OSR 45-10 (Rev 05-12-2015)

Procurement Specification Cover Sheet

Proc. Ref. E7, 2.14

1. Title: Saltstone Disposal Unit (SDU) 8&9: GCL, HDPE Geomembrane, Specification		
2. Specification/SOW Number: C-SPP-Z-00019	3. Revision: 0	4. Page: 1 of 3
5. Functional Classification: Production Support	6. Requestor Department: Design Services	7. Requestor Division: PD&CS
8. Cognizant Technical Function/Responsible Engineer		
Name: Randall Forty		Date: 4/3/19
Title: Structural Engineering Lead	Department: Design Engineering	
9. Verifier/Checker		
Name: Michele McHenry, P.E.		Date: 4/3/19
Title: Structural Engineer	Department: Design Services / Affiliate (Jacobs)	
10. Additional Reviewer		
Name: Sergio Mazul		Date: 4/8/19
Title: Procurement Specification Authority	Department: Project Engineering	
11. Cognizant Quality Function		
Name: Thomas Stanberry		Date: 04.08.19
Title: Quality Assurance Engineer	Department: Construction Quality Services	
12. Responsible Manager		
Name: William Bruss		Date: 4/3/19
Title: Project Engineer	Department: Design Services	
13. Additional Approver		
Name: Sergio Mazul		Date: 4/8/19
Title: Project Engineering Manager	Department: Project Engineering	
14. Additional Approver		
Name: Jon Lunn		Date: 4/8/19
Title: Project Manager	Department: Operations Projects	

Procurement Specification Revision History Sheet

1. Specification No C-SPP-Z-00019 Saltstone Disposal Unit – SDU 8&9: GCL, HDPE Geomembrane, Specification			2. Revision 0	3. Page 2 of 3
4. Date	5. Revision No.	6. Paragraph No.	7. Description of Changes	
4/8/2019	0	All	Initial Issue	

TABLE OF CONTENTS

SECTION	TITLE	No. of Pages
	Approval, History and Table of Contents	3
	DIVISION 1 – GENERAL REQUIREMENTS	
01004	Index of Documents and Drawings	1
01100	Summary of Work	8
01250	Change Procedures	2
01330	Submittal Procedures	7
	Attachment 01330-A: Engineering Document Requirements (EDR)	
01400	Quality Requirements	8
	Attachment 01400-A: Supplier Quality Assurance Program Requirements	
	Attachment 01400-B: Quality Program Requirements	
	Attachment 01400-C: Standard Receipt Inspection Criteria	
01450	Testing Laboratory Services	3
01600	Common Product Requirements	5
01640	Manufacturer's Field Services	5
	Attachment 01640-A: Manufacturer's Certificate of Compliance Form	
	Attachment 01640-B: Manufacturer's Certificate of Proper Installation Form	
01810	Inspection, Observation, and Testing	3
	DIVISION 2 – Site Work	
02510	High-Density Polyethylene Pipe and Fittings	3
02661	High-Density Polyethylene Geomembrane	13
	Attachment 02661-A: Geomembrane Installer's Certification of Subsurface Acceptability	
02667	Geosynthetic Clay Liner	9
	Attachment 02667-A: GCL Installer's Certification of Subsurface Acceptability	
	Total No. of Pages:	70

INDEX OF DOCUMENTS AND DRAWINGS

SECTION 01004

PART 1 GENERAL

1.1 SECTION INCLUDES

A. List of documents and drawings associated with Saltstone Disposal Unit - SDU 8&9.

1.2 DOCUMENTS

1. C-ESR-Z-00016, Rev. 0, SDU 8&9 Stormwater Pollution Prevention Plan (SWPPP)
2. OSR 45-4 Form, Supplier Deviation Disposition Request (SDDR)
3. QP-15 “Control of Non-Conforming Items”
4. QP-16 “Corrective Action”
5. C-QIP-Z-00026, SDU 8&9 GCL/HDPE Quality Inspection Plan

1.3 DRAWINGS

NOTES:

(a) Titles for Drawings that begin with C-C2-Z- are preceded with “Z Area Saltstone Disposal Site SDU 8&9 Tank Design General”.

(b) Titles for Drawings that begin with C-CC-Z- are preceded with “Z Area Saltstone Disposal Site SDU 8&9 Tank Design Concrete”.

(c) Titles for Drawings that begin with C-CG-Z- are preceded with “Z Area Saltstone Disposal Site SDU 8&9 Site Preparation”.

(d) Titles for Drawings that begin with C-CY-Z- are preceded with “Z Area Saltstone Disposal Site SDU 8&9 Tank Design Civil”.

1. C-C2-Z-00020, General Structural Notes
2. C-C2-Z-00021, Statement of Inspections
3. C-CC-Z-00071, Concrete Foundation Plan
4. C-CC-Z-00075, Wall and Column Sections and Details
5. C-CC-Z-00077, Concrete Sections and Details
6. C-CG-Z-00125, SDU 8 Excavation Grading Plan
7. C-CG-Z-00133, SDU 9 Excavation Final Grading Plan
8. C-CY-Z-00014, HDPE /GCL, Leakage, Detection Plan
9. C-CY-Z-00015, Leakage Detection System Sections and Details
10. C-CY-Z-00016, Leakage Detection System Details

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SUMMARY OF WORK

SECTION 01100

PART 1 GENERAL

1.1 SECTION INCLUDES

A. References
B. Definitions
C. Location of the Work
D. Project Summary
E. Work by Others
F. Work Sequence
G. General Requirements
H. Site Requirements
I. Existing Conditions
J. Administration
K. Acceptance and Inspection

1.2 RELATED SECTIONS

A. All Sections in this Specification

1.3 REFERENCES:

A. Required Codes / Standards
1. American Association of State Highway and Transportation Officials (AASHTO)
T 237, 2005, Standard Method of Test for Testing Epoxy Resin Adhesive
2. Intentionally Omitted.
3. American Society for Testing and Materials (ASTM)
Note: Material standard later editions or dated within ten (10) years from the date of Subcontract award are permissible as long as the Subcontractor verifies that physical and chemical properties of material meet the requirements of the required standard editions. Subcontractor shall provide documentation to justify the use of material standard editions described before, along with documents supporting the verification process, in accordance to the Submittal Procedures described in Section 01330 for LWC approval prior to use. Testing standards shall be the editions in effect at the time of Subcontract Award.
a. ASTM A Series
1. None
b. ASTM B Series
1. None
c. ASTM C Series
1. None
d. ASTM D Series
1. D638, Standard Test Method for Tensile Properties of Plastics
2. D792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

3. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting
4. D1004, Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
5. D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique
6. D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
7. D3895, Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
8. D4218, Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
9. D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
10. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
11. D4643, Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating
12. D4833, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
13. D4873, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
14. D5199, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
15. D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles
16. D5397, Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
17. D5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber
18. D5721, Standard Practice for Air-Oven Aging of Polyolefin Geomembranes
19. D5820, Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes
20. D5885, Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry
21. D5887, Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter
22. D5890, Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners
23. D5891, Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners
24. D5993, Standard Test Method for Measuring Mass Per Unit of Geosynthetic Clay Liners
25. D6241, Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
26. D6365, Standard Practice for the Nondestructive Testing of Geomembrane Seams Using Spark Test
27. D6392, Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
28. D6496, Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners

29. D6693, Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
30. D6768, Standard Test Method for Tensile Strength of Geosynthetic Clay Liners

e. ASTM E Series
1. E329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

f. ASTM F Series
1. F714, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
2. F2620, Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings

4. Plastics Pipe Institute, Inc. (PPI)
a. TR-33, 2012, Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe

B. Regulations
1. 49 CFR PT 192.285, Plastic Pipe: Qualifying Persons to Make Joints
2. SC R.72-300, Standards for Stormwater Management and Sediment Reduction
3. SCR 100000, NPDES Stormwater General Permit

C. Documents
1. C-ESR-Z-00016
2. C-QIP-Z-00026
3. Control of Nonconforming Items QP-15
4. Corrective Action QP-16

D. Drawings
1. C-CC-Z-00071
2. C-CC-Z-00075
3. C-CC-Z-00077
4. C-CY-Z-00014
5. C-CY-Z-00015
6. C-CY-Z-00016

1.4 DEFINITIONS

A. See individual sections for definitions related to scope of work in the section.

B. Acronyms common to all sections of this Specification

1.	ASTM	American Society for Testing and Materials
2.	EDR	Engineering Document Requirements
3.	EDWS	Electronic Document Workflow System
4.	FTB	Film Tear Bonding
5.	GAI-LAP	Geosynthetic Accreditation Institute-Laboratory Accreditation Program
6.	GCL	Geosynthetic Clay Liner
7.	HDPE	High-Density Polyethylene
8.	LLDPE	Linear Low-Density Polyethylene

9.	LWC	Liquid Waste Contractor
10.	MQC	Manufacturing Quality Control
11.	M&TE	Measuring and Test Equipment
12.	NIST	National Institute of Standards and Technology
13.	OSHA	Occupational Safety and Health Administration
14.	PDF	Portable Document Format
15.	QIP	Quality Inspection Plan
16.	RFI	Request for Information
17.	SA/PR	Subcontractor Administrator/ Procurement Representative
18.	SDDR	Supplier Deviation Disposition Request (OSR 45-4)
19.	SDU	Saltstone Disposal Unit
20.	SQAPR	Supplier Quality Assurance Program Requirements
21.	SRIC	Standard Receipt Inspection Criteria
22.	SRS	Savannah River Site
23.	STR	Subcontract Technical Representative
24.	SWPPP	Stormwater Pollution Prevention Plan

1.5 LOCATION OF THE WORK

A. The work is located in Z-Area of the Savannah River Site, a Department of Energy site south of Aiken, South Carolina.

B. See Drawing C-CG-Z-00122

1.6 PROJECT SUMMARY

A. Overview:

1. Subcontractor scope is to provide all material and installation of GCL and HDPE Geomembrane liner as shown in the Leakage Detection System drawings, C-CC-Z-00071, C-CC-Z-00075, C-CC-Z-00077, C-CY-Z-00014, C-CY-Z-00015 and C-CY-Z-00016 and to provide HDPE embedments, which will be installed by others.

B. Scope Phases (by SDU)

1. Phase IA: Material and Installation of GCL, HDPE Geomembrane by Subcontractor and material and installation of Non-Woven Geotextile (by others).
    a. Provide EDR submittals in accordance with Section 01330 for all the GCL and HDPE Geomembrane materials and installation.
    b. Upon approval of the GCL and HDPE Geomembrane submittals, procure materials and store for installation.
    c. Coordinate installation schedule with the STR to ensure readiness to begin installation.
    d. Install GCL and HDPE Geomembrane on the lower mudmat. Refer to drawing C-CY-Z-00014 for overall dimensions, C-CY-Z-00015 and C-CY-Z-00016 for installation details.
        1. The entire lower mudmat will be in place prior to beginning GCL/HDPE Geomembrane installation activities.
        2. Given the HDPE Geomembrane material propensity to deformation due to thermal variation, the upper mudmat placement by others will begin early during the installation of the GCL and HDPE Geomembrane to minimize deformation

and protect the GCL and HDPE Geomembrane. Coordinate installation schedule with the STR to ensure GCL and HDPE Geomembrane installation and upper mudmat placement are integrated.

3. Any repairs due to damage during the installation of the GCL, HDPE Geomembrane or during the placement of the upper mudmat will be responsibility of the Subcontractor to repair. Extreme care will be exercised by all to protect the integrity of this lining system during the installation process.
4. Plan daily GCL with corresponding HDPE Geomembrane coverage. If there is the potential for inclement weather, protect the completed coverage from water intrusion with 20-mil LLDPE textured polyethylene geomembrane until work resumes on the next shift. Subcontractor can submit alternative means for protection via SDDR.
5. During the installation of the upper mudmat, Non-Woven Geotextile will be placed by others over the areas where the upper mudmat construction joints contact the HDPE Geomembrane.
6. The sumps will be cast during the installation of the lower mudmat by others. In lieu of the permanent HDPE Geomembrane pipe, LWC will install a temporary insert for the duration of the tank construction. The subcontractor shall install the permanent Leakage Detection sump's HDPE Geomembrane pipe and cover during Phase IIA/B.

e. GCL and HDPE Geomembrane installation outlined in (1.6.B.1.d), shall be extended as follows:

1. The GCL coverage shall be the lower mudmat surface covered by the Upper mudmat per drawing C-CY-Z-00015.
2. The HDPE Geomembrane coverage shall be the approximate area of the lower mudmat (to within ~6" of the perimeter edge of the lower mudmat). (See drawing C-CY-Z-00015 Section A).

2. Phase IB: Embedments for installation by others

a. Concurrent with Phase IA, provide EDR submittals in accordance with Section 01330 for HDPE Embedments for the vertical edge of the tank foundation slab. Included in these submittals shall be confirmation of material compatibility with HDPE Geomembrane materials used in subsequent phase.

b. Upon approval of embedment submittals, provide butt-welded Embedment materials to LWC. These will be Cast-in-Place by others in the vertical edge of the tank foundation slab prior to Phase IIA/B. Refer to drawings C-CC-Z-00075, Section A, C-CC-Z-00077, Section A, C-CY-Z-00014, C-CY-Z-00015, Sections A and B.

c. Phase IA and IB shall be completed prior to demobilization for tank construction.

3. Phase IIA: HDPE Geomembrane final installment, sump installment and HDPE Geomembrane Weldment

a. Allow approximately 24-30 months from completion of Phase I to begin implementation of this phase.

b. Coordinate installation schedule with the STR to ensure readiness to begin installation.

c. Remove temporary sump insert (see 1.6.B.1.d.6) by others.

d. Subcontractor is responsible to complete the installation of the sump insert, fill the sump with No. 8 stone (procured by others), and install the sump cover with the two (2) inches diameter HDPE pipe(s) (Reference C-CY-Z-00015 and C-CY-Z-00016).

Placement of the stone filled non-woven geotextile pocket is by LWC, not Subcontractor scope.

e. Complete HDPE Geomembrane final installation from the lower mudmat HDPE Geomembrane to the vertical edge of the tank foundation slab at the HDPE embeds using extrusion fillet welds. See C-CY-Z-00015.

4. Phase IIB: HDPE embedment Installation at the vertical edge of the tank foundation slab during tank construction.
   a. Concurrent with Phase IIA, provide welding services to fuse the HDPE embedment (non-buttwelded joints between foundation slab sections) on the vertical edge of the tank foundation slab following completion of tank construction and prior to the HPDE Geomembrane final installment in Phase IIA.

1.7 WORK BY OTHERS

A. Clearing of working area in preparation for construction.
B. Temporary benchmarks and heave marker installation.
C. Stormwater management and sediment/erosion control measures, in accordance with SWPPP.
D. Site preparation.
E. Construction of concrete lower and upper mudmats.
F. Cleaning/drying of lower mudmat prior to initial start of GCL/HDPE installation and once after each upper mudmat placement.
G. Embedments installation.
H. Protection from traffic during tank construction.
I. Construction of the leak tight concrete tank.
J. Application of internal coatings/liner.
K. Procurement and Installation of Non-Woven Geotextile and No. 8 stone over the HDPE Geomembrane leak retention sumps.
L. Performance of Leak Tightness Test.
M. Backfill after tank construction and above final HDPE Geomembrane installation.
N. Site finish grading for erosion control including grassing.

1.8 WORK SEQUENCE

A. The following activity sequence integrates the scope of this specification and work done by others. As such, it shows the phases described in section 1.6.B. The Subcontractor schedule shall allow for time gaps identified and coordinate with the STR as indicated to ensure smooth transitions from one phase to the next until completion.
   1. Obtain authorization to proceed with Phase IA.
   2. Lower Mudmat construction by others.
   3. GCL and HDPE Geomembrane material and Installation **(Phase IA)**.
   4. Non-Woven Geotextile procurement and installation and upper mudmat construction by others.
   5. Provide HDPE Embedments **(Phase IB)**
   6. Installation of vertical edge of the tank foundation slab HDPE embedments by others during Tank construction **(Phase IB)**
   7. Tank Construction by others (24-30 months).

8. Installation of HDPE Geomembrane on exposed surface of lower mudmat **(Phase IIA)**
9. Installation of HDPE Geomembrane leak retention sumps
10. Procurement and Installation of Non-Woven Geotextile and No. 8 stone over the HDPE Geomembrane leak retention sumps by others.
11. Extrusion welding of exposed face of HDPE embedment joints in the vertical edge of the tank foundation slab following Tank construction **(Phase IIB).**
12. Final HDPE Geomembrane installation and Weldment Post Leak Tightness Test **(Phase IIA)**

1.9 GENERAL REQUIREMENTS

A. Requirements in Division 1 of this Specification apply to all sections of this Specification.
B. Maintain an on-site copy of the latest design documents, drawings and specifications for the duration of the project at all times.
C. Confirm and coordinate with the STR all aspects of the work including;
   1. Work by sub-tier subcontractors,
   2. Fabrication processes,
   3. Methods and sequences of construction.
   4. LWC Inspection coordination.
   5. Sharing access corridors with other Subcontractors and LWC construction.
D. Provide required testing as identified in the Subcontract Documents.

1.10 SITE REQUIREMENTS

A. General Provisions, Special Provisions and Subcontract Field Conditions are described in the procurement documents.

1.11 EXISTING CONDITIONS

A. Verify existing conditions, utilities, dimensions, and details affecting the work prior to performing other field activities.
B. Report any discrepancies or deviations from Subcontract Documents to STR as soon as conditions are identified using a Request for Information or SDDR in accordance with Section 01330 – Submittal Procedures.

1.12 ADMINISTRATION

A. The LWC STR for this effort will be identified at award of the subcontract.
B. The STR is the LWC representative responsible for all administrative and technical communication and direction between LWC and the Subcontractor.
C. All technical correspondence shall be directed to the STR with a transmittal copy to the Procurement Representative.

1.13 ACCEPTANCE AND INSPECTION

A. Prior to final acceptance, each phase of work will be inspected and accepted by LWC QC and the STR for conformance to Subcontract Document requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

CHANGE PROCEDURES

SECTION 01250

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Request for Information
B. Supplier Deviation Disposition Request
C. Change Notice

1.2 RELATED SECTIONS

A. Division 1 - All Sections

1.3 REFERENCES

Refer to Section 01004 for guidance on appropriate document editions to use.

A. Required National Codes / Standards
1. None Specified in this Section
B. Regulations
1. None Specified in this Section
C. Documents
1. OSR 45-4 Form (SDDR Form)
D. Drawings
1. None Specified in this Section

1.4 DEFINITIONS

A. Minor Change: Change to the project or clarifications of the Subcontract Documents in which the change does not impact the subcontract, including cost and schedule or performance requirements.
1. Changes are initiated by the LWC STR or the Subcontractor’s Point of Contact.
2. Level of quality shall be maintained with a minor change.
B. Deviation: Subcontractor initiated change for which the scope, cost and/or schedule of the Subcontract may be impacted (requires SDDR).
C. Subcontractor Authorized Representative: Individual within Subcontractor’s organization authorized to receive change documents and responsible for informing others in Subcontractor's employment or Sub-tier subcontractors of changes to the Work Scope.

1.5 SUBMITTALS

A. Submit the following Engineering Documents in accordance with Sections 01330 and 01400.
1. None Specified in this Section

1.6 REQUEST FOR INFORMATION (RFI)

A. Identify questions needing clarification or request services from LWC using a Request for Information (RFI).
1. RFI forms will be available from the LWC STR.
B. Transmit the RFI to the LWC STR.

C. RFI issues which, at any time during the course of the subcontract, result in changes to or deviations from the technical or quality requirements or otherwise impact the cost / schedule require the use of an SDDR prior to continuing the affected work.

D. Maintain a tracking log of RFI documents.

1.7 SUPPLIER DEVIATION DISPOSITION REQUEST (SDDR)

A. Prepare an SDDR for Subcontractor proposed deviations from the technical or quality requirements of this procurement.

B. Applies to proposed deviations that are not Minor Changes after award of subcontract.

1. RFI issues subsequently determined to be non-minor changes to the technical or quality requirements or otherwise impact the cost / schedule require implementation and completion of the SDDR process prior to continuing.

C. For each deviation:

1. Identify the following, as applicable:
   a. Specification and revision number.
   b. Affected drawing number, revision number, section or detail.
2. Identify criteria that cannot be met by item and specification section number.
3. Present explanation for the deviation.
4. Present proposal for resolution of the deviation.
5. Present price and schedule adjustment for the proposed resolution of the deviation.

D. Nonconforming Conditions

1. Nonconforming conditions are Subcontractor installed conditions which do not meet the technical or quality requirements of this subcontract.
2. Document nonconforming conditions on an SDDR when requesting acceptance of a “Use-As-Is” or “Repair” disposition.
   a. Include supporting technical justification.
3. Notify STR immediately upon the discovery of a non-conforming condition.

E. Transmit SDDR for review and disposition in accordance with Section 01330 - Submittal Procedures.

1. Proposed deviations shall be identified promptly and transmitted to STR to allow for adequate review and approval durations without impacting the subcontract schedule. A minimum of seven (7) calendar days should be allowed.

F. Do not perform work on affected scope or make delivery of any item for which an SDDR is submitted until a written disposition of the SDDR is received from LWC.

1. Continue the work in accordance with the written LWC disposition of the SDDR.

1.8 CHANGE NOTICE

A. LWC SA/PR (Buyer) will issue a Change Notice to identify additional scope, including a detailed description of proposed change with supplementary or revised drawings and/or specifications.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SUBMITTAL PROCEDURES

SECTION 01330

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for submittal of information for LWC review and/or acceptance.

1.2 RELATED SECTIONS

A. All Sections in this Specification

1.3 REFERENCES

Refer to Section 01004 for guidance on appropriate document editions to use.

A. Required National Codes / Standards
1. None Specified in this Section

B. Regulations
1. None Specified in this Section

C. Documents
1. None Specified in this Section

D. Drawings
1. None Specified in this Section

1.4 DEFINITIONS

A. See Section 01100 for general requirements not included in this section.

1.5 QUALITY ASSURANCE

A. See Section 01400 for general requirements.

1.6 SUBMITTALS

A. Required Submittals:
1. Specified in the individual specification sections and listed on the Engineering Document Requirements (EDR) form, Attachment 01330-A.
2. Review prior to submission.
3. Certify conformance of documents to specification requirements by signature of the Subcontractor's Authorized Engineering Representative.
4. List the following on each submittal transmittal cover letter:
    a. Document category number, and applicable specification Section and Article number (Ref. Columns 1 and 2 of Attachment 01330-A).
    b. Document description.

B. Correspondence letters, submittals and SDDR forms:
1. Uniquely identify with a control number
2. Reference the following Information:
    a. Subcontractor Name,
    b. Subcontractor's Order Reference Number,
    c. LWC Purchase Order No.: (Defined on Award),
    d. LWC Project Number and Title: (SDU 8&9, Saltstone Disposal Unit- 8&9),

e. Date of transmittal,
f. Sequence page number and total number of pages on each page.

3. Transmit with a completed Transmittal Letter.

C. Transmit Adobe Acrobat Portable Document Format (PDF) files of EDR submittals, Request for Information, and SDDR forms to (unless directed otherwise by the STR): vendordocuments@srs.gov**.**

1. When paper copies are required, transmit to (unless directed otherwise by the STR):

   Liquid Waste Contractor
   Document Control Center
   Building 704-1N
   Aiken, SC 29808
   Project: Saltstone Disposal Site – SDU 8&9

D. Transmit a copy of correspondence letters, submittals, SDDR forms, and Request for Information forms to:

   STR.
   Name: (Defined on Award)
   Savannah River Site
   Building / Room: (Defined on Award)
   Aiken, SC 29808

E. Transmit correspondence and a copy of all transmittal letters to:

   Procurement Representative
   Name: (Defined on Award)
   Savannah River Site
   Location: (Defined on Award)
   Aiken, SC 29808

F. Mark "RESUBMITTAL" on resubmitted documents and include the previous submittal document number provided with submittal review comments.

G. Electronic Submittals: Submittals shall, unless specifically accepted otherwise, be made in electronic format.

1. Each submittal shall be an electronic file in Adobe Acrobat Portable Document Format (PDF). Use the latest version available at time of execution of the Agreement.
2. Electronic files that contain more than ten (10) pages in PDF format should contain internal bookmarking from an index page to major sections of the document.
3. PDF files shall be set to open "Bookmarks and Page" view.
4. Add general information to each PDF file, including title, subject, author, and keywords.
5. PDF files shall be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch. No other paper sizes will be accepted.
6. Submit new electronic files for each resubmittal.
7. STR will reject submittal that is not electronically submitted, unless specifically accepted due to specific content.
8. Provide STR with authorization to reproduce and distribute each file as many times as necessary for Project documentation.
9. Detailed procedures for handling electronic submittals will be discussed at the preconstruction conference.
10. Paper submittals are acceptable.

11. Durations provided for submittal and review cycles are calendar days.
12. Where duration “after award” is provided, duration is measured in calendar days after notification of award is given for this Subcontract, rather than any sub-tier subcontracts.

1.7 REVIEW, ACCEPTANCE AND STATUS OF SUBMITTALS

A. Submit documents listed on the Engineering Document Requirements form, Attachment 01330-A, on or before the submittal schedule identified in Column 5.

B. Unless noted otherwise, EDR submittals will be returned to the Subcontractor within 14 days of receipt indicating the submittal status by identifying it as follows:

1. Status 1: Work may proceed.
2. Status 2: Submit final documentation. Work may proceed.
3. Status 3: Revise and resubmit. Work may proceed subject to resolution of indicated comments.
4. Status 4: Revise and resubmit. Work may not proceed.
5. Status 5: Permission to proceed not required.

C. Incorporate changes as required in accordance with LWC comments.

1. Clearly indicate revisions on all resubmitted documents.
2. Resubmit corrected Engineering Documents for review within 21 days of the date of receipt.

D. Assignment of Status 1 or Status 5 to the Engineering Documents by LWC does not relieve the Subcontractor of any part of their obligation to meet all requirements of this Specification or their responsibility for the correctness of such Engineering Documents, and the adequacy and suitability of material and equipment represented thereon for the intended function.

E. Do not change previously accepted, Status 1 or Status 5, documents without notification to the STR.

1.8 ATTACHMENTS

A. 01330-A: Engineering Document Requirements (EDR), with Instructions

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

Engineering Document Requirements

1. Document Category Number	2. Specification Paragraph Reference	3. Document Description	4. Permission to Proceed Required		5. Submittal Schedule	6. Quantity Required		7. Kind of copies	8. Remarks
			Yes	No		Init	Final		
28.0	01450 1.10 A.	Testing Laboratory Business Information	Y		Prior to Initiating HDPE Work		1	Repro	
*13.0	01600 2.1 C.	"Or-Approved-Equal" Item Substitution	Y		Two (2) Weeks Prior to Use		1	Repro	Only as Required
11.0	02510 2.1 D.	HDPE Pipe and Fittings Catalog Information	Y		Four (4) Weeks Prior to Use		1	Repro	
1.3	02510 2.1 E.	HDPE Pipe, Sump, and Fittings Drawings	Y		Four (4) Weeks Prior to Use		1	Repro	
28.0	02510 1.6 B.1	Pipe Manufacturer Qualifications	Y		Four (4) Weeks Prior to Use		1	Repro	
28.0	02510 1.6 B.2	HDPE Pipe Fuser Qualifications	Y		Four (4) Weeks Prior to Use		1	Repro	
28.0	02661 1.7 A. 2.	HDPE Geomembrane Manufacturer Qualifications	Y		One (1) Week After Award		1	Repro	
28.0	02661 1.7 B. 2.	HDPE Geomembrane Installer Qualifications	Y		Four (4) Weeks Prior to Use		1	Repro	
28.0	02661 1.7 C. 2.	HDPE Geomembrane Field Supervisor or Superintendent Resume and References	Y		Four (4) Weeks Prior to Use		1	Repro	
28.0	02661 1.7 D. 2.	HDPE Geomembrane Field Crew Resumes and References	Y		Four (4) Weeks Prior to Use		1	Repro	
28.0	02661 1.7 E.3.	Independent Testing Agency Qualifications	Y		Eight (8) Weeks Prior to Installation		1	Repro	
11.0	02661 2.3 H.	HDPE Geomembrane Manufacturer's Specifications, Literature for Each Geomembrane Lot/Batch (provide with proposal)	Y		One (1) Week After Award		1	Repro	
4.0	02661 2.6 B.	HDPE Geomembrane Installation Plan	Y		One (1) Week After Award		1	Repro	
11.0	02661 2.5 C.	HDPE Embedment Catalog Information Conforming to Requirements of Section 02661(provide with proposal)	Y		One (1) Week After Award		1	Repro	
4.0	02661 2.5 D.	HDPE Embedment Drawings of Specific Connection Details	Y		Twelve (12) Months After Award		1	Repro	
28.0	02667 1.7 A. 2.	GCL Manufacturer Qualifications	Y		Two (2) Weeks After Award		1	Repro	
28.0	02667 1.7 B. 2.	GCL Installer Qualifications	Y		Four (4) Weeks Prior to Use		1	Repro	
28.0	02667 1.7 C. 2.	GCL Field Supervisor or Superintendent Resume and References	Y		Four (4) Weeks Prior to Use		1	Repro	
28.0	02667 1.7 D. 2.	GCL Field Crew Resumes and References	Y		Four (4) Weeks Prior to Use		1	Repro	

Engineering Document Requirements

1. Document Category Number	2. Specification Paragraph Reference	3. Document Description	4. Permission to Proceed Required		5. Submittal Schedule	6. Quantity Required		7. Kind of copies	8. Remarks
			Yes	No		Init	Final		
11.0	02667 2.3 J.	GCL Manufacturer's Specifications, Literature	Y		Two (2) Weeks After Award		1	Repro	
4.0	02667 2.6 B.	GCL Installation Plan	Y		Eight (8) Weeks Prior to Use		1	Repro	
*28.0	02661 2.1 A.	HDPE Geomembrane and Embedments Letter of Compliance for the Materials Delivered at Project Site	Y		With Shipment		1	Repro	
*28.0	02661 2.6 C.	HDPE Geomembrane Installer's Certification of Subsurface Acceptability	Y		Prior to Placement		1	Repro	
26.1	02510 3.2 A.1.c	HDPE Pipe, Sump & Fitting Test Procedure		N	Four (4) Weeks Prior to Use		1	Repro	
*28.0	02661 3.7 B.	HDPE Geomembrane Manufacturer's Certificate of Proper Installation		N	Two (2) Weeks After Installation		1	Repro	
24.0	02661 3.9 A.7.a	Vacuum Box Detailed Test Procedure		N	Four (4) Weeks Prior to Use		1	Repro	
26.2	02661 3.9 A.7.b	High Voltage Spark Leak Detector Detailed Test Procedure		N	Four (4) Weeks Prior to Use		1	Repro	
26.0	02661 3.9 A.7.c	Pressurized Air Channel Equip Detailed Test Procedure		N	Four (4) Weeks Prior to Use		1	Repro	
26.0	02661 3.9 A.7.d	Shear and Peel Apparatus Detailed Test Procedure		N	Four (4) Weeks Prior to Use		1	Repro	
26.0	02661 3.9 A.14	Calibration Records and Post Calibration record for Test Equipment		N	Prior to Use		1	Repro	
*28.0	02667 3.7 A.	GCL Manufacturer's Certificate of Proper Installation		N	Two (2) Weeks After Installation		1	Repro	
28.0	2667 2.1 A	GCL Letter of Compliance for the Materials Delivered at Project Site		N	With Shipment		1	Repro	

Engineering Document Requirements Instructions

Purpose The Engineering Document Requirements (EDR) form is prepared by the originator, establishes a basis for actions required of a Supplier and provides the schedule for the submittal of engineering documents by the Supplier.

Legend Entry

No. Information Required

1 Document category number – see below.
2 Applicable specification number and appropriate paragraph.
3 Description corresponding to document category number.
4 Permission to proceed with fabrication or other specific processes is marked yes, if required.
5 List a milestone after award i.e., prior to fabrication, prior to test, prior to shipment, or with shipment that the listed document is to be submitted by Supplier.
6 Number of copies required for submittal.
7 Reproducible (Repro): PDF, Paper, Mylar, Vellum, etc.
8 Enter remarks when appropriate.

Document Category Number and Descriptions

1.0 Drawings
- 1.1 Outline Dimensions, Services, Foundations and Mounting Details – Drawings providing external envelope, including lugs, centerline(s), location and size for electrical cable, conduit, fluid, and other service connections, isometrics and details related to foundations and mountings.
- 1.2 Assembly Drawings – Detailed drawings indicating sufficient information to facilitate assembly of the component parts of an equipment item.
- 1.3 Shop Detail Drawings – Drawings which provide sufficient detail to facilitate fabrication, manufacture, or installation. This includes pipe spool drawings, internal piping and wiring details, cross-section details and structural and architectural details.
- 1.4 Wiring Diagrams – Drawings which show schematic diagram equipment, internal wiring diagrams, and interconnection wiring diagram for electrical items.
- 1.5 Control Logic Diagrams – Drawings which show paths which input signals must follow to accomplish the required responses.
- 1.6 Piping and Instrumentation Diagrams – Drawings which show piping system scheme and control elements.

2.0 Parts Lists and Costs – Sectional view with identified parts and recommended spare parts for one year's operation and specified with unit cost.

3.0 Complete SRS Data Sheets – Information provided by Supplier on data sheets furnished by SRS.

4.0 Instructions
- 4.1 Erection/Installation – Detailed written procedures, instructions, and drawings required to erect or install material or equipment.
- 4.2 Operations – Detailed written instructions describing how an item or system should be operated.
- 4.3 Maintenance – Detailed written instructions required to disassemble, reassemble and maintain items or systems in an operating condition.
- 4.4 Site Storage and Handling – Detailed written instructions, requirements and time period for lubrication, rotation, heating, lifting or other handling requirements to prevent damage or deterioration during storage and handling at jobsite. This includes shipping instruction for return.

5.0 Schedules: Engineering and Fabrication/Erection – Bar charts or critical path method diagram which detail the chronological sequence of activities, i.e., Engineering submittals, fabrication and shipment.

6.0 Quality Assurance Manual/Procedures – The document(s) which describe(s) the planned and systematic measures that are used to assure that structures, systems, and components will meet the requirements of the procurement documents.

7.0 Seismic Data Reports – The analytical or test report which provides information and demonstrates suitability of material, component or system in relation to the conditions imposed by the stated seismic criteria.

8.0 Analysis and Design Reports – The analytical data (stress, electrical loading, fluid dynamics, design verification reports, etc.) which demonstrate that an item satisfies specified requirements.

9.0 Acoustic Data Reports – The noise, sound and other acoustic vibration data required by the procurement documents.

10.0 Samples
- 10.1 Typical Quality Verification Documents – A representative data package which will be submitted for the items furnished as required in the procurement documents.
- 10.2 Typical Material Used – a representative example of the material to be used.

11.0 Material Descriptions – The technical data describing a material which a Supplier proposes to use. This usually applies to architectural items, e.g., metal siding, decking, doors, paints, coatings.

12.0 Welding Procedures and Qualifications – The welding procedure, specification and supporting qualification records required for welding, hard facing, overlaying, brazing and soldering.

13.0 Material Control Procedures – The procedures for controlling issuance, handling, storage and traceability of materials such as weld rod.

*13.0 Material Verification Reports – Reports relative to material which confirm, substantiate or assure that an activity or condition has been implemented in conformance with code and material specifications imposed by the procurement documents.

14.0 Repair Procedures – The procedures for controlling materials removal and replacement by welding, brazing, etc., subsequent thermal treatments, and final acceptance inspection.

15.0 Cleaning and Coating Procedures – The procedures for removal of dirt, grease or other surface contamination, and preparation and application of protective coatings.

16.0 Heat Treatment Procedures – The procedures for controlling temperatures and time at temperature as a function of thickness, furnace atmosphere, cooling rate and methods, etc.

*17.0 Material Property Reports
- *17.4 Materials Certificate of Conformance – Documents which certify conformance to the requirements of the applicable material specification.

19.0 UT – Ultrasonic Examination Procedures – Procedures for detecting discontinuities and inclusions in materials by the use of high frequency acoustic energy.

20.0 RT – Radiographic Examination Procedures – Procedures for detecting discontinuities and inclusions in materials by x-ray or gamma ray expose of photographic film.

21.0 MT – Magnetic Particle Examination Procedures – Procedures for detecting surface or near surface discontinuities in magnetic materials by the distortion of an applied magnetic field.

22.0 PT – Liquid Penetrant Examination Procedures – Procedures for detecting discontinuities in materials by the application of a penetrating liquid in conjunction with suitable developing materials.

23.0 Eddy Current Examination Procedures – Procedures for detecting discontinuities in materials by distortion of an applied electromagnetic field.

24.0 Pressure Test – Hydro, Air, Leak, Bubble or Vacuum Test Procedures – Procedures for performing hydrostatic or pneumatic structural integrity and leakage tests.

25.0 Inspection Procedures – Organized process followed for the purpose of determining that specified requirements (dimensions, properties, performance results, etc.) are met.

*25.0 Inspection and Verification Reports – Documented findings resulting from an inspection.

26.0 Performance Test Procedures – Test performed to demonstrate that functional design and operational parameters are met.
- 26.1 Mechanical Tests – e.g., pump performance, data, valve stroking, load, temperature rise, calibration, environmental, etc.
- 26.2 Electrical Test – e.g., impulse, overload, continuity, voltage, temperature rise, calibration, saturation, loss, etc.

Engineering Document Requirements Instructions

*26.0 Performance Test and Verification Reports – Reports of Test Results
27.0 Prototype Test Reports – Reports of a test which is performed on a standard or typical examination of equipment or item, and which is not required for each item produced in order to substantiate the acceptability of equal items. This may include tests which result in damage to the item(s) tested.
28.0 Personnel Qualification Procedures – Procedures for qualifying welders, inspectors and other special process personnel.
*28.0 Certificate of Conformance – A document signed or otherwise authenticated by an authorized individual certifying the degree to which items or services meet specified requirements.
29.0 Supplier Shipping Preparation Procedures – Procedures used by a Supplier to prepare finished materials or equipment for shipment from its facility to the jobsite.

Note: * used for sub-categories.

QUALITY REQUIREMENTS

SECTION 01400

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General Quality Requirements.

B. Site inspection and oversight requirements.

1.2 RELATED SECTIONS

A. All Sections in this Specification

1.3 REFERENCES

Refer to Section 01004 for guidance on appropriate document editions to use.

A. Required Codes / Standards

1. American Society for Testing and Materials (ASTM)
    a. E329

B. Regulations

1. None Specified in this Section

C. Documents

1. C-QIP-Z-00026
2. Control of Nonconforming Items QP-15
3. Corrective Action QP-16

D. Drawings

1. C-C2-Z-00020
2. C-C2-Z-00021

1.4 DEFINITIONS

A. Quality Control (QC): Means by which LWC ensures that the construction, to include that performed by sub-tier subcontractors and suppliers, complies with the requirements of the subcontract. LWC will provide QC for on-site constructions activities.

1.5 QUALITY ASSURANCE

A. Quality Program Requirements

1. Perform work in the execution of this specification in accordance with the Quality Program defined in Attachment 01400-A and 01400-B.

B. All work is subject to LWC Quality Control inspection and testing to ensure strict compliance with the terms of the Subcontract Documents.

1. When subcontracting any portion of this contract or when procuring structures, systems, components, items and materials, the Subcontractor is required to implement the applicable QA program requirements by flowing it down to sub-tier supplier(s). LWC reserves the right, at any time, to manage the QA Program defined in Attachments 01400-A and 01400-B by verifying that all QA applicable requirements have been correctly selected and imposed on Subcontractor's sub-tier suppliers. Access to lower tier sub-supplier facilities will be requested through the supplier prior to access and may be performed jointly.

2. The flow down of requirements encompasses verification that the sub-tier supplier has been appropriately qualified for performance of activities complying with this procurement.
3. The Subcontractor shall maintain objective evidence of the flow down of requirements to sub-tier suppliers, subsequent successful implementation of requirements, and provide such evidence to LWC upon request.
4. The Subcontractor is furthermore responsible to flow down all commercial Terms and Conditions, including articles incorporated by reference, to all sub-tier suppliers.
5. This flow down is also required at all levels if the sub-tier supplier to the prime Subcontractor deems it necessary to further subcontract its parts of this LWC subcontract.
6. Right of Access
    a. LWC reserves the right to review aspects of the design, fabrication, inspection, examination and testing of the equipment to the extent necessary to ensure compliance to this specification and code requirements.
    b. Review includes the right to access the Subcontractor's facilities, including sub-tier Subcontractors, vendors, and suppliers, for review, audit, surveillance, and witnessing of fabrication, inspection, examination, and testing activities.

C. LWC quality control inspections and tests are for the sole benefit of LWC and do not:
1. Relieve Subcontractor of responsibility for providing adequate quality control measures;
2. Relieve Subcontractor of responsibility for damage to or loss of the material before acceptance;
3. Affect the continuing rights of LWC after acceptance of the completed work.

D. The presence or absence of a quality control inspector does not relieve Subcontractor from any subcontract requirement.

E. Subcontractor Records
1. Retain documents and other records generated in association with this specification during the course of the subcontract, to include but not limited to:
    a. Subcontract documents, including this specification and associated SDDRs.
    b. Documentation submittals.
    c. Any document generated for this subcontract (e.g. procedures, quality records, reports, certifications, qualifications, letters, etc.) not required as a submittal (e.g. quality assurance records).
2. The records shall be accessible to LWC, upon request, during construction.
3. Records pertaining to this specification shall be retained by the Subcontractor until contract closure and transmitted to LWC upon contract closure.

1.6 NOTIFICATION AND COORDINATION

A. Coordinate all LWC QC notifications through STR.

1.7 SUBMITTALS

A. None for this section.

1.8 GENERAL REQUIREMENTS

A. LWC QC shall oversee testing as required by Codes and Standards and this specification.
B. Subcontractor shall perform testing.

1.9 SITE INSPECTION AND OVERSIGHT REQUIREMENTS

A. See Section 01810 and QIP.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 GENERAL

A. LWC will manage the Quality Program for the GCL, HDPE Geomembrane and Non-Woven Geotextile installation as defined in Attachment 01400-A and 01400-B.

B. LWC will document, process and close all inspection records for the GCL, and HDPE Geomembrane installation.

C. LWC QC shall perform receipt inspection of all material that is being permanently installed as part of SDU 8&9 per Attachment 01400-C.

3.2 COORDINATION MEETING

A. After a Preconstruction Conference, but before start of construction, schedule a meeting with LWC QA, through the STR to provide the required Project QA Briefing to the subcontract personnel to include Project Manager, Project Engineer, Field Engineers, Superintendents and Foremen.

3.3 QUALITY CONTROL ORGANIZATION

A. LWC QA/QC Manager:

1. Individual within LWC organization who will be responsible for overall management of QA/QC and has the authority to act in QC matters for LWC.

B. LWC QC Staff:

1. LWC shall provide QC support for on-site construction activities. Subcontractor shall notify STR and LWC QA/QC Manager when QC support is required on the weekend and after regular hours. Notify STR a minimum of 48 hours prior to required coverage.

3.4 PREPARATORY MEETING FOR QUALITY CONTROL

A. Subcontractor shall request STR to setup a Preparatory Meeting to be held by the LWC QA/QC Manager prior to start each of the activities identified in section B. The meeting shall address the following:

1. Preparatory Meeting:
    a. Subcontractor shall notify STR at least 48 hours in advance of beginning any of the required action of the preparatory phase.
    b. This phase shall include a meeting conducted by the LWC QA/QC manager and attended by the superintendent, field engineers and LWC QC personnel and the foreman responsible for the definable feature.
    c. The LWC QC Manager shall instruct applicable LWC QC staff as to the acceptable level of workmanship required to meet subcontract requirements.
    d. Perform prior to beginning work on each definable feature of work:
        1. Review applicable Subcontract Specifications.
        2. Review applicable Subcontract Drawings.
        3. Verify that all materials and/or equipment have been tested, submitted, and receipt inspected.
        4. Verify that provisions have been made to provide required QC inspection and testing.
        5. Review required submittals and ensure all applicable submittals have an acceptable status to allow work to start, if not document the open items and track to completion prior to allowing the work to start. Perform a physical examination

of required materials, equipment, and sample work to verify that they are on hand, conform to approved Shop Drawing(s) or submitted data, and are properly stored.

6. Review procedures for constructing the work, including repetitive deficiencies.
7. Document the results of the preparatory meeting by separate minutes prepared by the LWC QA/QC Manager. Any significant changes to the work processes shall require another preparatory meeting.

2. Additional meetings shall be conducted on the same definable features of work as determined by LWC QA/QC Manager when:
   a. The quality of ongoing work is unacceptable,
   b. There are changes in the on-site production supervision or work crew,
   c. Work on a definable feature is resumed after a substantial period of inactivity.

B. Preparatory meetings shall be held for the following work features:

1. Prior to start GCL Installation
2. Prior to start HDPE Geomembrane Installation over GCL and prior to the first Independent Laboratory testing.
3. Butt welding of HDPE Embedments
4. HDPE Geomembrane Closure Construction.

3.5 QUALITY INSPECTION PLAN

A. Plan shall be prepared by LWC and shall include details of what to be inspected (Reference QIP C-QIP-Z-00026).

3.6 QUALITY CONTROL REPORT

A. LWC QC shall complete the inspection reports for the applicable feature and provide them to LWC QA for closure and processing to records.

3.7 TESTING QUALITY CONTROL

A. Testing Procedure:

1. Perform tests specified or required to verify that control measures are adequate to provide a product which conforms to subcontract requirements.
2. Procure services of a licensed testing laboratory.
   a. Refer to Section 01450 for Testing Laboratory qualifications and requirements.
3. Perform the following activities and record the following data:
   a. Verify testing procedures comply with subcontract requirements.
   b. Verify facilities and testing equipment are available and comply with testing standards.
   c. Check test instrument calibration data against certified standards.
   d. Verify recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
   e. Documentation:
      1. Record results of all tests taken, both passing and failing, on the test report for the date taken.
      2. Actual test reports may be submitted later, if approved by STR, with a reference to the test number and date taken.
      3. Provide directly to STR an information copy of tests performed by an off-site or commercial test facility. STR will provide test reports to LWC QC.
      4. Test results shall be signed by an engineer registered in the state where the tests are performed.

3.8 COMPLETION INSPECTION

A. All testing of this part of the work is provided by the Subcontractor's approved independent Testing Agency and witnessed by LWC QC. LWC QC shall perform final inspection of the applicable feature and provide the Subcontractor a punch list of the open items requiring correction prior to final acceptance.

3.9 ATTACHMENTS

A. 01400-A: Supplier Quality Assurance Program Requirements (SQAPR)
B. 01400-B: Quality Program Requirements
C. 01400-C: Standard Receipt Inspection Criteria (SRIC) – Sample Form

END OF SECTION

Supplier Quality Assurance Program Requirements

Attachment No.	Spec/Req No.	Revision No.

Note to the CTF/CQF

Level 1 - Procurements require verification of the supplier's quality program through the performance of an evaluation or audit that compares against the national or international consensus standard designated in Section A. Additional verification methods may also be designated in Section C.

Level 2 - Procurements that invoke a supplier quality assurance program, shall require the supplier to provide a copy of their Quality Assurance Manual for an adequacy/concurrence review and may apply the same consensus standard verification process as designated in Section A, otherwise designate at least one alternate evaluation method in Section C. (Ref. 1Q, 7-2; 1Q, 18-3; and 3E, 1.1)

Section A

National Consensus Standards for Supplier Quality Program Requirements are identified, but not limited to the ones below.

- ☐ ASME/NQA-1 Part I - Nuclear Quality Assurance Program Requirements (Pages 2-4 must be completed.)
- ☐ ISO 17025 (Calibration/Testing Standard)
- ☐ ASME Section VIII Division I (Appendix 10)
- ☐ NQA-1, Part II
  - ☐ 2.1 Fluid/Comp Clean
  - ☐ 2.2 Pack/Ship/Rec/Store/Handle
  - ☐ 2.3 Housekeeping
  - ☐ 2.4 IIT Power/Instr/Control Equipment
  - ☐ 2.5 IIT Con/Steel/Soils/Foundation
  - ☐ 2.7 Software*
  - ☐ 2.8 IIT Mechanical
  - ☐ 2.14 CGD
  - ☐ 2.15 Hoist/Rig/Transport
  - ☐ 2.18 Maintenance
  - ☐ 2.20 Subsurface
- ☒ Other For Testing Laboratory Services, provide Quality Program as required by ASTM E329, Section 8.
- ☒ Other See Section B of this Form.

*When invoking 2.7, Req. 4 and 7 shall also be invoked unless the procuring of software by the supplier is prohibited. If so, a statement to this effect is to be added as a comment on this form for Req. 4 and 7.

NOTE - When necessary, use an attachment to define additional requirements and/or details.

Section B

Clarifications/Exceptions (as needed)

Subcontractor shall comply with the limited scope QA Program provided by LWC as noted on the attachment.

Section C

For Level 2 procurements, methods of evaluating supplier's quality assurance program are listed below.

1. The supplier will provide a copy of their Quality Assurance Manual for an adequacy/concurrence review, and
2. One or more of the boxes marked below will also be applied.

- ☐ Performance of an audit as defined in Section A
- ☐ Submittal of current applicable ASME certificate
- ☐ Review of the Suppliers last 12 months of performance history
- ☐ Supplement audit/evaluation
- ☒ Document submittals identified on EDR document (e.g., process procedures, welder qualifications, etc.
- ☐ Supplier surveillance activities
- ☐ Receiving Inspection
- ☐ Other

The following attachment pages define the flow down requirements, as they are required for each applicable section of the CSI specification. The attachment pages identify the flow down by specification section as they pertain to the installer and/or service provider as well as the procurement of materials used to install the Leakage Detection System.

HDPE Geomembrane/GCL Subcontractor will work to the following Quality Requirements as defined by this specification and Quality Procedures (QP) defined below. Subcontractor will be required to complete a Quality Assurance Overview prior to starting work. This briefing will identify the required Quality Programs to be implemented and how they will be addressed for the subcontractor.

Quality Program and Training and Indoctrination

The program shall provide for indoctrination, training, and qualification as necessary of personnel, managing activities affecting quality to assure that suitable proficiency is achieved and maintained. Quality Overview will be given to all personnel managing quality affecting work. Specific job titles required to complete the QA Briefing:

Subcontractor Project Manager, Subcontractor Superintendent, and any other Subcontractor personnel directing personnel performing Quality related work.

QP-06 "Document Control"

Subcontractor will be provided controlled drawings, instructions and procedures by the STR.

QP-10 "Inspection"

Inspections will be performed by the LWC QC as defined in the Quality Inspection Plan (C-QIP-Z-00026) and documented by LWC QC. Receipt inspection of materials shall be performed by LWC QC. The Subcontractor is responsible for performing the Receipt inspection at the time of offloading and barricading and tagging the material with a "Pending Inspection' tag. After the subcontractor has determined that the material is acceptable, the subcontractor shall request LWC QC perform the receipt inspection. LWC QC will tag the material with an 'Accept Tag" when the receipt inspection is complete, and the material accepted. Verify attributes on Attachment 01400-C. No documentation of verification is required by subcontractor.

Measuring and Test Equipment (M&TE)

Records for calibration of M & TE required for testing shall be submitted as required by the specification.

QP-13 "Handling, Storage, and Shipping"

Materials shall be stored in accordance with the manufacturer's requirements; this includes environmental requirements as specified by the manufacturer.

LWC QA/QC will perform monthly walk downs to validate proper material storage.

QP-15 "Control of Nonconformances"

Nonconformance's will be managed by LWC QA and implemented using the procedures QP-15 'Control of Nonconformance's"

QP-16 "Corrective Action"

Corrective action will be managed by LWC QA/QC and implemented using the procedure QP-16 "Corrective Actions".

Records

Required records for this specification include the inspection records and the items identified on the EDR as applicable. No additional quality program attributes are required.

Oversight

Oversight of the quality related activities will be performed by LWC QA

Standard Receipt Inspection Criteria

Inspection Report #:		**Quality Level:**	
PO#:	**Quantity Received:**	**Delivery Ticket/Bill of Lading #**	**Date:**
Sampling Standard:	**Sample Sizes**	**Item Description:**	

Item No.	**Description**		**Accept/ Reject**	**LWC QC Initial/Date**
1	ID and Markings	Verify, as stated in the procurement document or in the bill of materials, that items are marked and/or identified with either: the manufactures/supplier ID marking, part and/or model number, name plate and/or tags.		
2	Physical Damage & Packaging	Verify that there is no apparent damage to the item or packaging. This inspection will be a general external visual inspection.		
3	Sample Plan	Invoke the sampling requirements of ANSI/ASQ Standard Z1.4- 2008, general inspection level II, table IIA, with an AQL = 1.0 for all inspection criteria, unless otherwise directed. Note that this plan requires 100% inspection for quantities less than 13.		
4	Cleanliness	Verify that the item is generally clean. Verify that visually accessible surfaces are clean, dry, and do not exhibit signs of harmful dirt, rust, oil, or other contaminating impurities.		
5	Configuration & Workmanship	Verify through visual examination, general workmanship and configuration. Verify that nominal dimensions such as minimum thickness, etc. comply with the size given in the PO, BOM, or other procurement document (PROC doc.). This is not intended to be a detailed dimensional verification, but rather is intended to provide reasonable assurance that the item inspected is the same as the item that was ordered.		
6	Suspect/Counterfeit	Suspect/counterfeit items: Verify that the item does not appear to be altered, refurbished, remanufactured, or not made of the original manufactured parts. Verify that fasteners, if any, are not suspect/counterfeit by checking the suspect head mark list and the controlled product list. Verify that documentation has not been altered.		
7	Documents	- Documents received as required by the PO are acceptable. - Verify CMTRs are received and acceptable with the purchase of the material, when applicable.		
8	Storage	Verify the materials are properly stored in accordance with the manufacturer's recommendations.		
Inspection Performed By:		Signature: _____	Date: _____	

TESTING LABORATORY SERVICES

SECTION 01450

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Subcontractor and Testing Laboratory services.

1.2 RELATED SECTIONS

A. All Sections in this Specification.

1.3 REFERENCES

A. Required Codes / Standards
1. American Society for Testing and Materials (ASTM)
a. E329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

B. Regulations
1. None Specified in this Section

C. Documents
1. None Specified in this Section

D. Drawings
1. C-C2-Z-00020

1.4 QUALITY ASSURANCE

A. See Section 01400 for general requirements.

B. Conform to specified Codes / Standards requirements for testing of construction materials.

1.5 NOTIFICATION AND COORDINATION

A. Notify the STR at least 48 hours prior to expected time for testing operations unless specified otherwise.

1.6 SUBMITTALS

A. Submit the following Engineering Documents in accordance with Sections 01330 and 01400.
1. Testing Laboratory Business Information, 1.10 A.

1.7 LABORATORY PERFORMANCE REQUIREMENTS

A. Provide Testing Laboratory services from a firm authorized to operate in the State of South Carolina.

B. Perform testing in accordance with the requirements specified in the individual sections and Drawings.

C. Perform specified sampling, and testing of products in accordance with referenced codes, standards, and the requirements of this specification.

D. Ascertain compliance of physical and chemical properties of materials in accordance with the requirements of the Subcontract Documents.

E. Notify STR of observed irregularities or nonconformance of work or materials.

F. Utilize testing equipment calibrated at intervals with devices traceable to either the National Institute of Standards and Technology (NIST) or accepted values of natural physical constants.

1. As a minimum, calibrate equipment annually under normal use or semi-annually under heavy or dynamic use.
2. Recalibrate or replace equipment in which the standard operating range has been exceeded, damaging physical or electrical conditions have occurred, or otherwise exposed to abnormal operating conditions.
3. Display calibration sticker or certificate on equipment.

G. Subcontractor shall process an SDDR immediately, in accordance with Section 01250, upon notification by the Testing Laboratory of out of calibration equipment used to perform testing of the equipment and material used.

1.8 QUALIFICATIONS

A. Staff:

1. Maintain technical staff for review services experienced in the designated discipline.
2. Technical staff shall have a minimum of five (5) years' experience on similar projects.

1.9 REPORTS

A. After performance of a test, a test report shall be given to the STR, who will provide it to LWC QC.

B. As a minimum, include the following information on each test report:

1. Date issued,
2. LWC Project Title and Purchase Order Number,
3. Name and signature of on-site sampling / testing personnel,
4. Acceptability when acceptance criteria have been specified,
5. Date and time of on-site sampling, or test,
6. Identification of Specification number, section and paragraph,
7. Sample or test location on the project work site,
8. Type of test, and the sequential control number identifying the test.
9. Any deviation from the test method or procedure specified, including technical justification of the deviation and how it meets or exceeds the original requirement,
10. Name and signature of laboratory inspector or test technician,
11. Measurement and date of laboratory test,
12. Result of laboratory test,
13. Observations, sketches, drawings, plots, etc. as required by test standards,
14. Standards used, including the date / revision designation,
15. Each criterion tested,
16. Specific acceptance criteria for each criterion tested,
17. Specific result of test for each criterion,
18. Identification and serial number of test apparatus used,
19. Certification of conformance with subcontract documents,
20. Name and Signature of individual checking / reviewing the test results.

1.10 RESPONSIBILITY

A. Submit Testing Laboratory Business Information including:

1. Testing Laboratory name, address, telephone number, and names of laboratory technicians and technical staff assigned to the Project and the responsible officer.
   a. Include personnel resumes, qualifications, and certifications.
2. Current accreditation document(s) received from the nationally recognized accreditation organization(s).
3. Independent Testing Laboratory Quality Assurance program details.
4. Documentation of laboratory's authorization to operate in State in which the laboratory facilities are located.
5. Current list of testing equipment and associated components with calibration documents for the two (2) most recent calibrations.

B. Update business information for any changes in personnel.

C. Employment of testing laboratory shall in no way relieve Subcontractor of any obligation to perform work in accordance with requirements of the Subcontract documents.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

COMMON PRODUCT REQUIREMENTS

SECTION 01600

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products
B. Substitutions
C. Handling, shipping, and storage

1.2 RELATED SECTIONS

A. All Sections in this Specification

1.3 REFERENCES

Refer to Section 01004 for guidance on appropriate document editions to use.

A. Required Codes / Standards
1. None Specified in this Section

B. Regulations
1. None Specified in this Section

C. Documents
1. None Specified in this Section

D. Drawings
1. C-C2-Z-00020

1.4 DEFINITIONS

A. Products:
1. New items for incorporation in the work, whether purchased by Subcontractor or LWC for the Project, or taken from previously purchased stock, and may also include existing materials or components required for reuse.
2. Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and terms of similar intent and is not intended to change meaning of such other terms used in Subcontract Documents, as those terms are self-explanatory and have well recognized meanings in construction industry.
3. Items identified by manufacturer's product name, including make or model designation, indicated in manufacturer's published product literature, that is current as of the date of the subcontract award.
4. Reference in this specification to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition of "or-equal" products.

B. Substitutions
1. The substitution of specified products or materials shall be processed through a Submittal for LWC approval in accordance with Section 01330 – Submittal Procedures.
2. A substitution request represents that the Subcontractor has determined the proposed substitution:
   a. Provides the same function as the specified product.
   b. Meets or exceeds the quality level of the specified product.

c. Provides the same or better warranty as the specified product.
1. Does not result in additional time extensions or additional costs to the project.

3. Provide documentation with the Submittal; such as product data, test reports, etc. including above representations; in support of substitution request.
a. Substitutions without formal substitution approval are unacceptable.

C. In case this specification allows a selected product or material to be used as an “Approved Equal”, then, the alternative product or material, preferred by the Subcontractor, shall be submitted for proper review and approval, by including all required objective evidence of equivalency showing that the use of the alternative product or material is not in conflict with design.

D. See Section 01100 for additional definitions not included in this section.

1.5 QUALITY ASSURANCE

A. See Section 01400 for general requirements.

1.6 NOTIFICATION AND COORDINATION

A. Coordinate all LWC engineer approvals through STR.

1.7 SUBMITTALS

A. Submit the following Engineering documents in accordance with Sections 01330 and 01400.
1. Submit proposed “or-equal” product, material or equipment, as required per 2.1.C.

1.8 DELIVERY, STORAGE AND HANDLING

A. Handle, store, and protect products in accordance with manufacturer's instructions, Section 01600 and any specific requirements identified in the individual Division II sections.

NOTE: Materials supplied for use by others are the responsibility of the LWC.

B. Require finished components and assemblies to be wrapped and / or crated at the factory to prevent damage or marring of surfaces during shipping and handling.

C. Receive products in manufacturer's original containers, with seals and labels intact.
1. The STR may reject as non-complying, any materials or products which do not bear product identification satisfactory to the STR as to manufacturer, grade, quality, or any additional product information required for product verification.

D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products and store by methods to prevent soiling, discoloration, staining, disfigurement, or damage.
1. Use of damaged items is unacceptable.

F. Storage - General:
1. Arrange storage of products to permit access for inspection.
2. Periodically inspect to ensure products are not damaged and are maintained under specified conditions.
3. Promptly remove damaged material and unsuitable items from the job site and replace with material meeting the specified requirements.
4. Place on sloped supports.
5. Above ground.
6. Ensure drainage.

7. Prevent entrance of debris.
8. Cover products subject to deterioration or exposure to water vapor with impervious sheet covering.
9. Provide additional protection for materials sensitive to UV deterioration in accordance with manufacturer's instructions.
10. Provide ventilation to prevent condensation and product degradation.
11. Provide environments as recommended by the manufacturer.
12. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion per manufacturer's instructions.
13. Neatly stack sheet materials lying flat to prevent sagging or damage to edges, ends, and surfaces.
    a. All materials shall be stacked in such a manner as to allow safe management and maintenance of storage requirements and safe removal for use.
    b. Utilize manufacturer's recommendations for stacking configurations (i.e., dunnage spacing, maximum safe stacking heights, etc.).
14. Protect against dirt, water, chemical, mechanical damage, and construction traffic.
15. Provide additional or specific storage requirements as required in technical specifications.

1.9 DESIGN REQUIREMENTS

A. Provide design information for components and their anchorage as required by the applicable specification sections.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Altitude: Provide materials and equipment suitable for installation and operation under rated conditions at 320 feet above sea level.
B. Provide equipment and devices installed outdoors or in unheated enclosures capable of continuous operation within an ambient temperature range of minus three (-3) to one hundred seven (107) degrees F (M-TC-Z-00010, Section DC 3.1.3.2)
C. All products, materials, and/or equipment shall be used in compliance to the SWPPP. In case of any deviation, the Subcontractor shall have notified it to the STR for proper review and address before proceeding.
D. Materials requiring temperature controls by the manufacturer shall be stored in a temperature controlled enclosure with high and low temperature gauge.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide manufacturer's standard materials suitable for service conditions, unless otherwise specified in the applicable specification sections.
B. Where product specifications include a named manufacturer, with or without model number, and also include performance requirements, named manufacturer's products must meet the performance specifications.
C. Manufacturer, Supplier, and Product Data are representative of required level of quality or performance. Material or equipment proposed by Subcontractor that is functionally equal to named items and sufficiently similar so that no change in related work will be required may be submitted as an "or-equal" product.
   1. Alternate systems or components that will require evaluation and may change related work may be proposed as a Substitution.

D. Like items of products furnished and installed in the work shall be end products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, manufacturer's services, and implement same or similar process instrumentation and control functions in same or similar manner.

E. Do not use materials and equipment removed from existing premises, except as specifically permitted by Subcontract Documents.

F. Provide interchangeable components of the same manufacturer, for similar components, unless otherwise specified.

G. Equipment, Components, Systems, and Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, state, and local health and safety regulations.

2.2 FABRICATION AND MANUFACTURE

A. General:

1. Manufacture parts to U.S.A. standard sizes and gauges.
2. Two (2) or more items of the same type shall be identical, by the same manufacturer, and interchangeable.
3. Modify standard products as necessary to meet performance Specifications, after LWC approval via an SDDR.

2.3 SOURCE QUALITY CONTROL

A. Where Specifications call for testing to be witnessed by LWC, notify STR prior to schedule test.

B. Calibration Instruments: Bear the seal of a reputable laboratory certifying instrument has been calibrated within the previous twelve (12) months to a standard traceable to the National Institute of Standards and Technology (NIST).

C. Factory Tests: Perform in accordance with LWC accepted test procedures and document successful completion.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect materials and installation equipment for signs of pitting, rust decay, or other deleterious effects of storage.

1. Do not install material showing such effects.
2. Remove damaged material or installation equipment from the Site and expedite delivery of identical new material or installation equipment.

3.2 INSTALLATION

A. Do not cut or notch any structural member or surface without specific approval of STR.

B. Handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's instructions, and as may be specified.

1. Retain a copy of manufacturers' instruction at Site, available for review at all times.

C. For material and equipment specifically indicated or specified to be reused in the work:

1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed work.

2. Arrange for transportation, storage, and handling of products that require off-site storage, restoration, or renovation

END OF SECTION

MANUFACTURER'S FIELD SERVICES

SECTION 01640

PART 1 GENERAL

1.1 SECTION INCLUDES

A. References
B. Definitions
C. Submittals
D. Qualification of Manufacturer's Representative

1.2 RELATED SECTIONS

A. All Sections in this Specification

1.3 REFERENCES

Refer to Section 01100 for guidance on appropriate document editions to use.

A. Required Codes / Standards
1. None Specified in this Section
B. Regulations
1. None Specified in this Section
C. Documents
1. None Specified in this Section
D. Drawings
1. None Specified in this Section

1.4 DEFINITIONS

A. Quality Control (QC): The means by which LWC ensures that the construction, to include that performed by sub-tier subcontractors and suppliers, complies with the requirements of the subcontract.
B. See Section 01100 for definitions not included in this section.

1.5 QUALITY ASSURANCE

A. See Section 01400 for general requirements.

1.6 NOTIFICATION AND COORDINATION

A. Coordinate all LWC approvals through STR.

1.7 SUBMITTALS

A. Submit the following Engineering documents in accordance with Sections 01330 and 01400.
1. None Specified in this Section.

1.8 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective product, equipment, subsystem, or system, with full authority by the manufacturer to issue the certifications required of the manufacturer.
1. Additional qualifications may be specified in the individual specification sections.
B. Representatives are subject to acceptance by LWC.

1. No substitute representatives will be allowed unless prior written approval by LWC has been given.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Furnish manufacturers' services, when required by an individual specification section, to meet the requirements of this section.

B. Where time is necessary in excess of that stated in the specifications for manufacturers' services, or when a minimum time is not specified, time required to perform specified services shall be considered incidental.

C. Determine, before scheduling services, conditions necessary to allow successful testing has been met.

D. Only those days of service approved by STR will be credited to fulfill specified minimum services.

E. When specified in individual specification sections, manufacturer's on-site services shall include:

1. Assistance during product (system, subsystem, or component) installation to include observation, guidance and instruction of Subcontractor's assembly, erection, installation or application procedures.
2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish Manufacturer's Certificate of Proper Installation.
3. Providing, on a daily basis, copies of manufacturers' representative's field notes and data to STR.
4. Revisiting the Site as required to correct problems and until installation is acceptable to CTF and STR.
5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer's products and systems.
6. Assistance during functional and performance testing.

3.2 MANUFACTURER'S CERTIFICATE OF COMPLIANCE

A. When so specified, a Manufacturer's Certificate of Compliance, Attachment 01640-A, shall be completed in full, signed by entity supplying the product, material, or service, and submitted prior to shipment of product or material or execution of the services.

B. LWC may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.

C. Such form shall certify proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.

D. May reflect recent or previous test results on material or product, if acceptable to LWC.

3.3 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

A. When so specified, a Manufacturer's Certificate of Proper Installation form, Attachment 01640-B, shall be completed and signed by product or equipment manufacturer's representative.

B. Such form shall certify signing party is a duly authorized representative of manufacturer, is empowered by manufacturer to inspect, approve, and operate installation equipment and is authorized to make recommendations required to ensure product is complete and is properly installed to perform required purpose.

3.4 TRAINING

A. General:

1. Furnish manufacturers' representatives for hands-on training on installation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications, as necessary.
2. Furnish complete training materials to be retained by each trainee.

3.5 ATTACHMENTS

A. 01640-A: Manufacturer's Certificate of Compliance Form.
B. 01640-B: Manufacturer's Certificate of Proper Installation Form.

END OF SECTION

MANUFACTURER'S CERTIFICATE OF COMPLIANCE

PROJECT NAME: SDU 8&9

PROJECT NO.: _____

PRODUCT, MATERIAL, OR SERVICE SUBMITTED: _____

Comments: _____

_____

_____

_____

_____

_____

I hereby certify that the above-referenced product, material, or service called for by the subcontract for the named Project will be furnished in accordance with all applicable requirements. I further certify that the product, material, or service are of the quality specified and conform in all respects with the Contract requirements and are in the quantity shown.

Date of Execution: _____, 20___

Manufacturer: _____

Manufacturer's Authorized Representative *(print)*: _____

_____

(Authorized Signature)

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

PROJECT: SDU 8&9 EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

- ☐ Trained Subcontractor's personnel
- ☐ Installed in accordance with Manufacturer's recommendations.
- ☐ Inspected, checked, and adjusted.
- ☐ Serviced with proper initial lubricants or adhesives.
- ☐ Electrical and mechanical connections meet quality and safety standards.
- ☐ All applicable safety equipment has been properly installed.
- ☐ Functional tests.
- ☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer: _____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

INSPECTION, OBSERVATION, AND TESTING

SECTION 01810

PART 1 GENERAL

1.1 SECTION INCLUDES

A. References
B. Definitions
C. Submittals
D. Summary
E. Statement of Inspections Requirements

1.2 RELATED SECTIONS

A. All Sections in this Specification

1.3 REFERENCES

Refer to Section 01004 for guidance on appropriate document editions to use

A. Required Codes/Standards
1. None Specified in this Section
B. Regulations
1. None Specified in this Section
C. Documents
1. C-QIP-Z-00026
D. Drawings
1. C-C2-Z-00020
2. C-C2-Z-00021

1.4 DEFINITIONS

A. Agencies and Personnel:
1. Approved Agency: An established and recognized agency regularly engaged in conducting tests, when such agency has been approved.
2. LWC QC Inspector: Qualified person employed by LWC who will demonstrate competence to the satisfaction of LWC for inspection of a particular type of construction or operation requiring Inspection.
3. Professional Observer: LWC Registered design professional or designee providing professional observation of the work for general conformance to the approved construction documents.
B. Inspection:
1. Inspection required of materials, installation, fabrication, erection, or placement of components and connections requiring special expertise to ensure compliance with approved Contract Documents and referenced standards.
C. Professional Observation:
1. Does not include or waive responsibility for required Inspection or inspections by LWC.
2. Requirements are indicated on Statement of Inspections provided on Drawings.
D. Statement of Inspections: Detailed written procedure contained on Drawings establishing systems and components subject to Inspection, Observation, and Testing during

construction, type and frequency of testing, extent and duration of Inspection, and reports to be completed and distributed by LWC QC Inspector and Professional Observer.

E. See Section 01100 for additional definitions not included in this section.

1.5 QUALITY ASSURANCE

A. See Section 01400 for general requirements.

1.6 NOTIFICATION AND COORDINATION

A. Coordinate all LWC inspections, observations and testing through STR.

1.7 SUBMITTALS

A. Submit the following Engineering documents in accordance with Section 01330 and Section 01400:

1. None Specified in this Section

1.8 SUMMARY

A. This section covers requirements for Inspection, Observation, and Testing as required per drawings.

1.9 STATEMENT OF INSPECTIONS

A. Statement of Inspections:

1. The following identifies elements of the inspection, observation, and testing program to be followed in construction of the work:
   a. Type and frequency of Inspection required.
   b. Type and frequency of testing required.

B. Testing of shop fabrication and field construction will be performed by an approved accredited independent agency.

1. Subcontractor shall secure the services of the agency to perform testing.

C. The required inspection with testing and Professional Observation, as provided in Statement of Inspections and on Drawings does not:

1. Relieve Subcontractor of responsibility for providing adequate quality control measures.
2. Relieve Subcontractor of responsibility for damage to or loss of material before acceptance.
3. Affect continuing rights of LWC after acceptance of completed work.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 GENERAL

A. Provide access to shop or Site for Inspection and Testing and Professional Observation.

B. Notify STR in advance of required Inspection and Professional Observation no later than 72 hours prior to date of Inspection and Professional Observation.

C. Materials and systems, inclusive, shall be inspected during placement where Continuous Inspection is required.

D. Materials and systems shall be inspected during or at completion of their placement where Periodic Inspection is allowed.

1. Periodic Inspection shall be performed so that work inspected after, but not during, its placement can be corrected prior to other related work proceeding and covering inspected work.
2. Periodic Inspection does not allow sampling of a portion of the work. All work shall be inspected.

3.2 ATTACHMENT

A. None Specified in this Section

END OF SECTION

HIGH-DENSITY POLYETHYLENE PIPE AND FITTINGS

SECTION 02510

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High-Density Polyethylene Pipe and Sump Assembly

1.2 RELATED SECTIONS

A. Division 1 – All Sections
B. Section 02661

1.3 REFERENCE

Refer to Section 01004 for guidance on appropriate document editions to use

A. Required Codes and Standard
1. American Society for Testing and Materials (ASTM)
   a. D3350
   b. F714
   c. F2620
2. Plastics Pipe Institute, Inc. (PPI)
   a. TR-33

B. Regulations
1. 49 CFR PT 192.285

C. Documents
1. None Specified in this Section

D. Drawings
1. C-CY-Z-00014
2. C-CY-Z-00015
3. C-CY-Z-00016

1.4 DEFINITIONS

A. See Section 01100 for additional definitions not included in this section.

1.5 QUALITY ASSURANCE

A. See Section 01400 for general requirements.

1.6 SUBMITTALS

A. Submit the following Engineering documents in accordance with Sections 01330 and 01400.
1. HDPE Pipe and Fittings Catalog Information, 2.1 D.
2. HDPE Pipe, Sump, and Fittings Drawings, 2.1 E.
3. HDPE Pipe, Sump, and Fittings test procedure, 3.2 A.1.c

B. Qualifications
1. Pipe Manufacturer: Listed with Plastic Pipe Institute.

2. Persons fusing HDPE Geomembrane pipes shall be certified under 49 CFR PT 192.285, have minimum of five (5) years of experience with fusing HDPE Geomembrane pipe and shall have received a minimum of twenty (20) hours of training for fusing HDPE Geomembrane pipe from pipe Subcontractor or fusing equipment supplier.

1.7 DELIVERY, STORAGE AND HANDLING

A. Shipping: Do not cut, kink, or otherwise damage pipe during transportation.

B. Storage:

1. Where necessary, because of ground conditions, store assembly on wooden sleepers.
2. Keep assembly shaded from direct sunlight prior to installation.

C. See Section 01600 for general requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe, Sump, and Fittings:

1. Conform to requirements of ASTM F714.
2. Resin:
    a. Polyethylene resin shall meet or exceed requirements of ASTM D3350 for PE 3608 material.
3. Pressure Rating: 110 psi and nominal DR of 15.5.

B. Joints: Thermal butt-fusion or continuous fusion fillet weld.

C. Products that restrain HDPE pipe with wedges, machined serrations, or clamps are not acceptable.

D. Submit HDPE Pipe and Fittings Catalog Information confirming pipe, fittings, and other materials conform to requirements of this section.

E. Submit HDPE Pipe, Sump, and Fittings Drawings of specific connection details.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Section 01100 1.6.B for phasing approach of installation.

B. General:

1. Shop fabricate polyethylene sump assembly in conformance with PPI TR-33, ASTM F2620, and manufacturer's recommendations.
2. Joining: Fabricate pipes, sumps, and fittings in accordance with manufacturer's recommendations.
3. If HDPE pipe surface temperature is above 90 degrees F, as measured with infrared temperature gun, allow pipe to cool prior to making any connections to flanges, connecting pipes or embedments.

3.2 INSPECTION, EXAMINATION, TESTING, AND OBSERVATION

A. Perform Testing in accordance with Section 01400.

1. Sump Hydrostatic Test:
    a. Notify STR in writing 48 hours in advance of testing.
        1. Perform testing on site in the presence of LWC QC.

b. Furnish testing equipment and perform tests in manner satisfactory to STR.
   1. Testing method shall provide observable and accurate measurements of initial service leak.
c. Submit testing procedure.
d. If there is leakage, repair defective pipe section and repeat hydrostatic test.

B. Provide for LWC QC inspection, professional observation and testing, as provided in the Statement of Inspections, drawings, Section 01810 and the QIP.
   1. Subcontractor responsibilities and related information are included in Section 01810.

C. LWC quality assurance oversight inspection: Inspection, examination and testing by LWC as stated in Section 01400.

END OF SECTION

HIGH-DENSITY POLYETHYLENE GEOMEMBRANE

SECTION 02661

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High-Density Polyethylene (HDPE) Geomembrane

1.2 RELATED SECTIONS

A. Division 1 – All Sections
B. Section 02667

1.3 REFERENCE

Refer to Section 01004 for guidance on appropriate document editions to use

A. Required Codes and Standard
1. American Society for Testing and Materials (ASTM)
   a. D638
   b. D792
   c. D882
   d. D1004
   e. D1505
   f. D3895
   g. D4218
   h. D4833
   i. D5199
   j. D5397
   k. D5641
   l. D5721
   m. D5820
   n. D5885
   o. D6365
   p. D6392
   p. D6693

B. Regulations
1. None Specified in this Section

C. Documents
1. None Specified in this Section

D. Drawings
1. C-CC-Z-00071
2. C-CC-Z-00075
3. C-CC-Z-00077
4. C-CY-Z-00014
5. C-CY-Z-00015

6. C-CY-Z-00016

1.4 DEFINITIONS

A. Film Tearing Bond: Failure in ductile mode of one bonded sheet, by testing, prior to complete separation of bonded area.

B. Geomembrane: Essentially impermeable geosynthetic composed of one or more layers of polyolefin materials fusion bonded into single-ply integral sheet.

C. Panel: Piece of geomembrane composed of two or more sheets seamed together.

D. Sheet: Seamless piece of geomembrane.

E. Watertight: Geomembrane installation free of flaws and defects that will allow passage of water and gases, liquids, and solids to be contained under anticipated service conditions.

F. See Section 01100 for additional definitions not included in this section

1.5 QUALITY ASSURANCE

A. See Section 01400 for general requirements.

1.6 SUBMITTALS

A. Submit the following Engineering documents in accordance with Sections 01330, 01400 and 01640.

1. HDPE Geomembrane Manufacturer Qualifications, 1.7 A. 2.
2. HDPE Geomembrane Installer Qualifications, 1.7 B. 2.
3. HDPE Geomembrane Field Supervisor or Superintendent Resume and References, 1.7 C. 2.
4. HDPE Geomembrane Field Crew Resumes and References, 1.7 D. 2.
5. Independent Testing Agency Qualifications, 1.7.E.3
6. HDPE Geomembrane and Embedments Letter of Compliance for the Materials Delivered at Project Site, 2.1 A.
7. HDPE Geomembrane Manufacturer’s Specifications, Literature for Each Geomembrane Lot/Batch, 2.3 H.
8. HDPE Embedment Catalog Information Conforming to Requirements of this Section, 2.5.C
9. HDPE Embedment Drawings of Specific Connection Details, 2.5.D.
10. HDPE Geomembrane Installation Plan, 2.6 B.
11. HDPE Geomembrane Installer’s Certification of Subsurface Acceptability, 2.6 C.
12. HDPE Geomembrane Manufacturer’s Certificate of Proper Installation, 3.7 B.
13. Vacuum Box Detailed Test Procedure 3.9.A.7.a
14. High Voltage Spark Leak Detector Detailed Test Procedure 3.9.A.7.b
15. Pressurized Air Channel Equipment Detailed Test Procedure 3.9.A.7.c
16. Shear and Peel Apparatus Detailed Test Procedure 3.9.A.7.d
17. Calibration records and Post-Calibration record for test equipment, 3.9 A 14.

1.7 QUALIFICATIONS

A. Manufacturer

1. Successfully manufactured a minimum of ten (10) million square feet of each type of geomembrane material specified or approved equal.

2. Submit HDPE Geomembrane Manufacturer Qualifications.

B. Installer

1. Successfully installed in the last five (5) years a minimum of two (2) projects (a minimum of 60-mil HDPE Geomembrane) and no less than a combined total of one (1) million square feet of HDPE Geomembrane specified in applications similar to the Project.
2. Submit HDPE Geomembrane Installer Qualifications.

C. Field Supervisor or Superintendent

1. Successfully installed in the last five (5) years a minimum of two (2) projects on no less than a combined total of one (1) million square feet of HDPE Geomembrane specified in applications similar to the Project.
2. Submit HDPE Geomembrane Field Supervisor or Superintendent Resume and References.

D. Field Crew

1. Knowledgeable and skilled in HDPE Geomembrane installation methods and shall have installed, collectively, at least two (2) million square feet of HDPE Geomembrane.
2. Submit HDPE Geomembrane Field Crew Resumes and References.

E. Independent Testing Agency

1. Laboratory shall maintain calibrated instruments, equipment, and documented standard procedures for performing specified testing.
2. Certified by the Geosynthetic Accreditation Institute-Laboratory Accreditation Program (GAI-LAP) for geosynthetics material testing.
3. Submit Independent Testing Agency Qualifications.

1.8 DELIVERY, STORAGE AND HANDLING

A. HDPE Geomembrane:

1. Individually package each sheet and protect from damage during shipment.
2. Mark each package with identification of material type, size, and weight.

B. Epoxy Adhesive:

1. Storage Temperature:
    a. Control temperature above 60 degrees F and dispose of cartridges if shelf life has expired.
    b. If stored at temperatures below 60 degrees F, test adhesive prior to use to determine if adhesive meets specified requirements. See Section 01100 1.3.A.1 for reference.

C. See Section 01600 for general requirements.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install HDPE Geomembrane or perform seaming under the following conditions, unless it can be demonstrated to satisfaction of STR that performance requirements can be met under these conditions:

1. Air temperature is less than 35 degrees F or more than 90 degrees F.
2. Relative humidity is more than ninety percent (90%).
3. Raining, snowing, frost is on ground, or wind is excessive.

B. Do not place materials on HDPE Geomembrane when ambient temperature is less than 35 degrees F, unless it can be demonstrated to satisfaction of STR that materials can be placed without damage.

1.10 SEQUENCING AND SCHEDULING

A. Before placing HDPE Geomembrane on GCL, prepare GCL surface as specified in Section 02667.

PART 2 PRODUCTS

2.1 MANUFACTURING QUALITY CONTROL (MQC)

A. Submit HDPE Geomembrane and Embedments Letter of Compliance for the Materials Delivered at Project Site.

1. Referenced to the batch, lot, and roll numbers and Manufacturing Quality Control (MQC) test data.

2.2 MANUFACTURERS

A. HDPE Geomembrane:

1. GSE Environmental, Inc., Houston, TX.
2. Poly-America, LP, Grand Prairie, TX.
3. AGRU America, Georgetown, SC.
4. Or approved equal.

2.3 HDPE GEOMEMBRANE

A. Composition: High density polyethylene (HDPE Geomembrane) containing no plasticizers, fillers, extenders, reclaimed polymers, or chemical additives, except following:

1. Approximately two percent (2%) by weight of carbon black to resin for ultraviolet resistance per ASTM D4218.
2. Antioxidants and heat stabilizers, not to exceed one and a half percent (1.50%) total by weight, may be added as required for manufacturing.

B. Furnish in rolled single-ply continuous sheets with no factory seams.

C. Sheet Thickness: 100-mil, values determined in accordance with ASTM D5199.

D. Sheet Width: Minimum 22 feet.

E. Roll Length: Longest that will be manageable and reduce field seams.

F. Meet manufacturer’s most recent published specifications and required Minimum Physical Properties for HDPE Geomembrane as follows:

1. Specific Gravity: 0.940 to 0.936, g/cc; not more than 15% greater than base resin density
    a. Test Method: ASTM D792, Method A 1 or ASTM D1505
2. Smooth-Surface, HDPE Geomembrane Minimum Properties, Each Direction
3. Tensile Stress at Yield: 2.1 lb/in-width/mil thickness
    a. Test Method: ASTM D6693
        1. Yield Strength - 210 lb/in
        2. Break Strength - 380 lb/in
        3. Yield Elongation - 12%
        4. Break Elongation - 700%

4. Elongation at Yield: 12% minimum
5. Thickness, Nominal, 100-mil
    a. Test Method: ASTM D5199
6. Puncture Resistance: 1.8 lb/mil thickness
    a. Test Method: ASTM D4833
7. Tear Resistance, in.: 0.70 lb/mil thickness, min average
    a. Test Method: ASTM D1004, Die C
8. Modulus of Elasticity (per Formulation): 80,000 lb/sq in
    a. Test Method: ASTM D882, Method A or ASTM D638
9. Bonded Seam Strength in Shear: 2 lb/in-width/mil thickness, min. and FTB
    a. Test Method: ASTM D6392
10. Bonded Seam Strength in Peel: 1.2 lb/in-width/mil thickness, min. and FTB
    a. Test Method: ASTM D6392
11. Stress Crack Resistance: 300 hours
    a. Test Method: ASTM D5397, Appendix
12. Oxidative Induction Time, Standard Pressure: 100 min. average
    a. Test Method: ASTM D3895, (50 C; O2, 1 atm)
13. Oven Aging, Standard Pressure: eighty percent (80%), min. average
    a. Test Method: ASTM D5721 or ASTM D5885, (85 C; 1 atm)
14. Ultraviolet Resistance, High Pressure: fifty percent (50%)
    a. Test Method: ASTM D5885, (1600 hours)

G. Extrudate for Fusion Welding of HDPE Geomembranes: Formulated from the same resin as geomembrane and shall meet applicable physical property requirements.

H. Submit HDPE Geomembrane Manufacturer's Specifications and Literature for each Geomembrane Lot/Batch.

2.4 CAST-IN-PLACE HDPE EMBEDMENT

A. Properties: Compatible for attaching HDPE Geomembrane materials by extrusion welding to provide watertight seal.

B. Manufacturers:

1. GSE Environmental, Houston, TX: GSE Polylock.
2. Poly-America, LP., Grand View, TX: Polyethylene Embed Channel (PEC).
3. AGRU America, Georgetown, SC: AGRU Tri-Lock.
4. Or approved equal

C. Submit HDPE Embedment Catalog Information conforming to requirements of this section.

D. Submit HDPE Embedment documentation of specific connection details.

2.5 HDPE GEOMEMBRANE INSTALLATION PLAN

A. Prepare HDPE Geomembrane installation plan addressing the following topics:

1. Prepare installation drawings for overlap locations, penetration seals, splicing, panel layouts, placement, repairs, patching, seams, anchorage, and other necessary details to install HDPE Geomembrane.

a. Installation drawings shall be in accordance with manufacturer's recommendations.
b. HDPE Geomembrane welds and HDPE embedments with cap shown on drawings - provide suggested guidelines for installation.
1. Provide equivalent performance in final design for welds and embedments.

2. Compensation allowance calculation and numerical values for temperature induced HDPE Geomembrane expansion and contraction determined based on manufacturer's literature is acceptable.
3. Production dates for HDPE Geomembrane.
4. Storage and handling instructions.
5. Provide HDPE Geomembrane sheet layout with proposed size, panel identification coding system, position, and sequence of sheet placement, and location of field seams.
6. Deployment of HDPE Geomembrane, GCL, equipment used, and coordination with concrete mudmat placement.
a. Provide documentation for the loading of the HDPE Geomembrane deployment spreader bars for review of the STR.
b. Provide precautions for use during installation to install a leak tight HDPE Geomembrane layer.
c. Provide precautions to protect the GCL.
7. Testing and Repair procedures.

B. Submit HDPE Geomembrane Installation Plan

C. Submit HDPE Geomembrane Installer's Certification of Subsurface Acceptability Attachment 02661-A.

PART 3 EXECUTION

3.1 PREPARATION

A. Refer to Section 01100 1.6.B for phasing approach of installation.

B. Do not place HDPE Geomembrane until condition of GCL installed is acceptable to STR.
1. Maintain in smooth and uniform condition as specified in Section 02667 during installation of geomembrane.

C. Concrete Surfaces in Contact with HDPE Geomembrane:
1. Provide smooth surface, free of projections, rough spots, voids, honeycomb, or other irregularities.
a. Grind uneven concrete surface to which geomembrane is to be attached, flat and smooth.
2. Clean contact surfaces of dirt, dust, oil, curing compounds, and other coatings.

3.2 WELDING UNITS

A. Single or double hot-wedge fusion seam welding.

B. Extrusion welding systems.

C. Hot-air welding is not acceptable.

3.3 HDPE GEOMEMBRANE INSTALLATION

A. Do not install geomembrane or seam unless Subcontractor can demonstrate successful performance and test results showing seams meet strength specifications.

B. Protection:

1. Do not use geomembrane surfaces as work area for preparing patches, storing tools and supplies, or other uses.
    a. Use protective cover as work surface, if necessary.
2. Instruct workers about requirements for protection of geomembrane, such as, handling geomembrane material in high winds, handling of equipment, and walking on geomembrane surfaces.
    a. Shoes of personnel walking on geomembrane shall be smooth bonded sole or be covered with smooth type of over boot.
    b. Prohibit smoking, eating, or drinking in vicinity of geomembrane, placing heated equipment directly on geomembrane, or other activities that may damage geomembrane.
3. Do not operate equipment without spark arrestors in vicinity of geomembrane material nor place generators or containers of flammable liquid on geomembranes.
4. Protect from vehicle traffic and other hazards.
5. Keep free of debris during placement.
6. Prevent uplift, displacement, and damage by wind.
7. Only small rubber-tired equipment, with maximum tire inflation pressure of five (5) pounds per square inch, shall be allowed directly on geomembrane, unless otherwise approved by STR.
    a. Demonstrate that equipment can be operated without damaging geomembrane.

C. Placement:

1. Miscellaneous products required for completion of geomembrane installation shall be in accordance with this specification and geomembrane manufacturer’s recommendations.
2. Prevent wrinkles, folds, or other distress that can result in damage or prevent satisfactory alignment or seaming.
    a. Provide for factors such as expansion, contraction, overlap at seams, anchorage requirements, seaming progress, and drainage.
3. Temporarily weight sheets to anchor or hold them in position during installation.
    a. Use continuous hold downs along edges to prevent wind flow under sheet.
4. Anchor perimeter of geomembrane as shown or in accordance with manufacturer’s instructions.
    a. Anchor and seal geomembrane to structures and other types of penetrations as shown.

D. Field Seams:

1. Wipe sheet contact surfaces clean to remove dirt, dust, moisture, oil, and other foreign materials and prepare contact surfaces in accordance with seaming method in the manufacturer’s instructions.
2. Lap sheet edges to form seams.

a. Adjust edges to be seamed and temporarily anchor to prevent wrinkling and shrinkage.

3. Avoid seam intersections involving more than three thicknesses of geomembrane material.
    a. Offset seam intersections at least 2 feet.
    b. Extend seams through HDPE embedments to sheet edges.
4. Seal seam “T” intersections by removing excess material and extrusion welding lap joint.
5. Seam sheets together, using fusion-extrusion or hot-wedge welding system, equipment, and techniques.

E. Geomembrane Attachment to Flat Concrete Surfaces:

1. HDPE Embedments:
    a. HDPE Embedments installation by others. Supply fusion butt-welded lengths of Embedments extending six (6) inches minimum past construction joints in the tank bottom (See C-CC-Z-00071) with exposed face ground flush (at butt-welded joints).
    b. Provide extrusion welds on the exposed face of the Embedments to close the joints between butt-welded sections. Prior to extrusion welding, use a grinder as necessary to provide a joint configuration that will allow for placement of a very flat extrusion weld bead.
    c. Make full perimeter weld of HDPE Geomembrane to HDPE Embedment to ensure maximum water tightness.

3.4 PLACING PRODUCTS OVER HDPE GEOMEMBRANE

A. Prior to placing material over geomembrane, notify STR.

1. Do not cover installed geomembrane until after STR provides authorization to proceed.

B. Coordinate the timing of extrusion welding geomembrane to HDPE embedments to allow mudmat placement to push HDPE Geomembrane wrinkles to the perimeter prior to welding.

C. Geomembrane installer shall remain available during placement of upper mudmat to repair geomembrane if damaged.

1. If tears, punctures, or other geomembrane damage occurs during placement of overlying products, repair damage as specified in Section 3.5.

3.5 REPAIRING HDPE GEOMEMBRANE

A. On penetration by foreign objects, replace or cover and seal with an additional layer of geomembrane material of proper size.

B. Repair damaged or rejected seams with pieces of flat and unwrinkled geomembrane material free from defects and seams.

1. Patches shall be tightly bonded on completion of repair work.

C. Patch shall be neat in appearance and at least six (6) inches larger in all directions than area to be repaired.

1. Round corners of patch to minimum one (1) inch radius.

D. Prepare contact surfaces and seam patch in accordance with paragraph 3.3.D (Field Seams).

1. Pull and hold flat receiving surface in area to be patched.
2. Seal each patch by extrusion welding continuous bead along edge, with no free edge remaining.
    a. Vacuum box test each patch on completion.

3.6 AS-BUILT RECORD DOCUMENTATION

A. This Section not used.

3.7 MANUFACTURER'S SERVICES

A. In accordance with Section 01640, HDPE Geomembrane manufacturer's representative or installer trained by HDPE Geomembrane manufacturer shall be present at Site for technical supervision and assistance as follows:

1. Preparation and inspection of surfaces on which HDPE Geomembrane is to be placed and initial two (2) days of installation.
2. A minimum of one (1) additional Site inspection visit, for a minimum of four (4) hours, in order to provide Manufacturer's Certificate of Proper Installation, in accordance with Section 01640.

B. Submit HDPE Geomembrane Manufacturer's Certificate of Proper Installation.

3.8 CLEANUP

A. Cleanup work area as the work proceeds.

B. Take particular care to ensure that no trash, tools, and other unwanted materials are trapped beneath geomembrane and that scraps of geomembrane material are removed from the work area prior to completion of installation.

3.9 INSPECTION, EXAMINATION, TESTING, AND OBSERVATION

A. Geomembrane Installer shall perform Field Testing in accordance with this Section Witnessing of testing and the performance of inspections will be by LWC QC in accordance with Section 01400.

1. Notify STR in the event that non-compliant subsurface materials are encountered at the GCL or top of concrete mudmat elevation.
2. Inspect HDPE Geomembrane rolls delivered to the site for conformance with the requirements of the Specifications.
3. Inspect for damage such as cuts, tears, holes, blisters, undispersed raw materials, and deleterious conditions.
    a. Subcontractor shall replace damaged or non-conforming materials.
4. Prior to starting geomembrane installation and daily thereafter for installation on GCL, HDPE Geomembrane installer shall certify that surface upon which geomembrane shall be installed is acceptable, on form located on Attachment 02661-A.
    a. Submit Geomembrane Installer's Certification of Subsurface Acceptability.
5. Identify each test by date of sample, date of test, sample location, name of individual who performed test, standard test method used, and list of departures from standard test methods, at a minimum.
6. Installation Observation and Testing:
    a. Visually inspect geomembrane sheets, seams, anchors, seals, and repairs for defects as installation progresses and again on completion.

b. Depending on seam welding method used, test each seam and repair using vacuum testing device, spark testing device, or air channel pressure test for double wedge welded seams, or shear and peel testing.
    1. Submit Detailed test plan and procedures.
c. Perform testing in presence of LWC QC Inspector.

7. Field Testing Equipment:
    a. Vacuum Box: Conform to ASTM D5641.
    b. High Voltage Spark Leak Detector in accordance with ASTM D6365 requirements.
    c. Pressurized Air Channel Equipment per ASTM D5820.
    d. Shear and peel Apparatus in accordance with ASTM D6392.
8. Startup Seam Sampling:
    a. Verify that seaming equipment and operators are performing adequately.
    b. Produce test seam samples at beginning of each shift for each seaming crew.
    c. If seaming has been suspended for more than ½ hour, or if breakdown of seaming equipment occurs, produce test seam samples prior to resuming seaming.
    d. Produce test samples for every 500 lineal feet of weld produced for each seaming crew
    e. Sample Size: twelve (12) inches wide plus seam width, and 60 inches long.
9. Nondestructive Seam Sampling:
    a. All seams shall be nondestructive tested over full length.
        1. HDPE Geomembrane closure weld at the outer edge of the tank foundation slab shall be tested using copper wire for a spark test. Spark test shall be witnessed by the LWC QC Inspector.
    b. For seams that cannot be otherwise tested, e.g., closure weld to the HDPE embed at the outer edge of the tank foundation slab, insert copper wire for spark test at edge of overlapping sheet in extrudate of weld prior to fillet welding.
10. Sample Identification:
    a. Number, date, and identify each sample as to personnel making seam and location of sample or location of field seam work in progress at time Sample is made.
    b. Mark location of sample, or location of field seam in progress at time sample is made, on panel/sheet layout drawing.
11. Testing Requirements: Conform to the following testing requirements for seam tests used to define quality of field seams:
    a. Perform shear and peel testing on portion of sample as specified hereinafter using approved field tensiometer.
        1. LWC QC Inspector will observe testing.
    b. Provide a portion of the 500 lineal feet sample to the Independent Testing Laboratory for verification of field test results. Ship sample overnight to laboratory and obtain the results report the next day with notification to STR, unless noted or specified otherwise.

Test Failure: If a laboratory specimen fails, the entire field seam from which it was taken or representing shall be considered a failure and shall be rejected as a result of nonconformance with specification requirements. The rejected field seam shall be repaired in accordance with specification requirements or a sample from the affected seam may be removed and retested.

c. Conform to ASTM D6392 and this section.

12. Field Seam Strength Sample Testing:
    a. Produce samples using same materials, equipment, personnel, and procedures as field seams made at time of work in progress and under same conditions
    b. Field test each sample for seam peel and shear strength.
    c. Save test samples, including specimens tested, until notified otherwise by the LWC QC Inspector.
    d. Each field test specimen that fails under test shall be shipped immediately by express delivery to Independent Testing Agency with notification to STR for determination of corrective measures required.
        1. .
    e. Bonded Strength of HDPE Geomembrane:
        1. In Shear: Minimum two (2) pounds per inch width per mil thickness as determined in accordance with ASTM D6392.
        2. In Peel: Minimum 1.2 pounds per inch width per mil thickness as determined in accordance with ASTM D6392.
    f. Test Failure: If a field specimen fails, entire field seam from which it was taken or representing shall be considered a failure and shall be rejected as a result of nonconformance with specification requirements. Comply with following corrective measures:
        1. Destructive Sample Failure: Rerun field weld test using same sample.

           If that test passes, LWC QC may assume error was made in first test and accept field seam.

           If second test fails, cap each field seam represented by failed sample and submit new test Sample made during capping.
        2. Vendor shall be allowed to take samples from field seams in the event the trial samples fail. Seams associated with field samples that pass strength testing are acceptable. Seams associated with field samples that fail strength testing must be repaired in accordance with specification requirements. This option should minimize the amount of repair required if trial samples fail.
    g. Independent laboratory test reports shall be provided to the STR, who will provide reports
       to LWC QA.

13. Nondestructive Seam Integrity Testing: LWC QC Inspector shall observe Subcontractor testing.
    a. All seams shall be nondestructive integrity tested over full length, with the following exception.
        1. HDPE Geomembrane welds to embedment strips do not require nondestructive seam testing.
        2. Visual inspection will be performed by the LWC QC Inspector.

b. Vacuum Box Testing of Geomembrane Welds:
   1. Vacuum box test each of these types of welds: Fillet, extrusion lap, and single hot-wedge fusion lap.
   2. Testing procedures: Conforming to ASTM D5641.

c. High-Voltage Spark Testing of Fillet Welds:
   1. Provide each seam to be tested with copper wires properly embedded in seam and with provisions for electrical grounding to test equipment.
   2. Pass spark tester along length of seam containing copper wire.
   3. Presence of a visible spark along tested seam shall be evidence of a faulty seam.
   4. Mark faulty areas for repair and retesting.
   5. Holes due to penetration of test wire must be repaired after spark testing is completed with no need of additional wire-hole post-repair testing.
   6. Testing Procedures: Conforming to ASTM D6365.

d. Air Channel Pressure Testing of Double Hot-Wedge Seam:
   1. Insert a needle with gauge in air space between welds.
   2. Pump air into space to 30 psi and hold for five (5) minutes.
   3. At end of five (5) minutes, depressurize seam by placing needle hole in air space between welds at opposite end of seam and observe gauge.
   4. Seam is acceptable if seam maintains at least 27 psi during five (5) minute hold and pressure drops within 30 seconds of depressurization.
   5. Detailed Test procedure in accordance ASTM D5820.

14. Calibration records for gages and any other test equipment used for acceptance, as well as post-calibration record shall be provided to LWC QC prior to demobilization.
    a. Allow time for LWC QC inspection, professional observation and testing, as provided in the Statement of Inspections, Drawings, Section 01810 and the QIP.
    b. LWC QC oversight inspection: Inspection, examination and testing by LWC QC as stated in Section 01400.
    c. LWC QC Inspector shall perform the following inspections.
       1. Visually inspect geomembrane sheets, seams, anchors, seals and repairs for defects as installation progresses and again on completion.
       2. Observe random nondestructive seam sampling and field testing.
       3. Witness nondestructive seam integrity testing conducted by geomembrane installer

.

3.10 ATTACHMENT

A. Geomembrane Installer's Certification of Subsurface Acceptability.

END OF SECTION

GEOMEMBRANE INSTALLER'S CERTIFICATION OF SUBSURFACE ACCEPTABILITY

Geomembrane installer, _____
for Liquid Waste Contractor SDU 8&9 Project, hereby certify that supporting surfaces are acceptable for installation of geomembrane, undersigned having personally inspected condition of prepared surfaces. This certification is for areas shown on Subcontractor's Attachment figure or defined by Subcontractor as follows:

_____

_____

_____

_____

Condition of supporting surfaces in defined area meets or exceeds minimum requirements for installation of geomembrane.

Signed: _____
(Representative of Geomembrane Installer)

_____
(Position)

Date: _____

Witness: _____

GEOSYNTHETIC CLAY LINER

SECTION 02667

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Geosynthetic Clay Liner (GCL)

1.2 RELATED SECTIONS

A. Division 1 – All Sections
B. Section 02661

1.3 REFERENCE

Refer to Section 01004 for guidance on appropriate document editions to use.

A. Required Codes and Standard
1. American Society for Testing and Materials (ASTM)
    a. D4643
    b. D4873
    c. D5199
    d. D5261
    e. D5887
    f. D5890
    g. D5891
    h. D5993
    i. D6496
    j. D6768

B. Regulations
1. None Specified in this Section

C. Documents
1. None Specified in this Section

D. Drawings
1. C-CC-Z-00075
2. C-CC-Z-00077
3. C-CY-Z-00014
4. C-CY-Z-00015
5. C-CY-Z-00016

1.4 DEFINITIONS

A. Geosynthetic Clay Liner (GCL): Flexible panel made of a layer of domestic, natural, high swelling sodium bentonite clay (montmorillonite) encapsulated between two Non-Woven Geotextiles.

B. Non-Woven Geotextile: Nonwoven permeable manmade textile used with geotechnical engineering related materials.

C. Maximum Average Roll Value (MaxARV): Maximum of a series of average roll values representative of product furnished.

D. Minimum Average Roll Value (MinARV): Minimum of a series of average roll values representative of product furnished.

E. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.

F. See Section 01100 for additional definitions not included in this section.

1.5 QUALITY ASSURANCE

A. See Section 01400 for general requirements.

1.6 SUBMITTALS

A. Submit the following Engineering documents in accordance with Sections 01330, 01400 and 01640.

1. GCL Manufacturer Qualifications, 1.7 A. 2.
2. GCL Installer Qualifications, 1.7 B. 2.
3. GCL Field Supervisor or Superintendent Resume and References, 1.7 C. 2.
4. GCL Field Crew Resumes and References, 1.7 D. 2.
5. GCL Letter of Compliance for the Materials Delivered at Project Site, 2.1 A.
6. GCL Manufacturer's Specifications, Literature, 2.3 J.
7. GCL Installation Plan, 2.6 B.
8. GCL Manufacturer's Certificate of Proper Installation, 3.7 A.

1.7 QUALIFICATIONS

A. Manufacturer

1. Successfully manufactured a minimum of ten (10) million square feet of each type of GCL material specified.
2. Submit GCL Manufacturer Qualifications.

B. Installer

1. Successfully installed in the last five (5) years a minimum of two (2) projects on no less than a combined total of one (1) million square feet of GCL specified in applications similar to the Project.
2. Submit GCL Installer Qualifications.

C. Field Supervisor or Superintendent

1. Successfully installed in the last five (5) years a minimum of two (2) projects on no less than a combined total of one (1) million square feet of GCL specified in applications similar to the Project.
2. Submit GCL Field Supervisor or Superintendent Resume and References.

D. Field Crew

1. Knowledgeable and skilled in GCL installation methods and shall have installed, collectively, at least two (2) million square feet of GCL specified in applications similar to the Project.
2. Submit GCL Field Crew Resumes and References.

1.8 COORDINATION MEETINGS

A. Meet at least once prior to commencing each of the following activities. Meeting will be given by LWC QA Manager.
1. Installation of GCL.

B. Attendees:
1. STR.
2. LWC QC Inspector.
3. Representatives of GCL Subcontractor.
4. Others requested by STR.

C. Topics:
1. GCL Installation Plan.
2. GCL Quality Inspection Plan.
3. Submittal requirements and procedures.
4. Schedule for beginning and completing GCL installation.
5. Training for installation personnel.
6. Installation crew size.
7. Establishing GCL marking system, to include sheet identification, defects, and satisfactory repairs, to be used throughout work.

1.9 DELIVERY, STORAGE AND HANDLING

A. Store and handle GCL material in accordance with ASTM D4873.

B. Wrap GCL in plastic to protect it from moisture and degradation during shipment and storage.

C. Store GCL in a dry, protected facility or in protected area on pallets off the ground.
1. Cover materials stored outside with heavy, waterproof covering that allows free flow of air between covering and materials.

D. See Section 01600 for general requirements.

PART 2 PRODUCTS

2.1 MANUFACTURING QUALITY CONTROL

A. Submit GCL Letter of Compliance for the Materials Delivered at Project Site, in accordance with Section 01640.
1. Reference to the batch, lot, and roll numbers and Manufacturing Quality Control (MQC) test data.

2.2 MANUFACTURERS

A. Needle-Punched GCL Products: GSE Lining Technology, Houston, TX; BentoLiner EC.

B. Adhesive-Stabilized GCL Products: Colloid Environmental Technologies Co. (CETCO), Arlington Heights, IL; Bentomat 200R.

C. Or approved equal.

2.3 GEOSYNTHETIC CLAY LINING

A. Panels of bentonite and encapsulating Geotextiles manufactured shall perform as continuous lining.

1. Panels shall contain a MinARV of 0.75 pound per square foot of high-swelling granular sodium bentonite clay at zero percent (0%) moisture content, or equivalent weight at other moisture content using ASTM D5993.

B. Bentonite Properties:

1. High quality natural sodium bentonite without chemical resistance enhancers or polymers.
2. Ninety percent (90%) typical montmorillonite content by weight.
3. Minimum Bentonite Swell Index of 24 mL/2g when tested pursuant to ASTM D5890.
4. Maximum moisture content of twelve percent (12%) when tested pursuant to ASTM D4643.
5. Maximum fluid loss of eighteen (18) mL when based on ASTM D5891 test standard.

C. GCL shall be manufactured so the bentonite component is continuously contained throughout GCL and to support Non-Woven Geotextile so that no displacement of the bentonite occurs when material is unrolled, moved, cut, torn, or punctured.

1. To contain granular bentonite, GCL materials shall be stabilized by process of needle punching through top and bottom layers of Non-Woven Geotextile and bentonite, or the adhesive used to stabilize GCL shall be inert, nontoxic, and water soluble.

D. Encapsulating Geotextile materials shall protect the bentonite component and be sufficiently porous to allow bentonite flow-through to create a positive bentonite-to-bentonite seal at seams.

E. Woven Carrier Geotextile Mass: 3.1 oz/sq yd, MinARV in accordance with ASTM D5261.

F. Non-Woven Cover Geotextile Mass: 3.0 oz/sq yd, MinARV in accordance with ASTM D5261.

G. Sheet Width: Minimum fifteen (15’-0”) feet.

H. Roll Length: Minimum one-hundred fifty (150’-0”) feet.

I. Manufactured GCL products shall meet the following material properties:

1. Mass (Weight), lb/sq ft, MinARV: 0.81
    a. Test Method: ASTM D5993
2. Grab Strength, lbs/in, Tested Dry, MinARV: 30
    a. Test Method: ASTM D6768
3. Peel Strength, lbs/-in, Tested Dry, MinARV: 1.0
    a. Test Method: ASTM D6496
4. Index Flux, $m^3/m^2/sec$, max. at 34.5 kPa: $1x10^{-8}$
    a. Test Method: ASTM D5887

J. Submit GCL Manufacturer’s Specifications, Literature that identifies the following:

1. Montmorillonite content by weight, typical moisture content, and swell index values.
2. Recommended sealing compound.
3. Repair adhesive.

2.4 BENTONITE SEALING COMPOUND

A. Bentonite sealing compound in powder or granular form shall be same product used in manufacture of GCL materials.

B. Sealing compound shall be applied to seal around penetrations and structures shown on Drawings.

1. Use manufacturer's recommended minimum amount of sealing compound to use in each instance in order to affect adequate seal.

2.5 ANCILLARY MATERIALS

A. Repair adhesive for securing GCL patches shall be nontoxic adhesive as recommended by GCL manufacturer.

B. Linear Low Density Polyethylene (LLDPE) textured liner used as a construction aid to prevent rainwater ponding at edges of installed GCL shall have a U.V. stabilized upper surface and 20 mil thickness min., values determined in accordance with ASTM D5199. For this application, the amount of LLDPE shall be determined by daily LLDPE coverage.

2.6 GCL INSTALLATION PLAN

A. Prepare GCL Geomembrane installation plan addressing the following topics:

1. Prepare installation drawings for overlap locations, penetration seals, panel layouts, anchorage, and other necessary details to install GCL.
    a. Drawings shall be verified, reviewed, signed by Subcontractor's or Specialty Subcontractor's who is qualified to perform work based on previous design work of the same nature.
2. Production dates for GCL.
3. Storage and handling instructions.
4. Provide GCL sheet layout with proposed size, panel identification coding system, position, and sequence of sheet placement, and location of overlap.
5. Deployment and protection of GCL, including equipment used, and coordination with HDPE Geomembrane and concrete mudmat placement.
    a. Provide documentation for the loading of the GCL deployment spreader bars for review of the STR.
    b. Use equipment that will not damage supporting mudmat surface.
    c. Provide precautions from sudden wind damage and rainwater.
    d. Provide precautions for protecting GCL during placement of HDPE Geomembrane.
6. Repair procedures.

B. Submit GCL Installation Plan

PART 3 EXECUTION

3.1 PREPARATION

A. Refer to Section 01100 1.6.B for phasing approach of installation.

B. Do not place GCL until condition of concrete mudmat is acceptable.

1. Maintain surface on which GCL is to be placed in firm, clean, dry, and smooth condition during GCL installation.

C. Remove only quantity of material from storage that is to be installed during current work day.

3.2 PLACEMENT OF GEOSYNTHETIC CLAY LINING

A. Only those GCL panels that can be anchored and covered in the same day shall be unwrapped and placed in position.

B. Place GCL surface on underlying concrete mudmat with surface of GCL in contact with mudmat as recommended by manufacturer.

C. GCL panels shall not be dragged over surface, except for slight adjustments as may be necessary for obtaining correct overlap of panels. Rolled-up panels shall not be allowed to unroll unrestrained down slope.

D. Anchor GCL per manufacturer's recommendations.

E. Panels shall be placed to provide overlap of six (6) inches to nine (9) inches on longitudinal seams and twenty-four (24) inches on transverse seams. Overlap area must be dry before placing another GCL panel.

1. No lap seams parallel to slope shall be allowed on slopes steeper than 7H:1V, unless otherwise approved by STR.
2. Such approval will be dependent upon demonstration by Subcontractor that sufficient additional overlap will be provided to anchor GCL and prevent it from moving downslope during and after placement of overlying materials.

F. Protection:

1. GCL panels shall not be installed in standing water, while it is raining, or when rain may begin before panels can be covered with HDPE Geomembrane and protected.
    a. GCL shall be "dry" (no water damage and no transferable moisture present) when installed and "dry" when HDPE Geomembrane is installed over the GCL.
2. Protect GCL against wind in accordance with manufacturer's recommendations.
3. Instruct workers about requirements for protection of GCL, such as, handling GCL material in high winds, handling of equipment, and walking on GCL surfaces.
    a. Shoes of personnel walking on GCL shall be smooth bonded sole or be covered with smooth type of over boot.

G. GCL shall be laid smooth without creases or wrinkles and without stretching material to fit area.

1. GCL shall be free of tension or stress upon completion of installation.

H. Cover GCL with required HDPE Geomembrane cover as soon as practicable after it is installed.

1. Exposed GCL is to be completely covered and protected by soil, HDPE Geomembrane, or other approved cover material at end of each shift or workday.
2. Subcontractor shall limit amount of exposed GCL to the amount which can be immediately covered in event of rain.

I. Leading edge and panels of GCL left uncovered shall be protected with heavy, waterproof membrane or tarp that is adequately secured and protected with sandbags or other ballast.

3.3 SEAMING GCL PANELS

A. Mark overlaps six (6) inches and nine (9) inches from panel edge longitudinally on GCL to assist in obtaining proper overlap.

B. Prior to lapping, remove dirt, gravel, or other debris from overlap area.

C. Apply ¼ pound of sealing compound per lineal foot of seam, or as otherwise recommended by manufacturer, whichever represents greatest amount of bentonite.

D. Where soil and sand encroaches lap areas after initial application of bentonite sealant, additional bentonite sealant in amount of ¼ pound per lineal foot shall be spread evenly across longitudinal seam area.

E. Alternative seaming methods may be used upon successful demonstration to STR that alternative method will result in a seam equivalent to seam specified above.

1. Subcontractor shall strictly adhere to manufacturer's recommendations and conditions of approval for these alternative seams.

F. Seam overlap on slopes shall be shingled so direction of flow is from top panel onto bottom panel.

1. Overlaps shall be as hereinbefore specified.

G. Hot Weather Installation:

1. Provide compensation for shrinkage when ambient temperatures are greater than 85 degrees F.
    a. At minimum, longitudinal overlap should be increased to twelve (12) inches and transverse overlap should be increased to 36 inches.

3.4 PATCHING AND REPAIRS

A. Irregular shapes, cuts, or tears in GCL shall be overlapped minimum of twelve (12) inches in all directions from defect with additional layer of GCL material.

B. Patch seams parallel to slope and secure with repair adhesive recommended by manufacturer.

C. Patches and repairs shall not be allowed on slopes greater than 7H:1V.

D. Complete panels shall be removed and replaced with undamaged panels when damage is extensive as determined by STR.

3.5 PLACEMENT OF OVERLYING MATERIALS

A. Equipment shall not operate directly on GCL, except to minimum extent necessary to deploy HDPE Geomembrane materials on GCL.

B. Deploy HDPE Geomembrane with equipment and by methods approved by STR.

3.6 AS-BUILT RECORD DOCUMENTATION (BY OTHERS)

A. Record Documents, include the following:

1. Panel numbers.
2. Identity and location of each repair, cap strip, and sample taken from installed GCL for testing.

3.7 MANUFACTURER'S SERVICES

A. In accordance with Section 01640, GCL manufacturer's representative or installer trained by GCL manufacturer shall be present at Site for technical supervision and assistance as follows:

1. Inspection of surfaces on which GCL is to be placed and on first day of GCL installation.
2. A minimum of one (1) additional Site inspection visit, for a minimum of two (2) hours, in order to provide Manufacturer's Certificate of Proper Installation.
3. Submit GCL Manufacturer's Certificate of Proper Installation

3.8 CLEANUP

A. Clean up work area as the work proceeds.

B. Take particular care to ensure that no trash, tools, and other unwanted materials are trapped beneath GCL and that scraps of GCL material are removed from the work area prior to completion of installation.

3.9 INSPECTION, EXAMINATION, TESTING, AND OBSERVATION

A. GCL Installer shall perform Field Testing in accordance with Section 01400.

1. Notify STR in the event that non-compliant subsurface materials are encountered at the top of concrete mudmat elevation.
2. Inspect GCL rolls delivered to the site for conformance with the requirements of the Specifications.
3. Inspect for damage such as cuts, tears, holes, blisters, undispersed raw materials, and deleterious conditions.
    a. Replace damaged or non-conforming materials.
4. Prior to starting GCL installation and daily thereafter for installation on concrete mudmat, GCL installer shall certify that surface upon which GCL shall be installed is acceptable, on form located at end of section.
    a. Submit GCL Installer's Certification of Subsurface Acceptability.
5. Installation Observation and Testing:
    a. Visually inspect GCL panels, overlap, damaged areas, and repairs for defects as installation progresses and again on completion.
    b. No installation tests are required.

B. Provide for LWC QC Inspection and observation, as provided in the Statement of Inspections Plan on the Drawings, Section 01810 and the QIP.

1. Subcontractor responsibilities and related information are included in Section 01810 and the QIP.

C. LWC quality assurance oversight inspection: Inspection and examination by LWC as stated in Section 01400.

D. LWC QC Inspector shall perform the following inspections:

1. Visually inspect GCL panels.
2. Verify overlap area is clean.
3. Verify the amount of sealing compound applied at GCL overlaps is as specified or as recommended by manufacturer.
4. Observe repair of damaged areas.

3.10 ATTACHMENT

A. 02667-A: GCL Installer's Certification of Subsurface Acceptability.

END OF SECTION

Attachment 02667-A
GCL INSTALLER'S CERTIFICATION OF SUBSURFACE ACCEPTABILITY

GCL installer, _____
for Liquid Waste Contractor SDU 8&9 Project, hereby certify that supporting surfaces are acceptable for installation of GCL, undersigned having personally inspected condition of prepared surfaces. This certification is for areas shown on Subcontractor's Attachment figure or defined by Subcontractor as follows:

_____

_____

_____

_____

Condition of supporting surfaces in defined area meets or exceeds minimum requirements for installation of GCL.

Signed: _____
(Representative of GCL Subcontractor)

_____
(Position)

Date: _____

Witness: _____