALVE BOXES

- A. All automatic valves, manual gate valves and quick coupler valves shall be enclosed in Carson Industries with locking lid or approved equal.
- B. Manual drain valves shall be enclosed in a two (2) inch PVC pipe and covered with a Weathermatic 906L locking cap and PVC pipe or approved equal.
- C. Provide two (2) lid keys and two (2) valve keys per Valve Box type to Owner's Representative.
- D. Size valve boxes as required to provide approximately three (3) inches clear between valve box and valve on all sides. Provide and install valve box extensions as required.

2.10 PRESSURE-REDUCING VALVE

- A. Shall be of the type, manufacturer and size shown on the Drawings.

2.11 BACKFILL MATERIALS

- A. Sump Gravel (for use under valve boxes only):
 1. Three-quarter (3/4) minus round, water worn, washed pea gravel.

- B. Sand (backfill soils around PVC pipe within ballfield areas):
 - 1. Fine granular material naturally produced by rock disintegration and free from organic material, loam, clay and other deleterious substances.
- C. Native Material (backfill soil around PVC pipe – non-ballfield areas):
 - 1. Soil native to project site free of wood and other deleterious materials and rocks over one (1) inch diameter.

2.12 OTHER SUPPLIES

- A. Electrical tape shall be black plastic, three-quarters (3/4) inch wide and a minimum of 0.007 inches thick and the all-weather type.
- B. All flexible nipples or pipe joints shall be "Toro Funny Pipe"; "Rainbird Swing Pipe"; "Triple Swing Joint Assembly" or approved equal.
- C. All electrical wire splices must be made watertight with sealing 3M Direct Burial Splice Kit or approved equal.
- D. Thrust blocking shall be on three (3) inch and larger mainline only.

PART 3 EXECUTION

3.01 TRENCHING

- A. Trenches shall allow for twelve (12) inches of cover over sprinkler lines, eighteen (18) inches of cover for irrigation main lines and twenty-four (24) inches of cover for main supply line from point of connection to backflow preventer unless otherwise noted on Drawings. Maintain a minimum clearance of three (3) inches between irrigation lines within a common trench. Trenches for sleeves shall allow for a minimum of eighteen (18) inches of cover unless otherwise noted on the Drawings. Excavate no wider at any point than is necessary to lay pipe or install equipment. Excavate with vertical sides and provide bracing and shoring as required.
- B. All trenches must be straight and not have abrupt changes in grade. Trenching that may potentially disturb root systems of existing trees shall be brought to the attention of the Landscape Architect before proceeding with work.
- C. The trench bottoms and bedding material surrounding all pipes must be free of rocks greater than one (1) inch in diameter and all sharp-edged objects. Bed and surround all pipe with approved specified "BACKFILL MATERIAL" (see Main and/or Lateral Pipe Trench Detail).
- D. Pulling of pipe is not permitted unless otherwise approved by the Owner's Representative and Landscape Architect.

3.02 INSTALLATION

- A. PVC Pipe and Fittings (includes pipe sleeves):

1. Due to the nature of PVC pipe and fittings, the Contractor shall exercise care in handling, loading, unloading and storing to avoid damage. Any pipe that has been dented or damaged shall be discarded until such damage has been cut out and the pipe is rejoined with a coupling.
2. PVC pipe ends shall be cut to ninety (90) degrees to the pipe length and cleaned of all cutting burrs prior to cementing. Use approved reaming tool. Pipe ends shall be wiped clean with a rag lightly wetted with PVC thinner. Cement shall be applied with a light coat on the inside of the fitting and a heavier coat on the outside of the pipe. Pipe shall be inserted into the fitting and given a quarter turn to seat the cement. Excess Cement Shall Not Be Used. Pipe will be tested as indicated elsewhere in these specifications. No backfilling will be permitted other than at the centers of pipe lengths until the pressure test is completed.
3. Backfilling shall be done when pipe is not in an expanded condition due to heat or pressure. Cooling of the pipe can be accomplished by operating the system for a short time before backfill or by backfilling in the early part of the morning before the heat of the day.
4. No PVC pipe may be threaded or connected to a threaded fitting without an adapter.
5. Great care must be taken to insure that the inside of the pipe is absolutely clean. Any pipe ends not being worked on must be protected and not left open.
6. All threaded joints are to have Teflon tape or pipe dope applied to male threads only.
7. Provide and install bare copper trace wire with all piping, main and lateral lines. Attach trace wire to pipes with nylon wire ties at 10' intervals and at all changes in direction. All trace wire splices shall be made by twisting wire ends together and attaching with water tight splices as specified.
8. Provide a manual valve in a valve box on the upstream side where a mainline crosses a paved area. The manual valve shall be the same size as the mainline.

B. Head Locations.

1. Heads immediately adjacent to walks, curbs, shrub/groundcover planting bed edge, etc. shall have one (1) inch clearance between head and walks, curbs, shrub/groundcover planting bed edge etc. unless otherwise noted. Sprinkler heads located adjacent to parking area curb shall be located on-center with parking stall striping. **CONTRACTOR SHALL REMOVE AND DISPOSE OF PAVEMENT (THAT PORTION OF PAVEMENT FOR HEAD AND PIPE ONLY) ADJACENT TO CURBS TO ALLOW ONE (1) INCH CLEARANCE PER THE ABOVE.**

C. Control Wire:

1. Control wires are to be taped together at five (5) foot intervals: then this bundle is to be taped to the bottom of the supply line at ten (10) foot intervals with at least three (3) wraps of electrical tape.
2. All splices must be made watertight with sealing 3M Direct Burial Splice Kit and contained in valve boxes.

3. Splices will be permitted only at the valves and never between valves or valve and controller unless in a separate valve box. There must be a separate lead or "hot" wire to each automatic valve. One (1) common wire will be acceptable.
4. Minimum size of wire is to be determined strictly by the wire sizing chart provided by Rainbird or approved equal.
5. The control wires shall be color coded.
6. Arrange valve stations to operate in sequence shown on "As-Built" Drawings.
7. Contractor shall field verify if spare wires exist. If spare wires are existing, spare wire(s) shall be provided to all control valves. The spare wire(s) shall be shared by all the valves and shall complete the circuit back to the controller. Wire sizes shall be the same as the Ground Wire.

D. Risers:

1. All sprinklers and quick coupler head risers must be constructed according to the "Riser Assembly" details. The pipe risers must have the same inlet size as the sprinkler and quick coupler heads.
2. Minimum riser size shall be the pipe size of the sprinkler head.
3. Risers are to be capped after installation to keep inside of pipe clean.
4. Care must be taken not to over-tighten the steel pipe into the PVC fittings.

E. Automatic Controller:

1. A diagram or schedule sealed in a plastic cover shall be posted in the controller to facilitate the selection of the valves to be operated.

F. Manual Drain Valve:

1. See "Manual Drain Valve Assembly" detail for installation of three-quarter (3/4) inch drain valves. DRAIN VALVES ARE NOT REQUIRED FOR GENERAL DRAINAGE OF THE IRRIGATION SYSTEM UNLESS OTHERWISE NOTED ON THE DRAWINGS; IRRIGATION SYSTEM SHALL BE AIR BLOWN TO DRAIN. DO NOT EXCEED MANUFACTURER'S RECOMMENDED PRESSURE FOR AIR BLOWING IRRIGATION SYSTEM.

G. Automatic Valves:

1. Install as shown on "Automatic Valve Assembly" detail.
2. Before installation of any automatic valves, the supply line must be thoroughly flushed.
3. All automatic valves shall be enclosed in valve boxes set above finish grade as shown on details. Valve box extension may be required. Locate valve boxes in shrub and groundcover planting beds wherever possible and at points of easy access from paved and/or lawn areas.

4. Locate outside of paved areas and grouped together where possible. Where valves occur adjacent to paved areas, install so that valve boxes will not be closer than twelve (12) inches to paving and perpendicular or parallel to it. Group boxes shall be spaced evenly to provide a neat appearance.
- H. Quick Coupling Valves:
1. Locate all quick couplers in shrub and/or groundcover planting beds when possible and at points of easy access from paved and/or lawn areas.
- I. Pipe Sleeves:
1. All sleeves shall extend a minimum of twelve (12) inches beyond the edges of pavement.
 2. Pipe for irrigation mains and laterals may be installed with sleeves but shall not include any pipes with couplers whenever possible.
 3. Plug all ends of sleeves and irrigation mains and laterals to prevent soil from entering.
- J. Pressure Testing:
1. Before backfilling, flush all new steel, cast iron and VC main water lines; then pressure test at ninety (90) psi. This pressure shall be maintained until all joints, fittings and pipes have been inspected. Correct any leakage and repeat test until the system is watertight. Maximum psi loss in a fifteen (15) minute test shall be five (5) psi. Contractor to test system prior to Owner's Representative/Landscape Architect final test.
 2. Before backfilling, all PVC sprinkler lateral lines shall be flushed and pressure tested with the system exposed to static pressure. This pressure shall be maintained until all joints, fittings and pipes have been inspected. Correct any major leakage and repeat test until the system is reasonably watertight. Contractor to test system prior to Owner's Representative/Landscape Architect final test. **DO NOT INSTALL HEADS PRIOR TO TESTING -- PLUG RISERS AT LOCATION OF HEAD CONNECTION.**
 3. To be valid, all tests must be witnessed by the Owner's Representative and/or the Landscape Architect. The Contractor must give at least twenty-four (24) hours written notice to the Owner's Representative and the Landscape Architect prior to the anticipated date of inspection.
- K. Backfilling:
1. In refilling trenches, the bedding around the pipe and fittings shall be approved "Backfill Material" and shall be well tamped. If necessary, provide suitable imported backfill. Trenches shall be thoroughly compacted and water-settled. Trenches shall be backfilled uniform with the surrounding grade, raked to a slight mound, then rolled with a two hundred fifty (250) pound roller, or compacted with a vibrator.
 2. All roots, rocks and surplus excavation shall be removed from the site unless otherwise directed.

3. Trenches or tunnels under roads or paved areas shall be backfilled and tamped with a mechanical tamper in successive six (6) inch lifts to at least ninety-five (95) percent density as determined by ASTM:D 1557. Paving shall be replaced to the satisfaction of the Owner's Representative's.
4. Before backfilling, all underground appurtenances including risers, valves, etc., must remain exposed so that they can be viewed during testing. Leave all joints exposed; then complete backfilling after flushing, pressure testing, inspection and preparation of "As-Built Drawings". The location, inspecting and testing provisions of these specifications will be strictly adhered to. If, for any reason, any part of the sprinkler system is backfilled before approved location, testing, or inspection is authorized by the Owner's Representative and/or the Landscape Architect, it must be completely uncovered and exposed until approved for backfilling by the Owner's Representative and/or the Landscape Architect.

3.03 CLEAN-UP

- A. Clean all work areas including paving, curbs, catch basins, manholes and lawn, or debris caused by the Contractor's work on this project, or any part of the project, on completion of operations and prior to watering. All hard surfaced areas shall be washed clean. Daily clean up shall be required on all areas used for circulation, parking, or other daily use

3.04 FINAL TESTING

- A. Before the sprinkler system will be accepted, the Contractor, in the presence of the Landscape Architect and the Owner's Representative, shall perform a water "Performance Coverage Test" to determine if the water coverage and operation of the system is complete and satisfactory. If any part of the system is inadequate, it shall be repaired or replaced at the Contractor's expense and the test repeated until accepted. The Contractor must give at least twenty-four (24) hours written notice to the Owner's Representative and the Landscape Architect prior to the field review. The Contractor shall also adjust and balance sprinkler heads for optimum and uniform coverage without excessive fogging or overthrow on to signage, pavement(s), structure(s) and building(s); adjust all sprinkler head heights and set all valve boxes to proper grade prior to final review by Owner's Representative and the Landscape Architect.

3.05 SYSTEM FAMILIARIZATION

- A. Upon acceptance of the system by the Owner's Representative, the Contractor shall provide the Owner's Representative the necessary keys and/or other tools necessary to operate/drain/activate the system and spend sufficient time with the Owner's Representative to insure that the system operation/maintenance/winterizing can continue after the departure of the Contractor. The Contractor will be liable for all damages or losses resulting from failure to comply with the provisions of this paragraph.

3.06 FINAL ACCEPTANCE

- A. Upon completion and approval of all tests, final acceptance of the system will be contingent upon Contractor providing signed and approved

sprinkler/plumbing/health/electrical permits as may be applicable in the area as well as reproducible "As Built Drawings" and two (2) three (3) ring binders of all catalog cuts/manufacturers' instructions/maintenance and operation information.

- B. Prior to final acceptance of the irrigation system, the Contractor shall cooperate with Landscape Contractor in recommending watering schedules.

END OF SECTION 32 84 00