Prince William County
PUBLIC SCHOOLS
Providing A World-Class Education

ADDENDUM

ADDENDUM # 2 **DATE: February 27, 2012**

REFERENCE:	Invitation for Bid No.:	S-LB-12607
	IFB Issue Date:	February 13, 2012
	Title:	Nokesville K-8 School
	Architect/Engineer:	Moseley Architects
	Sealed Bid Due Date:	March 13, 2012 @ 7:00 pm

THE FOLLOWING CHANGES, ADDITIONS, DELETIONS AND CLARIFICATIONS ARE HEREBY MADE PART OF THE BIDDING REQUIREMENTS AND CONTRACT DOCUMENTS FOR THE ABOVE REFERENCED PROJECT AND SHALL BE TAKEN INTO ACCOUNT IN THE PREPARATION OF ALL BIDS AND THE EXECUTION OF ALL WORK. BIDDERS SHALL ACKNOWLEDGE RECEIPT OF THIS ADDENDUM IN THE APPROPRIATE SPACE ON THE BID FORM.

1. **GENERAL:**

1.1 PREBID CONFERENCE MEETING MINUTES: February 22, 2012

1.1.1. This is a mandatory pre-bid with the sign in list being "closed" at 9:15 AM.

1.1.2. This is being recorded for record purposes, meeting minutes will be issued as part of an addenda including the sign in list.

1.1.3. Please review the bid instructions for all times, dates and procedures as well as allowance amounts and COST ITEMS to be used with this bid and contract. The award per the specifications is based on the lowest lump sum amount. Cost items will be used by the only if required for budgetary reasons not as basis of award.

1.1.4. The contractor is encouraged to visit the site and take note of working areas.

1.1.5. Contractors are encouraged to ask questions at this time or in writing to the architect. Questions will be answered in a posted addenda. These need to be asked in a timely manner to allow enough time for issuing the addenda.

1.1.6. The contractor is reminded that this project is adjacent to and involves an occupied school and all such work must be coordinated with the owner so as to not interfere with or disrupt the function of the school.

1.1.7. The contractor is reminded to review the scheduled phasing plans for the site. Contractor is further reminded this is an unclassified to subgrade site and is a build to grade shown site.

1.1.8. This project (buildings) is a complex structure per the county and therefore is part of the critical structures review and inspection process. The owner has arranged for the required third party inspections.

1.1.9. All contractors will be required to adhere to the security requirements of PWCS and parking for construction purposes will be in the area of construction not the existing High School parking areas.

1.1.10. The contractor is reminded to review the substitution procedure for submission and time requirements.

1.1.11. The contractor will be required to obtain a VDOT permit for the road and entrance work. As well as ALL trade and building permits including each out building. The SITE permit is paid for by the owner and the Permit Allowance is only for Building Permits.

1.1.12. The irrigation well has been permitted and drilled. The contractor at his option may make use of this well in accordance with Health Department Standards for construction water.
1.1.13. Requests for drawings and deposits must be received at least ten (10) days prior to bid opening date.
1.1.14. Bids will be received until 7:00 PM March 13, 2012 at the Purchasing Office, Prince William County School Board , Edward L. Kelly Leadership Center, Financial Services/ Purchasing Room #1500, 14715 Bristow Road.
1.1.15. Bidders need to allow enough time to pass through the security check-in process at the Kelly Leadership Center which includes scanning ID's and issuing badges.
1.1.16. Later arrivals will not be allowed to enter the room where bids are being received.
1.1.17. All addendums will be posted on the Prince William County Public Schools website.
1.1.18. Contractor must legibly complete the Bid Form, including acknowledgement of all addenda, a copy of the Virginia contractor's license and bidders bond.
1.1.19. The Bidders were reminded to refer to Section 01010 (Summary of Work and General Provisions) for the three (3) Cost Items, Allowances and Unit Prices.
1.1.20. PWCPS is not responsible for misinformation given out by plan rooms. PWCPS website is the official website.
1.1.21. The Bidders were reminder to carefully review the phasing requirements of Drawing C1.3 as well as the undercut areas in the Building and at Aden Road.
1.1.22. The Bidders were instructed that blasting would not be allowed on site.
1.1.23. The Project is pursuing a Silver LEED certification.
1.1.24. A general overview of the site and building were provided by the Civil Engineer and the Architect.
1.1.25. Spray-on fireproofing for the building structure was discussed as being unnecessary, Specification Section 07811 Applied Fireproofing describes a concealed thermal barrier for cellular foam plastics.
1.1.26. Sitework consists of Erosion & Sediment Control, Grading, Utilities which include three stormwater management facilities, multiple filterra structures in the front parking bus loop area, sanitary sewer and pump station, private water system and road improvements.
1.1.27. Sheet C1.3 Phasing Plan identifies site phasing and begin and completion dates for the work in the areas of the existing Brentsville District High School Competition Baseball and Softball Fields, the Synthetic Turf Field, access from the High School site, and the existing field area which is not to be disturbed until the other phased work is completed. The Contractor shall be responsible for maintaining the existing irrigation to the existing field until the other phased work is completed.
1.1.28. Earthwork for the project is unclassified and is a build to grade project. Undercut areas have been indicated on sheet C1.3 which include building areas #2 and #3 and the work within Aden Road. Blasting shall be prohibited.
1.1.29. Site cost items include the sitework associated with the proposed structures at the existing Brentsville District High School Competition Baseball and Softball Fields and the Synthetic Turf Field to be constructed as a sodded irrigated field.
1.1.30. Site LEED items include the roof drain collection system with two 25,000 gallon storage tanks to be used for irrigating the one P.E. Field just east of the proposed building and the areas in front of the proposed building as designated on the Landscape Plan, and signage and striping for Low Emitting and Fuel Efficient Vehicle Drop-off and Parking.

2. **MODIFICATIONS TO THE PROJECT MANUAL:**

2.1. SECTION 00800- PWCPS- Supplementary Conditions

2.1.1. Paragraph 11.1, last paragraph, DELETE first sentence beginning with "Before starting work…" and REPLACE with "Before starting work, Contractor is required to provide a certificate of insurance stating that PWCS is the additional insured at or above the coverage listed in the supplementary conditions. The ACORD form will be accepted."

2.1.2. Paragraph 11.5.4.3 DELETE sentence "All sub contractors whose…."

2.2. SECTION 01200- PWCPS- Project Meetings

2.2.1 Under 3.2 Preconstruction Conference after item C.13., ADD Item "C. 14. Procedures for LEED compliance." Also ADD Items D., E. and F.:

D. "LEED Orientation and Q&A Sessions:

1. Schedule: Schedule a LEED Orientation session at the Project site or other convenient location no later than fifteen (15) days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments. This session may be included in the pre-construction conference if time permits.
2. Attendees: The Owner, Architect, Civil Engineer, Mechanical/Electrical/Plumbing Engineer, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
3. Agenda:
4. Overview of the LEED Green Building Rating System
5. Review requirements for action plans once at the beginning of construction:
    i. Create Construction Waste Management (CWM) Plan
    ii. Create Construction IAQ Management (CIAQM) Plan
    iii. Create Action Plans for pursuing:
        1. MRc4 Recycled Content
        2. MRc5 Regional Materials
        3. MRc7 Certified Wood
6. Question and Answer session

E. Construction Waste Management (CWM) Plan Development Session:

1. Schedule: Schedule a Construction Waste Management planning session at the Project site or other convenient location no later than fifteen (15) days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
2. Attendees: The Owner, Architect, the Contractor and its superintendent and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
3. Agenda:
    i. Discussion of waste to be generated during construction and renovations
        1. Discussion of how waste can be reduced, recycled, reused, or donated
        2. Identify wastes that must be landfilled
        3. Quantify amounts of waste in each category
    ii. Discussion of how and where waste is to be separated on site

iii. Discussion of how recycling, material reuse, donation, and landfilling rates will be tracked and reported for each category

F. Construction Indoor Air Quality (IAQ) Management Plan Development Session:

1. Schedule: Schedule a Construction Indoor Air Quality Management planning session at the Project site or other convenient location no later than forty-five (45) days after execution of the Agreement and prior to commencement of wall assembly construction activities. Conduct the meeting to review responsibilities and personnel assignments.
2. Attendees: The Owner, Architect, Mechanical Engineer, the Contractor and its superintendent and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
3. Agenda:

i. Protection: Discussion of how and where materials that could impact IAQ will be stored, including but not limited to:
   1. Insulation
   2. Gypsum board
   3. Flooring materials
   4. Ceiling tiles
   5. Furnishings
   6. Odorous chemicals

ii. Protection: Discussion of how HVAC equipment will be stored, installed, and operated during construction

iii. Source Control: Discussion of the selection of building materials that can contaminate indoor air, including but not limited to:
   7. Adhesives
   8. Sealants
   9. Paints
   10. Carpets
   11. Composite wood

iv. Pathway Interruption: Discussion of how airflow between construction zones will be limited to prevent the spreading of pollutants from one part of the building to another

v. Housekeeping: Discussion of how the building will be kept clean and dry

vi. Scheduling: Discussion of what wet (odor emitting) materials will be used on this project, in order to schedule their installation before fuzzy (odor absorbing) materials

vii. Scheduling: Discussion of how to ensure sufficient time to flush building out with fresh air for two (2) full weeks after construction is complete and before occupancy"

2.2.2 Under Item 3.3 Project Progress Meetings Item C. Minimum Agenda after Item 7, ADD Item "8. Review monthly LEED progress reports of items noted in 1.3.C under Submittals above."

2.3 SECTION 01352-Sustainable Design Requirements

2.3.1. DELETE Paragraph 1.2.B beginning "Contractor's on-site supervisory…" and SUBSTITUTE "Contractors project staff shall include a LEED Coordinator for the duration of construction. The LEED Coordinator must have earned the LEED Accredited Professional with Building Design & Construction specialty or LEED Green Associate credential, as recognized by the Green Building Certification Institute or demonstrated experience on two LEED Certified projects of similar scope and complexity. This individual may also serve as waste management and IAQ management coordinator."

2.4. SECTION 01910- General Commissioning Requirements

2.4.1. DELETE entire section and SUBSTITUE attached SECTION 01910- General Commissioning Requirements Addendum No.2.

2.5. SECTION 02450- All Purpose Synthetic Grass Fields

2.5.1. DELETE entire section and SUBSTITUE attached SECTION 02450- All Weather Grass Fields Addendum No.2.

2.6. SECTION 07553- PWCPS- SBS-Modified Bituminous Membrane Roofing

2.6.1. DELETE entire section and SUBSTITUE attached SECTION 07553- PWCPS- SBS-Modified Bituminous Membrane Roofing Addendum No. 2 dated 2/23/2012.

2.7. SECTION 08110- PWCPS- Steel Doors and Frames

2.7.1. Under Part 3-Execution at Item 3.1.B. DELETE entire Sentence beginning "2. In new masonry wall construction, apply asphaltic…"

2.7.2. Under Part 3-Execution at Item 3.1. after Item C.2. ADD Item "D. Paints and coatings applied inside the weatherproofing system shall comply with the following:

1. Architectural paints, coatings, and primers shall not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993. VOC limits are printed in the LEED Reference Guide and are available from the Architect upon request.
2. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates shall not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997"

2.7.3. Under Part 3-Execution at Item 3.2. DELETE Item 3.2.A and SUBSTITUTE "3.2 ADJUSTING AND CLEANING

A. Prime-Coat Touch up: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air drying primer.

1. Paints and coatings applied inside the weatherproofing system shall comply with the following:
   a) Architectural paints, coatings, and primers shall not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993. VOC limits are printed in the LEED Reference Guide and are available from the Architect upon request.
   b) Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates shall not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997."

2.8. SECTION 08311- Access Door and Frames

2.8.1. DELETE paragraph 1.3.C.3. (Clarification: No field-applied primers or paints)

2.9. SECTION 08710- PWCPS- ES Finish Hardware

2.9.1. ADD Hardware Set 116B (Fire Rated Kitchen Serving Line Door with Track Arm Hold Open)

Each opening to receive

3ea	Hinge	TA2772 4 1/2 US26D	(Mck)
3ea	Back plate	BP-10 4 1/2 US26D	(Mck)
1 ea	Entrance Lockset	21-28-11G05 LJ US26D	(Sar)
	(Thumb Turn located on kitchen side of door)		
1ea	Push Plate	P053- 4 x 16 US32D	(Mck)
1ea	Pull Plate	DP503- 4 x 16 US32D	(Mck)
2ea	Mop Plate	KP50M - 6" x 4" LDW x B4E x TEK - US26D	(Mck)
1ea	Stop/ Holder	ADH01 - US26D	(Mck)
(Install wall strike hook on the wall to align with holder roller mounted at the top of the door)			
3ea	Silencer	S1M	(Mck)

2.10. SECTION 09656- PWCPS- Flexible Terrazzo Tile

2.10.1. Under Item 2.2 Materials after Item F. ADD Items G. and H. as follows "

G. Floor Adhesive: add performance criteria for EQc4.1 adhesives:
1. Adhesives applied inside the weatherproofing system shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits as required for LEED. VOC limits correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits are reprinted in the LEED Reference Guide and are available from the Architect upon request.

H. Sealer and Finish: add performance criteria for EQc4.1 sealants EQc4.2 coatings:
1) Sealants and sealant primers applied inside the weatherproofing system shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits as required for LEED.
a) Architectural Sealants: 250 g/L or less.
b) Other Sealants: 420 g/L or less.
c) Architectural sealant primers (nonporous): 250 g/L or less.
d) Architectural sealant primers (porous): 775 g/L or less.
e) Other sealant primers: 750 g/L or less.
2) Paints and coatings applied inside the weatherproofing system shall comply with the following:
a) Clear wood finishes, floor coatings, stains, sealers, and shellacs applied to interior elements shall not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings, rules in effect on January 1, 2004. VOC limits are reprinted in the LEED Reference Guide and are available from the Architect upon request."

2.11. SECTION 10100- PWCPS- Visual Display Boards

2.11.1. Under Item 2.2.A. Materials Item 5. ADD "Core: add performance criteria for EQc4.4:

a. Composite wood and agrifiber products permanently installed inside the weatherproofing system shall contain no added urea formaldehyde resins or laminating adhesives."

2.11.2. Under Item 2.2.A. Materials Item 7. ADD "Laminating Adhesive: add performance criteria for EQc4.1 adhesives:

a. Adhesives applied inside the weatherproofing system shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits as required for LEED. VOC limits correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits are reprinted in the LEED Reference Guide and are available from the Architect upon request."

2.11.3. Under Item 3.1 Installation after Item B. ADD Item "B.1 add performance criteria for EQc4.1 adhesives:

a. Adhesives applied inside the weatherproofing system shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits as required for LEED. VOC limits correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits are reprinted in the LEED Reference Guide and are available from the Architect upon request."

2.12. SECTION 10161- Solid-Polymer Toilet Partitions

2.12.1. DELETE Paragraph 1.3.B.3.

2.13. SECTION 10431- Signage

2.13.1. DELETE specification header "LINTON HALL ROAD ELEMENTARY SCHOOL" and SUBSTITUTE "NOKESVILLE K-8 SCHOOL." DELETE "493390" from specification footer.

2.14. SECTION 11050- Library Furnishings

2.14.1. Paragraph 2.2.B. DELETE "cf CASE SHELVING."

2.14.2. Paragraph 2.2.C DELETE "PREMIUM" GRADE TOP. "HGS" modern term for horizontal grade laminate 6/16/2008 NA"

2.14.3. DELETE 2.5A and SUBSTITUTE the following:

A. Basis-of-Design Products: Subject to compliance with requirements, provide specified products of **Brodart Company, Wood Shelving** or a comparable product by one of the following:

1. Buckstaff Company (The).
2. Jasper Library Furniture (former Blanton & Moore)
3. Texwood Furniture, Ltd.
4. Worden Company (The).
5. Russwood Library Furniture Company (shelving)

2.14.4. ADD Subparagraph 2.6A 5 "Russwood Library Furniture Company." (tables)

2.14.5. ADD Subparagraph 2.7A 5 "Russwood Library Furniture Company." (technical pieces)

2.14.6. ADD Subparagraph 2.8A 5 "Russwood Library Furniture Company." (chairs)

3. MODIFICATIONS TO THE DRAWINGS:

3.1. DRAWING C3.1

3.1.1. REVISED spot elevation and transition length. ADD attached Drawing AD2-C1.

3.2. DRAWING C3.2

3.2.1. REVISED waterline bend stationing and storm pipe information. ADD attached Drawing AD2-C2.

3.3. DRAWING C3.3

3.3.1. REVISED waterline tee information. ADD attached Drawing AD2-C3.

3.4. DRAWING C3.4

3.4.1. REVISED limits of construction. ADD attached Drawing AD2-C4.

3.5. DRAWING C7.2

3.5.1. REVISED inlets 14 and 14A throat lengths. ADD attached Drawing AD2-C5.

3.6. DRAWING C7.3

3.6.1. REVISED inlet type for structure 20. ADD attached Drawing AD2-C6.

3.6.2. REMOVED duplicated underground storage tank profile. ADD attached Drawing AD2-C7.

3.6.3. REVISED note and invert information on underground storage tank profile. ADD attached Drawing AD2-C8.

3.7. DRAWING C7.4

3.7.1. REVISED inlet type for structure 27A and pipe information. ADD attached Drawing AD2-C9.

3.8. DRAWING C7.6

3.8.1. REVISED invert information at sanitary sewer structure F. ADD attached Drawing AD2-C10.

3.9. DRAWING C7.7

3.9.1. REVISED sanitary sewer pump station chamber invert for the design elevations. ADD attached Drawing AD2-C11.

3.10. DRAWING C9.2

3.10.1. REVISED Typical Section Underdrain System at All Weather Field Detail. ADD attached Drawing AD2-C12.

3.11. DRAWING A0.1

3.11.1. At Text Layout Elevation, Architect's Sign and Project Sign Elevation; DELETE all three details. (Clarification: refer to Specification Section 01500/12 for Project Sign requirements; sign indicated on the Drawings has been deleted. Provide sign required by specifications.)

3.12. DRAWING A1.2

3.12.1. At Datestone Detail 11/A1.2, at "2013" DELETE "2013" and SUBSTITUTE "2014."

3.13. DRAWING A10.1

3.13.1. At Enlarge Roof Plan: ADD "General Note: SP= sedum plugs (Plugs reference Specification Section 07563-8 2.2 K1.a); SC= sedum carpet (Vegetative Carpet reference Specification Section 07563-8 2.2 K1.b.)"

END OF ADDENDUM #2

PRINCE WILLIAM COUNTY PUBLIC SCHOOLS
INVITATION FOR BID
MANDATORY PRE-BID CONFERENCE
LOCATION – ADMINISTRATION BUILDING, ROOM 247, BLDG. #51
14800 JOPLIN ROAD, MANASSAS, VA 20112

IFB#	S-LB-12607
Title:	Nokesville K-8 School
Mandatory Pre-Bid Date:	February 22, 2012 @ 9:00 a.m.
Bid Due Date:	March 13, 2012 @ 7:00 p.m.

Company Legal Name and Address	Representative (Print Name)	Telephone & Fax No.	GC OR SUB
1. CALDWELL & SANTMYER, INC 409-A JACK ENDLENS, BLVD BERRYVILLE, VA 22611	LARRY@CALDWELLSANTMYER.COM LARRY W. MYERS	540-955-5701 FAX # 540-955-5707	GC
2. WHITENER & JACKSON INC 8592 VA. MEADOWS DR. MANASSAS, VA. 20109	EDWATKINS	703-530-0868 (FAX) 703-361-4411	GC
3. V.F. PAVONE CONST. CO 11120 INDUSTRIAL RD MANASSAS, VA 20109	RAY DEMEMBER	703-818-8841 571-379-5693	GC
4. SIGAL CONSTRUCTION 2231 CRYSTAL DRIVE SUITE 200 ARLINGTON VA 22202	R. Gordon Raines	703-302-1500 F. 703-302-1520	GC
5. Kenbridge Construction P.O. Box 480, 1101 FIFTH Ave Kenbridge, VA. 23944	Jeff Colvin	434-676-8201 434-676-8815	GC
6. JOHN C. GRIMBERG CO 3200 TOWER OAKS BLVD SUITE 300 ROCKVILLE MD 20852	KEVIN KELLY	301-881-5120 F 301-881-4938	GC
7. CFI Construction Corp. 4945 Wyaconda Rd. Rockville, MD 20852	John Bedenbaugh	240-558-1255 F 240-558-1260	G.C.
8. HESS Construction 804 W. Diamond Ave Gaithersburg, MD 20878	Tom Beach	301-670-9008 301-670-9009	GC
9. Meridian construction 1375 Piccard Dr Rockville, MD 20850	Kevin Mullen	301-670-4677 301-670-4676	GC
10. Scheibel Construction 115 Prospect Dr. Huntingtown, MD 20736	Phillip Cranford	301-855-7900 301-855-6072	GC
11. Dustin Construction 2510 Frederick RD Ellicott City, MD	TODD CUMMIN	301-810-4320	GC

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Company Legal Name and Address	Representative (Print Name)	Telephone & Fax No.	GC OR SUB
12. Henley Construction 7940 Queen Air Dr Gaithersburg MD 20879	Jennifer Hodges	301-417-1006	GC
13. FORRESTER CONST. 12231 PARKLAWN ROCKVILLE MD 20852	KADIRCAN KARAKUS	301-715-4079	GC
14. RIVAS WRR Wrrestoration INC.	12720 Occoquan rd woodbridge VA Walter R Vas 22192	703 843 7787	GC.
15. PWCPS	Neil Bagwell Dee Thompson		owner
16. MOSELEY ARCHITECTS 3200 NORFOLK ST. RICHMOND VA 23230	BILLY PHIPPS	804-794-7555	ARCH.
17. ROSS, FRANCO & RATCLIFF, LTD. 8802 SUDLEY ROAD MANASSAS, VA. 20110	MIKE MASSEY	703-361-4188	CIVIL
18. WDP & Associates 10621 Gateway Blvd Manassas, VA 20110	Bob Schaller	703 257-9280	Geotech
19. Brian Burtaker	PWCS	703 791 8726	owner
20.			
21.			
22.			

SECTION 01910 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED FOR COMMISSIONING

A. Commissioning of the building energy systems, to include at a minimum:
   1. HVAC and refrigeration systems
   2. Domestic hot water systems
   3. Lighting Controls
   4. Building automation systems

B. Provide requirements for commissioning to all participants

C. Equipment Start-Up and FPT

D. Equipment and systems installation validation

E. Coordination and requirements of 'Training Events'

F. Documentation of tests, procedures, and installations

G. Sequencing of testing

1.2 RELATED DOCUMENTS

A. Commissioning Plan - This document describes the responsibilities of all parties involved in the commissioning process and gives an overall view of the entire process specific to the project.

B. Provisions of the Contract and of the Contract Documents apply to this Section.

C. OPR and BOD documentation prepared by Owner and A/E contain requirements that apply to this Section.

D. Section 019113 – Functional Testing Procedures

E. Specification section 15800 – HVAC & Plumbing System Commissioning

F. Specification section 16800 – Electrical System Commissioning

G. Specification section 15880 – Building Automation System Commissioning

1.3 SUMMARY

A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

B. Commissioning Authority (CxA) works with the Contractor and the design engineers to direct and oversee the Cx process and perform FPT.

C. This section and other sections of the specification details the Contractor's responsibilities regarding the Cx process. The Cx describes roles and responsibilities of outside of the construction contract.

1.4 DEFINITIONS

A. A/E: General reference to the Architect/Engineer lead-design entity.

B. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers.

C. Basis of Design (BOD) Document: The BOD document is developed by the design team, and responds to and is consistent with the performance criteria specified in the OPR. The BOD illustrates the means by which the OPR criteria are to be achieved, documenting the assumptions and parameters used in the design, and documenting the primary thought processes or decisions made that resulted in the selected alternatives. At the end of the project, the final BOD content may be incorporated into the Systems Manual if desired in part or in its entirety. The BOD is a required component for LEED-certified projects, and is recommended by ASHRAE for all projects subject to the Cx process.

D. Commissioning (Cx): The process of ensuring that all building systems perform interactively according to the design intent, that the systems are efficient and cost effective, and that they meet the Owner's operational needs.

E. Commissioning Authority (CxA): The party retained by the Owner who will oversee and manage the Cx process, develop and stipulate many of the Cx requirements, and ensure and validate that systems and equipment are designed, installed and tested to meet the Owner's requirements.

F. Commissioning Coordinator (CxC): The parties designed by the Contractor and each major subcontractor to be the primary contacts for Cx activities.

G. FPT: Functional Performance Testing.

H. Leadership in Energy and Environmental Design (LEED): Green building rating system administered by the U.S. Green Building Council.

I. Owner's Project Requirements (OPR): The OPR is intended to provide the basis from which all design, construction, acceptance, and operational decisions are made. It details the functional requirements of the project, including systems subject to commissioning. The OPR defines the benchmarks and metrics by which the success of the project is ultimately judged, and evolves through each project Phase. The OPR is typically developed early in the project cycle by the Owner and the A/E and provides the user needs, requirements, goals, and metrics that are defined by the Owner to be important. The OPR criteria are referenced by and should be the foundation of the BOD narrative. At the end of the project, content from the final BOD may be incorporated into the Systems Manual.

J. Start-Up Checklist: A list of items to inspect to verify proper installation of equipment or systems by the Contractor. Checklist items simply require a 'Yes/No' or 'OK/Not' response. These include primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension checked, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). Start-Up Checklist items are one component of the Start-Up Documentation (Start-Up Tests being the other).

K. Start-Up Documentation: Refers to the combination of Start-Up Checklists + Start-Up Tests. The Contractor documents the Start-Up procedure by completing and submitting the Start-Up Documentation. Start-Up Documentation may be a combination of procedures prepared by the CxA, those included in the Contractors in-house quality assurance process, and those required by the manufacturer. Regardless of the context of the checklist or format of the form used to documents it, the reference to 'Start-Up Documentation' includes all of the stated checklists and tests.

L. Start-Up Test: This is a quality-assurance test that is required to ensure the system is ready to be placed into service. It differs from a checklist item in that it requires more than a binary (yes/no, OK/Not OK) response - an observation, measurement, or sequence of events must be documented. Start-Up Tests are one component of the Start-Up Documentation (Start-Up Checklists being the other).

M. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean “as-built” systems, subsystems, and equipment.

N. TAB: Testing, Adjusting, and Balancing.

1.5 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of the Contractor, including Project Superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.6 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and the Contractor for use in developing the Commissioning Plan, Systems Manual, operation and maintenance training plan, and testing plans and checklists.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:

1. Coordination meetings.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Testing meetings.
4. Demonstration of operation of systems, subsystems, and equipment.

C. Provide utility services required for the commissioning process.

D. Provide the BOD documents, prepared by the A/E and approved by Owner, to the CxA and the Contractor for use in developing the Commissioning Plan, Systems Manual, and operation and maintenance training plan.

1.7 CONTRACTOR'S RESPONSIBILITIES

A. Construction Phase: The following items describe the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Construction Phase.

1. Designate a Commissioning Coordinator (CxC) from each major subcontractor with activities related to commissioning. These Commissioning Coordinators are to be the primary contacts for Cx activities.
2. Attend Construction Phase Cx Kick Off Meeting. The CxC and Project Manager from each major subcontractor shall attend.
3. The CxCs shall attend all Cx progress meetings unless otherwise agreed to by the CxA.
4. Remedy any deficiencies identified throughout construction.
5. TAB shall submit sample balancing forms for approval prior to starting work.

6. Schedule and coordinate Cx efforts into the construction schedule. Incorporate the precedent diagram provided by the CxA into the construction schedule. Indicate at a minimum all tasks enumerated on the precedent diagram for all systems.
7. Coordinate the work of subcontractors, vendors, manufacturers, and testing agencies provided with the bid, and ensure that they are informed of and are adhering to the requirements of the Cx process specified throughout the Contract Documents.
8. Contractor-Developed Documentation: Contractor shall develop and submit the following information as specified:
    a. Draft Start-Up Documentation (submit along with the manufacturer's application, installation and Start-Up procedures);
    b. O&M Documentation content as specified;
    c. Systems Manual content as specified;
    d. Training Plan, and materials and documentation of training;
    e. Comprehensive integrated procedures for scheduling and task notification and documenting them in a common format.
9. Develop and submit Temporary Conditioning Plan.
10. Provide assistance to the CxA in preparation of the specific FPT procedures. Contractors, subcontractors and vendors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests. Damage caused to equipment performed in accordance with the approved procedures will be the responsibility of the Contractor.
11. Thoroughly complete and inspect installation of systems and equipment as detailed throughout Contract Documents, as required by reference or industry standards, and as specifically indicated elsewhere this Section.
12. Start-up, test, adjust, and balance systems and equipment prior to verification and FPT by the CxA. Start-Up Documentation shall be in accordance with Contract Documents, reference or industry standards, and specifically individual Cx specifications. Provide skilled technicians qualified to do the work required. Provide factory trained/authorized technicians where required by the Contract Documents and stated in the applicable technical section. Start-Up and FPT shall proceed from device checkout, to component checkout, to system checkout, to inter-system checkout.
13. Prepare spaces with adequate security for on-site contractors to store equipment. Provide secure space with 120 volt AC power for the CxA, TAB, and BAC to base their operations and store test equipment, drawings, files, and the like.
14. Schedule for any required representative space mock-ups as early as possible to facilitate determining standards for closeout.
15. Record Start-Up procedures on approved Start-Up Documentation and certify that the systems and equipment have been started and or tested in accordance with the requirements specified above. Each task or item shall be indicated with the party actually performing the task or procedure.
16. Provide skilled technicians qualified to perform the work required.
17. Provide factory-trained and authorized technicians where required by the Contract Documents.
18. Tag equipment that is started with the individual's name and date.
19. Demonstrate the operation of all systems as specified.
20. Certify that systems have been installed and are operating per Contract Documents prior to FPT.

21. Maintain an updated set of Record Documentation as required by the Contract Documents.
22. Copy the CxA on indicated documentation.
23. Conduct and document Equipment and Systems Training events as required by this Section and Division 1, and by applicable sections of the specifications pertaining to each piece of equipment or system.

B. Acceptance Phase: The following delineates the Cx-related responsibilities of the Contractor (and their subcontractors) during the Acceptance Phase.

1. Assist CxA in FPT. Assistance will generally include the following:
   a. Manipulate systems, equipment, BAS, and other control systems to facilitate testing (as dictated in Section 019110 ; in most cases this will entail only an initial sample).
   b. Provide any specialized instrumentation necessary for FPT.
2. Correct any work not in accordance with Contract Documents.
3. Participate in Training Events relative to use of O&M information and the preventative maintenance program.
4. Maintain record documentation, and update and resubmit it when Acceptance Phase is completed.
5. Compensate CxA for additional site time incurred due to incompleteness of systems or equipment at time of FPT.

1.8 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Prepare a construction-phase Commissioning Plan. Collaborate with Contractor and with subcontractors to develop test and inspection procedures. Include design changes and scheduled commissioning activities coordinated with overall Project schedule. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.

C. Review and comment on submittals from Contractor for compliance with the OPR, BOD, Contract Documents, and construction-phase Commissioning Plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BOD.

D. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The CxA shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.

E. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals, operation and maintenance training sessions, TAB work, and project completion.

F. Observe and inspect construction and report progress and deficiencies. In addition to compliance with the OPR, BOD, and Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.

G. Prepare project-specific test and inspection procedures and checklists.

H. Schedule, direct, witness, and document tests, inspections, and systems Start-Up.

I. Compile test data, inspection reports, and certificates and include them in the Systems Manual and Commissioning Report.

J. Certify date of acceptance and Start-Up for each item of equipment for start of warranty periods.

K. Review Project Record Documents for accuracy. Request revisions from Contractor to achieve accuracy. Project Record Documents requirements are specified in Division 1 Section "Project Record Documents."

L. Review and comment on operation and maintenance documentation and Systems Manual outline for compliance with the OPR, BOD, and Contract Documents. Operation and maintenance documentation requirements are specified in Division 01 Section "Operation and Maintenance Data."

M. Prepare operation and maintenance training program and provide qualified instructors to conduct operation and maintenance training. Operation and maintenance training is specified in Division 1 Section "Demonstration and Training."

N. Videotape and edit training sessions.

O. Videotape construction progress including hidden shafts.

P. Prepare Commissioning Report.

Q. Assemble the final commissioning documentation, including the Commissioning Report and Project Record Documents.

1.9 COMMISSIONING DOCUMENTATION

A. Index of Commissioning Documents: CxA shall prepare an index to include storage location of each document.

B. OPR: A written document, prepared by Owner, which details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.

C. BOD Document: A document, prepared by Architect, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

D. Commissioning Plan: A document, prepared by CxA, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited to the following:

1. Plan for delivery and review of submittals, Systems Manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting Commissioning Plan.
2. Description of the organization, layout, and content of commissioning documentation (including Systems Manual) and a detailed description of documents to be provided along with identification of responsible parties.
3. Identification of systems and equipment to be commissioned.

4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
5. Identification of items that must be completed before the next operation can proceed.
6. Description of responsibilities of commissioning team members.
7. Description of observations to be made.
8. Description of requirements for operation and maintenance training, including required training materials.
9. Description of expected performance for systems, subsystems, equipment, and controls.
10. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
11. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.
12. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
13. Process and schedule for completing prestart and Start-Up checklists for systems, subsystems, and equipment to be verified and tested.
14. Step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.

E. Test Checklists: CxA, with assistance of the mechanical engineer, shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist. Specific checklist content requirements are specified in Division 1 Section "HVAC Commissioning Requirements." Each checklist, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested item.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Deficiencies.
8. Issue number, if any, generated as the result of test.

F. Certificate of Readiness: Certificate of Readiness shall be signed by the Contractor, Subcontractor(s), Installer(s), and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate.

G. Test and Inspection Reports: CxA shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. CxA shall compile test and inspection reports and test and inspection certificates and include them in Systems Manual and Commissioning Report.

H. Corrective Action Documents: CxA shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.

I. Issues Log: CxA prepares and maintains an issues log that describes design, installation, and performance issues that are at variance with the OPR, BOD, and Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.

1. Creating an Issues Log Entry:
    a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
    b. Assign a descriptive title of the issue.
    c. Identify date and time of the issue.
    d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
    e. Identify system, subsystem, and equipment to which the issue applies.
    f. Identify location of system, subsystem, and equipment.
    g. Include information that may be helpful in diagnosing or evaluating the issue.
    h. Note recommended corrective action.
    i. Identify commissioning team member responsible for corrective action.
    j. Identify expected date of correction.
    k. Identify person documenting the issue.
2. Documenting Issue Resolution:
    a. Log date correction is completed or the issue is resolved.
    b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
    c. Identify changes to the OPR, BOD, or Contract Documents that may require action.
    d. State that correction was completed and system, subsystem, and equipment is ready for retest, if applicable.
    e. Identify person(s) who corrected or resolved the issue.
    f. Identify person(s) documenting the issue resolution.
3. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, CxA shall prepare a written narrative for review of outstanding issues and a status update of the issues log. As a minimum, CxA shall include the following information in the issues log and expand it in the narrative:
    a. Issue number and title.
    b. Date of the identification of the issue.
    c. Name of the commissioning team member assigned responsibility for resolution.
    d. Expected date of correction.

J. Commissioning Report: CxA documents results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The Commissioning Report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BOD, and Contract Documents. The Commissioning Report shall include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances in the OPR, BOD, and Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It

shall describe components and performance that exceed requirements of the OPR, BOD, and Contract Documents and those that do not meet requirements of the OPR, BOD, and Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.

2. OPR and BOD documentation.
3. Commissioning Plan.
4. Testing plans and reports.
5. Corrective modification documentation.
6. Issues log.
7. Completed test checklists.
8. Listing of off-season test(s) not performed and a schedule for their completion.

K. Systems Manual: CxA shall gather required information and compile Systems Manual. Systems Manual shall include, but is not limited to, the following:

1. OPR and BOD, including system narratives, schematics, and changes made throughout the Project.
2. Project Record Documents as specified in Division 01 Section “Closeout Procedures.”
3. Final Commissioning Plan.
4. Commissioning Report.
5. Operation and maintenance data as specified in Division 01 Section “Closeout Procedures.”

1.10 SUBMITTALS

A. Commissioning Plan Prefinal Submittal: CxA shall submit four hard copies of prefinal Commissioning Plan. Deliver one copy to Contractor, one to Owner, and one to Architect. Present submittal in sufficient detail to evaluate data collection and arrangement process. One copy, with review comments, will be returned to the CxA for preparation of the final construction-phase Commissioning Plan.

B. Commissioning Plan Final Submittal: CxA shall submit two hard copies and two sets of electronically formatted information of final Commissioning Plan. Deliver one hard copy and one set of discs to Owner, and one copy to Architect. The final submittal must address previous review comments. The final submittal shall include a copy of the prefinal submittal review comments along with a response to each item.

C. Test Checklists and Report Forms: CxA shall submit sample checklists and forms to Contractor quality-control manager and subcontractors for review and comment. Submit two copies of each checklist and report form.

D. Certificates of Readiness: CxA shall submit Certificates of Readiness.

E. Test and Inspection Reports: CxA shall submit test and inspection reports.

F. Corrective Action Documents: CxA shall submit corrective action documents.

G. Prefinal Commissioning Report Submittal: CxA shall submit three hard copies of the prefinal Commissioning Report. Include a copy of the preliminary submittal review comments along with CxA's response to each item. CxA shall deliver one copy to Owner and one copy to Architect. One copy, with review comments, will be returned to the CxA for preparation of final submittal.

H. Final Commissioning Report Submittal: CxA shall submit two hard copies and two sets of electronically formatted information of the final Commissioning Report. CxA shall deliver one hard copy and one set of discs to Owner, and one copy to Architect. The final submittal must address previous review comments and shall include a copy of the pre-final submittal review comments along with a response to each item.

1.11 QUALITY ASSURANCE

A. Instructor Qualifications: Factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.

B. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.12 COORDINATION

A. Coordinating Meetings: CxA shall conduct monthly coordination meetings of the commissioning team to review progress on the Commissioning Plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.

B. Pretesting Meetings: CxA shall conduct pretest meetings of the commissioning team to review Start-Up reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment, and component to be tested.

C. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

D. Manufacturers' Field Services: CxA shall coordinate services of manufacturers' field services.

1.13 FUNCTIONAL PERFORMANCE TESTING

A. The objective of FPT is to demonstrate that each system is operating according to the documented OPR/BOD and Contract Documents. FPT facilitates bringing the systems from completed Start-Up to Functional Completion. During the FPT, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems. System parameters are further tuned and optimized to provide for stable control and interrelated system effects are also addressed.

B. The logistics and procedures involved in FPT are outlined below and in Section 019110.

1.14 DEFICIENCIES IDENTIFIED DURING FUNCTIONAL TESTING

A. Non-Conformance Deficiencies. Non-conformance deficiencies identified during FPT shall be resolved as follows:

1. The CxA will record the results of the functional test. All deficiencies or non-conformance issues shall be noted as Action Items and reported to the Contractor.

2. Corrections of identified minor deficiencies may be made during the tests at the discretion of the CxA. In such cases, both the deficiency and associated resolution will be documented in the issues log.

3. As tests progress and a deficiency is identified, the CxA will discuss the issue with the executing Contractor.
    a. When there is no dispute on the deficiency and the Contractor accepts responsibility to correct it:
        1) The CxA shall document the deficiency along with the Contractor's response and intentions, and then proceed forward to another test. A copy/email of the deficiency shall be generated and provided to the Contractor and CxA. The Contractor shall then correct the deficiency, complete the Action Item response certifying that the issue is resolved and /or the equipment is ready to be retested, and sends it back to the CxA.
        2) The CxA reschedules the test and the test is repeated until satisfactory performance is achieved. CxA then closes the Action Item.
    b. If there is a dispute about a deficiency, regarding whether it is a deficiency and/or who is responsible:
        1) The deficiency shall be documented as an Action Item with the Contractor's response and the Contractor and Owner will be notified. The Contractor will track this issue under the construction contract dispute resolution provisions.
        2) Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
        3) The CxA documents the resolution to the Action Item.
        4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, and responds to the Action Item indicating completion. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved. CxA then closes the Action Item.

B. Cost of Retesting: The cost for the CxA to retest a Start-Up or FPT shall be paid by the Contractor responsible for the deficiency. Owner shall pay the CxA directly and back charge the responsible Contractor.

C. Failure Due to Manufacturer's Defects. If 10% or three, whichever is greater, of identical pieces of equipment fail to perform to the required Contract Document criteria (mechanically or substantively) due to manufacturing defect, all identical units may be considered unacceptable by the Owner. (For the purposes of defining 'identical equipment' for this Section, size or capacity alone does not constitute a difference.) In case of failure due to manufacturer's defects, the Contractor shall provide the Owner with the following:
    1. Manufacturer's response in writing as to the cause of the failure and proposed resolution.
    2. Manufacturer shall implement their proposed resolution on a representative sample of the product.
    3. The Owner will determine whether a replacement of all identical units or a repair is acceptable.
    4. Upon acceptance, the manufacturer shall replace or repair all identical items at their expense and shall extend the warranty accordingly (if the original equipment warranty had begun).
    5. Manufacturer or Contractor shall pay the costs of all retesting necessitated by the failure.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. Training Preparation Conference: Before operation and maintenance training, convene a training preparation conference to include Owner's operation and maintenance personnel, Contractor, and subcontractors. In addition to requirements specified in Division 01 Section "Closeout Procedures," perform the following:

1. Review the OPR and BOD.
2. Review installed systems, subsystems, and equipment.
3. Review instructor qualifications.
4. Review instructional methods and procedures.
5. Review training module outlines and contents.
6. Review course materials (including operation and maintenance manuals).
7. Inspect and discuss locations and other facilities required for instruction.
8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

B. Training Modules: Develop an instruction program that includes individual training modules for each system, subsystem, and equipment as specified in Division 01 Section "Closeout Procedures."

C. Training Prerequisites: Conduct Equipment and Systems Training ("Training") for subject system or equipment upon completion of Start-Up Documentation requirements and Turn-Over.

END OF SECTION 01910

SECTION 02450 – ALL WEATHER GRASS FIELDS

1.1 GENERAL REQUIREMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications, and other sections of the Specifications not referenced below shall also apply to the extent required for proper performance of the Work of this section.

TECHNICAL SPECIFICATIONS FOR CONSTRUCTION

SECTION 02450.A STORM DRAINAGE

STORM SEWERAGE SYSTEM

I. General

A. Work Included
1. Furnish and place storm system as shown on the drawings.
2. Excavation and backfill.

B. Related Work
1. Manholes, catch basins, and similar structures.
2. Subsurface Drainage.
3. Site grading.
4. Asphaltic concrete paving.

II. Products

A. Materials
1. Pipe;
a. 10” Diameter Advantedge, by Advanced Drainage Systems N-12 dual wall perforated pipe.

b. Concrete pipe or CMP can be used only for storm line connections beyond the drainage network of the field.

B. Joints
1. Joints for 10 inch pipe shall be of Tylox Type CR rubber gasket or equal using bell and spigot design and shall conform to current specification ASTM C-443.

2. Joints for 10” shall be round rubber gasket, using a modified bell and spigot design.

a. The spigot shall have an external groove accurately sized to receive the gasket, so that when the pipe is laid and the joint completed, the gasket shall be enclosed on all four surfaces.

b. Joints and gaskets shall conform to the current ASTM specifications C-443.

c. The durometer hardness of rubber gaskets shall be 45 plus or minus 5 and the gaskets shall have a circular cross-section.

C. End Sections

1. End sections shall be precast or prefabricated units equal to the size, strength and material of the pipe to which it is joined.

2. Sizes and locations are shown on the plans.

D. Pipe Marking

1. Pipe shall have the markings which are required by the governing standard specification.

2. Additionally, each pipe fitting and special section shall have plainly and permanently marked thereon:

a. Pipe class.

b. Date of manufacture.

c. Manufacturer's name or trademark.

d. On bends the angle turned thereby.

e. Markings shall be indented in the pipe or painted thereon with waterproof paint.

III. Execution

A. Sewer Installation

1. Laying Sewer Pipe

a. The construction shall begin at the outlet end and proceed toward the upper end.

b. The pipe shall be carefully laid in the prepared trench to the line and grade shown on the plans with the spigot and downstream.

c. The bottom of the trench shall be so shaped to permit a firm and even bearing along the barrel of the pipe in accordance with Subsurface Drainage.

d. The pipe shall be fitted close and tight and with smooth inverts.

e. Unless otherwise shown on the plans, all pipe shall be laid straight between changes in alignment and at a uniform grade between changes in grade.

f. Except where bends are installed adjacent to manholes, all lines shall be laid so that each section between manholes will lamp.

g. Pipe shall be protected from lateral displacement by means of pipe embedment.

h. Under no circumstances shall pipe be laid in water and no pipe shall be laid under unsuitable weather or trench conditions.

i. When jointed in the trench, the pipe shall form a true and smooth line. The pipe trench shall be a minimum 24" in depth and 48" wide. The trench will be backfilled with ¾" – 100% crushed and washed stone with the top 1" being 3/8" washed crushed stone, stabilized with the airfield or geogrid over the entire trench.

j. Pipe shall not be trimmed, except for closures, and pipe not making a good fit shall be removed.

k. While pipe laying is in progress not less than three unfilled joints shall be in place ahead of any joint filling or sealing work so that the sealed joints will not be disturbed by pipe laying operations.

2. Pipe Handling

a. Pipe, fittings and accessories shall be handled in a manner that will insure their installation in the work in sound, undamaged condition.

b. Equipment, tools and methods used in unloading, reloading, hauling and laying pipe and fitting shall have broad, well-padded contact surfaces.

c. Care shall be taken to avoid dragging the spigot ring on the ground or allowing fit to come in contact with hard objects.

d. Joint rings which have been damaged in any way will not be accepted and shall not be incorporated in the work.

g. Concrete pipe and fittings shall be handled with suitable slings and lifting hooks.

1. No hooks shall be permitted to come in contact with joint surfaces.

2. Pipe units shall be kept from contact with adjacent units during handling and storage.

3. Pipe Cleaning

a. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter before being installed and shall be kept clean until the work has been accepted.

b. All joint contact surfaces shall be kept clean until the joining is completed.

c. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being installed.

d. No debris, tools, clothing or other materials shall be placed in the pipe.

e. Whenever pipe laying is stopped the end of the pipe shall be closed with an end board closely fitting the end of the pipe and having a number of small holes drilled near the center, to prevent the trench from filling with water and to keep sand and earth out of the pipe.

4. Pipe Inspection

a. Each piece of sewer pipe shall be tested for soundness after its delivery.

b. All pipe shall be subject to rejection on account of failure to conform to any requirements of the governing ASTM Standard Specification.

c. All broken or surplus material shall be removed from both sewers.

d. A T-saddle or other approved connection shall be installed.

e. The cut-in pipe shall not extend beyond the inner wall of the existing pipe.

f. The joint shall be sealed with 1:2 mortar, and with a sufficient bead or fillet of such mortar to insure a solid connection.

g. When so directed by the Consultant, the Contractor shall place such a bead or fillet on the inside as well as on the outside of the larger sewer.

5. Existing Manholes/Catch Basins

A. Materials:

1. If applicable each Catch Basin shall be capped with a ¾" steel plate 24" x 24" (or larger)

B. Excavation

1. Excavation shall be of sufficient dimensions to provide ample space for sheathing and bracing is required, and ample space for the workmen to perform their work in a satisfactory manner.

C. Adjusting Existing Structures

1. Whenever existing manholes, catch basins, valve chambers, or similar structures occur, the tops of such structures shall be adjusted or rebuilt so that the top of the casting will fit the crown and/or grade of the finished surface.

2. Raising castings shall be accomplished by use of precast adjusting rings and/or brick set in a full mortar bed with the casting re-set in accordance with preceding requirements for new construction.

3. Lowering castings shall be accomplished by removing a sufficient amount of the existing structure to allow for reconstruction of the taper section and resetting the casting in accordance with the preceding requirements for new construction.

a. All manholes shall be constructed to conform to the requirements of Section

4. Catch Basins

   a. All catch basins shall be constructed to conform to the requirements of this Section.

5. Rip-Rap

   a. Rip-Rap and Zip-rap shall be laid on geotextile membrane

   b. Each piece of Rip-Rap shall be laid individually by hand and shall be bedded with gravel between pieces.

   c. Rip-rap shall be thoroughly compacted as it is installed and shall be bedded with gravel between pieces.

   d. Rip-rap shall be thoroughly compacted as it is installed and the finished surface shall be even and tight.

   e. Voids between the Rip-Rap shall be filled with mortar grout.

D. Acceptance Tests

1. Acceptance tests will be conducted by the Engineer to determine the acceptability of the sewers as constructed. The Contractor shall furnish suitable assistants to help the Engineer during the conduction of the tests.

2. Each section of sewer line between manholes is required to be straight and uniformly graded. Each section shall be lamped.

3. All defects in the sewers shall be repaired to the satisfaction of the OWNER.

SUBDRAINAGE SYSTEMS

I. General

A. Work Included:
   Drainage tile system with filter wrap, complete with required couplings and accessories
B. Related Work:
   1. Site Grading
   2. Trenching, backfilling and compacting
C. Reference Standards:
   ASTM F-405-W
D. Materials
   1. Drainage Tile
      ASTM F-405 perforated corrugated polyurethane tubing by Advanced Drainage System, Chagrin Falls, Ohio complete with required couplings and fittings
   2. The Tubing shall be wrapped with the nylon filter sock.

II. Installation

A. Hand trim excavating to required elevations. Do not over excavate. Remove large stones or other hard matter which could damage drain tile.
B. Have drain tile ready for installation.
C. Place a four inch(4") thick bed of filter aggregate.
D. Install the drainage tile on the filter aggregate bed.
E. Ensure complete connection to storm sewer using perforated pipe.
F. Cover the pipe with filter aggregate to top of trench and compact to 90% Modified Proctor.
G. The Catch Basins for the drain system shall be connected to this drain tile system with the 8" solid PVC pipe.

SECTION 02450.C ALL WEATHER GRASS BASE AND GEOTEXTILE MEMBRANE

ALL WEATHER GRASS BASE
PART I - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Conditions of Contract, Special Provisions, apply to the work of this Section.

1.02 DESCRIPTION OF WORK

A. Site excavation.

B. Excavation of a perimeter drainage collector network and installation of drainage grid system.

C. Construction of a stable and permeable aggregate layer primarily for Method A installation. See paragraph 2.01 E. of this section for the rock base system. See also Section –All Weather Grass System for explanation of the installation.

D. Related Work:

a. Demolition
b. Earthwork and Grading
c. Drainage Facilities
d. Synthetic Grass System
e. Geotextile Membrane

1.03 SITE EVALUATION

A. Verifying cleaning operations of organic material was sufficient to prepare for subgrade preparation.

1.04 SUBMITTALS

A. Contractor shall submit sieve analyses of the rock courses specified to verify conformance to these specifications. Submittals shall include permeability testing as specified below, at compaction percentages specified.

1.05 QUALITY ASSURANCE

A. Testing:

1. The permeability of the aggregate shall be checked by a registered geotechnical engineer from a sampling of the aggregate sieve prior to shipping the rock to the site. In addition, testing shall occur during installation at 800 ton intervals. The rock shall have a permeable rate no less than 6" per hour and shall be per Din 8035 Part 7, ASTM 2434 (constant head), or ASTM D3385 (double-ring) testing methods. In addition to the lab testing, after installation of any aggregate base cross-section, designed to conduct rainfall from the turf to the sub-soils and/or under-drain system, the finished aggregate base shall be tested, in situ for infiltration rate, using a double-ring infiltrometer (ASTM D-3385-94). The test shall be performed by a registered P.E. or certified agronomist, in at least 12 critical areas of the field, as determined by the Owner's representative. The average infiltration rate of all locations shall not be less than 6" per hour, with no one location having a rate less than 4" per hour. The Contractor is responsible to meet this performance specification, before proceeding with installation of the synthetic turf, and shall bear the cost of the on-site testing and the cost of any additional work necessary to achieve compliance with the specification.

2. All test results shall be logged and documented by the Owner's Technical Representative or Geotechnical Engineer. If at any time the processed stone base does not meet specifications, it shall be the Contractor's responsibility to restore, at his expense, the processed stone base to the required grade, cross-section and density.

3. After the contractor has independently confirmed compliance with all the above tolerances (planarity and elevation verified by a licensed surveyor and compaction, gradation, & permeability verified by Geotechnical Engineer), he shall notify the appropriate party and schedule a final inspection for approval. The contractor shall make available an orbital laser system to the Inspection Team for the inspection process.

4. All testing fees shall be paid for by the Contractor.

B. Standard Specifications: Shall mean the Department of Transportation Standard Specifications, latest active edition.

PART II - PRODUCTS

B. MATERIALS

a. Manufactured Sand
b. VDOT #8 Stone
c. VDOT #57 Stone
d. Liner: Shall be as specified in Section - Geotextile Membrane.

PART III - EXECUTION

1. EXCAVATION

a. A single benchmark shall be established prior to any excavation and maintained by a licensed surveyor of record during the entire construction process. The site shall be excavated to subgrade depth as indicated on the Plans and specified in Section Earthwork and Grading.

b. In the event of over-excavation, select-fill material shall be used to achieve design subgrade elevations. Select materials shall be as specified in Section Earthwork and Grading.

c. Proof roll and mark "soft spots" for additional compaction or correction. Use static tandem drum-type roller of not less than five (5) tons weight. Proof rolling operations shall be performed in the presence of the Engineer.

d. Excavate perimeter drainage collector trenches as shown on the Plans. The trenches shall be excavated with a minimum of 0.5% slope starting from the low point of the drainage system at the outlet extending toward the high point(s). Design of the collector trenches shall incorporate the following:

i. All loose debris shall be removed from the trenches.
ii. The trenches shall be backfilled using base materials specified in this Section.

2. UNDER DRAIN SYSTEM

a. Membrane: Verify subgrade elevations of the finished subgrade. The elevations shall conform to the elevations shown on Drawings.

b. Prior to under drain system construction, the subgrade surface shall be uniform and free of rocks, depressions, voids, and irregularities.

c. Membrane: Install geotextile membrane to subgrade and collector trenches as specified in Section Geotextile Membrane.

d. Perimeter Collector Drains: Install perforated pipe in the perimeter collector trenches. The centerline of the pipe shall coincide with the centerline of trench. The pipes shall be strong and capable of withstanding the anticipated loading without deformation.

i. A minimum of 2” of the collector trench drain rock shall be placed in the bottom of collector trenches, on top of the membrane. The crushed stone shall be compacted suitably.
ii. Fill the remainder of the collector trenches with the specified 3/4” drain rock to top of subgrade; compact suitably.

3. AGGREGATE LAYER

A. Install the impermeable base over the entire subbase and the composite drain system. The aggregate shall comprise of a minimum 4" compacted, stable, permeable, processed stone. Care shall be taken to maintain the grade designed for the subbase. The capability of the processed stone drainage layer to meet the stability and permeability requirement shall be determined by a certified laboratory prior to construction of the course. The processed stone layer shall be compacted to a minimum density of 95%. Nuclear density tests shall be performed during aggregate placement and rolling to ensure specified compaction.

4. INSTALLATION OF TOP LEVELING LAYER

A. Handling and Placement:

1. Prior to aggregate placement, remove any excess or contaminated backfill from the drainage trenches.
2. Should any separation of the materials occur, during any stage of the spreading or stockpiling, the Contractor shall immediately remove and dispose of segregated material and correct or change handling procedures to prevent any further separation. Double handling of materials shall not be allowed.
3. The Contractor shall utilize laser control equipment for the grading of the processed stone to ensure accuracy in the grade tolerances of +0" to -1/4".
4. Install processed stone base, from sideline toward center-line, parallel to the composite drain network, to the lines and grades shown on the drawings. Under no circumstance shall the material be pushed more than 30' from the point of discharge.
5. The Contractor shall shape the complete surface of the processed stone and continue until the deviation from the required elevation does not exceed a maximum deviation from grade of +0" to -1/4" in ten feet (10'), when measured in any direction using a 10' straight-edge.
6. Each layer shall be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation of the aggregates), preferably a self-propelled paving machine or small laser controlled low ground pressure (LPG) dozer.

B. Compaction and Planarity:

1. The processed stone shall be compacted to a minimum density of not less than 95% of maximum density as determined by ASTM D698 and measured using a nuclear method.
2. Proofroll wherever possible and mark "soft spots" for additional compaction or correction. Use static tandem drum-type roller of not less than five (5) tons weight. Proof rolling operations shall be preformed in the presence of the Engineer.
3. The finished surface shall not deviate (tolerance-to-grade) from designated compacted grade. This means that the surface shall not deviate more than 1/4" in 10' (any direction) when placed under a10 foot straight edge. This tolerance is required over the entire field.

C. Areas that deviate shall be marked with spray paint and corrected with 1/4” to 3/8” crushed stone or granite chips (limestone will not be acceptable) and rolled tight to achieve proper density. Such remedial actions shall be done by hand and rechecked by means of test procedures described above.

D. Testing:

1. The surface of the processed stone course shall be well drained at all times. No standing water shall be permitted at any time. The permeability of the aggregate shall be checked per Din 8035 Part 7, ASTM 2434 (constant head), or ASTM D3385 (double-ring) testing methods. Test samples shall be taken (at a minimum of) one sample per every 5,000 square feet or as otherwise directed by the Owner’s Representative.

2. All test results will be logged and documented by the Owner's Technical Representative or Geotechnical Engineer. If at any time the processed stone base does not meet specifications, it shall be the Contractor's responsibility to restore, at his expense, the processed stone base to the required grade, cross-section and density.

3. After the contractor has independently confirmed compliance with all the above tolerances (planarity and elevation verified by a licensed surveyor and compaction, gradation, & permeability verified by Geotechnical Engineer), he shall notify the appropriate party and

schedule a final inspection for approval. The contractor shall make available an orbital laser system to the Inspection Team for the inspection process.

GEOTEXTILE MEMBRANE
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Provide all labor, material and equipment necessary to treat the compacted subgrade of the new synthetic grass area with a vegetation sterilant.

1.03 SUBMITTALS

A. The Contractor shall submit a sample of the proposed geotextile membrane prior to installation of the product. This is to be submitted at the time of contract award so as to assure the delivery of this product in time to meet installation schedules.

B. The material shall be installed in 12-foot wide rolls. Geotextile filter fabric shall be used to line the new drainage trench on three sides (not covering the top).

C. The material shall be overlapped at all edges and head seams and taped with a 2" duct type tape.

D. All overlapped material shall be overlapped by 12".

PART 2 – PRODUCTS

2.01 MATERIALS

A. Soil Sterilant shall be: The materials for this work shall consist of Casoron as manufactured by Uni Royal, Finale, Roundup or Primitrol. A letter from the state DEP indicating that this material is registered with them and is suitable for this application is required before use. No fuel oils or petro chemicals shall be used.

DESCRIPTION:

Provide all labor, material and equipment necessary to treat the compacted subgrade of the synthetic turf and areas indicated with a vegetation sterilant.

MATERIALS:

The materials for this work shall consists of Finale as manufactured by Monsanto, or Roundup. A letter from the state DEP indicating that this material is registered with them and is suitable for this application is required before use.

CONSTRUCTION METHODS:

The method and rate of application shall be per the manufacturer's instructions for a total kill of vegetation, a copy of which will be provided the Engineer for approval prior to use. The individual applying this material must be licensed with the appropriate State agency.

The applications shall not exceed the limits of this contract. The amount of sterilant required for this work is one gallon per 5,000 square feet of undiluted material. The sterilant shall be applied in a diluted form of 20 parts water to 1 part sterilant (or as recommended by the manufacturer).

Care must be taken to avoid all lawn and planted areas from receiving this material. Any damage caused to these areas by this material shall be corrected by the contractor at no additional cost to the Owner.

BASIS OF PAYMENT:

There shall be no separate payment for this work. All labor, materials and equipment shall be included in the lump sum price for the Contract.

B. The geotextile shall be:

1. The geotextile shall be of a 6 oz. non-woven, mechanically bonded construction and consist of long-chain polymeric fibers composed of polypropylene or polyester. The fibers shall be oriented into a multi-directional stable network. The geotextile shall be free of any chemical treatment or coating which reduces permeability and shall be inert to chemicals commonly found in soil. The geotextile shall conform to the mechanical and hydraulic property requirements listed below:

2. Required

Property	Value*	Test Pressure
Tensile Strength	230 lbs.	ASTM D-1682
Tensile Elongation	50%	ASTM D-1682
Mullen Burst	465 psi	ASTM D-3786
Trapezoidal Tear Strength	95 lbs.	ASTM D-4533
Puncture Strength	120 lbs.	ASTM D-751_
Apparent Opening Size	<=0.210 mm	COE CW-02215
Permeativity	1.0 gal/sec/sy	ASTM D-4491

*The Required Value refers to the minimum value, determined from any on test performed on any one sample, associated with the geotextile's weaker principal direction. Therefore, the Required Values are absolute minimum values not statistically derived "minimum average" or "average" values.
Tension testing machine with ring clamp; steel ball replaced with a 5/16" diameter solid steel cylinder with flat tip centered within the ring clamp.
The geotextile shall be furnished in a protective wrapping which will protect the fabric from ultraviolet radiation and abrasion. The geotextile shall be covered with the appropriate soil cover within two weeks of its placement.

PART 3 – EXECUTION

3.01 GENERAL

A. The method and rate of application shall be per the manufacturer's instructions for a total kill of vegetation, a copy of which will be provided the School for approval prior to use. The individual

applying this material must be licensed with the State DEP. Care must be taken to avoid all lawn and planted areas from receiving this material. Any damage caused to these areas by this material shall be corrected by the contractor at no additional cost to the School.

B. The geotextile shall be placed in the manner and at the locations shown on the plans. Should the geotextile be damaged during construction, the torn or punctured section shall be repaired by placing a piece of fabric that is sufficiently large to cover the damaged area plus two feet of adjacent undamaged geotextile in all directions.

SECTION 02450.D ALL WEATHER GRASS SYSTEM FOR FIELDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

D. The work under this section includes but is not limited to the installation of the geotextile membrane, new all weather grass system, in-fill materials, in-laid markings, perimeter termination and maintenance equipment.

B. The contractor is required to supply an additional 200 lineal feet of nylon or Mylar seaming tape (15" width). In addition, supply and deliver an additional 5-gallon pails of glue material used on the project. This is for each project.

D. This contractor shall supply at the end of the project:

- Greens Groomer brush unit. This unit will be three 6 foot width brushes with electric height adjustment.
- Parker or Craftman leaf sweeper: Three Minuteman Tow-Behind Parker Trailette Lawn Sweeper — 36in. Wide, Model# TE9036 with tow bar attachment to join all three.

1.03 SUBMITTALS

A. Installation Qualifications: The all weather grass sub/contractor shall demonstrate experience on at least five (5) installations of the proposed material or similar in the last year. The synthetic grass manufacturer shall certify the designated supervisory personnel on the project. A letter on the manufacturer's letterhead shall be submitted affirming the sub/contractor as competent in the installation of the material, including seaming methods, in-laid markings, termination and proper installation of the product.

B. All Weather Grass Sample: The Contractor shall submit an 6"X9" sample of the all weather grass and in-fill system proposed for this contract for approval of colors, in-fill, seaming materials and layout of the system prior to ordering the materials.

C. Warranty: The Contractor shall submit a manufacturer's warranty listing an eight (8) year guarantee against Ultra-violent ray fading, degradation, or defects, such as excessive wear of defibrillation. The guarantee shall include and cover that the product will not decrease in pile height by more than 15%, decrease in face weight (without in-fill) by more than 20% and not exceed a G-max (force reduction) of 120 G's initially and not exceed 135 G's over the guarantee period. The Contractor is required to

perform the necessary testing during a scheduled time at least one time per year during the guarantee period. The results of the testing shall be submitted to the School within 30 days of each test. Failure to submit the results will serve as notice to perform such testing by the School to determine the extent of the needs under this guarantee.

The Contractor is required under this guarantee to supply and install all in-fill materials and all weather grass to maintain the performance levels of this guarantee.

E. Testing and Quality Control: Submit to the Project Manager a copy of the results certified by an independent testing laboratory for the following tests performed on the synthetic grass system.

Pile Yarn Type	Film 100% Polyethylene Fiber
Yarn Denier	ASTM D-1577
Yarn Breaking Strength	ASTM D-2256
Yarn Melting Point	ASTM D-789
Pile Height	ASTM D-418
Pile Weight	ASTM D-418
Total Weight	ASTM D-418
Backing Perforations	ASTM D-418
Tuft Bind (Without in-fill)	ASTM D-1335
Tuft Bind (With in-fill)	ASTM D-1335
Grab Tear Strength	ASTM D-1682
Impact Attenuation	ASTM D-355
Pill Burn Test	ASTM D-2859

E. Maintenance and Operating Data: Submit to the Project Manager a copy of maintenance and operating data for the all weather grass system. Provide descriptions of all equipment recommended for the maintenance, repair, citing turf and activities not recommended relative to the warranty. Include maintenance recommendations including coverings for special events, small repair procedures, minor seam repair, discussion of the precautions to be practiced, general maintenance and uses to avoid to protect the all weather grass system.

F. Site Acceptance: As apart of this contract, this contractor shall be responsible to oversee the installation of the base and drainage and to comment on any problems or conflicts that may be discovered. Upon completion of the base work, submit a letter confirming the site inspection has been performed, noting any discrepancies, problems and/or conflicts. A summary of certification of the acceptance of the base and drainage shall be submitted.

1.04 STANDARD SPECIFICATIONS FOR LAYOUT AND RULES

A. All markings shall be performed using selected colors of turf materials.

1.05 FIELD SLOPE

A. Each field shall be installed with a SLOPED surface. The slope of the field may not exceed a finish profile of 0.25% grade for the Base Bid. This will be maintained throughout. Any modification to this slope shall be submitted in advance to the Project Manager for final review and approval.

1.06 DELIVERY, STORAGE AND HANDLING

Packing and Shipping: Deliver products in original unopened packaging with legible manufacturers' identification. All materials shall be stored in a dry place out of the direct sunlight.

A. Bulk Materials: Deliver materials in clean, washed and covered trucks to eliminate contamination during transportation. On site stockpiling locations to be coordinated with the School. Stockpile only in areas free of debris and away from drainage routes. Cover all materials with plastic or geotextile if materials are to be stockpiled more than 48 hours.

1.07 FIELD SYSTEM HOLD HARMLESS

The contractor shall hold the School, Project Manager and Field Consultant harmless from infringement of any current or future patent issued for the all weather grass system, fibers, backings, including shock pad (if required), installation methods and vertical draining characteristics. The successful Proposer will be required to submit a letter for consent from their surety. Surety will indemnify the requirements.

F. FIELD DIMENSIONS AND LAYOUT

The Contractor will be responsible for furnishing, setting and marking all lines, seams and markings for the field. The Contractor shall at all times maintain all necessary benchmarks and control points to locate all events and markings.

1.09 PROTECTION OF UTILITIES AND STRUCTURES

This Contractor shall take special care to protect all field and stadium structures and utilities.

1.10 WARRANTY OF ALL WEATHER GRASS SYSTEM

A. The Warranty/Guarantee shall cover, in general, the usability of the turf system (and pad if required); accessories use characteristics and suitability of the installation. All items covered by the warranty are to be replaced or repaired with new materials, including installation at the sole expense of the warranting contractor for a period of eight (8) years to the School from the date of substantial completion. The field materials shall be guaranteed for the designated uses as follows:

1. Marching Band
2. Football
3. Soccer
4. Physical Education exercises
5. Physical Education activities
6. Lacrosse
7. Field Hockey
8. Rugby
9. Pneumatic rubber tired maintenance and service equipment
10. Pedestrian traffic and other similar uses

B. A principal of the applicable firm, duly authorized to make contracts, shall sign the turf contractor warranty. The term "contractor" contained herein means the firm furnishing the warranty. "Owner" is the USD Board of Education. If the turf manufacturer of the synthetic grass system is not the same entity as the contractor, the warranty shall be co-signed by the manufacturer and the installation contractor.

1.11 FORM OF WARRANTY OF THE ALL WEATHER GRASS SYSTEM

A. Contractor hereby warrants to the School, subject to the limitations and conditions set forth below, that its all weather grass system consisting of the all weather turf described as _____, the shock-absorbing under-pad (if necessary) described as _____, and the adhesives used in the installation, are free from defects in material and workmanship and shall, for a period of Eight (8) years from the date of acceptance by the School, remain serviceable for the activities as listed above.

B. Contractor warrants to the School that it's all weather grass materials shall not fade, fail, shrink, wrinkle or reflect excessive wear. Contractor shall, at their sole expense and cost, replace such areas of the all weather grass system not performing to these standards for the life of the warranty.

C. Definitions:
   1. The term "not fade" in the context of this warranty shall mean that the all weather grass material remain a uniform shade of green or the other colors installed with no significant loss of color as defined by not greater than 20% loss or shade reduction.
   2. The term "not fail" or "excessive wear" as used in the context of this warranty shall mean that the length and weight of the face yarn or pile material in the all weather grass surface shall not have been decreased by more than 8% per year according to ASTM D418, nor exceed 20% during the warranty period. In the event that the all weather grass materials do not retain its fiber height or shock absorbency and is consequently no longer serviceable during the warranty period, the Contractor shall, at their sole expense, replace such portions of the system that are no longer serviceable.
   3. The term "serviceable" in the context of this warranty shall mean that the all weather grass material shall have a maximum '"G" force value according to Procedure A, B, or C of ASTM D355, not exceed 120 G's at any location upon installation and shall not exceed 135 G's thereafter throughout the life of the warranty period. This shall be determined by conducting dynamic cushioning tests at the six field locations as required per ASTM D355 procedures. "G" force factor values to be determined at 70 degrees F. Any increase from 120 G's to allowable 135 G's maximum shall be at a relatively uniform rate not to exceed 10 G's in any single year.

D. Where applicable, the fabric shall adhere firmly and completely to the underpad or seaming tape over the entire warranty period.

E. Contractor warrants to the School that the permeable all weather grass system shall drain vertically a minimum of 10 inches precipitation per hour for a maximum of 24 hours continuously, without visible surface ponding.

F. Contractor shall replace with new materials, at their sole expense, any damage to the all weather grass system, which extends more than one meter beyond the location of foreign combustibles, which may ignite, and fire-damage the all weather grass system. The Contractor shall not be held responsible for any incidental or consequential damages. These warranties and the Contractor's obligations here-under are expressly conditioned upon;

   1. The School making all minor repairs to the all weather grass system upon the discovery of the need for such repairs.
   2. The School maintaining and properly caring for the all weather grass system in accordance wit the Contractor's maintenance manual and instructions.
   3. The School complying with the dynamic and static load specifications established by the Contractor.

G. The warranty is not to cover any defect, failure, damage or undue wear in or to the all weather grass system caused by or connected with abuse, neglect, deliberate acts, acts of God, casualty, static or dynamic loads exceeding Contractor's recommendations.

H. Contractor shall examine the all weather turf system at least once per year or in regards to any claim that the School makes to be present at any time, to analyze the results of all tests conducted by the School or others, and to conduct such tests of their own. Contractor shall not be responsible for any costs or expenses incurred by the School or others with respect to such tests, except the Contractor shall pay for costs of all tests and analysis conducted or directed by their representative. The annual testing will be at the expense of the Contractor and the results delivered to the School within 60 days of the testing.

I. In the event the Contractor does not respond to the School's written notice within 10 days of receipt of the notice or does not submit, schedule and execute corrective work within 60 days (weather permitting), the School has the option of having the work performed at the expense of the Contractor.

J. The Contractor will be given 7 days notice in the form of a certified letter notifying the Contractor of the end of the 60 day scheduling period.

K. Sample form of warranty herein set forth is a suggested for use for the work under this section. Manufacturers' standard form of warranty may be used provided conditions specified herein are incorporated. All claims by the School under this warranty must be made in writing to the Contractor's address.

Within 30 days after the School learns of the defect, giving rise to the claim. This warranty shall constitute a contract made in the State of Virginia and shall be governed by the laws of that State.

PART 2 – MATERIALS

2.01 GENERAL

A. The field surfacing system shall be a vertically draining permeable all weather grass system consisting of all weather grass like pile that shall be tufted into a triple layer synthetic backing. The final coating shall be a polyurethane based material.

B. The suppliers listed are capable vendors for the specified material. This specification will supercede any references to the vendor's specifications or product literature. The specification is meant to identify the quality and quantity of the specific components and performance results. Any material exceeding the specifications shall be considered as an equal. Any material with variations from the specifications shall be approved by the Owner prior to acceptance under this specification and contract.

The All Weather Grass Suppliers:

- FastGrass, by U.S. Track and Turf, Uvalde, TX (210) 831-6772
- Sprinturf, by Specialties Surfacing, Conshohocken, PA (610)828-6500
- ForeverGreen, by Forevergreen Fields, Levittown, PA (215) 547-1000
- ProGreen, by Progreen Sports Surfaces, Denver, CO. (508) 954-1000
- ProGrass, by ProGrass Sports, Pittsburgh, PA
- Equal Products Approved by the School
- Mondo Turf
- Hellas Construction & Partners (RealGrass Matrix Synthetic Turf)
- Field Turf Tarkett

C. The entire system shall be resistant to weather, insects, rot, mildew, fungus growth and be non-allergenic and non-toxic. The entire system shall be constructed to maximize dimensional stability, to resist damage and normal wear and tear from its designated uses and to minimize the ultra-violet degradation.

D. All adhesives used in bonding the system together shall be resistant to moisture, bacterial and fungus attacks, and resistant to ultra-violet rays at any location upon installation.

E. Include all labor, materials, equipment, transportation and services to install complete all-weather grass system.

2.02 DYNAMIC CUSHIONING REQUIREMENTS OF THE ALL WEATHER GRASS SYSTEM

A. The dynamic cushioning of the combined turf and in-fill system (and pad if required) shall not exceed a maximum of 120 G's at 70 degrees F. per ASTM 1936-98, F355, Procedure A at any location within 30 days of the installation. The system shall not exceed 135 G's over the warranty period.

B. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturers' identification. All materials shall be stored in a dry place out of the direct sunlight.

C. Rubber infill shall be ambient ground and produced of 100% recycled automobile tires. The material shall have a size not to exceed 14 mesh nor smaller than 20 mesh. The fine particles shall not exceed 7% by volume.

D. The in-fill system shall have not less than 3 pounds per square foot installed. Any system that requires less rubber as in-fill shall be required to use an in-situ shock pad system as a force reduction vehicle. The pad shall be designed and tested by the Contractor to show compliance with the shock attenuation requirements.

E. If a combination of sand and rubber are used as the in-fill system, the rubber content shall be not less than 3 pounds per square foot and the sand shall not be less than 3 pounds per square foot.

2.03 PERMEABILITY REQUIREMENTS OF THE ALL WEATHER GRASS SYSTEM

A. After the subgrade is compacted and before the stone base and stone screenings leveling course is fine graded, compacted and made ready for the turf, the per section 02922 – Sterilant and Geotextile. Geotextile membrane (filter type fabric) is installed under stone base.

B. The combined turf and in-fill system (and pad if required) shall drain vertically at a minimum of 10 inches of precipitation per hour for 24 hours continuously, without visible surface ponding.

2.04 ADHESIVE MATERIAL PROPERTIES

A. Adhesive material to adhere the synthetic turf shall be:
   1. Polyurethane 34G or 34 S-3 adhesive as manufactured by Synthetic Surfaces, Inc. of Scotch Plains, NJ. The adhesive shall be applied at the rate not to exceed 60 square feet per gallon.
   2. Polyurethane Turf Grip adhesive as manufactured by ITW (Illinois Tool Works) of Rockland, MA. Material shall be solvent free. Application rate is not to exceed 60 square feet per gallon.

3. Sta-1000, two component adhesive as manufactured by Sports Turf Direct of Finleyville, PA. Material shall be mixed in strict accordance with manufacturers specifications but not less than 5 parts A to 1 part B. Application rate is not to exceed 60 square feet per gallon.
4. Hot melt glue method using National Adhesives (281) 731-8949 Product #34-5637. Application temperature shall be 280 degrees or more and shall be applied at the rate of 7 square feet per pound.

B. The adhesive shall have the same warranty period as the all weather grass system.

2.05 ALL WEATHER TURF PILE SURFACE

A. The pile surface shall provide good traction in all types of weather with the use of conventional “sneaker type shoes” and composition, molded sole athletic shoes. The pile surface shall be suitable for both temporary and permanent line. Markings and permanent markings using a rubber base paint where applicable.

B. The pile height shall be constructed to allow a total of 3/4” of free fiber after the in-fill materials are installed.

2.06 ALL WEATHER TURF SYSTEM MATERIAL COMPONENTS

A. Pile fibers shall both Olive green and Forest green to resemble freshly grown natural grass with alternating panels in appearance, texture and color (except for the color turf for markings).

B. Fibers shall be combination of parallel slit film and monofilament polyethylene film (8000 denier, 1.8mm wide and 1.2mm monofilament pattern) 100% Polyethylene fiber having a density of not less than 115 Microns for the slit film. The monofilament shall have a spine reforeced cross section of not less than 280 microns at the center and 130 microns on the wings. Total fiber weight shall be not less than 54 ounces per square yard.

C. Pile surface shall be nominally uniform in length not less than 2.5”.

D. The fibers are tufted through a triple layer (three separate layers) synthetic backing material.

E. The final coating or secondary backing shall be a moisture cure polyurethane. This backing shall be not less than 26 ounces. Latex backing material is acceptable. The secondary backing of Latex or Polyurethane coating shall be uniform and monolithic when cured.

F. If sewn, all turf seams shall be constructed of reinforced backing material or sewn with high strength polyester fiber cord. Sewn seams shall be a “DOUBLE LOOP STITCH” type seam sewn line. Seams shall lay flat after in-fill.

G. All glued seams shall have a 12” wide seaming tape of nylon or Mylar, fully coated with adhesive. All seams shall not have any adhesive applied to any exposed fibers. All graphics or markings can be in-laid, shaved or cut-in.

H. All turf shall be perforated for drainage after the final backing coating. The perforations shall be not less than 1/4” in diameter and have a uniform spacing of not less than 4” on center. Perforations shall be complete and full diameter for a minimum of 95% of the each roll.

1. Perforations shall be inspected by inserting a ¼" drill bit
2. Bit shall be able to pass thru each perforation with 3 lbs. of pressure.

I. On-site perforations are to be inspected prior to installation of the product.

J. Fabric surface shall be constructed and installed in minimum widths of 15 feet with no longitudinal or transverse seams, except for inlaid lines with a finished roll assembly. The seams shall be 15'-0" apart and shall have the white 5-yard line tufted into each panel for the full width of the field. Rolls that do not comply with the proper length or conform to the seaming diagram as submitted prior to the installation, shall be rejected from the site. No fitted pieces will be allowed to true alignment.

***Note: Field:

The field area shall be installed with alternating green color panels.
45 yard line to the 45 yard line shall be Forest Green.
Each 40 yard panel shall be Olive Green.
Each 35 yard panel shall be Forest Green
Each 30 yard panel shall be Olive Green.
Each 25 yard panel shall be Forest Green
Each 20 yard panel shall be Olive Green.
Each 15 yard panel shall be Forest Green.
Each 10 Yard panel shall be Olive Green.
Each 5 Yard Panel shall be Forest Green.
Each end zone shall be Olive Green.
Football Field perimeter shall be Forest Green.

2.07 PERFORMANCE AND TEST REQUIREMENTS

A.	Melting Point	ASTM D789	235 degrees F.
B.	Specific Gravity	ASTM D792	.950 to .960
C.	Breaking Strength	ASTM D5034	Length 283 lbs./ft. Width 208 lbs. /ft.
D.	Coefficient of Friction	ASTM D5034	Dry 1.15 Wet 1.00
E.	Pill Burn Test	ASTM D2859	8 Passed/0 Failed
F.	Tuft Bind (without in-fill)	ASTM D1335	11 lbs./sq.ft.
	Tuft Bind (with in-fill)	ASTM D1335	22 lbs./sq.ft.
G.	Pile Height	ASTM D418	2-1/2" minimum
H.	Fiber Face Weight	ASTM D418	55 oz./sq. yard
I.	Fiber Construction	ASTM D418	Slit film and Monofilament strands 100% Polyethylene (1.8mm slit film and 1.2mm monofilaments).
	Gauge Width	ASTM D418	Not more than 3/8"
J.	Fiber Denier	ASTM D418	8,000 Denier/ tuft.
	Fiber Thickness	ASTM D418	115 microns (minimum thickness)

K.	Fiber Manufacturers:	Ten Cote Nicolon B.V., Nijverdal, Netherlands Nexcel Synthetics, Chattanooga, TN Bonar Yarns and Fabrics, Dundee Scotland Desso, Div. of Armstrong Flooring, Lancaster, PA Tai Shan Sports USA, Burlingame, CA Riddici Yarns, Milan, Italy	
	***Note: No other fiber manufacturer shall be considered at this time.		
L.	Lead Testing:	Atomic Emission	Not more than 300 ppm
M	Secondary Backing	ASTM D418	26 ounces Latex (Black) or Polyurethane (non-pigmented)

2.08 MARKINGS

2.01 A complete field lining, marking and field boundary system with team areas limits, etc. shall be provided with the initial installation. Layouts shall be accurately surveyed and marked prior to installation.

2.02 All lines, numbers and field markings including the one-yard marks are to be tufted or inlaid with the specific colored turf. All markings shall be uniform in color, providing a sharp contrast with the turf color and shall have sharp and distinct edging. Markings shall be true and shall not vary more than 1/2” from specified width and location.

2.03 Manufacturer is to guarantee that the synthetic fiber is adaptable to painted lines.

Minimum Lining and Markings: All Green Field area with no markings.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Perform all work in strict accordance to the drawings, shop drawings and manufacturer’s specifications and instructions.

B. Verification: The Contractor is responsible for the inspecting, verifying and completing all installed work of this section.

C. Weather Permitted Conditions: The Contractor will not perform any work if the condition for working are;

1. Ambient air temperatures are below 45 degrees F.
2. Material temperature falls below 45 degrees F.
3. Rain is forecast or falling
4. Conditions exist or are pending that will be unsuitable to the installation of the system.

3.02 CERTIFICATION OF THE BASE INSTALLATION

A. THE BASE AND DRAINAGE, The Contractor is responsible for the review and acceptance of the base and drainage.

B. Upon completion of the base, this contractor will submit in written form the acceptance of the base noting any deficiencies.

3.03 DELIVERY AND INSPECTION OF MATERIALS

A. Prior to the installation of any materials and immediately upon delivery of the synthetic turf system and components to the project site, the Contractor shall inspect materials as follows:

1. For damaged or defective items
2. Measure turf pile height and roll lengths
3. Inspect the perforations and uniformity
4. Adhesives shall arrive in sealed dry containers.
5. Rubber in-fill shall arrive in large sacks or bags without tears and loose material about.
6. Rubber in-fill shall arrive dry and loose. No Rubber shall be accepted that is bulked or solid.

3.04 SCHOOL TESTING

A. The School reserves the right to submit any material, either before or after installation to any testing it deems necessary to satisfy the conditions of this contract.

B. Any material tested and found not in compliance with the contract will be rejected and replaced with material conforming to the specifications. This will be done at the sole expense of the contractor.

C. Any testing performed by the School will be at the School's expense. The contractor is responsible for the cost of all testing the fails.

3.05 TURF INSTALLATION

A. After acceptance of the base materials, any turf material with less than the 26 oz. secondary backing shall have a the 6 oz. non-woven geotextile membrane is installed under each area of the panel, the synthetic turf is staged and unrolled as necessary for a daily installation. No material will be allowed to be unrolled 24 hours prior to installation. If a shock pad is required, the in-situ pad can be installed over the accepted base. Control of the finish grade and contour shall be the responsibility of the contractor.

B. Seams:

1. All panel seams shall be securely sewn using a double stitch bagger seam and/or glued to a backing material of nylon or Mylar.
2. All panel seams spacing are to be held to a minimum of 15 feet unless prior approval of seaming diagram indicates a lesser panel.
3. All inlaid areas shall have full fastenings and no loose areas. At no time can pulling on the section separate the material.
4. All seams and inlaid areas shall be brushed thoroughly before infill materials are installed.

C. Turf Edges and Termination
All edges and ends of the turf shall be secured to a termination area. This termination shall be as detailed in the drawings. The contractor shall submit a shop drawing of this termination detail prior to any work on the site.

3.06 LINES, MARKINGS AND IN-LAID TURF

A. There are inlays for two sports for this project.
Football (White Turf)
- All five yard lines to be 4” wide
- Goal lines shall be 8” wide
- Sidelines and end lines shall be 12” wide
- Coaches boxes shall be 6 feet wide white turf – 150 feet long
- Kick off “X” s shall be at the 40 yard lines
- Five yard hash marks shall be 4” x 24”
- One Yard marks (four sets) shall be 4” x 24” inlaid white turf.
  - Note: Verify spacing of yard marks before installation.
- Twenty yard lines shall be 4” white bordered by 2” red
- Fifty yard line shall be 4” white bordered by 2” yellow for soccer.
- Ten yard field numbers on each side of the field. Numbers shall be six feet by four feet wide. Gettysburg Font.
- Camera arrows shall be inlaid at all locations as shown of the drawings.

Soccer (Yellow turf)
All lines shall be 4” wide yellow turf
Full soccer field layout with boxes, center circle, corners, etc.

3.07 INSTALLATION OF RUBBER IN-FILL

A. All in-fill materials shall be produced of 100% recycled automobile tires. No new tires, blemished tires or unused tires are to be used. There will be no evidence of steel fibers or strands in the material.

B. The in-fill material shall be installed at not less than 3 pounds per square foot allowing an exposed fiber of not less than 3/4” after finish brushing.

C. This contractor is responsible for the supply and installation of all in-fill materials and shall be required to return to the site after not less than 30 days to inspect and add in-fill materials as needed.

D. No in-fill materials shall be installed until the turf system is fully installed with all lines and markings.

E. The all weather turf shall be thoroughly brushed prior to any in-fill materials to remove any wrinkles and defibrillated the slit film.

F. The synthetic turf shall be brushed a minimum of 10 passes over each area prior to any in-fill areas.

G. The in-fill materials shall be installed in layers not to exceed 0.25 pounds per square foot per layer. If sand is added this will be performed as a mixture with the rubber prior to installation at the manufacturer’s recommendations.

H. The turf shall remain free draining at all times before, during and after the in-fill materials are installed.

3.08 GENERAL CLEANUP

A. The site shall be kept clean and free of debris throughout the installation. Empty barrels, sacks, bags and remnant materials shall be stored or disposed daily in a proper container or legal manner.

B. After completion of the entire project, the site shall have a general cleanup removing all debris remaining on the site that is not apart of the final project.

C. The cost of each unit supplied to each project shall be apart of the total proposal cost and become the sole expense of the Synthetic Turf Contractor.

SECTION 02450.E WARRANTY AND GUARANTEE

A: ALL WEATHER TURF SYSTEM:
GENERAL

- The Contractor shall be required to guarantee 100% of all labor, materials, workmanship and services for the All Weather Surface and Markings for:

- All Weather Grass System for a period of Eight (8) years. This warranty will not be subject to pro-rating of the surface for any failure due to installation or materials. The surface wear will be determined by an independent consultant acceptable to all parties.

- The guarantee for the surface systems shall remain in force for a period of not less than eight (8) Years specified from the date of written acceptance of the work.

    a. The Owner will notify the contractor in writing of any issues that require remedial work on the field area.
    b. The Contractor shall respond to the notification within 48 hours of receipt and schedule any major defect or repair within 72 hours or as weather permits.
    c. The warranty requires that the contractor shall be required to perform all required repairs in a permanent and suitable manner as deemed necessary to maintain a safe playing condition at all times.
    d. The warranty requires that in case of any major repair or replacement, the contractor is to schedule such work as to not interfere with the Owner's primary use or schedule.
    e. Any replacement or repair area shall match (as close as possible) the appearance of the existing turf.
    f. Failure to service the requirements of this warranty will be charge to the contractor.

- Any defects caused by delamination, peeling, normal abrasion or raveling that is not in original conformance with the testing specifications shall be repaired or replaced at no cost to the Board of Education during this guarantee period.

    a. In addition to the Contractor's warranty, the contractor shall be required to submit the following documents in regard to the guarantee:

        - Provide an eight year warranty for the turf product from the manufacturer for all work performed under this contract.

- Provide an eight year warranty for the fibers from the fiber manufacturer for all work performed under this contract.

- Provide an eight (8) year surfacing manufacturer and installer written guarantee for the synthetic grass.

- Documents shall be submitted to the School District Board of Education prior to final payment.

- The Contractor will be responsible for all tests that fail the specification. The School reserves the right to submit the surface to the above tests at any time during the length of the guarantee. Consideration will be given to the time and use of the surface.

- This warranty does not cover excessive wear of the surface caused by misuse. The School will be given an instructions and caretaking procedures before final acceptance. This is to follow the maintenance guidelines as specified by the surfacing manufacturer.

END OF SECTION 02450

SECTION 07553 - SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

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. SBS-modified bituminous membrane roofing.
      a. Torched Applied
   2. Roof insulation.

B. Related Sections include the following:
   1. Division 5 Section “Steel Deck”
   2. Division 6 Section “Rough Carpentry”
   3. Division 7 Section “Flashing and Sheet Metal.”
   4. Division 7 Section “Roofing Accessories”
   5. Division 7 Section “Joint Sealants.”
   6. Division 15 Section “Plumbing Specialties”

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and the National Roofing Contractors Associations (NRCA) glossary of roofing terms, for definition of terms related to roofing work in this Section.

B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt, within a range of plus or minus 25 deg F, measured at the mop cart immediately before application

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer.

C. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG's “Approval Guide” for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
   1. Surface Burning Characteristics: UL Class A
   2. Fire/Windstorm Classification: Class 1-90; roof system attachment to the deck shall be in accordance with the requirements of FMG Class 1-90 for a new steel deck. Provide a roof system supplied by a roofing manufacturer with a minimum FMG 1-90 wind uplift rating over a new steel deck.
   3. Hail Resistance: MH

D. All materials, installations, and fastenings shall meet the specifications of the primary membrane manufacturer for the No Dollar Limit roof system warranty. As such, the system warranty shall cover all membrane and flashing materials, installations, and their attachment, as well as all insulation, and accessory materials, installations and their attachment.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated in Part 2 of this Section.

1. If a listed product is not required for the completion of the project, submit a letter stating that the product is not required. If it is determined later in the project that the product is required for completion of the project, a submittal will be required prior to installation of product.

B. Shop Drawings: Provide manufacturer approved Shop Drawings showing roof configuration, fastener patterns, and details at perimeter edges on all roof sections included in the work, for all flashings, penetrations, scuppers, edges. Identify work by others; Contractor is responsible for coordinating provision of all components included in accepted shop drawings. provide layouts at 1/4-inch per 12-inches and details at 1-1/2-inches per 12-inches.

1. Base flashings, cants, and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.
4. Insulation fastening patterns.

C. LEED Submittals: Refer to Division 1 Section “Sustainable Design Requirements”.

1. Credit MR 4: Manufacturer’s certification letter and product data from manufacturer indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating material cost.
2. Credit MR 5: Manufacturer’s certification letter and product data from manufacturer indicating location and distance from Project of material manufacture and point of extraction, harvest, or recovery for each raw material. Include statement indicating material cost and the fraction by weight that is considered regional.
3. Credit SS 7.2: Manufacturers’ product data indicating roof material compliance with Solar Reflectance Index requirement.

D. Samples for Verification: For the following products:

1. 12-by-12-inch square of roofing membrane sheet(s)
2. 12-by-12-inch square of roof insulation.
3. 12-by-12-inch square of walkway pad or walkway cap sheet.
4. 12-inch length of metal termination bars.
5. Six insulation fasteners of each type, length, and finish.

E. Installation Manual: Submit three (3) copies of manufacturer’s current Division “7” installation manual for roofing systems required for project. Any deviation from the printed instructions must be approved in writing by the roofing system manufacturer’s authorized representative and the Owner.

F. Submit roof layout of insulation fastening patterns specific to this project for the field, perimeter and corner areas (Zones 1, 2 and 3) of the roof that show the pattern and the area dimensions for the zones. The fastening pattern for each zone needs to conform to the latest revisions of FMG Property Loss Prevention Data Sheet 1-29, to meet a Class 1-90-rated roof assembly as specified.

G. Qualification Data: For Installer and manufacturer.

1. Installer Certification indicating the manufacturer certifies that the Installer is approved, authorized, or is licensed by the manufacturer to install the specified system and is eligible to receive the No Dollar Limit (NDL) roofing manufacturer's warranty.
2. Certification signed by roofing system manufacturer certifying that the specified system complies with requirements specified in this section.
3. Submit documentation that on-site installers have been trained and approved by the manufacturer. This roofing system must be installed by a company specializing in specified system with a minimum of five (5) years experience and a minimum of twenty (20) installations. The company must be currently listed at the time of Bid as an Approved Contractor by the appropriate Warranty Program of the panel manufacturer.
4. Submit a list of five buildings roofed with the specified system of the proposed manufacturer and clients of the Contractor. Include phone number and name of in-field person responsible for inspection approval.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

I. Maintenance Data: For roofing system to include in maintenance manuals.

J. Storage Requirements: Provide the roof system manufacturers requirements for storage of all materials to be used.

K. Warranty: Submit sample copy of manufacturer's warranty, latest edition, acknowledging and incorporating the PWCPS Warranty Rider specified. (Submit executed project warranties of completed work as directed in Division 1 Section "PWCPS – Project Closeout.")

L. Inspection Reports of Roofing Manufacturer's Representative: Submit all inspection reports as outlined in Section 1.6-H 07553.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: This roofing system must be installed by a company specializing in SBS Modified Bitumen roof application with a minimum of five (5) years experience and a minimum of twenty (20) installations. The company must be currently listed at the time of Bid as an Approved Contractor by the appropriate Warranty Program of the membrane manufacturer. There must be no deviations made without the prior written approval of the Engineer and membrane manufacturer.

B. Manufacturer Qualifications: Obtain primary products from a single manufacturer, which have produced these types of products successfully for not less than five (5) years. Provide secondary products as recommended by manufacturer of primary products for use with modified bitumen roof system specified and covered under primary manufacturer's modified bitumen systems guarantee.

C. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.

D. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for applications indicated.

E. Pre-Submittal (First)-Roofing Conference: As soon as possible after roofing subcontract award, conduct a conference with Owner, Roofing Inspector, Architect, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment. Furnish copies of product data, manufacturer's standard roofing system warranty and warranty rider for Owner approval a minimum of fourteen business days prior to conference date.

1. Review requirements (Contract Documents), submittals, status of coordinating work, availability of materials, installation facilities, and establish preliminary installation schedule. Review requirements for inspections, testing, certifications, governing regulations, insurance requirements, and proposed installation procedures.
2. Discuss temporary protection requirements for roofing system during and after installation. Discuss cold weather requirements for storage and installation of materials, if applicable to the project. Discuss possible need for temporary roofing.
3. Contractor shall take minutes of discussion, including agreements on matters of significance, and shall furnish copies of recorded discussions to each participant.

F. Preliminary (Second) Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Notify participants at lest five (5) working days before conference.

1. Meet with same participants and review the same items listed for the Preinstallation Conference. In addition review status of submittals and coordination of work related to roof construction.

G. Preinstallation (Third) Conference: Conduct conference at Project site. Review methods and procedures related to roofing system including, but not limited to, the following. Notify participants at lest five (5) working days before conference.

1. Meet with Owner, Roofing Inspector, Architect, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review cold weather requirements for storage and installation of materials, if applicable to the project.
10. Review roof observation and repair procedures after roofing installation.
11. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

H. Inspection Reports of Roofing Manufacturer's Representative: Roofing manufacturer's representative shall inspect the work and provide copies of his inspection reports to the Architect, Roofing Inspector, and Owner. The Installer shall notify manufacturer's representative of intended start date & schedule of roofing work.

1. Installer shall notify he Architect and Owner a minimum of 48 hours prior to any manufacturer visits/inspections.
2. The Installer and Roofing Manufacturer's technical representative shall inspect the substrate surfaces (deck) to receive roofing system prior to beginning installation.
3. The Roofing Manufacturer's technical representative shall inspect the work no less than three times (startup, in-progress, and end-of-installation warranty inspection) during the application of the system & submit copies of inspection reports and punch list(s) to the Architect and Owner within 7 days of the inspection
4. Manufacturer's Punch List Inspection: Upon completion of the installation, arrange for an inspection by a Technical Representative of the system manufacturer to ascertain the roof system has been installed according to the system manufacturer's current published specifications and details for a 20-year system. Make corrections to the completed roof system to comply with the Project Manual and manufacturer requirements. Provide documentation of this inspection along with manufacturer's acceptance of corrected items.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.

B. Store temperature sensitive materials in original undamaged containers in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect polyisocyanurate as stated in PIMA "Technical Bulletin 109"and as follows:
   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

E. At a minimum, materials are to be covered/protected by reinforced tarpaulins.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Begin installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Manufacturer's No Dollar Limit Warranty: Provide roofing manufacturer's single-source total roofing system 20 year term guarantee including flashing endorsement, signed by an authorized representative of roofing system manufacturer, on form published with product literature as of date of Contract Documents. The maximum value of the repair or credit will not be pro-rated

over the life of the warranty or limited to the original cost of the total roof system installation; *i.e.* a "No Dollar Limit" warranty. The guarantee shall include materials and installation of the entire roofing system above the deck to remain intact and watertight for guarantee period, signed by manufacturer and roofing system installer.

B. Provide an addendum to the manufacturer's warranty on the "Roofing Warranty Rider" form provide in the project manual. The Warranty Rider must be acknowledged in and attached to the standard manufacturer's warranty.

C. Provide two-year Contractor's Warranty for materials and workmanship. If the contractor chooses to install a coated SBS Modified Bituminous Cap Sheet roofing system.

D. ***The contractor shall provide a legally binding services contract agreement to Prince William County Public Schools for recoating the entire roof surface, including flashings at a five and ten year interval from the substantial completion date of the roofing system for a total of two coating restorations. The services contract agreement shall include all materials and labor to restore the roof surface to the originally specified Energy Star requirements at no additional cost to the owner. All cost for the services contract agreement shall be factored into the contractor's bid. All materials and installation procedures of said materials shall meet the current specifications of the primary roofing manufacturer at the time of the coating restoration, with a minimum Solar Reflectance of .72 and a minimum Solar Reflective Index (SRI) of 87***.

E. ***Prior to the start of the coating restoration, the contractor shall submit documentation from primary roofing manufacturer to Prince William County Public Schools that they are aware of the coating restoration to the existing warranted SBS Modified Bituminous roofing system. Including that the coating restoration will have no adverse affect on the existing warranty and will be included in the existing warranty for the remainder of the warranty period.***

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Available Manufacturers: Subject to compliance with requirements.

2.2 SBS-MODIFIED ASPHALT-SHEET MATERIALS

A. SBS Modified Bitumen Base Ply: ASTM D 6162, Type II, Grade S or ASTM D 6164, Type I, Grade S, minimum 120 mils thick, smooth surfaced, reinforced membrane compliant with system warranty requirements; suitable for heat welding application method specified.

B. SBS Modified Bitumen Cap Sheet: ASTM D 6162, Type I, Grade S, ASTM D 6164, Grade S, Type II, or ASTM D 6164, Grade G, Type II with a Class A fire rating (FR), minimum 135 mils thick, polyester-reinforced, SBS-modified asphalt sheet; reflective white topside, Energy Star rated with a minimum Solar Reflectance of .72 and a minimum Solar Reflective Index (SRI) of 87; suitable for heat welding application method specified.

1. If the contractor chooses to install a coated SBS Modified Bituminous Cap Sheet roofing system. The contractor shall provide a legally binding services contract agreement to Prince William County Public Schools for recoating the entire roof surface, including flashings at a five and ten year interval from the substantial completion date of the roofing system for a total of two coating restorations. The services contract agreement shall include all materials and labor to restore the roof surface to the originally specified Energy Star requirements at no additional cost to the owner. All cost for the services contract agreement shall be factored into the

contractor's bid. All materials and installation procedures of said materials shall meet the current specifications of the primary roofing manufacturer at the time of the coating restoration, with a minimum Solar Reflectance of .72 and a minimum Solar Reflective Index (SRI) of 87.

2. Prior to the start of the coating restoration, the contractor shall submit documentation from primary roofing manufacturer to Prince William County Public Schools that they are aware of the coating restoration to the existing warranted SBS Modified Bituminous roofing system. Including that the coating restoration will have no adverse affect on the existing warranty and will be included in the existing warranty for the remainder of the warranty period.

2.3 BASE FLASHING SHEET MATERIALS

A. Base Ply, SBS Modified Bitumen Flashing: ASTM D 6162, Type II, Grade S or ASTM D 6164, Type I, Grade S, minimum 120 mils thick, smooth surfaced, reinforced membrane compliant with system warranty requirements; suitable for heat welding application method specified.

B. Cap Sheet, SBS Modified Bitumen Flashing: ASTM D 6162, Type I, Grade S, ASTM D 6164, Grade S, Type II, or ASTM D 6164, Grade G, Type II with a Class A fire rating (FR), minimum 135 mils thick, polyester-reinforced, SBS-modified asphalt sheet; reflective white topside, Energy Star rated with a minimum Solar Reflectance of .72 and a minimum Solar Reflective Index (SRI) of 87; suitable for heat welding application method specified.

1. If the contractor chooses to install a coated SBS Modified Bituminous Cap Sheet roofing system. The contractor shall provide a legally binding services contract agreement to Prince William County Public Schools for recoating the entire roof surface, including flashings at a five and ten year interval from the substantial completion date of the roofing system for a total of two coating restorations. The services contract agreement shall include all materials and labor to restore the roof surface to the originally specified Energy Star requirements at no additional cost to the owner. All cost for the services contract agreement shall be factored into the contractor's bid. All materials and installation procedures of said materials shall meet the current specifications of the primary roofing manufacturer at the time of the coating restoration, with a minimum Solar Reflectance of .72 and a minimum Solar Reflective Index (SRI) of 87.

2. Prior to the start of the coating restoration, the contractor shall submit documentation from primary roofing manufacturer to Prince William County Public Schools that they are aware of the coating restoration to the existing warranted SBS Modified Bituminous roofing system. Including that the coating restoration will have no adverse affect on the existing warranty and will be included in the existing warranty for the remainder of the warranty period.

2.4 WALKWAYS

A. Walkway Cap Sheet Strips: Provide manufacturer's compatible walkway cap sheet system. Contrast color to cap sheet, selected from manufacturer's standards

2.5 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Base Insulation: ASTM C 1289, Type II, Class 1, Grade 2 – 20 psi minimum compressive strength polyisocyanurate foam. Provide 4-foot by 8-foot boards only. Provide two layers of 2" insulation.

C. Tapered Insulation: Provide factory-tapered insulation boards meeting ASTM C 1289 fabricated to slope of 1/4 inch per 12 inches. Provide 4-foot by 4-foot boards only.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. On roof sections with 1/4 inch per 12 inch slope, fabricate slope of 1/2 inch per 12 inches. On roof sections that are ½ inch per 12 inch slope, fabricate slope of ¾ inch per 12 inches. Provide 4-foot by 4-foot boards only.

E. Insulation Cant Strips: ASTM C 728, perlite or ASTM C 208, Type II, Grade 1, cellulosic-fiber.

F. Cover Board: ASTM C 1177, glass-mat, water-resistant gypsum substrate with primer-sealer, 1/2 inch thick. Provide complying product of membrane manufacturer or “Dens-Deck” by Georgia-Pacific.

2.6 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

B. Asphalt Primer: ASTM D 41.

C. Modified Asphalt Elastomeric Flashing Cement: Modified asphalt roofing cement (“MBR”), asbestos free, of consistency required by roofing system manufacturer for application. ASTM D4586 Type I, Class II.

D. Mastic Sealant: Polyisobutylene, plain or modified bitumen, non-hardening, non-migrating, non-skinning, and nondrying, applied between layers of metal.

E. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

1. Insulation Fasteners: Maximum length of fasteners shall be no longer than 1-inch longer than the thickness of insulation being attached. 3-inch steel plates shall be used for the attachment of the insulation.

2. Membrane Fasteners: Maximum length of fasteners shall be no longer than 1-inch longer than the thickness of the insulation in the system. 2-inch steel plates shall be used for the attachment of the membrane.

F. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, white color.

G. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify tapered profile solid wood blocking is in place at parapet cap to receive roofing membrane flashing installation, and metal coping.
4. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 Section "Steel Deck."
5. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Wood blocking in addition to that indicated on drawings for roof system installation is not included in the NRCA standard details or design standard for this roof. Provide wood blocking in addition to that indicated on drawings if required or preferred by roofing manufacturer as a condition of warranty as work of this section, subject to Architect's approval and in conformance with Division 6 Section "Rough Carpentary" requirements, at no additional cost to the Owner.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 WEATHER CONTIONS

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufactures' recommendations and warranty requirements.

B. Follow roofing membrane manufacturer and NRCA guidelines for inclement weather or when air temperature may fall below 40 degrees Fahrenheit. Do not apply roofing membrane to damp, wet, or frozen deck substrate.

C. Maintain a daily log of working hours and the minimum and maximum air temperatures experienced during the hours and the presence, amount and severity of precipitation.

3.4 INSULATION INSTALLATION

A. Comply with roofing system manufacturer's written instructions for installing roof insulation.

B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips with MBR adhesive, as specified in 2.4 C of this section, at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations. Fit sloping insulation surfaces to meet smoothly without plateaus.

E. Install multiple layers of insulation under area of roofing to achieve required thickness at a Long Term Thermal Resistance (LTTR) value of 25 per ASTM C 1289-10. Where overall

insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

1. At sloping deck, provide two layers of 2 inch thickness polyisocyanurate for total 4.0 inch thickness (LTTR = 25). Crickets, cants, and tapered edge strips are also in addition to the isocyanurate insulation board thickness. Install coverboard over this insulation.
2. At level decks, provide polyisocyanurate base insulation thickness indicated in Paragraph 2.5B of this Section, in two layers. Install tapered insulation over base layer to provide adequate slope to roof. Crickets, cants, and tapered edge strips are also in addition to the isocyanurate insulation board thickness for the primary roof planes. Install coverboard over this insulation.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water. Install at a minimum, a 4-foot by 4-foot sump at all primary drains.

G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

H. Mechanically Fastened and Adhered Insulation: Install and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation according to requirements in FMG's “Approval Guide” for specified Windstorm Resistance Classification at corner, perimeter and field of roof.
2. Install polyisocyanurate fill and subsequent layers of insulation in full moppings of hot asphalt in order to meet the project wind uplift requirements and the manufacturer warranty requirement.
3. Install tapered insulation in full moppings of hot asphalt in order to meet the project wind uplift requirements and the manufacturer warranty requirement.

I. Provide crickets, as indicated and required, on the high side of all penetrations to allow for proper drainage of the roof system.

J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and secure to roof deck. Tape joints if required by roofing system manufacturer.

1. Install coverboard in full moppings of hot asphalt in order to meet the project wind uplift requirements and the manufacturer warranty requirement.

3.5 BASE SHEET INSTALLATION (as required by roofing manufacturer)

A. Make surfaces free of moisture, foreign material, oil, grease, dirt and other debris before start of base sheet application.

B. Install over cover board as recommended by the primary membrane manufacturer. Attach base sheet in accordance with manufacturer’s requirements, these specifications, and to meet current FM 1-90 uplift rating at steel deck.

3.6 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's “Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing” and ARMA/NRCA’s “Cold Weather Application Recommendations for Modified Bitumen Roofing.”

B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Cooperate with Owner’s Roof Inspector.

D. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.7 SBS-MEMBRANE INSTALLATION (TORCH APPLIED)

A. Install modified bituminous interply sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:

1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
2. Torch apply base ply in accordance with the roofing manufacturer’s printed instructions an to meet FMG’s 1-90 wind up lift standard
3. Adhere the cap sheet membrane to the base ply by the following methods applied in accordance with the requirements of the roofing system manufacturer.
   a. Torch apply cap sheet to base ply
4. Do not burn membranes and their respective reinforcements.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

1. Repair tears and voids in laps and lapped seams not completely sealed.
2. Embed granules in end laps to allow for proper adhesion of laps.

C. Install roofing membrane sheets so side and end laps shed water.

D. Granule Surfacing: Promptly after installing cap sheet, seed the asphalt flood-out with granules for uniform granule surface appearance of roofing.

3.8 FLASHING AND STRIPPING INSTALLATION

A. Install composition flashings at cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

1. Prime substrates with asphalt primer if required by roofing system manufacturer.

B. Flashing Sheet Application: Adhere flashing sheets to substrate by the following methods applied in accordance with requirements of the roofing system manufacturer.

1. Torch apply base ply flashing sheets to substrate.

C. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane as required by roofing system manufacturer.

D. Install base layer of flashings within ½-inch of counter-flashings to not less than 4-inches onto roof membrane and top layer of flashings, torch-grade cap sheet membrane, within ½-inch of counter-flashing to not less than 8-inches onto roof membrane

E. 3-inch minimum side laps on flashing with granules embedded on cap sheet to provide proper adhesion of flashing sheets.

F. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing. Space fasteners at not greater than 6" o. c.

G. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

H. Roof Drains:

1. The flange of the drain bowl shall be cleaned of grease and dirt and shall be dry.
2. The modified roofing base ply shall be neatly trimmed to the size of the bowl opening. Apply the roofing membrane in the area adjacent to and immediately surrounding the roof drains. The base ply shall extend under the roof drain clamping ring.
3. Lead flashing for roof drains shall be in one piece and provided with a hole one inch less in diameter than the size of the roof drain bell. The lead flashing shall be primed on both sides and evenly coated with modified elastomeric asphalt cement on the underside, then pressed into place over the drain flange and roofing. The lead shall be tapped into the bowl to fit closely to the vertical wall of drain.
4. Strip-in the lead prior to top ply installation with additional layers of base ply.
5. Apply the modified bitumen top ply over the base ply and lead flashing so that it extends under the clamping ring. Install top ply so that no sides or end laps are within 6 inches of the clamping ring.
6. Install primary and secondary (overflow) drains clamping ring in a bed of modified asphalt elastomeric flashing cement and tightly secure with all bolts. All drain bolts and washers are to be ASTM A 316 stainless steel.

I. Install roof system accessories in accordance with the Project Manual, Drawings, and Manufacturer’s Specifications.

3.9 WALKWAY INSTALLATION

A. Install rooftop traffic surfacing (walkpads) in accordance with walkpad manufacturer’s specifications and as required by membrane manufacturer for system warranty.

B. Space traffic surfacing sheets evenly around all rooftop mechanical equipment, equipment frames, access points and/or as recommended by the membrane manufacturer. Leave 6-inch gaps between walkpad sections to facilitate drainage. Walkpads shall not be located in insulation valley lines.

3.10 FIELD QUALITY CONTROL

A. Eliminate Ponding Water Conditions: Roof system construction resulting in ponding water shall be corrected by adding to or reworking the insulation configuration to eliminate a ponding water condition prior to acceptance of the completed roof system by Owner at no additional cost to the Owner.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

3.11 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Before moving equipment or materials over completed a roof, the Contractor shall protect the roof from damage during and following roofing work. Movement of equipment and materials without roof protection shall be cause for the Owner to stop work until protection is provided and any damage is corrected.

3.12 WARRANTY RIDER

Date

Manufacturer's Warranty Attachment No. _____

To Prince William County Public Schools

Re Project Name

Guarantee Number _____

Contractor _____

Address _____

_____

Manufacturer _____

Address _____

_____

The guarantee shall provide that the manufacturer agrees to repair any leaks that occur as a result of failure of any materials or workmanship in the membrane roofing or any components of the roofing system within the specified warranty period. Failures include, but are not limited to, deformation or deterioration of the roof membrane beyond normal weathering. This rider is an attachment to the manufacturer's warranty and shall supersede any terms or conditions contrary to the following:

1. The guarantee shall include all base sheets, insulation, cants, tapered edge, membrane, flashings, stripping plies, primer, flashing cement, fasteners, walkpads, roof accessories, sealants, and attachment of the same, whether provided by the above manufacturer or obtained from other manufacturers.
2. The guarantee shall provide confirmation that the Contractor is an approved applicator of the warranted roof system as specified.
3. The guarantee shall provide the manufacturer's certification or independent test reports confirming that materials utilized in the Work meet or exceed all performance criteria required by the technical specifications and the warranty requirements.
4. The Guarantor shall provide training to the Owner's personnel to teach them the proper procedures to use in making permanent minor repairs and modifications to the roof system, and that said repairs and modifications by trained Owner personnel will have no adverse effect on the warranty provided by the Roof membrane manufacturer.
5. The guarantee shall provide that in order for the manufacturer and Contractor to be relieved of any and all liability under this 20 year watertightness warranty because of failure of the Owner to provide written notice within 30 days of the discovery of any leaks, it must be shown that the Owner willfully, or habitually failed to make proper, timely notice.
6. The guarantee shall provide no exclusions in the warranty for wind speed less than 90 MPH.
7. The guarantee shall provide that the manufacturer's obligation under this warranty shall not depend on bills for installation, supplies, and services being paid in full, provided the Contractor has received payment from the Owner for work completed.

8. The manufacturer shall certify that they have reviewed the design drawings for adequate deck slope, tapered insulation, crickets, and water diverters. The Contractor shall be required to take adequate steps during construction to avoid ponded water. There shall be no limitation or exclusion in the warranty coverage for ponded water; except for situations where design inadequacy can be shown as the specific cause of deck deflection.
9. The guarantee shall provide that during the term of the guarantee, the manufacturer, its sales representatives or employees shall have free access to the roof during regular business hours with 24 hour notice given to the Owner.
10. The guarantee shall provide a warranty term of 20 years from the date of Substantial Completion of the Work.

Nothing in the list of requirements shall be construed to limit the Owner from using any and all legal remedies available in the event of a roofing problem that, in the Owner's opinion, has not been properly addressed and satisfactorily resolved.

The acknowledgement by attachment of the Warranty Rider by the above listed manufacturer shall constitute complete agreement with all terms and conditions listed in this document.

Signature _____

Printed Name & Title _____

Date _____

3.13 ROOFING INSTALLER'S WARRANTY

A. WHEREAS **<Insert name>** of **<Insert address**>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: Prince William County Public Schools
2. Address: **<Insert address.>**
3. Building Name/Type: **<Insert information.>**
4. Address: **<Insert address.>**
5. Area of Work: **<Insert information.>**
6. Acceptance Date: **<Insert date.>**
7. Warranty Period: **<Insert time.>**
8. Expiration Date: **<Insert date.>**

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

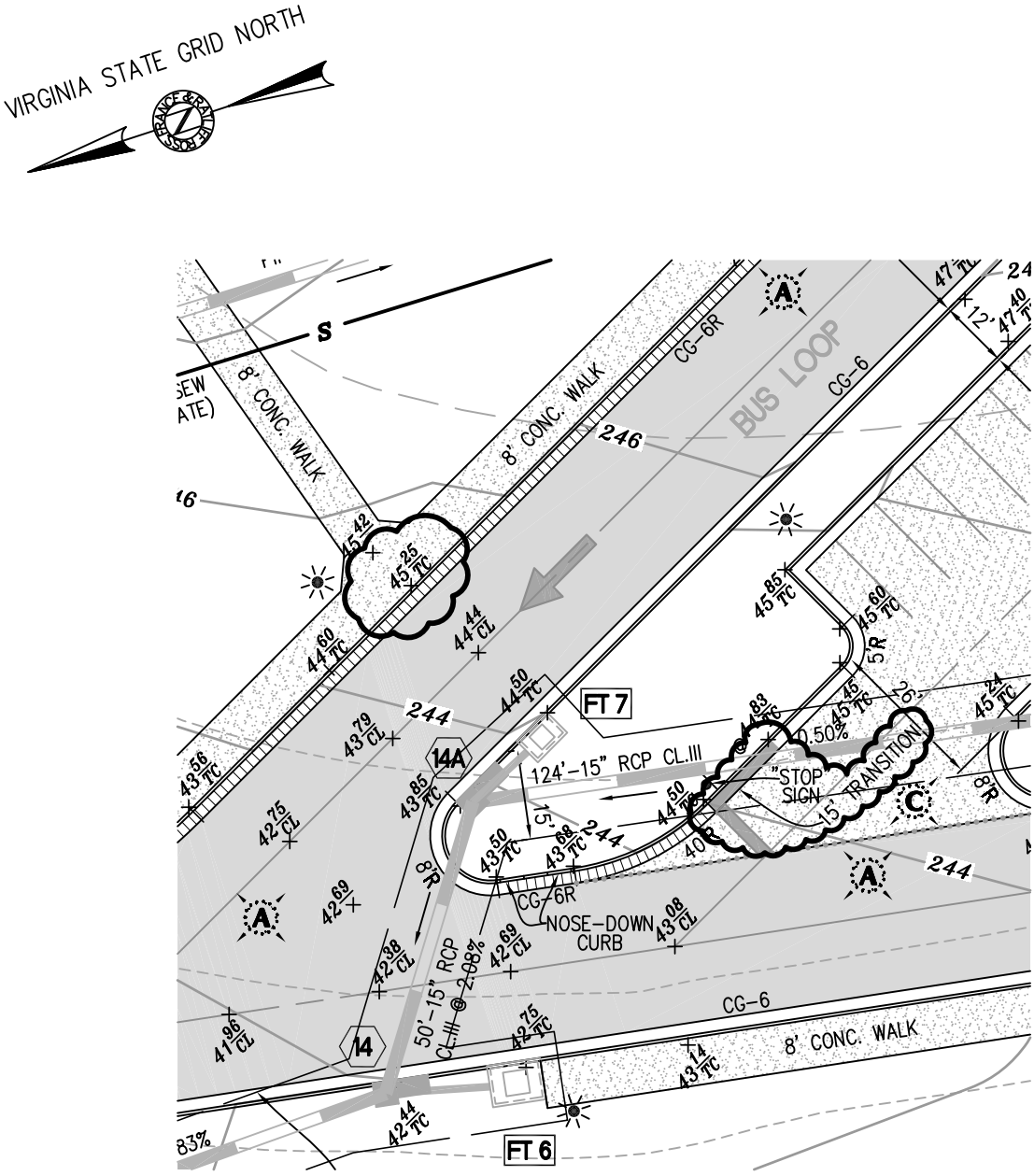
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    a. lightning;
    b. peak gust wind speed exceeding 90 mph;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.

1. Authorized Signature: **<Insert signature.>**
2. Name: **<Insert name.>**
3. Title: **<Insert title.>**

END OF SECTION 07553



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DRAWING TITLE: SITE PLAN

CONTRACT DWG NO.: C3.1

PROJECT: NOKESVILLE K-8 SCHOOL
PRINCE WILLIAM COUNTY, VA

MOSELEY ARCHITECTS
A PROFESSIONAL CORPORATION
3200 NORFOLK STREET, RICHMOND, VIRGINIA, 23230
PHONE (804) 794-7555 FAX (804) 355-5690
MOSELEYARCHITECTS.COM

DRAWN BY: JKM

ATTACHMENT TO: ADDENDUM #2

SUPPLEMENTAL DWG. NO: AD2-C1

DATE: 2/24/12

PROJECT NO.: 500109

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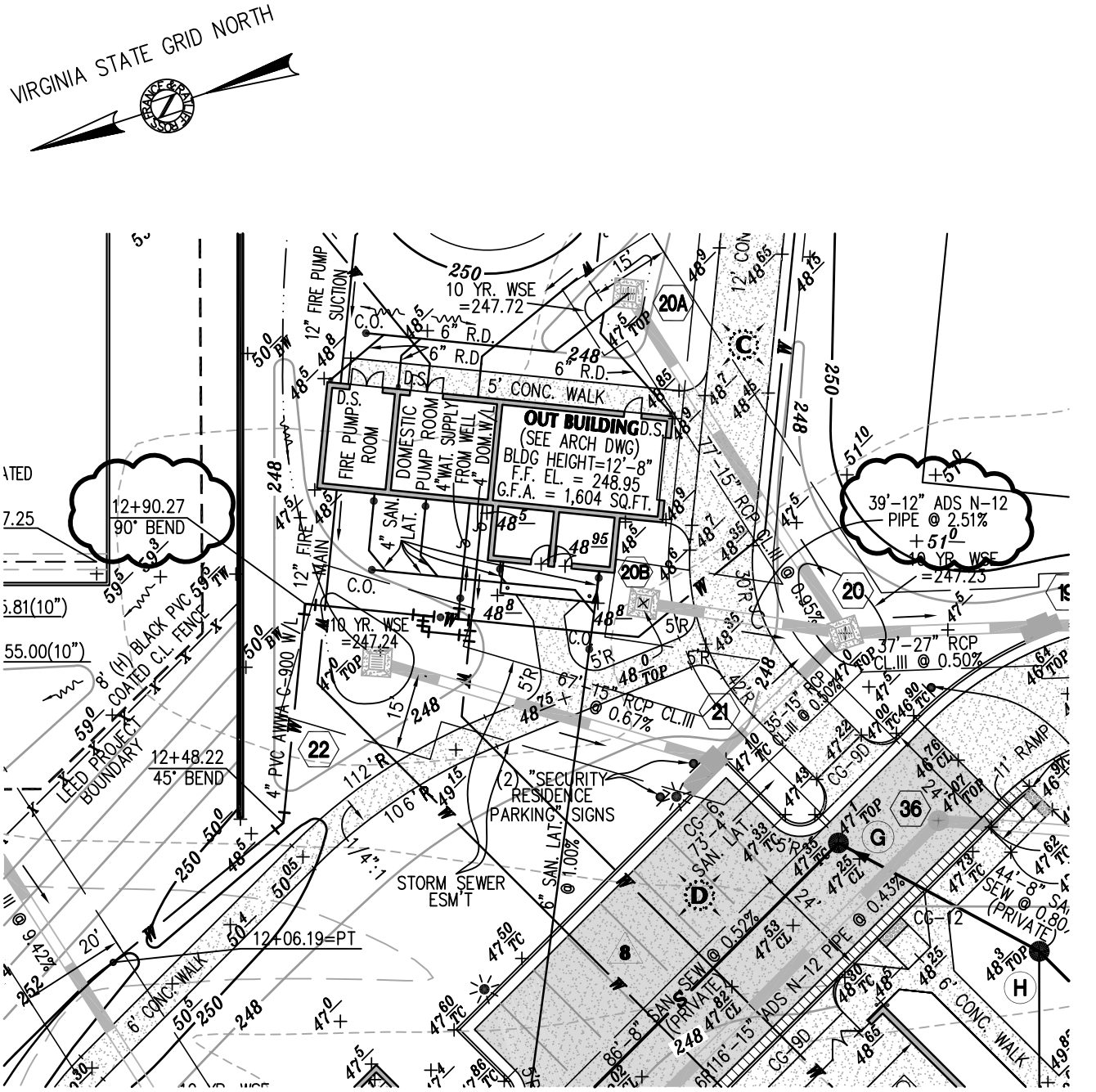

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SITE PLAN	**C3.2**	**NOKESVILLE K-8 SCHOOL** **PRINCE WILLIAM COUNTY, VA**

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DRAWN BY:	ATTACHMENT TO:	SUPPLEMENTAL DWG. NO:
JKM	ADDENDUM #2	**AD2-C2**
DATE: 2/24/12	**PROJECT NO.:** 500109	

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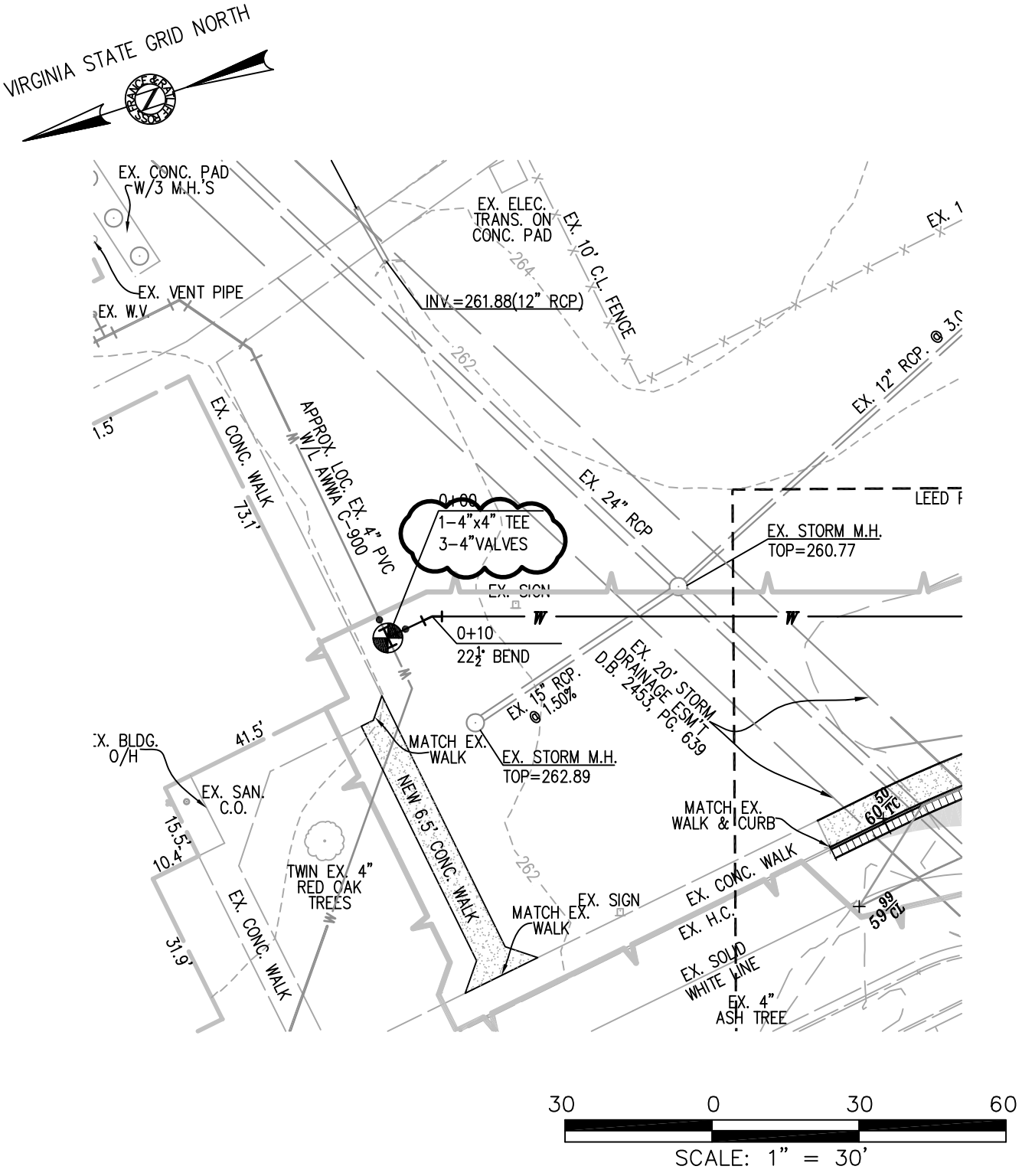

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SITE PLAN	**C3.3**	**NOKESVILLE K-8 SCHOOL** **PRINCE WILLIAM COUNTY, VA**

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DRAWN BY:	ATTACHMENT TO:	SUPPLEMENTAL DWG. NO:
JKM	ADDENDUM #2	**AD2-C3**
DATE: 2/24/12	**PROJECT NO.:** 500109	

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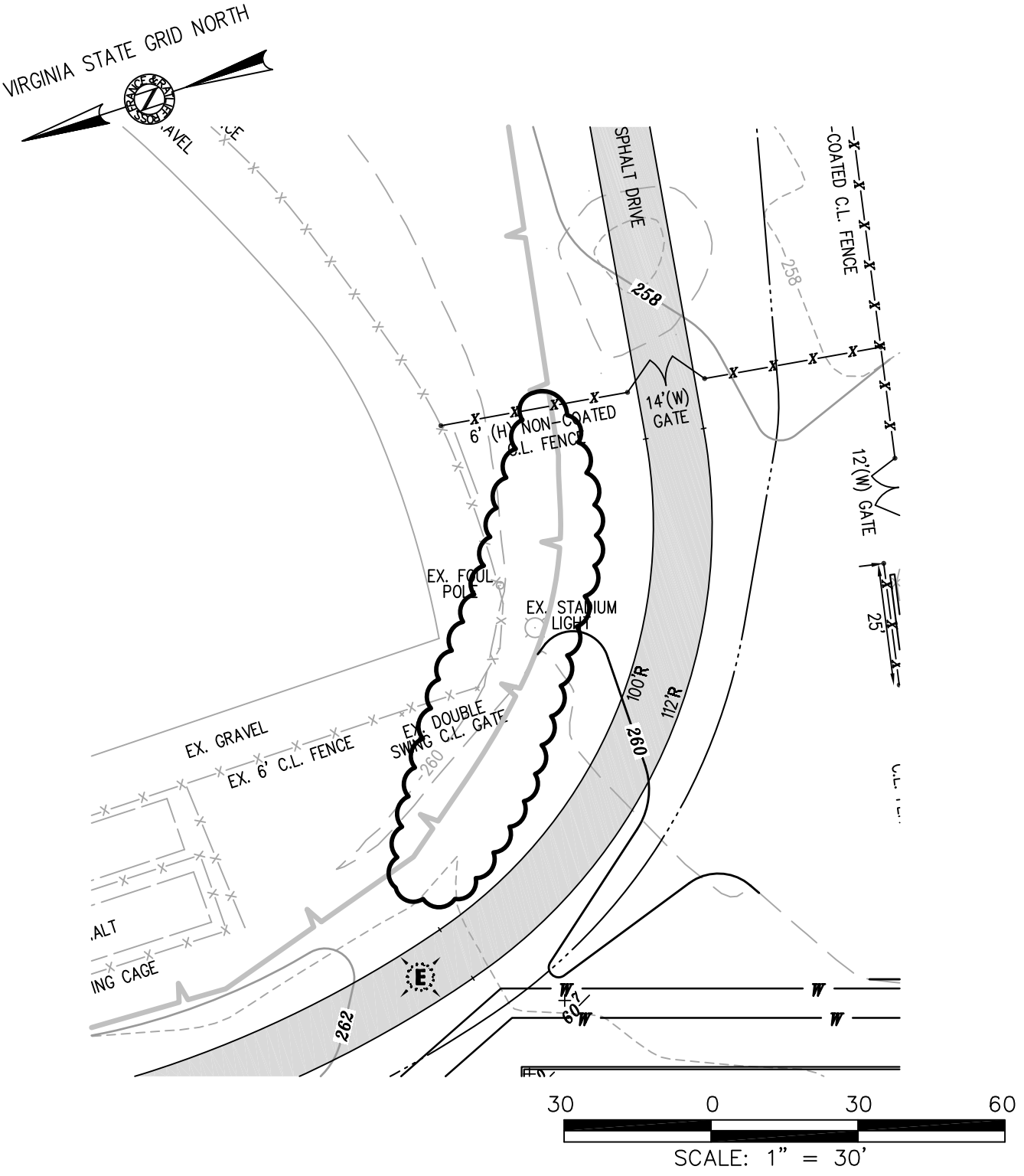

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SITE PLAN	**C3.4**	**NOKESVILLE K-8 SCHOOL** **PRINCE WILLIAM COUNTY, VA**

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DRAWN BY:	ATTACHMENT TO:	SUPPLEMENTAL DWG. NO:
JKM	ADDENDUM #2	**AD2-C4**
DATE: 2/24/12	PROJECT NO.: 500109	

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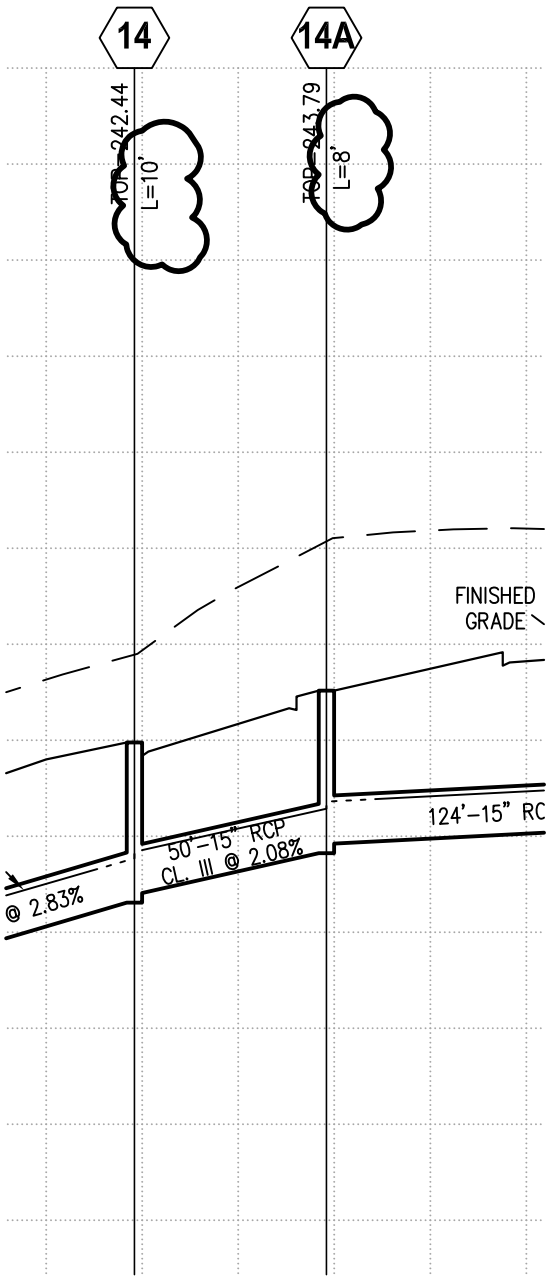

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DRAWING TITLE: **STORM SEWER PROFILES**	**CONTRACT DWG NO.:** **C7.2**	**PROJECT:** **NOKESVILLE K-8 SCHOOL** **PRINCE WILLIAM COUNTY, VA**

MOSELEY ARCHITECTS
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DRAWN BY: JKM	**ATTACHMENT TO:** ADDENDUM #2	**SUPPLEMENTAL DWG. NO:** **AD2-C5**
DATE: 2/24/12	**PROJECT NO.:** 500109	

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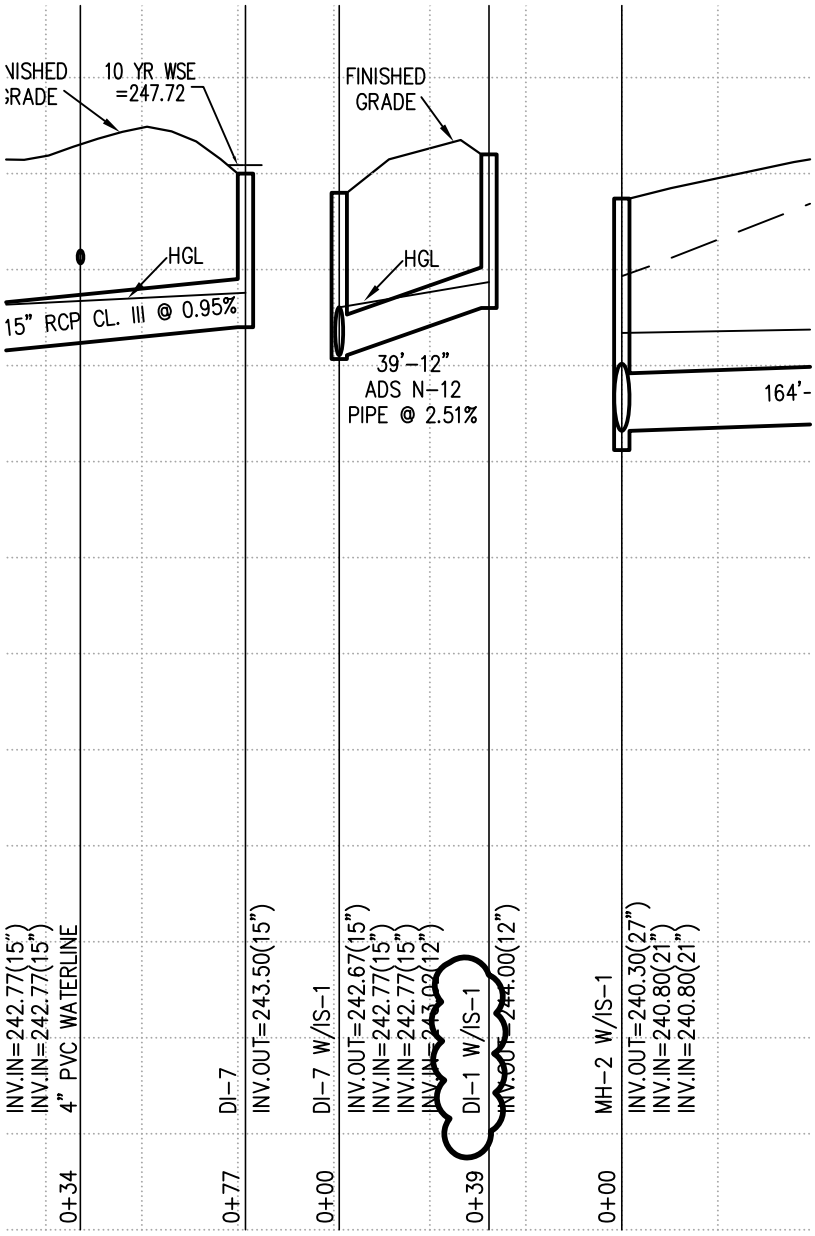

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DRAWING TITLE:
STORM SEWER PROFILES

CONTRACT DWG NO.:
C7.3

PROJECT:
NOKESVILLE K-8 SCHOOL
PRINCE WILLIAM COUNTY, VA

MOSELEY ARCHITECTS
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MOSELEYARCHITECTS.COM

DRAWN BY:	ATTACHMENT TO:	SUPPLEMENTAL DWG. NO:
JKM	ADDENDUM #2	AD2-C6
DATE: 2/24/12	PROJECT NO.: 500109	

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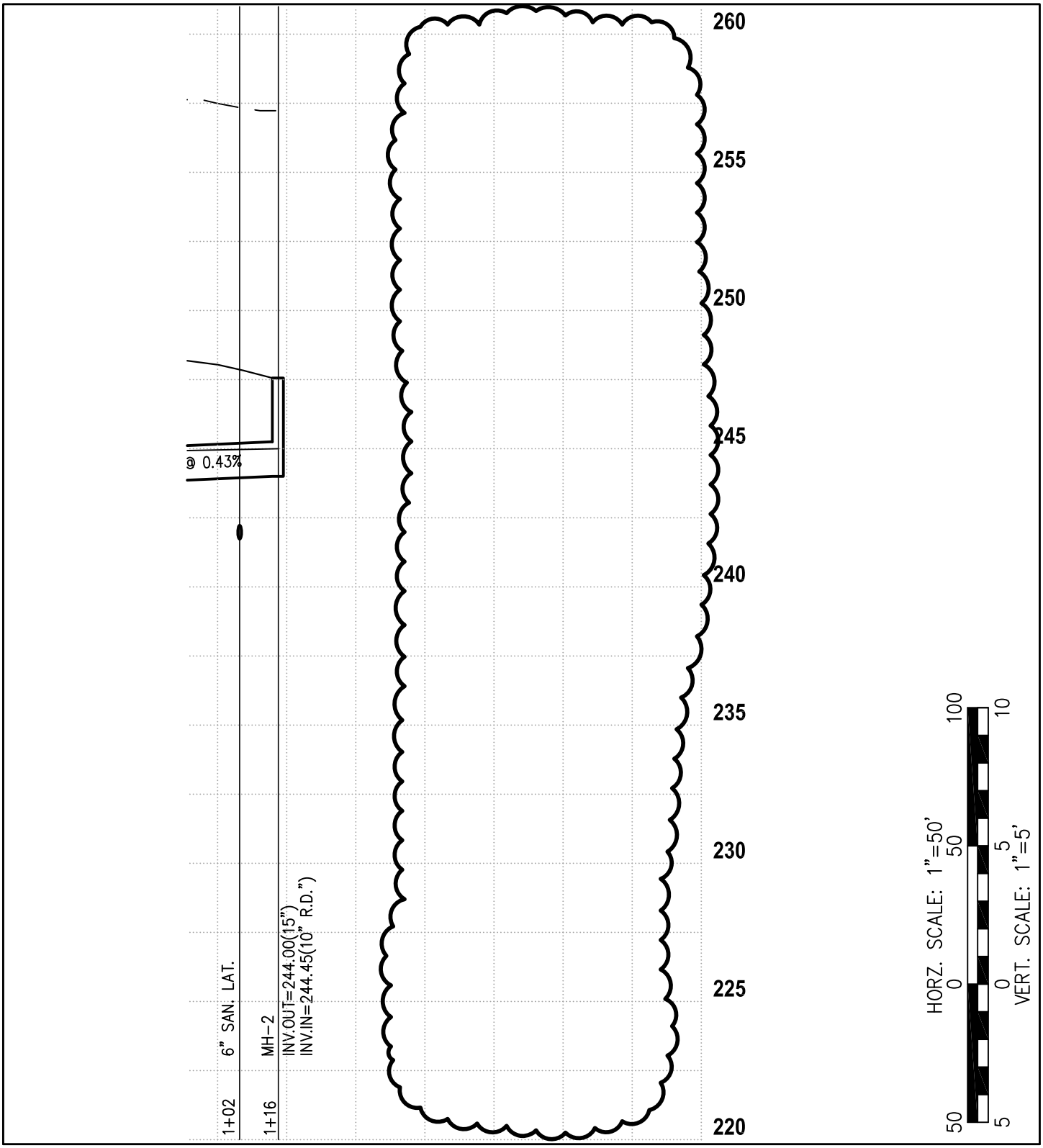

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DRAWN BY: JKM	**ATTACHMENT TO:** **ADDENDUM #2**	**SUPPLEMENTAL DWG. NO:**	
DATE: 2/24/12	**PROJECT NO.:** 500109	**AD2-C7**	

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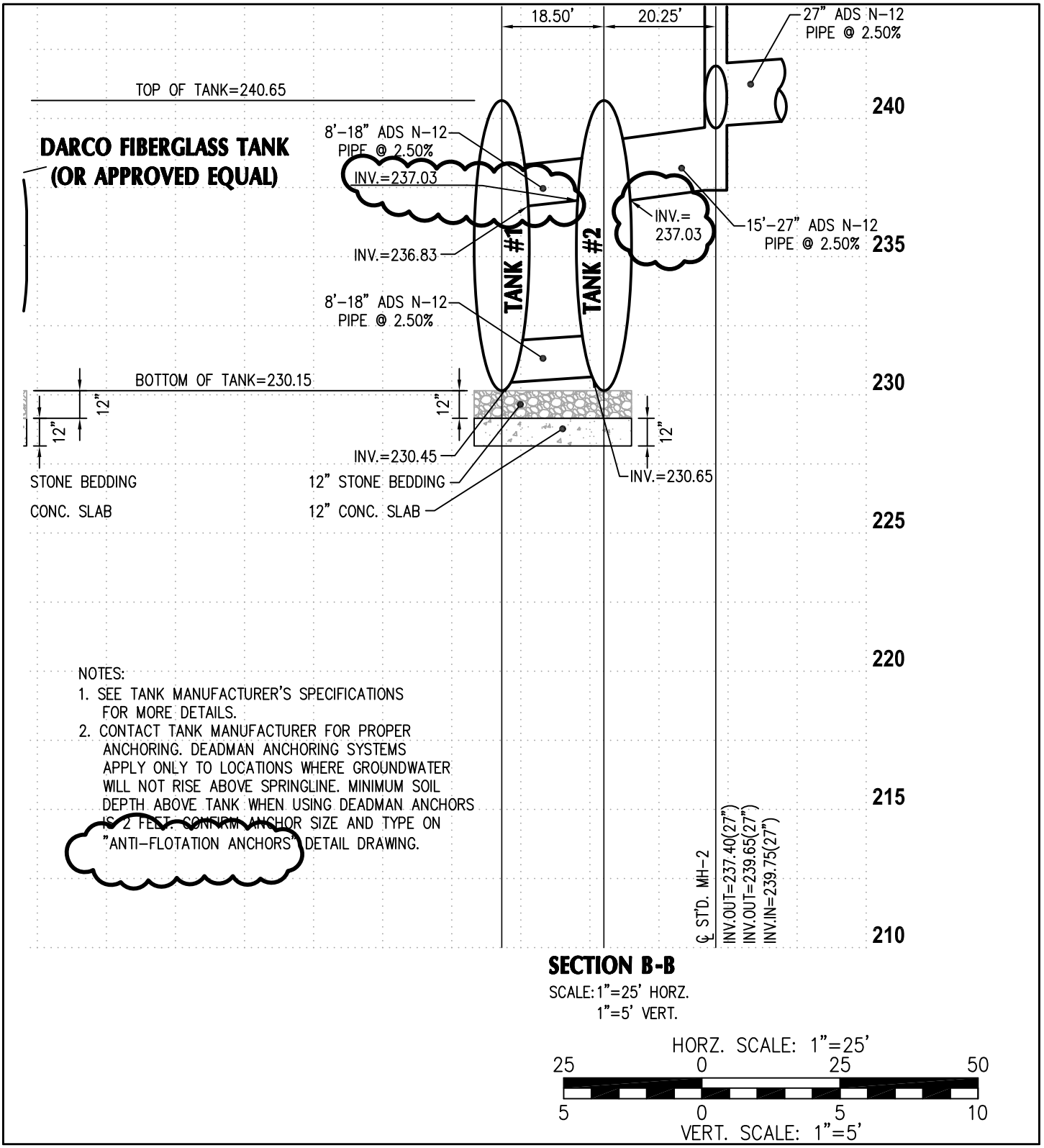

NOTES:
1. SEE TANK MANUFACTURER'S SPECIFICATIONS FOR MORE DETAILS.
2. CONTACT TANK MANUFACTURER FOR PROPER ANCHORING. DEADMAN ANCHORING SYSTEMS APPLY ONLY TO LOCATIONS WHERE GROUNDWATER WILL NOT RISE ABOVE SPRINGLINE. MINIMUM SOIL DEPTH ABOVE TANK WHEN USING DEADMAN ANCHORS IS 2 FEET. CONFIRM ANCHOR SIZE AND TYPE ON "ANTI-FLOTATION ANCHORS" DETAIL DRAWING.

SECTION B-B

SCALE: 1"=25' HORZ.
1"=5' VERT.

HORZ. SCALE: 1"=25'
25 0 25 50
5 0 5 10
VERT. SCALE: 1"=5'

DRAWING TITLE: STORM SEWER PROFILES

CONTRACT DWG NO.: C7.3

PROJECT: NOKESVILLE K-8 SCHOOL
PRINCE WILLIAM COUNTY, VA

MOSELEY ARCHITECTS
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3200 NORFOLK STREET, RICHMOND, VIRGINIA, 23230
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DRAWN BY:	ATTACHMENT TO:	SUPPLEMENTAL DWG. NO:
JKM	ADDENDUM #2	AD2-C8
DATE: 2/24/12	PROJECT NO.: 500109	

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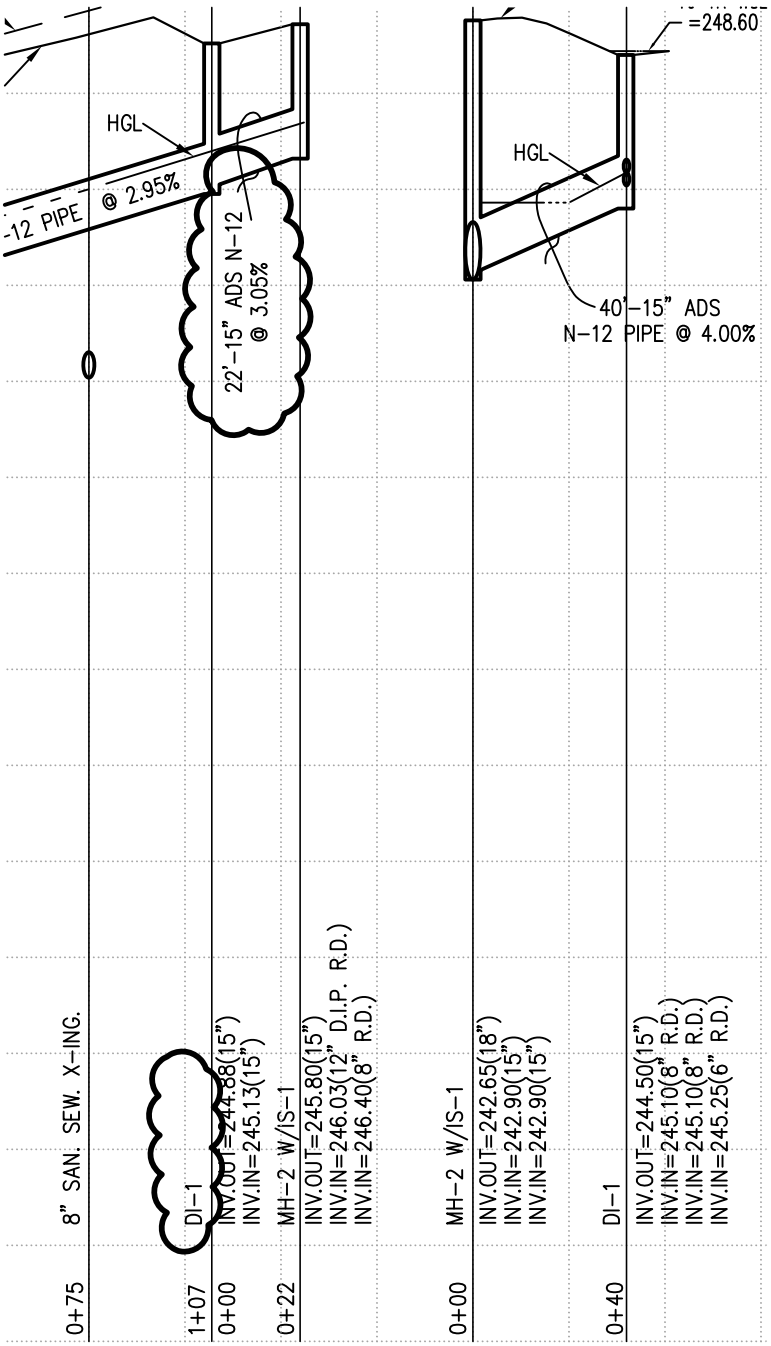

HORZ. SCALE: 1"=50'

50 0 50 100

5 0 5 10

VERT. SCALE: 1"=5'

DRAWING TITLE:
STORM SEWER PROFILES

CONTRACT DWG NO.:
C7.4

PROJECT:
NOKESVILLE K-8 SCHOOL
PRINCE WILLIAM COUNTY, VA

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DRAWN BY:	ATTACHMENT TO:	SUPPLEMENTAL DWG. NO:
JKM	ADDENDUM #2	AD2-C9
DATE:	**PROJECT NO.:**	
2/24/12	500109	

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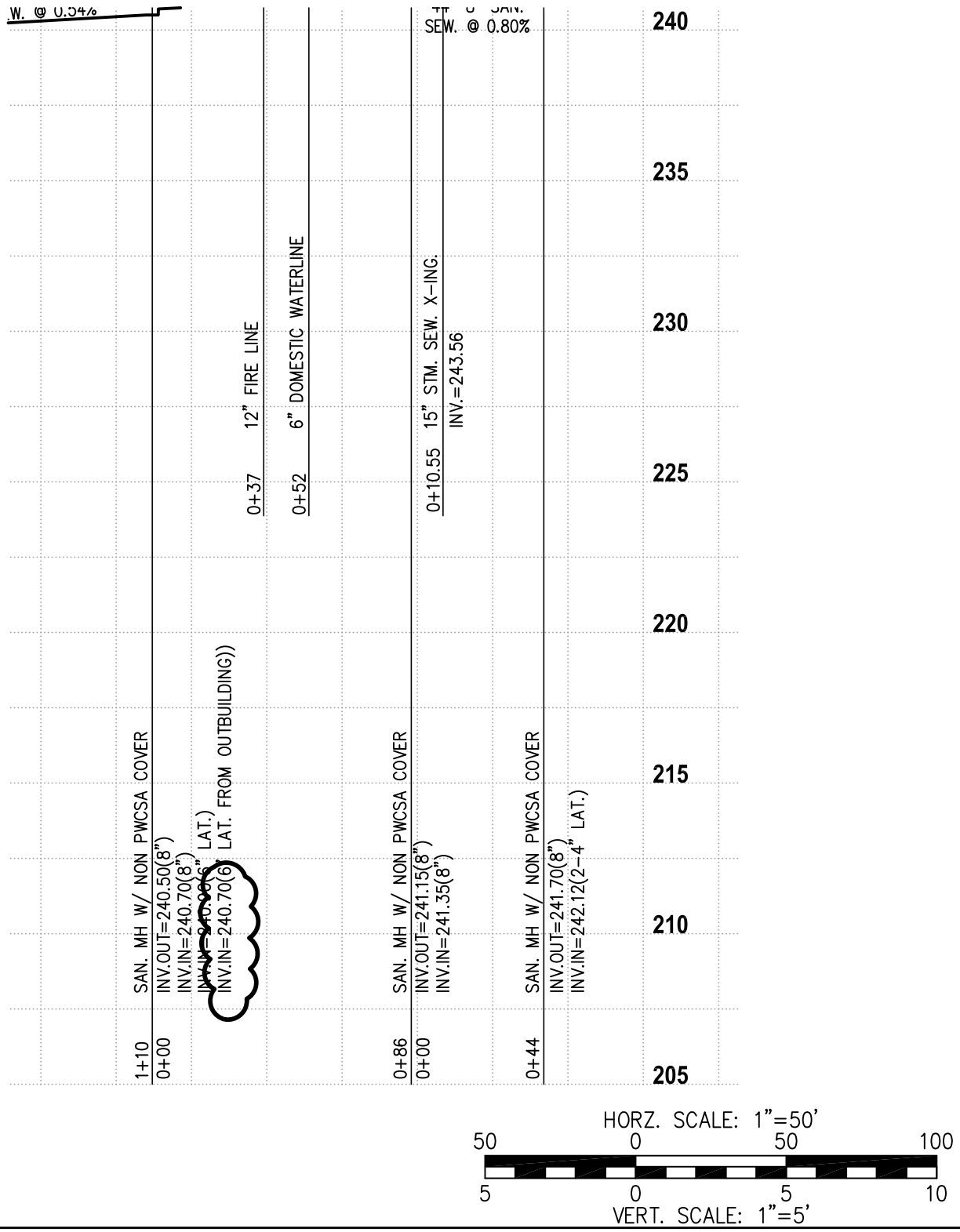

DRAWING TITLE:
SANITARY SEWER PROFILES

CONTRACT DWG NO.:
C7.6

PROJECT:
NOKESVILLE K-8 SCHOOL
PRINCE WILLIAM COUNTY, VA

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JKM	ADDENDUM #2	AD2-C10
DATE: 2/24/12	PROJECT NO.: 500109	

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DESIGN ELEVATIONS:
239.70 = TOP OF CHAMBER
230.82 = INVERT IN (8")
227.02 = ALARM ON
226.52 = LAG PUMP ON
226.02 = LEAD PUMP ON
225.22 = PUMP OFF (STATIC FLUID LEVEL)
223.22 = CHAMBER INVERT (2' DEPTH FOR PRIME & PUMP COOLING)

TOTAL STORAGE PROVIDED (PUMP OFF TO INVERT IN) = 2,852 GALLONS (1/4 DAY)

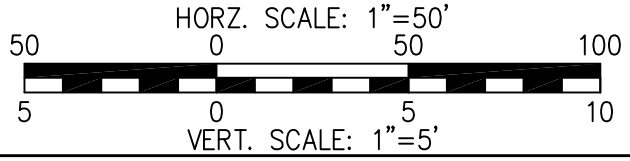
PUMP SYSTEM DATA:
STATIC HEAD:
235.80 = ELEVATION @ HIGH POINT IN SYSTEM
223.22 = ELEVATION PUMP OFF
12.6 = STATIC HEAD DIFFERENCE (USED AS MOST EXTREME HEAD CONDITION)

MINOR LOSSES APPROXIMATED AS 2.0' HEAD

PIPE LOSSES:
LENGTH OF 2" SDR – 21 PVC PIPE = 123', C=130

PUMP SELECTION:
FROM PUMP / SYSTEM CURVE PUMP SELECTION IS MYERS WGL20 SERIES, 2.0 H.P. PUMP WITH 460 VOLT – 3 PHASE MOTOR

PUMP SYSTEM SHALL BE EQUIPPED WITH ALL FLOATS, CONTROLS, ALARMS, CABLES, CABLE SUPPORTS AND HANGERS, AND SLIDE RAILS. ITEMS TO BE FURNISHED BY PUMP MANUFACTURER / SUPPLIER FOR USE AS A "PACKAGED SYSTEM". THESE ITEMS SHALL BE INSTALLED INTO THE PRE-CAST PUMP CHAMBER AND WIRED IN ACCORDANCE WITH ALL APPLICABLE CODES.



DRAWING TITLE: **SANITARY SEWER PUMP STATION DETAILS**	CONTRACT DWG NO.: **C7.7**	PROJECT: **NOKESVILLE K-8 SCHOOL** **PRINCE WILLIAM COUNTY, VA**

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DRAWN BY: **JKM**	ATTACHMENT TO: **ADDENDUM #2**	SUPPLEMENTAL DWG. NO: **AD2-C11**	
DATE: **2/24/12**	PROJECT NO.: **500109**		

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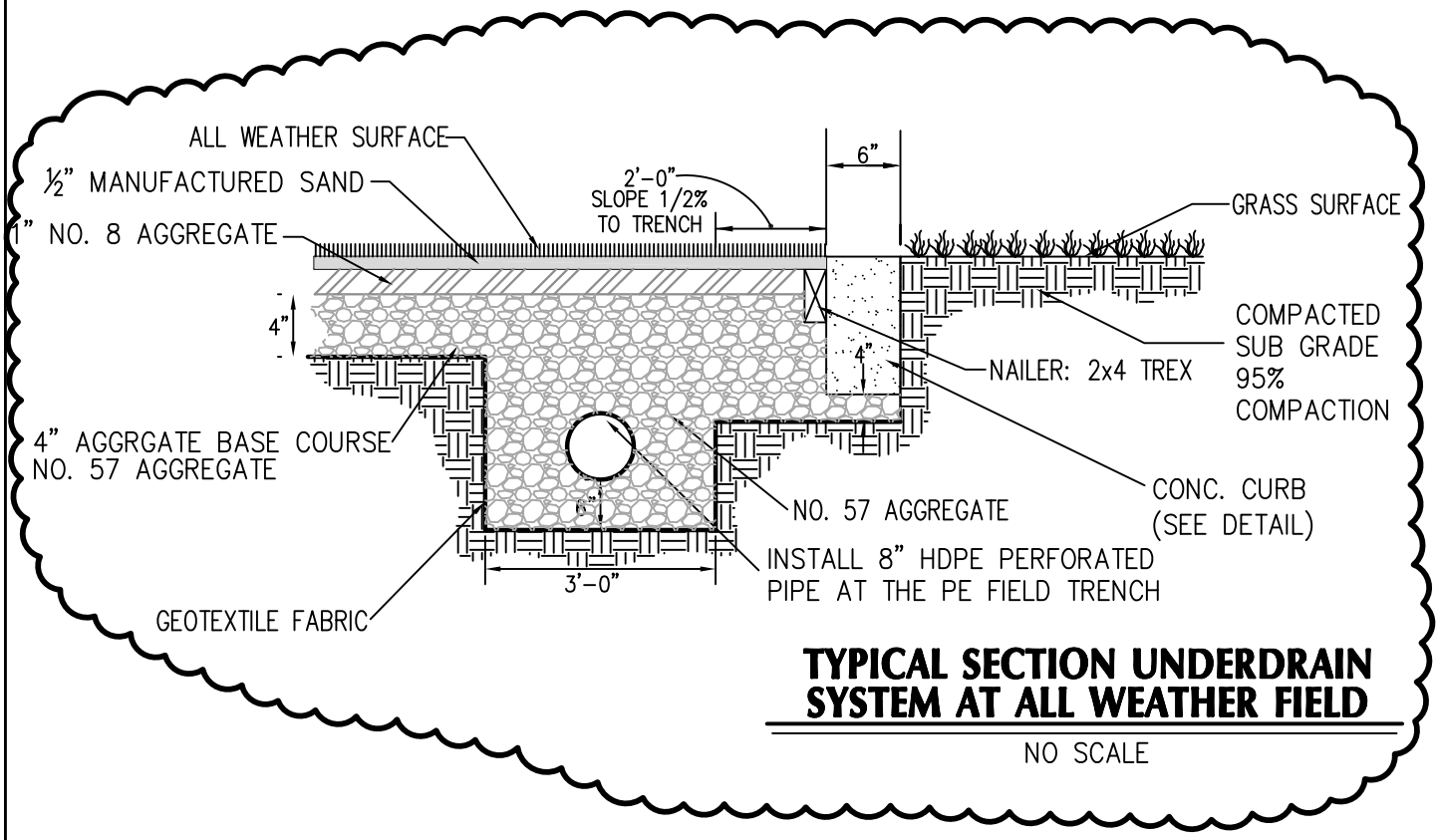

TYPICAL SECTION UNDERDRAIN SYSTEM AT ALL WEATHER FIELD

NO SCALE

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DRAWING TITLE: SITE DETAILS	**CONTRACT DWG NO.:** C9.2	**PROJECT:** NOKESVILLE K-8 SCHOOL PRINCE WILLIAM COUNTY, VA

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DRAWN BY: JKM	**ATTACHMENT TO:** ADDENDUM #2	**SUPPLEMENTAL DWG. NO:** AD2-C12	
DATE: 2/24/12	**PROJECT NO.:** 500109		