

McKenna Rowhouse Condominium Association

% Katie Myhre
360 Commercial Real Estate
701 E Washington Ave
Suite LL2
Madison, WI 53703
(608) 807-0660

6601 Raymond Rd Drainage

February 14, 2022

Overview

McKenna Rowhouse Condominium Association is located at the southeast corner of Raymond Rd and McKenna Blvd in Madison, WI. It comprises 50 units across seven (7) buildings grouped into three (3) “phases” of development. The newest units were completed in 1999.

The Phase 1 condo unit located at 6601 Raymond Rd has regularly experienced water entering the basement, over the foundation wall, and we have identified several factors contributing to the problem including that the foundation wall sits below the surrounding grade.

With this project we intend to permanently resolve that issue through grade adjustments, installation of a low retaining wall, installation of a storm water detention system, directing downspouts toward the detention system, and replacing a concrete sidewalk with permeable pavement.

The project also involves beautification through new shrub and ornamental grass plantings.

Goals

1. **Stop water from entering basement of 6601 Raymond:** Provide unit owner with peace of mind that basement flooding is a thing of the past.
2. **Prevent water from pooling in front of 6601 Raymond:** A storm water detention system has been designed to handle rooftop runoff and overflow from the adjacent roadway as we experienced in August 2018.

3. **Improve curb appeal of 6601 and 6605 Raymond:** Plant new shrubs and ornamental grasses for beautification in general and to obscure exterior vents and drains.
4. **Build community support for future projects:** The combined effect of the improvements in this project should build confidence within the community that similar holistic improvements should be pursued for our common property.
5. **Allow direct comparison of bids:** We define a common format for all responses to aid in our comparison of bids from multiple vendors.

Budget

The budget for construction of this project is \$90,000.

Specifications

The project will be governed by existing construction documents (i.e. sheets numbered “L-1” through “L-10”) prepared by our landscape architect, Kelly Design Group, LLC.

Construction Document Overview	Page
Grading and drainage plan	L-1
Horizontal and control plan	L-2
Details	L-3
Notes and specifications <ul style="list-style-type: none"> ● General notes (L-4) ● Construction notes (L-4) ● Grading and drainage notes (L-4) ● permaloc StructurEdge edging notes (L-4) ● NDS StormChamber notes (L4, L-5, L-6) ● Modular concrete retaining wall notes (L-7) 	L-4, L-5, L-6, L-7
Planting plan	L-8
Planting notes and specifications	L-9, L-10

Milestones

1. Solicitation of Bids

This request for proposal (RFP) was distributed to vendors beginning 2/14/2022.

2. Bid Selection

A winning bid will be selected on 3/8/2022.

3. Project Completion

Bids submitted for this RFP shall propose a completion date no later than 10/20/2022.

Bid Format

Vendors shall include the following information along with their submitted bid:

- Name and address of vendor
- Name and contact information for primary bid contact
- Certificate of insurance showing:
 - Proof of insurance
 - Coverage limits
- Fixed price quotation
- Projected breakdown of costs
 - Permeable walkway:
 - Cutting and removal of existing concrete
 - Estimated material costs; pavers, edging, base, etc.
 - Labor for installation
 - StormChamber, peripheral drains, and final grade:
 - Excavation and tree root removal
 - Estimated material costs; devices, pipes, stone, geotextiles, soil, etc.
 - Labor for installation
 - Retaining walls
 - Estimated material costs; blocks, stones, adhesives, etc.
 - Labor for installation
 - Plantings
 - Estimated material costs; plants, seed, sod, etc.
 - Labor for installation
 - Permits and inspections

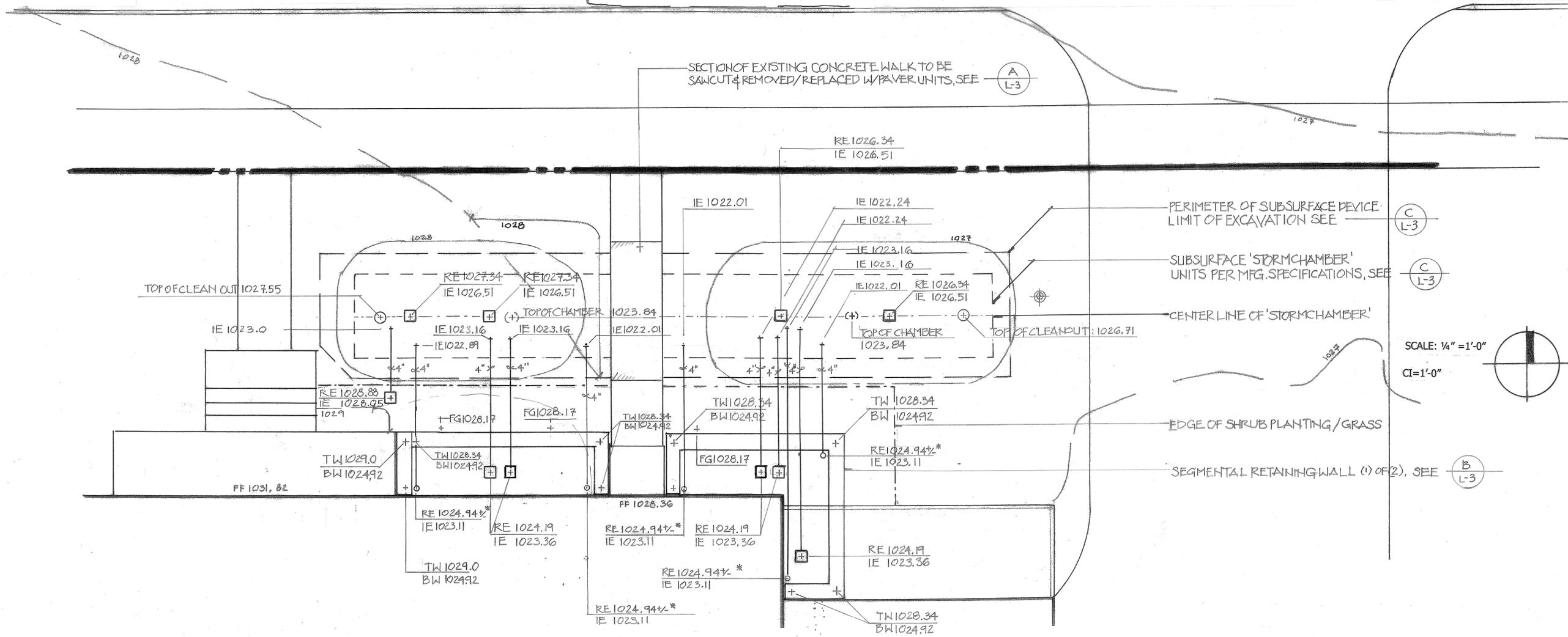
- Proposed key dates:
 - Excavation
 - Installation of StormChamber and peripheral drains
 - Construction of retaining walls
 - Construction of permeable walkway
 - Final grading
 - Seeding/planting of grasses
 - Planting of deciduous shrubs
 - Final acceptance date

GRADING AND DRAINAGE LEGEND

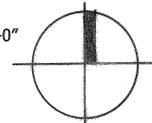
Symbol	Description
	EXISTING CONTOUR
	PROPOSED CONTOUR
FF	FINISH FLOOR ELEVATION
FG	FINISH GRADE
TW	TOP OF WALL
BW	BOTTOM OF WALL (inside FG)
RE	RIM ELEVATION
IE	INVERT ELEVATION
•	SEE DETAIL RE: LOCATION OF SILL PLATE
	EXISTING FIRE HYDRANT
	PROPERTY LINE
	CATCH BASIN see detail
	ATRIUM DRAIN see detail
	PVC SCH 40 RIGID PIPE
	PIPE SIZE (diameter) IN INCHES

NOTE

ALL PVC PIPE SHALL BE SET WITH CONSTANT SLOPE, NOT LESS THAN ONE PERCENT OVERALL. ALL PIPE CONNECTIONS SHALL BE CHEMICAL WELDED PER STANDARD SPECIFICATIONS FOR PVC DRAIN PIPE. SLOPE OF PIPE SHALL BE CREATED BY MANIPULATION OF ELBOWS AND CONNECTIONS WITH PIPE. ALL CONNECTIONS OF PIPE WITH 'STORMCHAMBER' STRUCTURE SHALL BE PER MANUFACTURER SPECIFICATIONS. CARE SHALL BE TAKEN TO PROTECT EXISTING FIRE HYDRANT, CITY SIDEWALK, AND BUILDING STRUCTURE. REMOVAL OF ACCESS WALK SECTION OVER 'STORMCHAMBER' SHALL BE DONE WITH CARE TO MINIMIZE DAMAGE TO REMAINING CONCRETE WALKS.

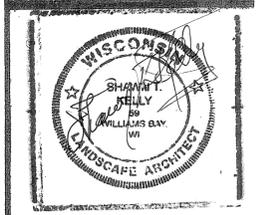


SCALE: 1/4" = 1'-0"
 CI=1'-0"



KELLY DESIGN GROUP, LLC
 LANDSCAPE ARCHITECTURE
 CONCEPT TO CONSTRUCTION DOCUMENTS
 LAND USE PLANNING
 SITE ANALYSIS
 P.O. BOX 460
 WILLIAMS BAY, WISCONSIN 53191
 262.245.1111
 kdesign.com

McKENNA ROWHOUSE CONDOMINIUMS
 2065 MCKENNA BOULEVARD
 MADISON, WISCONSIN



DATE	26 AUGUST 2021
DRAWN BY	
CHECKED BY	
SHEET TITLE	GRADING AND DRAINAGE PLAN
JOB NUMBER	0421.AB
SHEET NUMBER	

HORIZONTAL CONTROL LEGEND

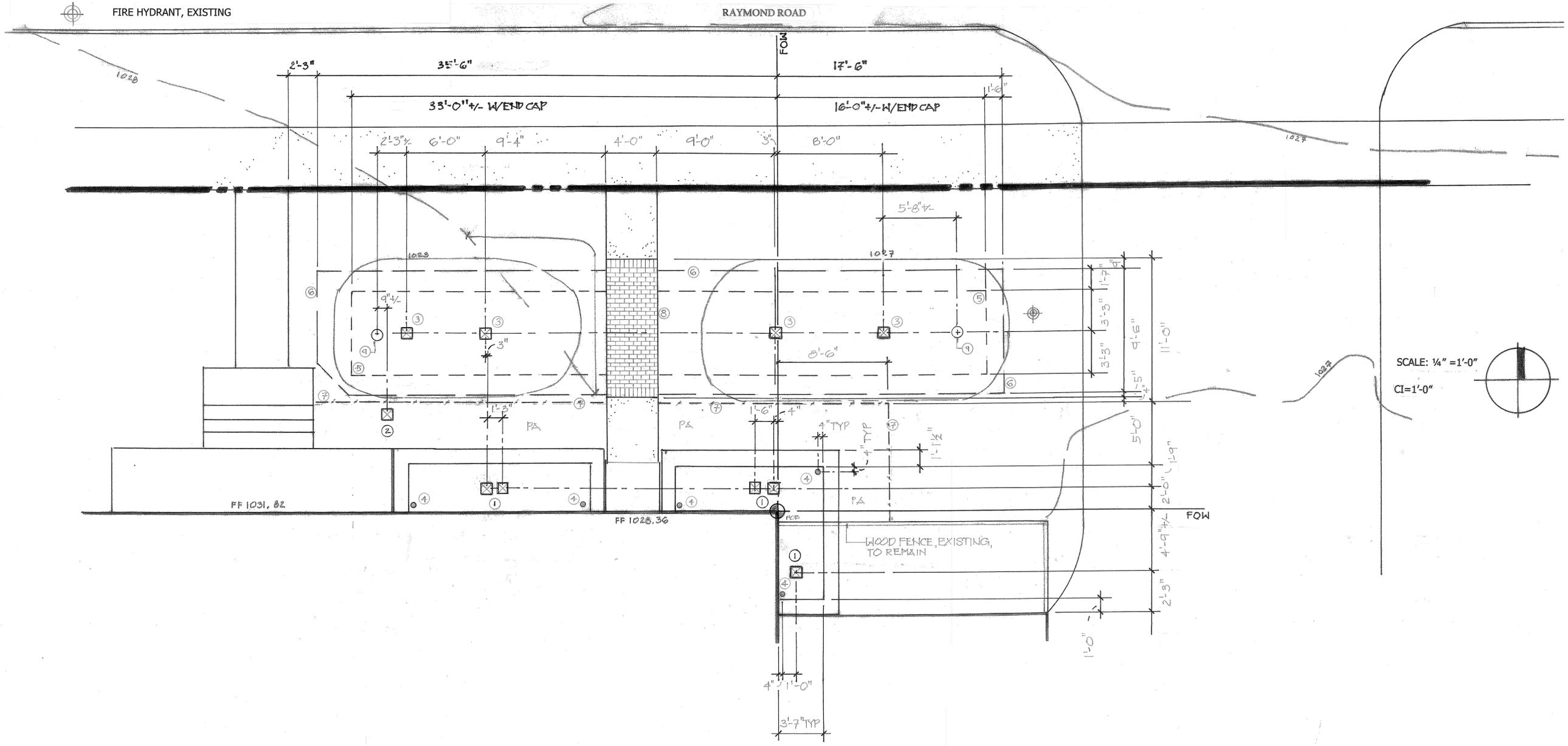
Symbol Description

- TYP TYPICAL
- POINT OF BEGINNING
- FOW FACE OF WALL
- FIRE HYDRANT, EXISTING

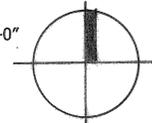
SCHEDULE

Symbol Description

- ① CATCH BASIN IN VAULT, SEE DETAILS D & B
- ② CATCH BASIN AT DOWNSPOUT IN YARD, SEE DETAIL C
- ③ CATCH BASIN OVER 'STORMCHAMBER'. SEE DETAIL C
- ④ ATRIUM DRAIN, SEE DETAIL D
- ⑤ 'STORMCHAMBER', SEE DETAIL C and specifications
- ⑥ NON-WOVEN GEOTEXTILE AND STONE, SEE DETAIL C
- ⑦ SHRUB/LAWN DIVISION, SEE PLANTING PLAN
- ⑧ PAVER SIDEWALK INSERT, SEE DETAIL A
- ⑨ 'STORMCHAMBER' CLEANOUT ACCESS, SEE DETAIL C and specifications



SCALE: 1/4" = 1'-0"
 CI=1'-0"



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 MADISON, WISCONSIN



DATE 26 AUGUST 2021
 DRAWN BY
 CHECKED BY
 SHEET TITLE
 HORIZONTAL CONTROL PLAN
 JOB NUMBER 0421.AB
 SHEET NUMBER

general notes

THE FOLLOWING GENERAL NOTES ARE PROVIDED TO GIVE DIRECTIONS TO THE CONTRACTOR BY THE LANDSCAPE ARCHITECT OF WORK FOR THE EROSION CONTROL PROJECT AT THE MCKENNA ROWHOUSE CONDOMINIUMS, 2065 MCKENNA BLVD., MADISON, WISCONSIN.

- NOTES ARE DIRECTED TO THE WORK OF THE GENERAL CONTRACTOR UNLESS NOTED ON PLANS.
- WORK NOT INTENDED TO BE UNDER GENERAL CONTRACTORS CONTRACT:
 - "N.I.C." (NOT IN CONTRACT)
 - "BY OTHERS"
 - "EXISTING" (REFERS TO IMPROVEMENTS THAT ARE PRESENTLY ON SITE.)
- CONTRACTOR SHALL VERIFY WITH LANDSCAPE ARCHITECT THAT PLANS ARE CURRENT AND APPROVED.
- WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LAWS AND ORDINANCES OF THE MUNICIPALITY IN WHICH THE WORK OCCURS
- THE OWNER SHALL BE PROVIDED A COPY OF THE ENGINEERING SOILS REPORT BY THE CONTRACTOR WHO SHALL BECOME FAMILIAR WITH THE REPORT'S RECOMMENDATIONS PRIOR TO BEGINNING ANY WORK. THE CONTRACTOR SHALL COMPLY WITH THE REPORT'S RECOMMENDATIONS AS THEY RELATE TO HIS WORK.
- THE CONTRACTOR SHALL OBTAIN ALL NECESSARY AND / OR REQUIRED PERMITS AND PAY ALL RELATED FEES AND/OR TAXES REQUIRED TO INSTALL THE WORK ON THESE PLANS.
- THE CONTRACTOR SHALL BE APPROPRIATELY LICENSED AS REQUIRED BY THE STATE IN WHICH THE WORK TAKES PLACE (Wisconsin).
- THE CONTRACTOR SHALL SUBMIT A SCHEDULE OF WORK TO BE APPROVED BY OWNER AND LANDSCAPE ARCHITECT PRIOR TO BEGINNING THE PROJECT. ALL WORK SHALL BE IN ACCORDANCE WITH SAID SCHEDULE.
- THE CONTRACTOR SHALL CAUSE THE LANDSCAPE ARCHITECT TO BE NOTIFIED PRIOR TO BEGINNING THE WORK AND SHALL BE RESPONSIBLE FOR COORDINATING WITH THE OWNER, LANDSCAPE ARCHITECT, GOVERNING AGENCIES AND OTHER TRADES.
- MATERIAL SHALL BE NEW UNLESS OTHERWISE SPECIFIED.
- THE CONTRACTOR SHALL IMMEDIATELY UPON BEING AWARDED THE CONTRACT, MAKE ANY ARRANGEMENTS NECESSARY TO INSURE THAT ALL MATERIALS, CONNECTIONS, AND SUPPLIES WILL BE AVAILABLE WHEN NEEDED FOR THIS PROJECT.
- UNIT PRICES FOR ALL IMPROVEMENTS SHALL BE ESTABLISHED AS A PART OF THE CONTRACT WITH THE PROJECT OWNER AND PRIOR TO BEGINNING WORK TO ACCOMMODATE ADDITIONS AND/OR DELETIONS OF MATERIAL AND/OR LABOR.
- NO ALTERATIONS WILL BE CONSIDERED FOR ITEMS SPECIFICALLY CALLED FOR ON THESE PLANS.
- DETERMINATION OF "EQUAL" SUBSTITUTIONS SHALL BE MADE ONLY BY THE LANDSCAPE ARCHITECT OR OWNER, AT THE OWNER'S DISCRETION.
- THE CONTRACTOR SHALL CAUSE THE LANDSCAPE ARCHITECT TO BE NOTIFIED NO LESS THAN 48 HOURS IN ADVANCE OF ANY SITE OBSERVATIONS OR MEETINGS.
- SITE OBSERVATIONS AND MEETINGS MAY INCLUDE:
 - PRE-CONSTRUCTION MEETING
 - GRADING AND SOIL SAMPLING
 - GENERAL CONSTRUCTION
 - FORM SETTING
 - PLACEMENT OF RIPRAP MATERIALS
 - LOCATION OF PIPE DAYLIGHT AT LAKESHORE
 - POST-MAINTENANCE (FINAL WALK THROUGH).

NOTE: "LANDSCAPE" SHALL REFER TO ALL IMPROVEMENTS WITHIN THIS SET OF DOCUMENTS THAT HAVE BEEN DESIGNATED BY THIS OFFICE.
- SITE OBSERVATIONS BY THE LANDSCAPE ARCHITECT DURING ANY PHASE OF THIS PROJECT DOES NOT RELIEVE THE CONTRACTOR OF HIS PRIMARY RESPONSIBILITY TO PERFORM ALL WORK IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS, AND GOVERNING CODES.
- CONTRACTOR SHALL BE BACKCHARGED FOR LANDSCAPE ARCHITECT'S TIME WHEN OBSERVATIONS ARE CALLED FOR AND IT IS FOUND THAT THE WORK IS NOT SIGNIFICANTLY READY UPON OBSERVATION OR APPOINTMENT IS NOT KEPT. TIME WILL BE CHARGED ON AN HOURLY BASIS.
- THIS FIRM DOES NOT PRACTICE OR CONSULT IN THE FIELD OF SAFETY ENGINEERING. THIS FIRM DOES NOT DIRECT THE CONTRACTOR'S OPERATIONS, AND IS NOT RESPONSIBLE FOR THE SAFETY OF PERSONNEL OTHER THAN OUR OWN ON THE SITE. THE SAFETY OF OTHERS IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHOULD NOTIFY THE OWNER IF HE CONSIDERS ANY OF THE RECOMMENDED ACTIONS PRESENTED HEREIN TO BE UNSAFE.
- NOTIFICATIONS, REQUESTS, AND OTHER COMMUNICATIONS FOR THE LANDSCAPE ARCHITECT MUST BE DIRECTED THROUGH THE OWNER.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR, UNLESS SPECIFICALLY STATED OTHERWISE IN THE CONTRACT AGREEMENT, DAMAGES TO THE CONTRACTOR'S WORK DUE "ACTS OF GOD," WORK DONE BY OTHERS, AND THEFT OF THE CONTRACTOR'S EQUIPMENT, MATERIALS, AND SUPPLIES.

NOTE:

THE USE AND PUBLICATION OF THESE PLANS, SPECIFICATIONS, AND DESIGNS SHALL BE RESTRICTED TO THE ORIGINAL SITE AND PASE FOR WHICH THEY WERE PREPARED AND TITLE THERETO REMAINS IN THE LANDSCAPE ARCHITECT. USE OR MODIFICATION WITHOUT WRITTEN CONSENT OF THE LANDSCAPE ARCHITECT IS PROHIBITED. VISUAL CONTACT CONSTITUTES ACCEPTANCE OF THE RESTRICTIONS.

construction notes

- IT IS THE INTENT THAT ALL IMPROVEMENTS SHALL BE CONSTRUCTED, ASSEMBLED AND INSTALLED IN AN EFFICIENT AND SATISFACTORY MANNER ACCORDING TO THE HIGHEST WORKMANLIKE STANDARDS. IMPROVEMENTS SHALL BE COMPLETE IN EVERY RESPECT AND SHALL BE LEFT READY FOR ITS INTENDED USE AND/OR OPERATION BY THE OWNER.
- SUBGRADES UNDER ALL HARDSCAPE ONLY SHALL BE COMPACTED TO 95% MINIMUM. TESTS TO BE MADE BY QUALIFIED TESTING LAB.
- DIMENSIONS ARE TAKEN FROM FACE OF BUILDING UNLESS NOTED ON PLANS.
- IN NO CASE SHALL WORKING DIMENSIONS BE SCALED FROM PLANS, SECTIONS OR DETAILS ON THE DRAWINGS.
- WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF THE WORK, THE CONSTRUCTION SHALL BE THE SAME AS OTHER SIMILAR WORK SHOWN OR NOTED ON THE DRAWINGS.
- LANDSCAPE ARCHITECT OR OWNER SHALL APPROVE ALL FORMING PRIOR TO POURING OF CONCRETE.
- OWNER WILL PROVIDE ENGINEER'S RECOMMENDATIONS FOR ALL HARDSCAPE INCLUDING REINFORCING, EXPANSION JOINTS, FOOTINGS, SUB-BASE COMPACTION, WEEP HOLES AND GROUTING AT CONTRACTOR'S REQUEST, OR HE SHALL REQUIRE CONTRACTOR TO SECURE SAME IN THE EVENT THAT THE CONTRACTOR REQUIRES THIS INFORMATION TO COMPLETE THE WORK SHOWN ON THE PLANS IN A MANNER ACCEPTABLE TO THE OWNER AND LOCAL CODES. RECOMMENDATIONS WILL VARY WITH SOIL CONDITIONS. DO NOT BEGIN CONSTRUCTION WITHOUT THIS INFORMATION AND SOILS REPORT.
- ALL WALL FOOTINGS SHALL BE ON 95% (OR GREATER) COMPACTED FILL AND TO APPROPRIATE DEPTH PER LOCAL CODES.
- TOP OF WALLS SHALL BE CONSTRUCTED LEVEL UNLESS OTHERWISE INDICATED ON PLANS.

grading and drainage notes

- EXISTING GRADES ARE SHOWN ON LANDSCAPE GRADING PLANS ACCORDING TO BASE INFORMATION PROVIDED BY CLIENT AT THE BEGINNING OF WORK. CONTRACTOR IS RESPONSIBLE FOR THE PROPER DRAINAGE OF THE AREAS INCLUDING NEW CONSTRUCTION. NO DRAINAGE SHALL BE DIRECTED TOWARD ANY BUILDING. VERIFY EXISTING CONDITIONS IN THE FIELD AND REPORT TO LANDSCAPE ARCHITECT ANY DISCREPANCIES PRIOR TO COMMENCING WORK SHOWN ON THESE DRAWINGS. PROPOSED GRADING CHANGES SHALL BE AS GRADUAL AS POSSIBLE. FEATHER INTO EXISTING GRADES. EASE TOP AND TOE OF ALL CREATED SLOPES. DRAIN PIPES ARE TO MAINTAIN MINIMUM 1% CONSTANT GRADES WITH OPTIMAL 2% CONSTANT GRADE SLOPE. PLASTIC DRAINAGE TUBING AND FITTINGS SHALL BE NON-PERFORATED UNLESS OTHERWISE NOTED, AND SIZED AS NOTED. CONTRACTOR SHALL PROVIDE TO LANDSCAPE ARCHITECT "RECORD DRAWINGS" INDICATION LOCATIONS OF DRAINLINES. LOCATE ON REPRODUCIBLE MATERIAL BY DIMENSIONING FROM TWO (2) FIXED POINTS.
- ALL CONTOURS AND DIMENSIONS ARE BASED ON PLANS, PROVIDED BY THE CLIENT AND FROM THE DANE COUNTY GIS DATABASE.

I. SPECIAL CONDITIONS

- GRADING**
GRADE ALL AREAS BY FILLING AND/OR REMOVING SURPLUS SOIL AS NEEDED TO ENSURE PROPER GRADES AND DRAINAGE AS INDICATED ON THE PLANS UNLESS OTHERWISE NOTED.
- MOISTURE CONTENT**
THE SOIL SHALL NOT BE WORKED WHEN MOISTURE CONTENT IS SO GREAT THAT EXCESSIVE COMPACTION WILL OCCUR, NOT SHALL IT BE SO DRY THAT DUST WILL OCCUR AND FORM IN THE AIR OR THAT CLODS WILL NOT BREAK READILY. WATER SHALL BE APPLIED IF NECESSARY TO PROVIDE IDEAL MOISTURE CONTENT FOR TILLING.
- TREE ROOT REMOVAL**
1. THE LOCATION OF THIS CONSTRUCTION IS THE SITE OF MULTIPLE TREES WHICH ARE ESTABLISHED IN SITU. THERE WILL BE LARGE ROOTS EXISTING WITHIN THE AREA TO BE EXCAVATED. PRIOR TO CONSTRUCTION, SPECIAL CARE MUST BE TAKEN BY CONTRACTOR TO SAW CUT THE ROOTS AT THE PERIMETER OF THE EXCAVATED AREA PRIOR TO MAJOR EXCAVATION SO THAT THE INTEGRITY OF THE PAVING IS NOT COMPROMISED, AND DAMAGE IS MINIMIZED TO THE EXISTING TREES. THE CONTRACTOR SHALL PROTECT THE EXISTING ASPHALTIC CONCRETE AREA FROM ANY DAMAGE DURING CONSTRUCTION.



Permaloc Corporation

1. Product Name
Permaloc StructureEdge

2. Manufacturer
Permaloc Corporation
13505 Barry Street
Holland, MI 49424
Ph: 616.399.9600
800.356.9660
Fax: 616.399.9770
Email: info@permaloc.com
www.permaloc.com

3. Product Description

StructureEdge is designed for the areas where hardform and natural landscape meet. Designers tell us that these areas are the most difficult to retain, although well defined on paper; their clarity is often lost to the realities of time and ongoing maintenance.

StructureEdge is a permanent paving restraint system that is designed to be easier to install and out-perform plastic, PVC, and steel systems.

StructureEdge readily forms to curves, radii and angles allowing wide installation flexibility.

StructureEdge provides a clean, unobstructed edge along the paver installation allowing the use of a power edger directly adjacent to the paving stones.

SIZES

StructureEdge is available in 3/32", 1/8", or 3/16" thickness by 1-1/8", 1-5/8" and 2-1/4" depths. Sections available in 8' lengths.

FINISHES

Finishes include: Mill (natural aluminum), Black DuraFlex (electrostatically applied, baked on paint).

ANCHORING

Anchoring is accomplished through the use of 10" spiral steel spikes and is designed to receive spikes every 4". Other anchoring options may be applicable.

CONNECTION

Our unique sliding connection system eliminates possible weak points in the system.

4. Technical Data

GENERAL
Manufactured of 6063 Alloy containing Silicon and Magnesium as the major alloying elements, contributing to good strength, corrosion resistance, weldability, and machinability.

According to the Aluminum Extruders Council (AEC) publication Extrusion Spotlight: Alloys, aluminum alloyed in the 6XXX series contain the following desirable properties:
1. Very lightweight, one-third that of steel

and concrete. 2. High strength, comparable to steel and steel/concrete composites. 3. Strength and ductility as high or higher at sub-zero temperatures than at room temperature. 4. Exceptional corrosion resistance. 5. Ease of fabrication by many techniques, including extrusion, to unique advantageous structural configurations. This publication can be found at www.aec.org.

EXTREME LOW TEMPERATURE
The many advantages of extruded aluminum are not impaired by exposure to low temperatures. Aluminum actually gains strength as temperature is reduced, making it an appropriate metal for low temperature applications.

ULTRAVIOLET RADIATION
Aluminum reflects ultraviolet radiation and is not damaged by it. Sunlight includes ultraviolet (electromagnetic) radiation which may cause chemical or structural changes in some commercial materials.

COMBUSTABILITY
Extruded aluminum will not burn, which makes it safer than many other materials, such as wood, paper, or plastic for design applications. Extruded aluminum does not emit any toxic, hazardous fumes when exposed to high temperatures.

5. Installation PREPARATION

Ensure that all underground utility lines are located and will not interfere with the proposed edging installation before beginning work. Locate border line of edging with string or other means to assure border straightness and curves as designed.

PLACEMENT

Install base of edging resting on compacted level base and facing (away from) [towards and under] paver, drive 3/8" x 10" (9.5 mm x 25.4 mm) bright spiral steel spikes through edging holes in section base of paver restraint edging at spaces for following applications:
1. Anchor each section end with spike.
2. Patios and Walkways: 12 inches (305 mm) to 24 inches (610 mm) on center.
3. Driveways: 4 inches (102 mm) to 12 inches (305 mm) on center.
4. Heavy Vehicular Loads: 4 inches (102 mm) on center.

CORNERS/ANGLES
Where edging sections turn at corners or angled runs, use hands or other object to form edging to desired shape. Edging can be hand formed to curves or intricate angles and shapes with minimal effort.

BACKFILLING AND CLEANUP

Backfill and compact backfill material along edging. Cleanup and remove excess material

from site.

6. Availability & Cost

AVAILABILITY
Product is supported by a global network of distributors. Consult manufacturer for information on local availability.

COST
Information regarding budget and installed costs can be obtained from the manufacturer.

7. Warranty
15-year limited material warranty for edging from manufacturing defects in workmanship or material. Contact manufacturer for more information on warranty terms.

8. Maintenance
Permaloc edging systems typically require maintenance only in the event that the landscape design is changed.

9. Technical Services
Permaloc Corporation works closely with the specifier to ensure the appropriate products are chosen for the application. For technical assistance, contact the manufacturer.

10. Filing Systems
Additional product information is available from the manufacturer at www.permaloc.com or by calling 1.800.356.9660.



For additional specification information and drawings, please visit www.permaloc.com.



PART 1 GENERAL

1.01 WARRANTY

Actual article number will be determined by location within the Part 1 portion of specification.
A. 15-year limited material warranty for paver restraint edging from manufacturing defects in workmanship or material.

PART 2 PRODUCTS

2.01 PAVER RESTRAINT EDGING

Actual article number will be determined by location within the Part 2 portion of specification.

- Product: Permaloc StructureEdge, 3/32 inch (2.4 mm) x 1-5/8 inches (41 mm) high, 1/8 inch (3.2 mm) x 1-1/8" (28mm) [1-5/8" (41 mm)] [2-1/4" (57 mm)] high, 3/16 inch (4.8 mm) x 1-5/8" (41 mm) [2-1/4" (57 mm)] high, extruded aluminum, 6063 alloy, T6 hardness, paver restraint edging for straight-line and curvilinear applications in corrugated L-shaped profile, as manufactured by Permaloc Corporation, Holland MI 49424, telephone (800) 356-9660 or (616) 399-9600. Horizontal base shall have holes spaced 4 inches (102 mm) apart along its length to receive spikes.
- Thickness: 3/32 inch (2.4 mm) gage section shall have 0.170 inch (4.32 mm) thick exposed top lip, 1/8 inch (3.2 mm) gage section shall have 0.190 inch (4.83 mm) thick exposed top lip, and 3/16 inch (4.8 mm) gage section shall have 0.210 inch (5.33 mm) thick exposed top lip.
- Length: 8 feet (2.44 meters).
- Connection Method: Section ends shall splice together with horizontal 0.060 inch (1.52 mm) thick x 1 inch (25 mm) wide x 4 inches (102 mm) long aluminum sliding connector.
- Anchoring: 3/8 inch x 10 inches (9.5 mm x 254 mm) bright spiral steel spike. Use plastic washers if desired. For hardened surfaces (i.e. concrete, masonry, etc.) use 3/16 inch x 1-1/2 inches (4.8 mm x 38 mm) or longer Ardox concrete nail or drive pin fastener equal to Hilli DX 40 powder actuated pin, Ramset Trakfast Automatic Fastening System pin, or Tapcon.
- Finish: Natural Mill Aluminum and Black DuraFlex Painted, AAMA 2603, electrostatically baked on paint.

PART 3 EXECUTION

Editorial Comment (shown in italic): The following information for base preparation and installation shall be specified in specification section for Paver and is recommended only as a generally accepted paver installation method. Professional assistance should be sought with respect to the specification and construction of a specific project.

Preparation of Base for Pavers: Remove excess soils and unstable subbase materials. Compact subgrade to 95% proctor density test.

Paver Base Installation: Backfill excavated area with appropriate depth aggregate material as specified in Unit Paver Section. Base shall be compacted in 2 to 3 lifts to achieve proper density. The base needs to extend 6 inches (152 mm) to 12 inches (305 mm) beyond the edge of paver installation. Screen sand (or equivalent material as specified) over base to uniform thickness of not less than 1 inch (25 mm) and not more than 1-1/4 inches (32 mm).

After installation of restraint edging and pavers: Sweep fine sand (or equivalent material as specified) into joints. Make several passes with a plate compactor with no less than 3,000 - 5,000 lbs. (1,361 kg - 2,268 kg) centrifugal compaction force and operates at 80 to 90 hertz. Continue sweeping sand into joints. Make several passes alternating direction of compactor each time. Remove excess sand from paver installation.

3.01 INSTALLATION OF PAVER RESTRAINT EDGING

Actual article number will be determined by location within the Part 3 portion of specification.

- Preparation: Ensure that all underground utility lines are located and will not interfere with the proposed edging installation before beginning work.
- Locate border line of edging with string or other means to assure border straightness and curves as designed.
- Edging Installation: Install base of edging resting on compacted level base and facing (away from) [towards and under] paver, drive 3/8" x 10" (9.5 mm x 242 mm) bright spiral steel spikes through edging holes in section base of paver restraint edging at spaces for following applications:
1. Anchor each section end with spike.
2. Patios and Walkways: 12 inches (305 mm) to 24 inches (610 mm) on center.
3. Driveways: 4 inches (102 mm) to 12 inches (305 mm) on center.
4. Heavy Vehicular Loads: 4 inches (102 mm) on center.
- Securely connect sections together in accordance with manufacturer's instructions.
- Install pavers.



NDS, Inc.
851 North Harvard Avenue
Lindsay, California 93247
Toll Free 800.726-1994
Phone 559-562-9888
Toll Free Fax 800-726-1998
Fax 559-562-4488
Website www.ndspro.com
Email nds@ndspro.com

Product Guide Specification

Specifier Notes: This product guide specification is written in Construction Specifications Institute (CSI) 3-Part Format in accordance with The CSI Construction Specifications Practice Guide, including MasterFormat, SectionFormat, and PaperFormat.

This section must be carefully reviewed and edited by the Engineer to meet the requirements of the project and local building code. Coordinate this section with Division 1, other specification sections, and the Drawings. Delete all Specifier Notes after editing this section.

Section numbers and titles are based on MasterFormat 2016 Update.

1. 33 46 23

MODULAR BURIED STORMWATER STORAGE UNITS

Specifier Notes: This section covers NDS, Inc. StormChamber®. Consult NDS, Inc. for assistance in editing this section for the specific application.

The performance of NDS StormChamber® is directly correlated to the load bearing capacity, plasticity, and permeability of native soil; frost-heave potential, volume and load-rating of project traffic; installation methods used; as well as the type, gradation, and thickness of the surrounding and overlay rock.

PART 1 GENERAL

1.1 SECTION INCLUDES

- Underground StormChamber® for detention / retention of facility stormwater runoff.

1.2 RELATED REQUIREMENTS

Specifier Notes: Edit the following list of related sections as necessary. Limit the list to sections with specific information that the reader might expect to find in this section, but is specified elsewhere.

- Section 31 23 16 10 - Stormwater Excavation: Subgrade preparation.

1.3 REFERENCE STANDARDS

Specifier Notes: List reference standards used elsewhere in this section, complete with designations and titles.

- ASTM F2922-12: Standard Specification for Polyethylene (PE) Corrugated Stormwater Collection Chambers.
- ASTM F2787-11: Standard Specification for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers.
- AASHTO Method T-99: Standard Test Method for Moisture-Density Relations of Soils using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12-in) Drop, 2018.

1.4 PREINSTALLATION MEETINGS

Specifier Notes: Edit preinstallation meetings as necessary. Delete if not required.

- Convene preinstallation meeting [1 week] [2 weeks] before start of Work of this Section.

1.5 SUBMITTALS

Specifier Notes: Edit submittal requirements as necessary. Delete submittals not required.

- Comply with Division 1.
- Product Data: Submit manufacturer's product data, including preparation and installation instructions.
- Submit Material Certification / Gradation Analysis for gravel.
- Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- Manufacturer's Project References: Submit manufacturer's list of successfully completed StormChamber® projects, including project name and location, name of architect, and type and quantity of StormChamber® furnished.
- Warranty Documentation: The manufacturer shall guarantee the stormwater infiltration chamber against all defects in materials and workmanship for a period of twelve (12) months from the date of delivery to the job site. The use of subsurface infiltration chamber shall be limited the application for which it was specifically designed.

1.6 QUALITY ASSURANCE

- Manufacturer's Qualifications: Manufacturer regularly engaged, for a minimum of 5 years, in the manufacturing of StormChamber® of similar type to that specified.
- Product:

The system shall be designed in accordance with the requirements of ASTM F2922-12: Standard Specification for Polyethylene (PE) Corrugated Stormwater Collection Chambers.

The system shall be designed in accordance with requirements of ASTM F2787-11: Standard Specification for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers.

The chambers shall be tested to meet or exceed AASHTO H-20 loading.
The system shall have a sediment collection device placed underneath the floor/bottom of the start and end chambers of the first row of chambers receiving flow. A riser pipe shall be placed vertically above and directly in line above the sediment collection device and attached to the chamber. The riser pipe and sediment collection device shall serve as the maintenance unit from which collected sediment is vacuumed out.

Maintenance of the system shall occur by lowering a vacuum hose into the riser pipe and vacuuming sediment from the sediment collection device. Flushing water into the system and vacuuming the sediment / sediment-laden water from the Sediment Trap, inflow row, or a separate access structure is allowed.

1.7 DELIVERY, HANDLING, AND STORAGE

- A full pallet of StormChamber® will weigh approximately 3,410 lbs and will be about 5 ft high x 8.5 ft long x 8.5 ft high.
- StormChamber® will arrive either on a flat bed trailer or in an enclosed van. A long chain, metal cable, or strong rope or straps may be needed to drag a pallet from the nose of the van and unload using a forklift. A forklift with extended blades will be needed to unload pallets of StormChamber® from a flat bed trailer.
- During periods of excessive and/or extended hot weather take one chamber at a time off of a pallet, just before placing it in the trench. If possible, keep pallets of chamber and backfill stone in the shade. Restrict chamber installation to the cooler morning periods, when temperature is below 85°F. Place stone and soil backfill on chambers as they are being installed. If necessary, spray water on the chambers and stone.

NDS SPECIFICATIONS CONTINUED
ON SHEET L-546

KELLY DESIGN GROUP, LLC
 LANDSCAPE ARCHITECTURE
 CONCEPT TO CONSTRUCTION DOCUMENTS
 LAND USE PLANNING
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 2065 MCKENNA BOULEVARD
 MADISON, WISCONSIN



DATE 26 AUGUST 2021

DRAWN BY

CHECKED BY

SHEET TITLE

NOTES AND SPECIFICATIONS

JOB NUMBER 0421.AB

SHEET NUMBER

L-4

NDS SPECIFICATIONS, CONTINUED

PART 2 PRODUCTS

2.1 MANUFACTURER

1. Manufacturer: NDS, Inc., 851 North Harvard Avenue, Lindsay, California 93247. Toll Free 800-726-1994. Phone 559-562-8888. Toll Free Fax 800-726-1996. Fax 559-562-4488. Website www.ndspro.com. Email nds@ndspro.com.

Specifier Notes: Specify if substitutions will be permitted.

2. Substitutions: [Not permitted] [Comply with Division 1]

2.2 MATERIALS SUPPLIED BY NDS

Specifier Notes: Specify the StormChamber® that will be used, i.e., SC-18 OR SC-34E OR SC-34W OR SC-44

1. **SC-1820 StormChamber®:** High Molecular Weight, High Density Polyethylene. Manufactured Nominal Dimensions of Chambers: 8.5 ft (101 in) long x 3.2 ft (38 in) wide x 1.5 ft (18 in) tall. Minimum Installed Chamber storage volume with 6" of gravel above and below, 6" between chamber rows, and 12" at each end: End/Start Unit: 43 cubic feet Middle Unit: 37 cubic feet Closed Unit: 65 cubic feet Chamber weight: 53 lbs

SC-3475 StormChamber®: High Molecular Weight, High Density Polyethylene. Manufactured Nominal Dimensions of Chambers: 8.6 ft (103 in) long x 5.0 ft (60 in) wide x 2.8 ft (34 in) tall. Minimum Installed Chamber storage volume with 6" of gravel above and below, 9" between chamber rows, and 12" at each end: End/Start Unit: 117 cubic feet Middle Unit: 108 cubic feet Closed Unit: 155 cubic feet Chamber weight: 100 lbs

SC-3475W StormChamber®: High Molecular Weight, High Density Polyethylene. Manufactured Nominal Dimensions of Chambers: 8.5 ft (101 in) long x 5.0 ft (60 in) wide x 2.8 ft (34 in) tall. Minimum Installed Chamber storage volume with 6" of gravel above and below, 9" between chamber rows, and 12" at each end: End/Start Unit: 118 cubic feet Middle Unit: 104 cubic feet Closed Unit: 153 cubic feet Chamber weight: 100 lbs

SC-44106 StormChamber®: High Molecular Weight, High Density Polyethylene. Manufactured Nominal Dimensions of Chambers: 7.5 ft (89.5 in) long x 6.4 ft (76.25 in) wide x 3.7 ft (44 in) tall. Minimum Installed Chamber storage volume with 12" of gravel above, 9" below, 9" between chamber rows, and 12" at each end: End/Start Unit: 172 cubic feet Middle Unit: 144 cubic feet Closed Unit: 226 cubic feet Chamber weight: 120 lbs

2. **SedimentTrap™** High Molecular Weight, High Density Polyethylene.

3. 30" dia x 20" tall HDPE Riser Pipe for 34" & 44" tall chambers. 24" dia x 12" tall HDPE Riser Pipe for 18" tall chambers. Pipe can be cut per Project requirement.

4. Non-woven polypropylene filter fabric TMG-4oz NNGW by TMPG or approved equal per details.

5. Woven polypropylene filter fabric 300HTM by WinFab or approved equal.

6. 10" diameter cast iron frame and lid.

PART 3 EXECUTION

Note for Specifier: Sections 3.1 through 3.6 may be substituted with a note to submit manufacturer's installation instructions.

3.1 TRENCH PREPARATION

- Do not excavate trench until dry weather is forecast long enough to allow at least covering the StormChamber® system with filter fabric prior to raining to avoid soil filling void spaces in the stone.
- Excavate to a width and length sufficient to accommodate the number of StormChamber® plus a minimum one foot border around the entire StormChamber® system for the border stone. The bottom of the bed must be level.
- Excavate a hole approximately 5 ft deep x 5 feet wide wherever SedimentTraps™ are specified. The SedimentTrap™ must be aligned directly below the riser pipe and centered below the defined top portal of the chamber/riser pipe. The 18" & 44" StormChambers do not have a defined top portal. The installer shall cut a top portal on the crown of the chamber at the defined distance from the end.
- Line bottom and walls of trench with non-woven filter fabric. Overlap adjacent filter fabric by at least 2'.
- Place at least 6" of 3/4" - 2" non-calcareous (i.e., no limestone) base stone at the bottom of trench each excavated hole for Sediment Traps. Base rock shall be angular stone and washed. Angular stone provides interlocking. Washed stone prevents fines being washed into the outflow.
- If it is not possible to excavate the entire trench from outside the trench, have the excavator back up as it excavates in front of it in order to avoid compaction of underlying soils.
- If use of heavy equipment on the excavated trench bed cannot be avoided, scarify the trench bottom and break up soil clumps before adding the stone base.

3.2 INSTALLING SEDIMENTTRAP™

- Place a SedimentTrap™ in the excavated holes at the first and last chamber of the row(s) receiving the storm water inflow.
- Fill around the SedimentTrap™ with the crushed, washed 3/4" - 2" non-calcareous stone. Only the top corrugation should be exposed above the height of the stone base.

3.3 INSTALLING BASE ROCK AND FILTER FABRIC

- Place crushed, washed, 3/4" to 2" non-calcareous (i.e., no limestone) stone on the bottom of the trench per project installation detail. DO NOT use limestone. Limestone gets pasty when wet and will tend to reduce the void spaces in the stone. Rock shall be angular stone and washed. Angular stone provides interlocking. Washed stone prevents fines being washed into the outflow.
- If necessary, use a light weight tracked dozer to level the stone. Dozer should not exceed 1,100 lbs/ft, maintaining at least 6" of stone under the tracks at all times to avoid soil compaction.
- Place the woven stabilization netting / filter fabric underneath the entire row(s) of StormChambers® receiving inflow. Cut a hole so that the netting fits snugly under the top of the corrugation of the SedimentTrap™.

3.4 PLACING THE STORMCHAMBER®

- Cut off the narrow shipping strips at the end walls to allow the chambers to overlap. Do not cut the weir walls of the Start Chamber.
- Place all Start Chambers first. Make sure the closed ends of the Start Chambers are at least 1 foot from the facing trench wall.
- Build the chamber rows by placing the first rib of a Middle Chamber over the last rib of each Start Chamber. Extend all rows equally rather than one at a time. Finish each row with the End Chamber placed at least 1 foot from the end of the trench.
- As you overlap the first rib of the next chamber over the last rib of the previous chamber, screw the chambers together at the foot of the overlapped ribs with 3" drywall screws. Include one screw on each side, making sure to bring the chambers close enough so that no stone can pass through during the backfilling process.
- To minimize installation time, begin placing pipe and backfilling as the remaining chambers are being placed taking care for worker safety during backfilling.

3.5 INSTALLING PIPES

- After placing the Start Chambers, cut open the side portals along the indentation guides for the lateral connecting pipes.
- Mark the mid points of each lateral connecting pipe and insert them between the adjacent chambers so that the midpoint is centered between the two chambers. The connecting pipe must be inserted about 6" into each chamber. This will require 4-ft or 5-ft sections of pipe.
- Cut out the top portals for the riser pipes. The 18" & 44" tall chambers do not have a defined top portal. The installer shall cut a top portal on the crown of the chamber at the defined distance from the end.
- Install the cleanout risers using 10" diameter PVC pipes and manhole frames and lids.
- If there is more than 1/2" gap between the pipe hole and pipe, cut an "X" sized just short of the hole diameter in one or more pieces of filter fabric and place it over the pipe hole before inserting the pipe. Keep repeating this process until the gap is filled and a tight seal is achieved. SC-44 does not have a defined top portal. The hole should be centered over the SedimentTrap and sized for the riser pipe.

3.6 Wrapping Inflow (Sediment Trap) Row

- Wrap inflow (Sediment Trap) row with non-woven filter fabric.

3.7 PLACING BACKFILL

- Deposit 3/4" - 2" crushed, washed, hard stone directly along the centerline of the StormChamber® to evenly flow down each side to keep the StormChamber® in proper alignment and prevent shifting of rows.
- Level the stone cover with a tracked vehicle not exceeding 1,100 lbs/ft. Make sure to keep at least 6" of stone under the tracks at all times.
- Cover the stone with non-woven filter fabric. Overlap adjacent sheets by at least 2'.
- Backfill the installation with soil and compact in lifts 6" to 8" high to at least 95% of the Standard Proctor Test (AASHTO Method T-99). Crusher run or other suitable backfill material may be used, if approved by the Engineer-of-Record. The same type of stone surrounding the StormChamber® can also be extended up to the pavement sub grade, if desired.
- Compaction shall be performed with a tracked dozer not exceeding 1,100 lbs/ft, keeping at least 1" of fill under the track at all times. Start at one corner of the system when grading lifts.
- After compaction of backfill and setting of final grade, avoid parking on or traversing over the StormChamber® installation with heavily loaded trucks and heavy equipment until paved.

3.8 POST-CONSTRUCTION PRECAUTIONS

- It is highly recommended that the system not be opened to receive stormwater flows until construction of the site has been completed. Even then, all stormwater inlets must be protected from sediment loading until the site is completely stabilized. Complete stabilization implies that the construction site has been cleared of construction-related debris and has incurred at least two storm events sufficient to wash most soil and other particulate matter off impervious surfaces.

3.9 MAINTENANCE

- The system is designed with a defined top portal that can be cut-out to accept a 10" diameter riser pipe. The riser is used as an observation well and for access of a vacuum truck tube that can be used to remove sediment.
- Perform visual inspection through the risers quarterly and after each large storm event. It is recommended that a log book be maintained showing the depth of water in the chamber at each observation in order to determine the rate at which the system dewaters after runoff producing storm events. Once the performance characteristics of the system have been verified, the monitoring schedule can be reduced to an annual basis, unless the performance data suggests that a more frequent schedule is required.
- Remove sediment by inserting the vacuum truck tube into the 10" riser pipe when deposits begin to spill over the top of the Sediment Trap.

Optional Notes for Specifier (see below):

3.10 OPTIONAL SEDIMENT REMOVAL DEVICES

- Under normal circumstances, a pre-treatment device is not necessary. However, under certain conditions, or local requirements, pre-treatment devices can be useful. Filtering, swirl concentrators, or other types of pre-treatment devices can be installed up-stream of the StormChamber® system for removal of sediment, floatables, oil and grease, etc. Their use is particularly helpful for stormwater "hot spot" areas, such as automobile repair shops, where abnormally high concentrations of pollutants such as oil and grease can be expected.
- The use of inlet structures with a 2-4 foot sump may allow for additional capture of sediment that can easily be removed with a vacuum truck or other device before it gets into the StormChamber® system. A sumped inlet structure placed at both ends of the first row of StormChamber® system can also be used to facilitate sediment removal within the StormChamber® system. Under this alternative, one or more additional chamber(s) is added to the beginning and end of the first row, the end of each being inserted directly into the sumped inlet structures. This provides for physical access into the first row for maintenance.
- An additional row of StormChamber® can be added for accumulation of sediment with minimal effect on the stormwater storage requirements of the system. This would be utilized as the "first row" of chambers - the row that accepts the stormwater flow from the inlet structures. Because the flow from the first row of chambers will have to make 90 degree turns through connecting pipes into the adjacent row, velocity of flow will decrease and most of the transported sediment load deposits within the first row of the StormChamber® system.
- The use of fully grated inlet structures will keep the vast majority of debris out of the StormChamber® system. It is suggested that these be placed near the entrance to the establishment being constructed as an incentive for owner maintenance.

These instructions assume accepted construction procedures and loaded trucks that do not exceed specified DOT load limits. Unconventional loads or improper load distribution in vehicles may require additional cover. Installations not in compliance with these instructions will void the warranty.

END OF CSI SPECIFICATION

STORMCHAMBER DESIGN CALCULATOR

Project Name: MCKENNA ROWHOUSE CONDOMINIUMS
 Engineer: KELLY DESIGN GROUP, LLC
 Location: MADISON, WI
 Date: 8/18/2021



Please note, while the SC-44 and SC-18 are available in all locations the SC-34W only ships from the West Coast of the US while the SC-34E only ships from the East Coast of the US.

ENTER SYSTEM PARAMETERS

Choose Measurement Type: Imperial

Required Storage Volume: 1350 ft³

Choose the Chamber Model: SC-44

Choose Design Constraint: Width

Design Constraint Dimension: 130 ft

Stone Above Chambers (min. 12 inches; max. 96 inches): 12 in

Stone Below Chambers (min. 9 inches): 18 in

Total Cover Over Chambers (min. 22 inches; max. 96 inches): 22 in

Stone Void (Industry Standard is 40%): 40 %

Desired Number of Layers: 1

Space Between each Layer (min. 12 Inches): 12 in

Number of Rows Desired: 1

Maximum Number of Rows Based on Constraint Dimension: 6

Space Between Each Row (min. 9 inches): 9 in

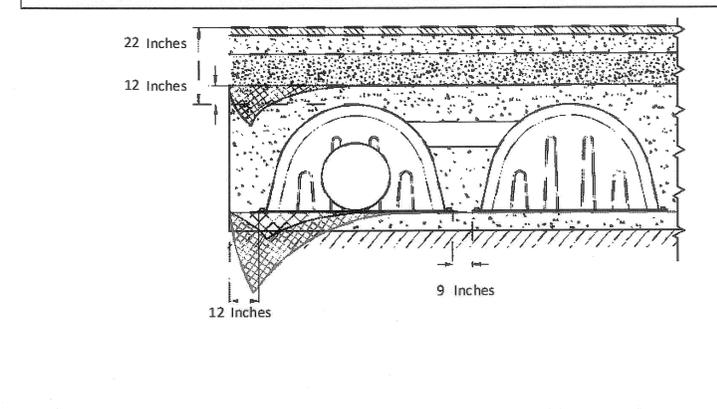
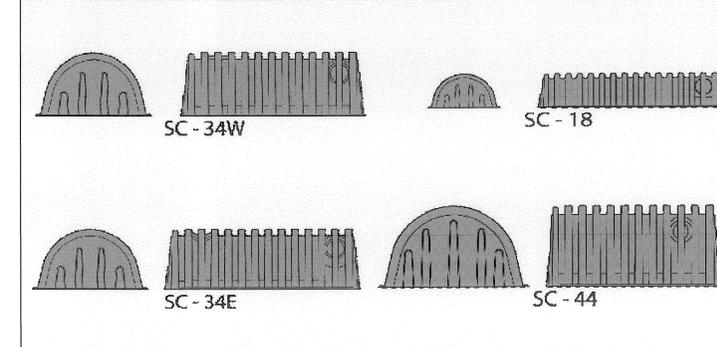
Number of Sediment Traps Desired: 2

Minimum Suggested Number of Sediment Traps (per inflow row): 2

Do you need impervious liner to restrict infiltration?: no

Number of Inflow Rows: 1

Trench depths beyond the range suggested may be achievable.
 For assistance please contact us at (888) 825-4716.



SYSTEM RESULTS

Total Chamber Storage Volume	676.30 Cubic Feet
Total Stone Storage Volume	648.97 Cubic Feet
Installed System Storage Volume	1373.45 Cubic Feet
Minimum Internal Storage of a Chamber	94.02 Cubic Feet
Minimum Installed Storage with stone	165.93 Cubic Feet
Total Number of Chambers Required	7

Try adjusting the number of rows until you are satisfied with the layout.

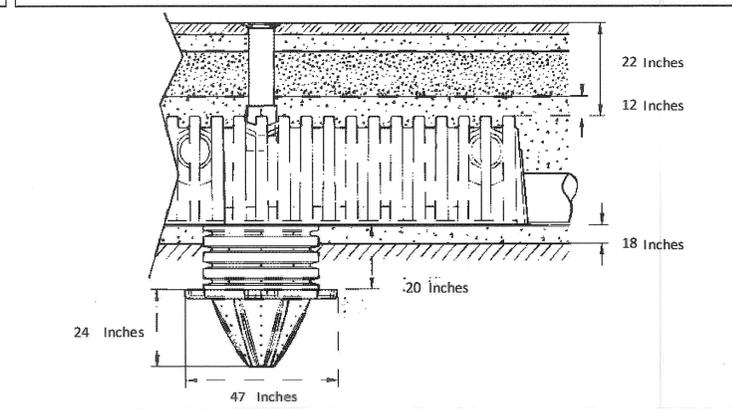
SYSTEM LAYOUT

Layer	Length	Width	Depth	Rows/Chambers	Installed Storage	Total Chambers
NO LAYER	0.00 ft	0 ft	0.00 ft	0 Row(s) of 0 Chambers	0.00 Cubic Feet	0
NO LAYER	0.00 ft	0 ft	0.00 ft	0 Row(s) of 0 Chambers	0 Cubic Feet	0
NO LAYER	0.00 ft	0 ft	0.00 ft	0 Row(s) of 0 Chambers	0 Cubic Meters	0
NO LAYER	0.00 ft	0 ft	0.00 ft	0 Row(s) of 0 Chambers	0.00 Square Yards	0

Minimum Trench Length: 46.96 ft
 Minimum Trench Width: 8.35 ft
 System Depth: 6.17 ft
 Trench Depth: 7.00 ft
 Minimum Bed Size Required: 392.30 Square Feet

System Components

Minimum Amount of Stone Required (3/4" - 2" crushed, washed, ANGULAR stone or concrete only)	69.92 Cubic Yards
Volume of Excavation (not including fill)	89.60 Cubic Yards
Non-woven Filter Fabric Required	251.28 Square Yards
Stabilization Fabric	1 Pieces
Impervious Liner	0.00 Square Yards

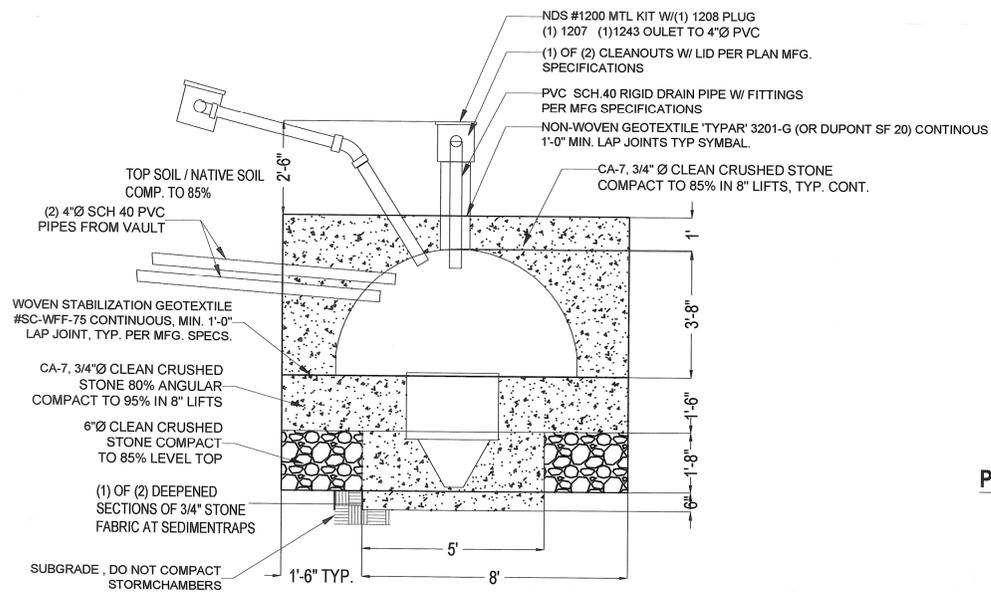


KELLY DESIGN GROUP, LLC
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MCKENNA ROWHOUSE CONDOMINIUMS
 2065 MCKENNA BOULEVARD
 MADISON, WISCONSIN

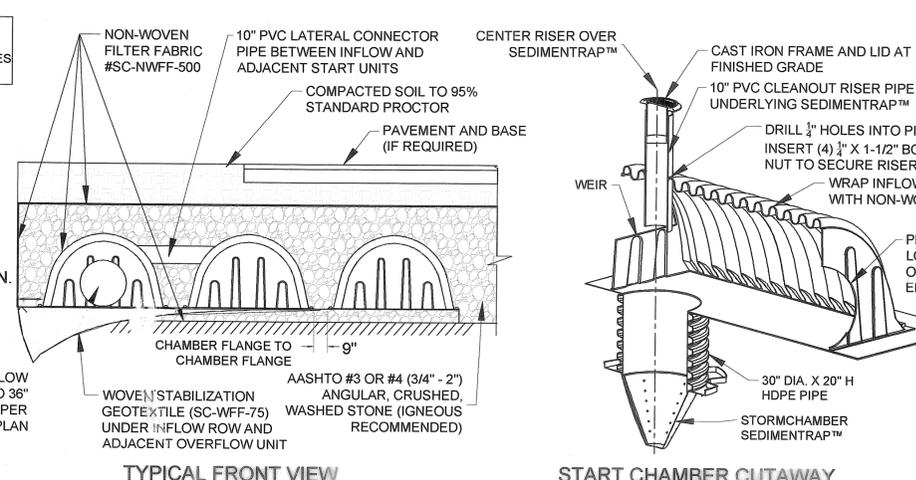
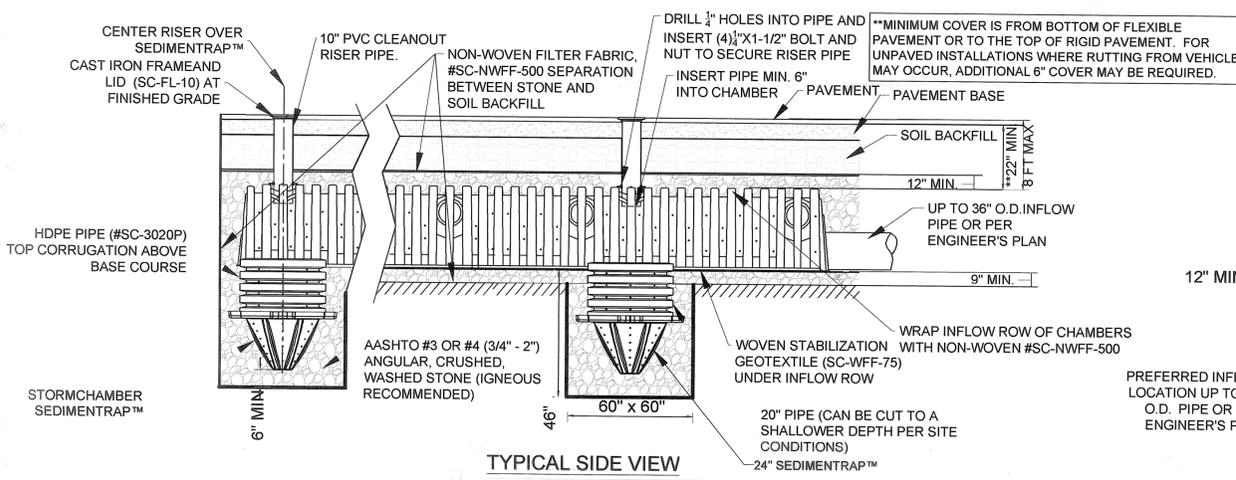
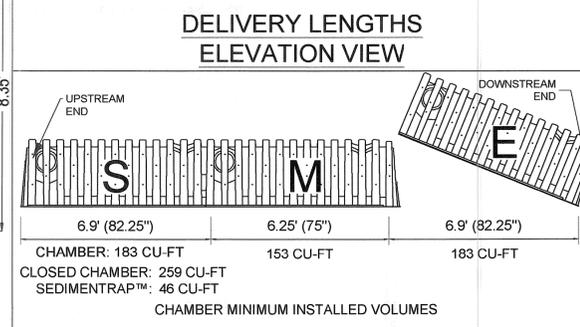
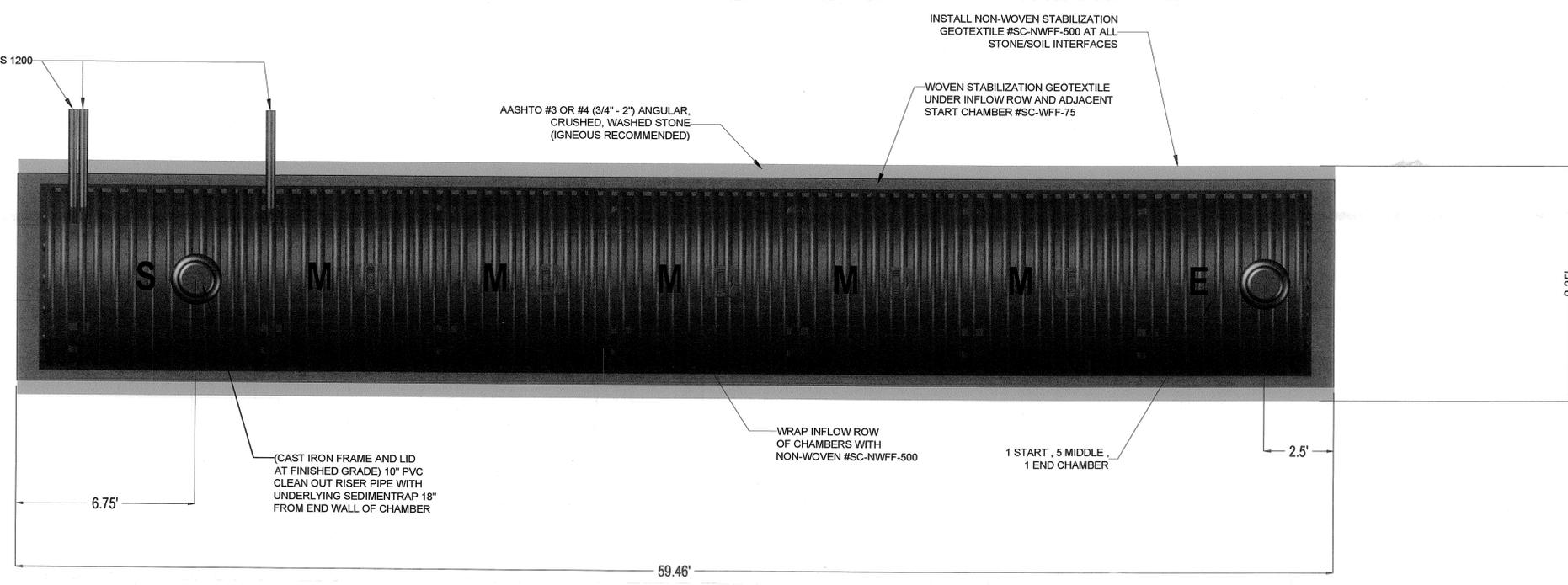
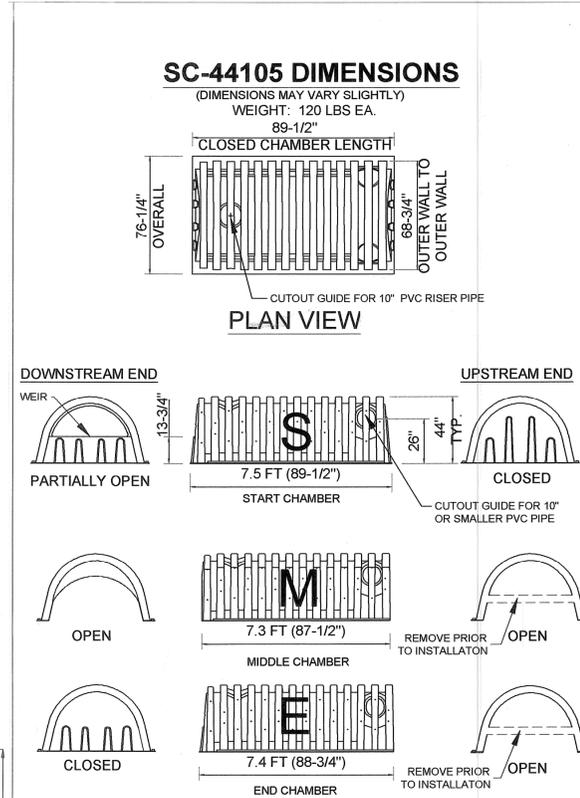


DATE: 26 AUGUST 2021
 DRAWN BY:
 CHECKED BY:
 SHEET TITLE: NOTES AND SPECIFICATIONS
 JOB NUMBER: 0421.AB
 SHEET NUMBER: L-5

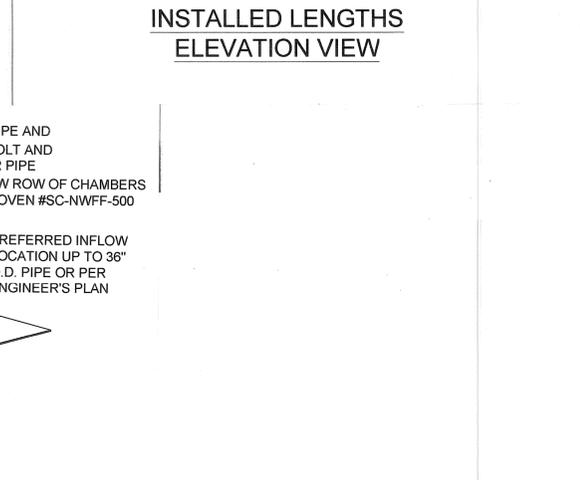


MATERIAL LIST

DESCRIPTION	STOCK CODE	QTY	UNIT
CHAMBERS AND ACCESSORIES:			
START CHAMBER	SC-44105-S-O	1	EACI
MIDDLE CHAMBER	SC-44105-M-O	5	EACI
END CHAMBER	SC-44105-E-O	1	EACI
CLOSED CHAMBER	SC-44105-C-O	N/A	EACI
SEDIMENTRAP™	SC-ST	2	EACI
NON-WOVEN GEOTEXTILE	SC-NWFF-500	1	SQ F
WOVEN STABILIZATION GEOTEXTILE	SC-WFF-75	1	SQ F
30" X 20" HDPE PIPE FOR SEDIMENTRAP™	SC-3020P	2	EACI
10" CAST IRON FRAME AND LID	SC-FL-10	2	EACI
MATERIALS BY OTHERS:			
10" DIAMETER RISER / LATERAL PIPE	OTHERS	2	EACI
IN-PLACE EXCAVATION (NO BULKING FACTOR)	OTHERS	89.60	CU Y
STONE BACKFILL	OTHERS	69.92	CU Y
1/4" X 1-1/2" NUT AND BOLT	OTHERS	8	EACI
3" SCREWS	OTHERS	8	EACI



- NOTES:**
- START CHAMBERS (CLOSED AT THE SIDE PORTAL END) ARE PLACED AT THE INFLOW END OF THE ROWS.
 - BEGIN PLACEMENTS WITH START CHAMBERS AND END ROWS WITH END CHAMBERS.
 - PLACE FIRST RIB OF THE NEXT CHAMBER IN THE ROW OVER THE LAST RIB OF THE PREVIOUS CHAMBER.



PROJECT # 1769

DATE: 8/18/2021
DRAWN BY: ARH

REVISION:



SC-44105 STORMCHAMBER LAYOUT

MEETS OR EXCEEDS ASTM F2922 AND ASTM F2787.
MEETS AASHTO HS-20, HS-25 AND HL-93 LIVE LOADING PER AASHTO LRFD SECTION 12

KELLY DESIGN GROUP, LLC
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2065 MCKENNA BOULEVARD
MADISON, WISCONSIN



DATE: 26 AUGUST 2021
DRAWN BY:
CHECKED BY:
SHEET TITLE: NOTES AND SPECIFICATIONS
JOB NUMBER: 0421.AB
SHEET NUMBER:

MODULAR CONCRETE RETAINING WALL

PART 1: GENERAL

1.01 Description

- A. Work shall consist of furnishing and construction of a KEYSTONE Standard Unit Retaining Wall System or equal in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown on the plans.
- B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit drainage fill and backfill to the lines and grades shown on the construction drawings.
- C. Work includes furnishing and installing geogrid soil reinforcement of the type, size, location, and lengths designated on the construction drawings.

1.02 Related Sections

- A. Section 02300 (31 00 00) - Earthwork

1.03 Reference Documents

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C140 Sampling and Testing Concrete Masonry Units
 - 2. ASTM C1372 Specification for Dry-Cast Segmental Retaining Wall Units
 - 3. ASTM D422 Particle-Size Analysis of Soils
 - 4. ASTM D698 Laboratory Compaction Characteristics of Soil - Standard Effort
 - 5. ASTM D1557 Laboratory Compaction Characteristics of Soil - Modified Effort
 - 6. ASTM D3034 Polyvinyl Chloride Pipe (PVC)
 - 7. ASTM D4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - 8. ASTM D4475 Horizontal Shear Strength of Pultruded Reinforced Plastic Rods
 - 9. ASTM D4476 Flexural Properties of Fiber Reinforced Pultruded Plastic Rods
 - 10. ASTM D4595 Tensile Properties of Geotextiles - Wide Width Strip
 - 11. ASTM D5262 Unconfined Tension Creep Behavior of Geosynthetics
 - 12. ASTM D5818 Evaluate Installation Damage of Geosynthetics
 - 13. ASTM D6637 Tensile Properties of Geogrids - Single or Multi-Rib
 - 14. ASTM D6638 Connection Strength - Reinforcement/Segmental Units
 - 15. ASTM D6708 Geosynthetic Pullout Resistance in Soil
 - 16. ASTM D6916 Shear Strength Between Segmental Concrete Units
- B. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M 252 Corrugated Polyethylene Drainage Pipe
- C. Geosynthetic Research Institute (GRI)
 - 1. GRI-GG4 Determination of Long Term Design Strength of Geogrids
 - 2. GRI-GG5 Determination of Geogrid (soil) Pullout
- D. National Concrete Masonry Association (NCMA)
 - 1. NCMA SRWU-1 Test Method for Determining Connection Strength of SRW
 - 2. NCMA SRWU-2 Test Method for Determining Shear Strength of SRW

1.04 Submittals/Certification

- A. Contractor shall submit a Manufacturer's certification, prior to start of work, that the retaining wall system components meet the requirements of this specification and the structure design.
- B. Contractor shall submit construction drawings and design calculations for the retaining wall system prepared and stamped by a Professional Engineer registered in the state of the project. The engineering designs, techniques, and material evaluations shall be in accordance with the Manufacturer's Design Manual, NCMA Design Guidelines For Segmental Retaining Walls, or the AASHTO Standard Specifications for Highway Bridges (whichever is applicable to designer).
- C. Contractor shall submit a test report documenting strength of specific modular concrete unit and geogrid reinforcement connection. The maximum design tensile load of the geogrid shall be equal to the laboratory tested ultimate strength of geogrid / facing unit connection at a maximum normal force limited by the "Hinge Height" of the structure divided by a safety factor of 1.5. The connection strength evaluation shall be performed in accordance with ASTM D6638 (NCMA SRWU-1).

1.05 Quality Assurance

- A. Contractor shall submit certification, prior to start of work, that the retaining wall system (modular concrete units and specific geogrid):
 - 1) Has been successfully utilized on a minimum of five (5) similar projects, i.e., height, soil fill types, erection tolerances, etc.; and
 - 2) Has been successfully installed on a minimum of 1 million (1,000,000) square feet of retaining walls.
- B. Contractor shall submit a list of five (5) previously constructed projects of similar size and magnitude by the wall installer where the specific retaining wall system has been constructed successfully. Contact names and telephone numbers shall be listed for each project.
- C. Contractor shall provide evidence that the design engineer has a minimum of five years of documentable experience in the design for reinforced soil structures. The design engineer shall provide proof of current professional liability insurance with an aggregate coverage limit of not less than \$2,000,000.
- D. Owner shall provide soil testing and quality assurance inspection during earthwork and wall construction operations. Contractor shall provide any quality control testing or inspection not provided by the Owner. Owner's quality assurance program does not relieve the contractor of responsibility for quality control and wall performance.

1.06 Delivery, Storage and Handling

- A. Contractor shall check all materials upon delivery to assure that the proper type, grade, color, and certification has been received.
- B. Contractor shall protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

PART 2: PRODUCTS

2.01 Definitions

- A. Modular Unit - a concrete retaining wall element machine made from Portland cement, water, and aggregates.
- B. Structural Geogrid - a structural element formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth and function primarily as reinforcement.
- C. Unit Drainage Fill - drainage aggregate, which is placed within and immediately behind the modular concrete units.
- D. Reinforced Backfill - compacted soil, which is placed within the reinforced soil volume as outlined on the plans.

2.02 Modular Concrete Retaining Wall Units

- A. Modular concrete units shall conform to the following architectural requirements:
 - 1. Face color - concrete gray, unless otherwise specified. The Owner may specify standard manufacturers' color.
 - 2. Face finish - sculptured rock face in angular tri-planer configuration. Other face finishes will not be allowed without written approval of Owner.
 - 3. Bond configuration - running with bonds nominally located at midpoint vertically adjacent units, in both straight and curved alignments.
 - 4. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 10 feet under diffused lighting.
- B. Modular concrete materials shall conform to the requirements of ASTM C1372 - Standard Specifications for Segmental Retaining Wall Units.
- C. Modular concrete units shall conform to the following structural and geometric requirements measured in accordance with ASTM C140 Sampling and Testing Concrete Masonry Units:
 - 1. Compressive strength: ≥ 3000 psi (21 MPa);
 - 2. Absorption: 8 % (6% in northern states) for standard weight aggregates;
 - 3. Dimensional tolerances: $\pm 1/8"$ (3 mm) from nominal unit dimensions not including rough split face, $\pm 1/16"$ (1.5 mm) unit height - top and bottom planes;
 - 4. Unit size: 8" (203 mm) (H) x 18" (457 mm)(W) x 18" (457 mm)(D) minimum;
 - 5. Unit weight: 100 lbs/unit (45 kg) minimum for standard weight aggregates.
- D. Modular concrete units shall conform to the following performance testing:
 - 1. Inter-unit shear strength in accordance with ASTM D6916 (NCMA SRWU-2): 1500 pif (21 kN/m) minimum at 2 psi (13 MPa) normal pressure.
 - 2. Geogrid/unit peak connection strength in accordance with ASTM D6638 (NCMA SRWU-1): 900 pif (13 kN/m) minimum at 2-psi (13 MPa) normal force.
- E. Modular concrete units shall conform to the following constructability requirements:
 - 1. Vertical setback: $1/8"$ (3 mm) \pm per course (near vertical) or 1" (25 mm) + per course per the design;
 - 2. Alignment and grid positioning mechanism - fiberglass pins, two per unit minimum;
 - 3. Maximum horizontal gap between erected units shall be $\leq 1/2$ inch (13 mm).

2.03 Shear Connectors

- A. Shear connectors shall be 1/2-inch (12 mm) diameter thermoset isophthalic polyester resin-pultruded fiberglass reinforcement rods or equivalent to provide connection between vertically and horizontally adjacent units with the following requirements:
 - 1. Flexural Strength in accordance with ASTM D4476: 128,000 psi (882 MPa) minimum;
 - 2. Short Beam Shear in accordance with ASTM D4475: 6,400 psi (44 MPa) minimum.
- B. Shear connectors shall be capable of holding the geogrid in the proper design position during grid pre-tensioning and backfilling.

2.04 Base Leveling Pad Material

- A. Material shall consist of a compacted crushed stone base or non-reinforced concrete as shown on the construction drawings.

2.05 Unit Drainage Fill

- A. Unit drainage fill shall consist of clean 1" (25 mm) minus crushed stone or crushed gravel meeting the following gradation tested in accordance with ASTM D-422:

Sieve Size	Percent Passing
1 inch (25 mm)	100
3/4-inch (19 mm)	75-100
No. 4	0 - 10
No. 50	0 - 5
- B. One cubic foot (0.028 m3), minimum, of drainage fill shall be used for each square foot (0.093 m2) of wall face. Drainage fill shall be placed within cores of, between, and behind units to meet this requirement.

2.06 Reinforced Backfill

- A. Reinforced backfill shall be free of debris and meet the following gradation tested in accordance with ASTM D-422:

Sieve Size	Percent Passing
2-inch (50 mm)	100
3/4-inch (19 mm)	100-75
No. 40	0-60
No. 200	0-35

Plasticity Index (PI) < 15 and Liquid Limit < 40 per ASTM D-4318.
- B. The maximum aggregate size shall be limited to 3/4 inch (19 mm) unless field tests have been performed to evaluate potential strength reductions to the geogrid design due to damage during construction.
- C. Material can be site-excavated soils where the above requirements can be met. Unsuitable soils for backfill (high plastic clays or organic soils) shall not be used in the backfill or in the reinforced soil mass.
- D. Contractor shall submit reinforced fill sample and laboratory test results to the Architect/Engineer for approval prior to the use of any proposed reinforced fill material.

2.07 Geogrid Soil Reinforcement

- A. Geosynthetic reinforcement shall consist of geogrids manufactured specifically for soil reinforcement applications and shall be manufactured from high tenacity polyester yarn or high-density polyethylene. Polyester geogrid shall be knitted from high tenacity polyester filament yarn with a molecular weight exceeding 25,000 Meg/m and a carboxyl end group values less than 30. Polyester geogrid shall be coated with an impregnated PVC coating that resists peeling, cracking, and stripping.
- B. T_a , Long Term Allowable Tensile Design Load, of the geogrid material shall be determined as follows:

$$T_a = T_{ult} / (R_{FCr} \cdot R_{FD} \cdot R_{Fid} \cdot FS)$$

$$T_a$$
 shall be evaluated based on a 75-year design life.
 - 1. T_{ult} , Short Term Ultimate Tensile Strength shall be determined in accordance with ASTM D4595 or ASTM D6637.
 - 2. R_{FCr} , Reduction Factor for Long Term Tension Creep R_{FCr} shall be determined from 10,000-hour creep testing performed in accordance with ASTM D5262. Reduction value = 1.45 minimum.
 - 3. R_{FD} , Reduction Factor for Durability R_{FD} shall be determined from polymer specific durability testing covering the range of expected soil environments. $R_{FD} = 1.10$ minimum.
 - 4. R_{Fid} , Reduction Factor for Installation Damage R_{Fid} shall be determined from product specific construction damage testing performed in accordance with ASTM D5818 (GRI-GG4). Test results shall be provided for each product to be used with project specific or more severe soil type. $R_{Fid} = 1.05$ minimum.
 - 5. FS , Overall Design Factor of Safety FS shall be 1.5 unless otherwise noted for the maximum allowable working stress calculation.

- C. The maximum design tensile load of the geogrid shall not exceed the laboratory tested ultimate strength of the geogrid/facing unit connection as limited by the "Hinge Height" divided by a factor of safety of 1.5. The connection strength testing and computation procedures shall be in accordance with ASTM D6638 Connection Strength between Geosynthetic Reinforcement and Segmental Concrete Units (NCMA SRWU-1).
- D. Soil Interaction Coefficient, C_i
 C_i values shall be determined per ASTM D6706 (GRI-GG5) at a maximum 0.75-inch (19 mm) displacement.
- E. Manufacturing Quality Control
The geogrid manufacturer shall have a manufacturing quality control program that includes QC testing by an independent laboratory.
The QC testing shall include:
Tensile Strength Testing
Melt Flow Index (HDPE)
Molecular Weight (Polyester)

2.08 Drainage Pipe

- A. If required, the drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM D-3034 or corrugated HDPE pipe manufactured in accordance with AASHTO M252.

2.09 Geotextile Filter Fabric

- A. When required, Geotextile filter fabric shall be 4.0 oz/sy, polypropylene, needlepunched nonwoven fabric.

PART 3: EXECUTION

3.01 Excavation

- A. Contractor shall excavate to the lines and grades shown on the construction drawings. Owner's representative shall inspect the excavation and approve prior to placement of leveling material or fill soils. Proof roll foundation area as directed to determine if remedial work is required.
- B. Over-excavation and replacement of unsuitable foundation soils and replacement with approved compacted fill will be compensated as agreed upon with the Owner.

3.02 Base Leveling Pad

- A. Leveling pad material shall be placed to the lines and grades shown on the construction drawings, to a minimum thickness of 6 inches (150 mm) and extend laterally a minimum of 6" (150 mm) in front and behind the modular wall unit.
- B. Soil leveling pad materials shall be compacted to a minimum of 95 % Standard Proctor density per ASTM D-698 or 92% Modified Proctor Density per ASTM D1557.
- C. Leveling pad shall be prepared to insure full contact to the base surface of the concrete units.

3.03 Modular Unit Installation

- A. First course of units shall be placed on the leveling pad at the appropriate line and grade. Alignment and level shall be checked in all directions and insure that all units are in full contact with the base and properly seated.
- B. Place the front of units side-by-side. Do not leave gaps between adjacent units. Layout of corners and curves shall be in accordance with manufacturer's recommendations.
- C. Install shear/connecting devices per manufacturer's recommendations.
- D. Place and compact drainage fill within and behind wall units. Place and compact backfill soil behind drainage fill. Follow wall erection and drainage fill closely with structure backfill.
- E. Maximum stacked vertical height of wall units, prior to unit drainage fill and backfill placement and compaction, shall not exceed two courses.

3.04 Structural Geogrid Installation

- A. Geogrid shall be oriented with the highest strength axis perpendicular to the wall alignment.
- B. Geogrid reinforcement shall be placed at the strengths, lengths, and elevations shown on the construction design drawings or as directed by the Engineer.
- C. The geogrid shall be laid horizontally on compacted backfill and attached to the modular wall units. Place the next course of modular concrete units over the geogrid. The geogrid shall be pulled taut, and anchored prior to backfill placement on the geogrid.
- D. Geogrid reinforcements shall be continuous throughout their embedment lengths and placed side-by-side to provide 100% coverage at each level. Spliced connections between shorter pieces of geogrid or gaps between adjacent pieces of geogrid are not permitted.

3.05 Reinforced Backfill Placement

- A. Reinforced backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack in the geogrid and installation damage.
- B. Reinforced backfill shall be placed and compacted in lifts not to exceed 6 inches (150 mm) where hand compaction is used, or 8 - 10 inches (200 to 250 mm) where heavy compaction equipment is used. Lift thickness shall be decreased to achieve the required density as required.
- C. Reinforced backfill shall be compacted to a minimum of 95 % Standard Proctor density per ASTM D-698 or 92% Modified Proctor Density per ASTM D1557. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer and shall be dry of optimum, $\pm 0\%$, $- 3\%$.
- D. Only lightweight hand-operated equipment shall be allowed within 3 feet (1m) from the tail of the modular concrete unit.
- E. Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum fill thickness of 6 inches (150 mm) is required prior to operation of tracked vehicles over the geogrid. Tracked vehicle turning should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.
- F. Rubber tired equipment may pass over geogrid reinforcement at slow speeds, less than 10 MPH (15 KPH). Sudden braking and sharp turning shall be avoided.
- G. At the end of each day's operation, the Contractor shall slope the last lift of reinforced backfill away from the wall units to direct runoff away from wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3.06 Cap Installation

- A. Cap units shall be glued to underlying units with an all-weather adhesive recommended by the manufacturer.

3.07 As-built Construction Tolerances

- A. Vertical alignment: $\pm 1.5"$ (40 mm) over any 10' (3 m) distance.
- B. Wall Batter: within 2 degrees of design batter.
- C. Horizontal alignment: $\pm 1.5"$ (40 mm) over any 10' (3 m) distance. Corners, bends & curves: ± 1 ft (300 mm) to theoretical location.
- D. Maximum horizontal gap between erected units shall be $\leq 1/2$ inch (13 mm).

3.08 Field Quality Control

- A. Quality Assurance - The Owner shall/may engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. This does not relieve the Contractor from securing the necessary construction control testing.
- B. Quality assurance should include foundation soil inspection. Verification of geotechnical design parameters, and verification that the contractor's quality control testing is adequate as a minimum. Quality assurance shall also include observation of construction for general compliance with design drawings and project specifications. Quality assurance is best performed by the site geotechnical engineer.
- C. Quality Control - The Contractor shall engage inspection and testing services to perform the minimum quality control testing described in the retaining wall design plans and specifications. Only qualified and experienced technicians and engineers shall perform testing and inspection services.
- D. Quality control testing shall include soil and backfill testing to verify soil types and compaction and verification that the retaining wall is being constructed in accordance with the design plans and project specifications.

NOTE:

THE USE AND PUBLICATION OF THESE PLANS, SPECIFICATIONS, AND DESIGNS SHALL BE RESTRICTED TO THE ORIGINAL SITE AND PASE FOR WHICH THEY WERE PREPARED AND TITLE THERETO REMAINS IN THE LANDSCAPE ARCHITECT. USE OR MODIFICATION WITHOUT WRITTEN CONSENT OF THE LANDSCAPE ARCHITECT IS PROHIBITED. VISUAL CONTACT CONSTITUTES ACCEPTANCE OF THE RESTRICTIONS.

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 CONCEPT TO CONSTRUCTION DOCUMENTS
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MCKENNA ROWHOUSE CONDOMINIUMS
 2065 MCKENNA BOULEVARD
 MADISON, WISCONSIN



DATE 26 AUGUST 2021

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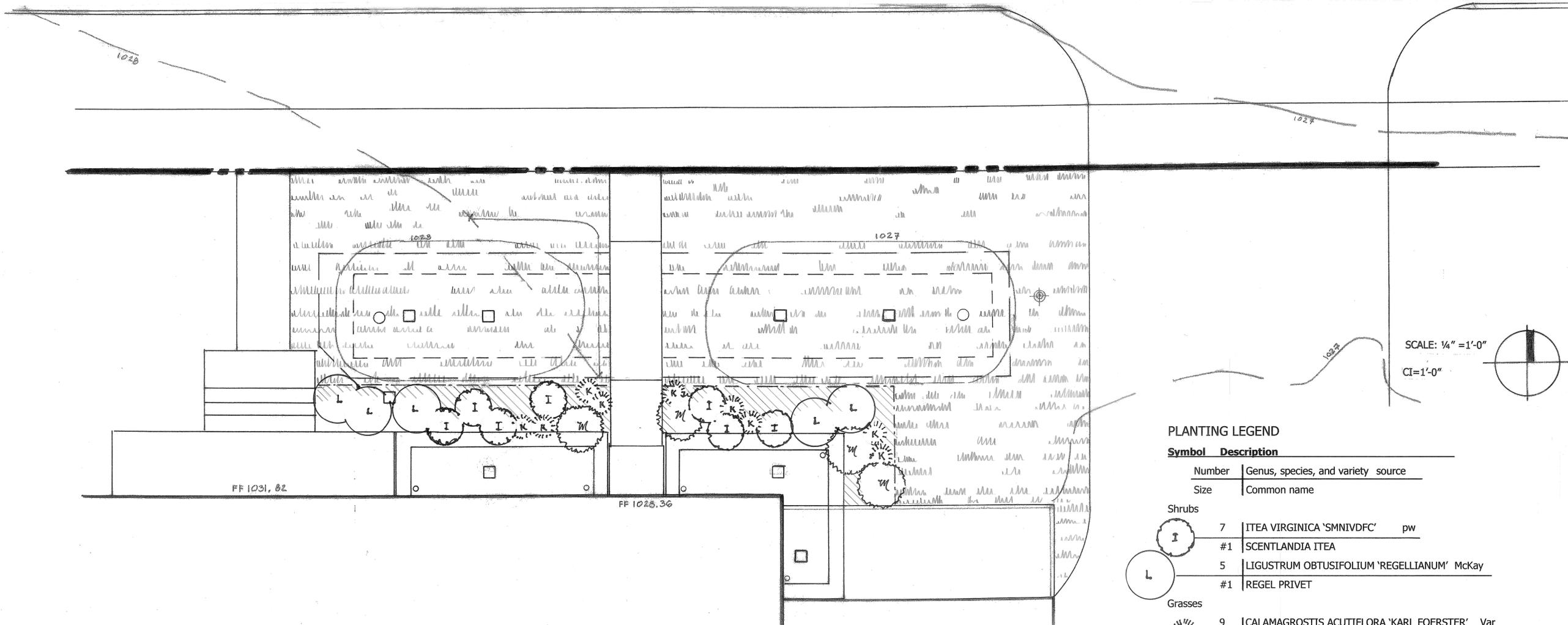
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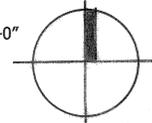
NOTES AND SPECIFICATIONS

JOB NUMBER 0421.AB

SHEET NUMBER



SCALE: 1/4" = 1'-0"
 CI=1'-0"



PLANTING LEGEND

Symbol Description

Number	Genus, species, and variety	source
Size	Common name	
Shrubs		
I	ITEA VIRGINICA 'SMNIVDFC'	pw
#1	SCENTLANDIA ITEA	
L	LIGUSTRUM OBTUSIFOLIUM 'REGELLIANUM'	McKay
#1	REGEL PRIVET	
Grasses		
9	CALAMAGROSTIS ACUTIFLORA 'KARL FOERSTER'	Var
#1	KARL FOERSTER REED GRASS	
4	MISCANTHUS SINENSIS 'LITTLE ZEBRA'	McKay
#1	DWARF ZEBRA GRASS	
Groundcover		
6" oc	LAMIUM MACULATUM 'ORCHID FROST'	hortech/var
Flats	ORCHID FROST SPOTTED DEAD NETTLE	
Seed	RHIZOMATOUS TALL FESCUE	
	RTF By Barenbrug Seed Company	

SUPPLIERS: McKay Nursery (McKay)
 Proven Winners (pw)
 Hortech and varius nurseries (hortech/var)

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 JOB NUMBER 0421.AB
 SHEET NUMBER

L-8

Part I. General

I. Description of Work

- A. Provide all exterior planting as shown on the drawings or inferable therefrom and/or as specified in accordance with the requirements of the Contract Documents.
- B. These specifications include standards necessary for and incidental to the execution and completion of planting, including hauling and spreading of topsoil, and finished grading as indicated on the prepared drawings and specified herein.
- C. Protection of existing features. During construction, protect all existing trees, shrubs, and other specified vegetation, site features and improvements, structures, and utilities specified herein and/or on submitted drawings. Removal or destruction of existing plantings is prohibited unless specifically authorized by the owner.

II. Applicable Standards

- A. *American National Standards for Tree Care Operations, ANSI A300*. American National Standards Institute, 11 West 42nd Street, New York, N.Y. 10036.
- B. *American Standard for Nursery Stock, ANSI Z60.1*. American Nursery and Landscape Association, 1250 Eye Street, NW, Suite 500, Washington, D.C. 20005.
- C. *Hortus Third*, The Staff of the L.H. Bailey Hortorium. 1976. MacMillan Publishing Co., New York.
- D. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

III. Qualifications

- A. Landscape planting and related work shall be performed by a firm with a minimum of five years experience specializing in this type of work. All contractors and their sub-contractors who will be performing any landscape work included in this section of the specification shall be approved by the landscape architect.

IV. Requirements of Regulatory Agencies

- A. Certificates of inspection shall accompany the invoice for each shipment of plants as may be required by law for transportation. File certificates with the landscape architect prior to acceptance of the material. Inspection by federal or state authorities at place of growth does not preclude rejection of the plants at the site.

V. Submittals

- A. **Manufacturer's Data:** Submit copies of the manufacturer's and/or source data for all materials specified, including soils.
- B. **Samples:** Submit samples of all topsoil, soil mixes, mulches, and organic materials. Samples shall weigh 1 kg (2 lb) and be packaged in plastic bags. Samples shall be typical of the lot of material to be delivered to the site and provide an accurate indication of color, texture, and organic makeup of the material.
- C. **Plant Photographs:** Submit color photographs of representative specimens of each type of tree and shrub on the plant list. Photos shall be 75 x 125 mm (3 x 5 in.) taken from angle that depicts the size and condition of the typical plant to be furnished. A scale rod or other measuring device shall be included in the photograph. For species where more than 20 plants are required, include a minimum of three photos that show the average plant, the best quality plant, and the worst quality plant to be provided. Label each photograph with the plant name, plant size, and name of the growing nursery.
- D. **Nursery Sources:** Submit a list of all nurseries that will supply plants, along with a list of the plants they will provide and the location of the nursery.
- E. **Soil Test:** Submit soil test analysis report for each sample of topsoil and planting mix from a soil testing laboratory approved by the landscape architect.

1. Provide a particle size analysis, including the following gradient of mineral content:

USDA Designation	Size in mm
Gravel	+2 mm
Very coarse sand	1-2 mm
Coarse sand	0.5 - 1 mm
Medium sand	0.25 - 0.5 mm
Fine sand	0.1 - 0.25 mm
Very fine sand	0.05 - 0.1 mm
Silt	0.002 - 0.05 mm
Clay	smaller than 0.002 mm

2. Provide a chemical analysis, including the following:

- a. pH and buffer pH
- b. Percentage of organic content by oven-dried weight.
- c. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil based on the requirements of horticultural plants.
- d. Soluble salt by electrical conductivity of a 1:2, soil: water, sample measured in millimho per cm.
- e. Cation exchange capacity (CEC).

- F. **Material Testing:** Submit the manufacturer's particle size analysis, and the pH analysis and provide a description and source location for the content material of all organic materials.

VI. Planting Season

- A. Planting shall be done within the following dates:

Deciduous trees and shrubs SMAY to 20 OCTOBER.

- B. Variance: If special conditions exist that warrant a variance in the above planting dates, a written request shall be submitted to the landscape architect stating the special conditions and the proposed variance. Permission for the variance will be given if warranted in the opinion of the landscape architect. Any variance in the planting season will not affect the guarantee period.

VII. Utility Verification

- A. The contractor shall contact the local utility companies for verification of the location of all underground utility lines in the area of the work. The contractor shall be responsible for all damage resulting from neglect or failure to comply with this requirement.

Part 2. Materials

I. Topsoil

A. Imported Topsoil

1. Loamy, friable soil, containing a minimum of 1.5 percent by dry weight organic matter; free from subsoil, refuse, roots, heavy or stiff clay, stones larger than 25 mm (1 in.), noxious seeds, sticks, brush, litter, and other deleterious substances; suitable for the germination of seeds and the support of vegetative growth. The pH value shall be between 5.5 and 6.5.

2. Approximate Particle Distribution Imported Topsoil

Gravel	Less than 10%
Coarse to medium sand	30-65%
Fine sand	5-20%
Very fine sand	0-20%
Silt	15-25%
Clay	15-25%

3. Provide a minimum of one soil sample with the accompanying soil test report per 200 cubic meters (250 cubic yards) of material required from samples obtained randomly throughout the source field location or stockpile.

B. Existing Topsoil

1. Existing topsoil may be used if it meets the requirements for imported topsoil or if approved by the landscape architect. Provide a minimum of one soil sample with accompanying soil test report for each topsoil type found at the site. Following the completion of the soil testing, the contractor and the landscape architect shall meet at the site prior to beginning of topsoil stripping and establish the limitations of areas where existing topsoil may be used and the depth of topsoil stripping permitted.
(NOTE: The landscape architect may test the existing soil prior to bidding the project and include the areas and depths of topsoil availability in the bid documents along with the soil test results.)

- C. Topsoil shall not be stripped, transported, or graded if moisture content exceeds field capacity or if the soil is frozen.

- D. Topsoil stockpiles shall be protected from erosion and contamination.

- E. E. Amendments required to be added as indicated on the soil test report shall be added by the contractor at the time of spreading and/or grading.

II. Plants

- A. Plants shall be true to species and variety specified and nursery-grown in accordance with good horticultural practices under climatic conditions similar to those in the locality of the project for at least two years. They shall have been freshly dug (during the most recent favorable harvest season).

1. All plant names and descriptions shall be as defined in *Hortus Third*.

2. All plants shall be grown and harvested in accordance with the *American Standard for Nursery Stock*.

3. Unless approved by the landscape architect, plants shall have been grown at a latitude not more than 325 km (200 miles) north or south of the latitude of the project unless the provenance of the plant can be documented to be compatible with the latitude and cold hardness zone of the planting location.
(NOTE: Many tree species are sensitive to the photoperiod of their native provenance. For example, red maple stock from native southern stock will not harden off in time for northern winters.)

- B. Unless specifically noted, all plants shall be of specimen quality, exceptionally heavy, symmetrical, and so trained or flared in development and appearance as to be unquestionably and outstandingly superior in form, compactness, and symmetry. They shall be sound, healthy, vigorous, well branched, and densely foliated when in leaf; free of disease and insects, eggs, or larvae; and shall have healthy, well-developed root systems. They shall be free from physical damage or other conditions that would prevent vigorous growth.

1. Trees with multiple leaders, unless specified, will be rejected. Trees with a damaged or crooked leader, bark abrasions, sunscald, disfiguring knots, insect damage, or cuts of limbs over 20 mm (3/4 in.) in diameter that are not completely closed will be rejected.

- C. Plants shall conform to the measurements specified, except that plants larger than those specified may be used if approved by the landscape architect. Use of larger plants shall not increase the contract price. If larger plants are approved, the root ball shall be increased in proportion to the size of the plant.

1. Caliper measurements shall be taken on the trunk 150 mm (6 in.) above the natural ground line for trees up to and including 100 mm (4 in.) in caliper, and 300 mm (12 in.) above the natural ground line for trees over 100 mm (4 in.) in caliper. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to branch tip. Plants shall be measured when branches are in their normal position. If a range of sizes is given, no plant shall be less than the minimum size, and no less than 50 percent of the plants shall be as large as the maximum size specified. Measurements specified are minimum sizes acceptable after pruning, where pruning is required. Plants that meet measurements but do not possess a standard relationship between height and spread, according to the *American Standards for Nursery Stock*, shall be rejected.

- D. Substitutions of plant materials will not be permitted unless authorized in writing by the landscape architect. If proof is submitted in writing that a plant specified is not obtainable, consideration will be given to the nearest available size or similar variety, with a corresponding adjustment of the contract price.

- E. The plant list at the end of this section, or on the drawing, is for the contractor's information only, and no guarantee is expressed or implied that quantities therein are correct or that the list is complete. The contractor shall ensure that all plant materials shown on the drawings are included in his or her bid.

- F. All plants shall be labeled by plant name. Labels shall be attached securely to all plants, bundles, and containers of plant materials when delivered. Plant labels shall be durable and legible, with information given in weather-resistant ink or embossed process lettering.

G. Selection and Tagging

1. Plants shall be subject to inspection for conformity to specification requirements and approval by the landscape architect at their place of growth and upon delivery. Such approval shall not impair the right of inspection and rejection during progress of the work.
2. A written request for the inspection of plant material at their place of growth shall be submitted to the landscape architect at least ten calendar days prior to digging. This request shall state the place of growth and the quantity of plants to be inspected. The landscape architect may refuse inspection at this time if, in his or her judgment, sufficient quantities of plants are not available for inspection.
3. All plants shall be selected and tagged by the landscape architect at their place of growth. For distant material, photographs may be submitted for pre-inspection review.
4. All field grown deciduous trees shall be marked to indicate the trees north orientation in the nursery. Place a 1-in. diameter spot of white paint onto the north side of the tree trunk within the bottom 12 inches of the trunk.

H. Anti-Desiccants

1. Anti-desiccants, if specified, are to be applied to plants in full leaf immediately before digging or as required by the landscape architect. Anti-desiccants are to be sprayed so that all leaves and branches are covered with a continuous protective film.

I. Balled and Burlapped (B&B) Plant Materials

1. Trees designated B&B shall be properly dug with firm, natural balls of soil retaining as many fibrous roots as possible, in sizes and shapes as specified in the *American Standard for Nursery Stock*. Balls shall be firmly wrapped with nonsynthetic, rottable burlap and secured with nails and heavy, nonsynthetic, rottable twine. The root collar shall be apparent at surface of ball. Trees with loose, broken, processed, or manufactured root balls will not be accepted, except with special written approval before planting.
(NOTE: Some nurseries practice result in the root flare being buried several inches deep. The top of the root ball may be at ground level, but the root flare actually is too deep. Remove the excess soil on the top of the root ball. Proper planting depth requires the root flare to be at or slightly above the finished grade.)

J. Container Plants

1. Plants grown in containers shall be of appropriate size for the container as specified in the most recent edition of the *American Standard for Nursery Stock* and be free of circling roots on the exterior and interior of the root ball.

2. Container plants shall have been grown in the container long enough to have established roots throughout the growing medium.

K. Bareroot and Collected Plants

1. Plants designated as bareroot or collected plants shall conform to the *American Standard for Nursery Stock*.
2. Bareroot material shall not be dug or installed after bud break or before dormancy.

- L. Immediately after harvesting plants, protect from drying and damage until shipped and delivered to the planting site. Rootballs shall be checked regularly and watered sufficiently to maintain root viability.

M. Transportation and Storage of Plant Material

(NOTE: No matter how good plant materials may be at a nursery, how that material is handled after it is dug is of critical importance.)

1. Branches shall be tied with rope or twine only, and in such a manner that no damage will occur to the bark or branches.
2. During transportation of plant material, the contractor shall exercise care to prevent injury and drying out of the trees. Should the roots be dried out, large branches broken, balls of earth broken or loosened, or areas of bark torn, the landscape architect may reject the injured tree(s) and order them replaced at no additional cost to the owner. All loads of plants shall be covered at all times with tarpaulin or canvas. Loads that are not protected will be rejected.
3. All bareroot stock sent from the storage facility shall be adequately covered with wet soil, sawdust, woodchips, moss, peat, straw, hay, or other acceptable moisture-holding medium, and shall be covered with a tarpaulin or canvas. Loads that are not protected in the above manner may be rejected.
4. Plants must be protected at all times from sun or drying winds. Those that cannot be planted immediately on delivery shall be kept in the shade, well protected with soil, wet mulch, or other acceptable material, and kept well watered. Plants shall not remain unplanted any longer than three days after delivery. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be lifted and handled with suitable support of the soil ball to avoid damaging it.

N. Mechanized Tree Spade Requirements

- Trees may be moved and planted with an approved mechanical tree spade. The tree spade shall move trees limited to the maximum size allowed for a similar B&B root-ball diameter according to the *American Standard for Nursery Stock* or the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller. The machine shall be approved by the landscape architect prior to use. Trees shall be planted at the designated locations in the manner shown in the plans and in accordance with applicable sections of the specifications.

III. Materials for Planting

- A. **Mulch:** *shredded hardwood bark*. Material shall be mulching grade, uniform in size, and free of foreign matter. Submit sample for approval.
- B. **Anti-desiccant:** shall be an emulsion specifically manufactured for agricultural use, which provides a protective film over plant surfaces. Anti-desiccants shall be delivered in containers of the manufacturer and shall be mixed according to the manufacturer's directions. Submit manufacturer literature for approval.
- C. **Tree Shelter:** shall be extruded, twin-walled polypropylene tubes, 80 mm to 105 mm (3-1/4 to 4-1/4 in.) in diameter, 600 mm (2 ft) tall, with manufacturer-supplied oak stakes and bird screen. Submit manufacturer literature for approval.
- D. **Tree Wrap:**

1. Option 1 - Extruded, translucent, twin-walled polypropylene protection board sheets; 3 mm thick. 1800mm (6 ft) long tree shelters may be utilized for short trunk trees 75 mm (3 in.) caliper or less. Submit manufacturer literature for approval.
2. Option 2 - Breathable synthetic fabric tree wrap. White in color, delivered in 75 mm (3 in.) wide rolls. Specifically manufactured for tree wrapping. Tree wrap shall be "Breathable Fabric Tree Wrap" as manufactured by the Dewitt Company, Inc., Sikeston, MO, or approved equal. Submit manufacturer literature for approval.
3. Tree wrap shall be secured to the trunk using bio-degradable tape suitable for nursery use and which is expected to degrade in sunlight in less than two years after installation.

- E. **Bio-stimulants:** shall contain soil conditioners, VAM, and endomycorrhizal and ectomycorrhizal fungi spores and soil bacteria appropriate for existing soil conditions. Submit manufacturer literature for approval.

IV. Materials for Soil Amendment

- A. **Pine Bark:** *(NOTE: Pine bark is high in lignin and is a superior organic amendment to regular compost.)* Horticultural-grade milled pine bark, with 80 percent of the material by volume sized between 0.1 and 15.0 mm.

1. Pine bark shall be aged sufficiently to break down all woody material. Pine bark shall be screened.
2. pH shall range between 4 and 7.0.
3. Submit manufacturer literature for approval.

- B. **Organic Matter:** Leaf matter and yard waste composted sufficiently to break down all woody fibers, seeds, and leaf structures, and free of toxic and nonorganic matter. Organic matter shall be commercially prepared compost. Submit 0.5 kg (1 lb) sample and suppliers literature for approval.
- C. **Course Sand:** Course concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.75 or greater.

1. Sands shall be clean, sharp, natural sands free of limestones, shells and slate particles.
2. Provide the following particle size distribution:

Sieve	Percentage Passing
100	100
3/8 in (9.5 mm)	95-100
No. 4 (4.75 mm)	80-100
No. 8 (2.36 mm)	50-85
No. 16 (1.18 mm)	25-60
No. 30 (0.60 mm)	10-30
No. 50 (0.30 mm)	2-10

- D. **Lime:** shall be ground, palletized, or pulverized lime manufactured to meet agricultural standards and contain a maximum of 60 percent oxide (i.e. calcium oxide plus magnesium oxide). Submit manufacturer literature for approval.

- E. **Sulfur:** shall be flowers of sulfur, pelletized or granular sulfur, or iron sulfate. Submit manufacturer literature for approval.

- F. **Fertilizer:** Agricultural fertilizer of a formula indicated by the soil test. Fertilizers shall be organic, slow-release compositions whenever applicable. Submit manufacturer literature for approval.

V. Planting Mix

- A. Mixture of clay loam topsoil, course sand, and pine bark, mixed to the following proportion:

Component	% by volume
Pine bark	10% - 12%
Course sand and clay loam topsoil	In quantities as necessary to achieve the particle distribution criteria
Approximate Finished Planting Mix Particle Distribution	
Gravel	Less than 10%
Course to medium sand	55-65%
Fine to very fine sand	15-25%
Silt	10-20%
Clay	15-20%

- B. Planting mix shall be thoroughly mixed, screened, and shredded.
- C. Clay loam topsoil shall meet all the requirements of imported topsoil, except the particle size distribution shall meet the USDA classification for clay loam.
- D. Prior to beginning the mixing process, submit a 1-kg (2-lb) sample of the proposed mix with soil test results that indicate the mix ratio and the results achieved.
- E. During the mixing process but prior to installing the mix, submit a 1-kg (2-lb) sample for each 200 cubic meters (250 cubic yards) of planting mix, taken randomly from the finished soil mix, with soil test results for approval. In the event that the test results do not meet the required particle size distribution, remix and resubmit a revised planting mix.
- F. Make all amendments of lime/sulfur and fertilizer indicated by the soil test results at the time of mixing.
- G. All mixing shall take place in the contractor's yard, using commercial mixing equipment sufficient to thoroughly mix all components uniformly.
- H. Protect the planting mix from erosion prior to installation.

Part 3. Execution

I. Excavation of Planted Areas

- A. Locations for plants and/or outlines of areas to be planted are to be staked out at the site. Locate and mark all subsurface utility lines. Approval of the stakeout by the landscape architect is required before excavation begins.

- B. Tree, shrub, and groundcover beds are to be excavated to the depth and widths indicated on the drawings. If the planting area under any tree is initially dug too deep, the soil added to bring it up to the correct level should be thoroughly tamped.

1. The sides of the excavation of all planting areas shall be sloped at a 45 degree. The bottom of all beds shall slope parallel to the proposed grades or toward any subsurface drain lines within the planting bed. The bottom of the planting bed directly under any tree shall be horizontal such that the tree sits plumb.

2. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not excavate compacted subgrades of adjacent pavement or structures.

3. Subgrade soils shall be separated from the topsoil, removed from the area, and not used as backfill in any planted or lawn area. Excavations shall not be left uncovered or unprotected overnight.

- C. For trees and shrubs planted in individual holes in areas of good soil that is to remain in place and/or to receive amendment in the top 150-mm (6 in.) layer, excavate the hole to the depth of the root ball and to widths shown on the drawing. Slope the sides of the excavation at a 45 degree angle up and away from the bottom of the excavation.

1. In areas of slowly draining soils, the root ball may be set up to 75 mm (3 in.) or 1/8 of the depth of the root ball above the adjacent soil level.

2. Save the existing soil to be used as backfill around the tree.

3. On steep slopes, the depth of the excavation shall be measured at the center of the hole and the excavation dug as shown on the drawings.

- D. **Detrimental soil conditions:** The landscape architect is to be notified, in writing, of soil conditions encountered, including poor drainage, that the contractor considers detrimental to the growth of plant material. When detrimental conditions are uncovered, planting shall be discontinued until instructions to resolve the conditions are received from the landscape architect.

- E. **Obstructions:** If rock, underground construction work, utilities, tree roots, or other obstructions are encountered in the excavation of planting areas, alternate locations for any planting shall be determined by the landscape architect.

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DATE 26 AUGUST 2021

DRAWN BY

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SHEET TITLE
PLANTING NOTES AND
SPECIFICATIONS

JOB NUMBER 0421.AB

SHEET NUMBER

II. Installation of Topsoil and Planting Mix

- Prior to the installation or modification of topsoil and planting mix, install subsurface drains, irrigation main lines, lateral lines, and irrigation risers shown on the drawings.
 - The landscape architect shall review the preparation of subgrades prior to the installation or modification of topsoil or planting mix.
 - Do not proceed with the installation of topsoil and planting mix until all utility work in the area has been installed.
 - Protect adjacent walls, walks, and utilities from damage or staining by the soil. Use 12-mm (1/2 in.) plywood and/or plastic sheeting as directed to cover existing concrete, metal, masonry work, and other items as directed during the progress of the work.
 - Clean up any soil or dirt spilled on any paved surface at the end of each working day.
 - Any damage to the paving or architectural work caused by the soils installation contractor shall be repaired by the general contractor at the soils installation contractor's expense.
- E. Till the subsoil into the bottom layer of topsoil or planting mix.
- Loosen the soil of the subgrade to a depth of 50 to 75 mm (2 to 3 in.) with a rototiller or other suitable device.
 - Spread a layer of the specified topsoil or planting mix 50 mm (2 in.) deep over the subgrade. Thoroughly till the planting mix and the subgrade together.
 - Immediately install the remaining topsoil or planting mix in accordance with the following specifications. Protect the tilled area from traffic. DO NOT allow the tilled subgrade to become compacted.
 - In the event that the tilled area becomes compacted, till the area again prior to installing the planting mix.
- F. Subsoiling: When subsoiling is indicated on the drawings, use a chisel plow subsoil ripping tool mounted on a machine of sufficient power to make vertical trenches 500 mm (18 in.) deep into the subsoil 600 mm (24 in.) apart. Run the ripping tool over each area in opposite directions so that each area is ripped twice to thoroughly break up the compacted subgrade material prior to the installation of topsoil and planting mix.
- G. Install the remaining topsoil or planting mix in 200- to 250-mm (8- to 10-in.) lifts to the depths and grades shown on the drawing. The depths and grades shown on the drawings are the final grades after soil settlement and shrinkage of the organic material. The contractor shall install the soil at a higher level to anticipate this reduction of soil volume, depending on predicted setting properties for each type of soil.
- Phase the installation of the soil such that equipment does not have to travel over already-installed topsoil or planting mixes.
 - Compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The soil in each lift should feel firm to the foot in all areas and make only slight heel prints. Overcompaction shall be determined by the following field percolation test.
 - Dig a hole 250 mm (10 in.) in diameter and 250 mm (10 in.) deep.
 - Fill the hole with water and let it drain completely. Immediately refill the hole with water, and measure the rate of fall in the water level.
 - In the event that the water drains at a rate less than 25 mm (1 in.) per hour, till the soil to a depth required to break the overcompaction.
 - The landscape architect shall determine the need for, and the number and location of percolation tests based on observed field conditions of the soil.
 - Maintain moisture conditions within the soils during installation to allow for satisfactory compaction. Suspend installation operations if the soil becomes wet. Do not place soils on wet or frozen subgrade.
 - Provide adequate equipment to achieve consistent and uniform compaction of the soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction.
 - Add lime, sulfur, fertilizer, and other amendments during soil installation. Spread the amendments over the top layer of soil and fill into the top 100 mm (4 in.) of soil. Soil amendments may be added at the same time that organic matter, when required, is added to the top layer of soil.
 - Protect soil from overcompaction after placement. An area that becomes overcompacted shall be tilled to a depth of 125 mm (6 in.). Uneven or settled areas shall be filled and regraded.

III. Installation of Organic Matter Layer

- After the specified topsoil or planting mix is installed and just prior to fine grading and the installation of tree, shrub, or flower plantings, spread 100 mm (4 in.) of organic matter over all bed areas designated on the drawings and rototill into the top 100 mm (4 in.) of the planting mix or topsoil.
- Allow the finished grades to remain 50 to 75 mm (2-3 in.) higher than the grades on the grading plan to anticipate settlement over the first year. At the end of the planting guarantee period, reset the grades in this area, if required, to the final grades shown on the grading plan.

IV. Fine Grading

- Grade the surface of all planted or lawn areas to meet the grades shown on the drawings after the 12-month settling period. Set grades at time of installation high enough relative to the type of soil mix and settlement anticipated so that the soil will be at the correct grades after the settlement period. Adjust the finish grades to meet field conditions as directed.
 - Provide for positive drainage from all areas toward the existing inlets and drainage structures.
 - Provide smooth transitions between slopes of different gradients and direction. Modify the grade so that the finish grade is flush with all paving surfaces or as directed by the drawings.
- Fill all dips and remove any bumps in the overall plane of the slope.
 - The tolerance for dips and bumps in lawn areas shall be a 12-mm (1/2 in.) deviation from the plane in 3,000 mm (10 ft).
 - The tolerance for dips and bumps in shrub planting areas shall be a 25-mm (1 in.) deviation from the plane in 3,000 mm (10 ft).
 - All fine grading shall be inspected and approved by the landscape architect prior to planting, mulching, sodding, or seeding.

V. Planting Operations

- Plants shall be set on flat-tamped or unexcavated pads at the same relationship to finished grade as they were to the ground from which they were dug, unless otherwise noted on the drawings. Plants must be set plumb and braced in position until topsoil or planting mix has been placed and tamped around the base of the root ball. Improper compacting of the soil around the root ball may result in the tree settling or leaning. Plants shall be set so that they will be at the same depth and so that the root ball does not shift or move laterally one year later.

- Determine the elevation of the root flare and ensure that it is planted at grade. This may require that the tree be set higher than the grade in the nursery.
 - If the root flare is less than 50 mm (2 in.) below the soil level of the root ball, plant at the tree the appropriate level above the grade to set the flare even with the grade. If the flare is more than 50 mm (2 in.) at the center of the root ball the tree shall be rejected.
- Lift plants only from the bottom of the root balls or with belts or lifting harnesses of sufficient width not to damage the root balls. Do not lift trees by their trunk or use the trunk as a lever in positioning or moving the tree in the planting area.
 - Remove plastic, paper, or fiber pots from containerized plant material. Pull roots out of the root mat, and cut circling roots with a sharp knife. Loosen the potting medium and shake away from the root mat. Immediately after removing the container, install the plant such that the roots do not dry out. Pack planting mix around the exposed roots while planting.
 - The roots of bare-root trees shall be pruned at the time of planting to remove damaged or undesirable roots (those likely to become a detriment to future growth of the root system). Bare-root trees shall have the roots spread to approximate the natural position of the roots and shall be centered in the planting pit. The planting-soil backfill shall be worked firmly into and around the roots, with care taken to fill in completely with no air pockets.
 - Cut ropes or strings from the top of shrub root balls and trees smaller than 3 in. caliper after plant has been set. Remove burlap or cloth wrapping and any wire baskets from around top half of balls. Do not turn under and bury portions of burlap at top of ball.
 - Do not immediately remove the ropes and burlap from trees larger than 3 in. caliper. Return to each tree three months after planting (six months for fall-planted material), and cut all ropes around the trunks and tops of the root balls of these trees.
 - Completely remove any waterproof or water-repellant strings or wrappings from the root ball and trunk before backfilling.
- F. Set balled and burlapped trees in the hole with the north marker facing north unless otherwise approved by the landscape architect.

(NOTE: Containerized material may not have a north orientation due to movement during the production process.)

- Place native soil, topsoil, or planting mix into the area around the tree, tamping lightly to reduce settlement.
 - For plants planted in individual holes in existing soil, add any required soil amendments to the soils, as the material is being backfilled around the plant. Ensure that the amendments are thoroughly mixed into the backfill.
 - For plants planted in large beds of prepared soil, add soil amendments during the soil installation process.
 - When required by the landscape architect, add biostimulants at the time of planting in the area directly around the plant rootball.
 - Ensure that the backfill immediately around the base of the root ball is tamped with foot pressure sufficient to prevent the root ball from shifting or leaning.
- Thoroughly water all plants immediately after planting. Apply water by hose directly to the root ball and the adjacent soil.
- Remove all tags, labels, strings, etc. from all plants.
- Remove any excess soil, debris, and planting material from the job site at the end of each workday.
- Form watering saucers 100 mm (4 in.) high immediately outside the area of the root ball of each tree as indicated on the drawings.

VI. Staking and Guying

- Stake or guy a tree only when necessary for the specific conditions encountered and with the approval of the landscape architect. Staking may be required in unusual circumstances such as sandy soils in either the root ball or adjacent soils or in extremely windy locations. Poor-quality trees with cracked, wet, or loose root balls, poorly developed trunk-to-crown ratios, or undersized root balls shall be rejected if they require staking, unless written approval to permit staking or guying as a remedial treatment is obtained from the landscape architect. Trees that settle out of plumb due to inadequate soil compaction either under or adjacent to the root ball shall be excavated and reset. In no case shall trees that have settled out of plumb be pulled upright using guy wires.
- When required, staking and guying methods shall be approved by the landscape architect. If no staking or guying requirements appear on the drawings, submit for approval a drawing of the staking or guying method to be used. Stakes, anchors, and wires shall be of sufficient strength to maintain the tree in an upright position that overcomes the particular circumstances that initiated the need for staking or guying. Guy wires shall be galvanized, multistrand, twisted wire.
- Where guy wires are attached around the tree, the trunk shall be protected with 20-mm (3/4 in.) diameter rubber hose, black in color, and of sufficient length to extend past the trunk by more than 105 mm (6 in.).
- Stakes and guys shall be installed immediately upon approval or planting, and shall be removed at the end of the first growing season. Any tree that is not stable at the end of this time shall be rejected.

VII. Wrapping

- Wrap the trunk of any tree only when necessary for the specific conditions encountered and with the approval of the landscape architect. Wrapping may be required for thin-barked species in unusual circumstances such as trees planted adjacent to South- or West-facing reflective surfaces, or when it is impossible to plant the tree with the trunk oriented to the same north orientation that it held in the growing nursery.
- When required, wrapping methods shall be approved by the landscape architect. If no wrapping requirements appear on the drawings, submit for approval a drawing of the wrapping method to be used. Wrapping material shall be as specified in this specification. Wrapping material shall be fastened using a biodegradable tape. All tape shall be loosely wrapped around the wrapping material in single layer to permit its breakdown in sunlight and permit a minimum of 25 mm (1 in.) of unrestricted trunk growth. Stapling or tying the wrap with non- or slowly biodegradable tape or any synthetic or natural fiber string shall be prohibited.
- Wrapping material shall be applied from the base of the tree to the first branch.
- All wrapping material shall be removed no later than at the end of the year after planting or as specified by the landscape architect.

VIII. Pruning

- Plants shall not be heavily pruned at the time of planting. Pruning is required at planting time to correct defects in the tree structure, including removal of injured branches, double leaders, waterspouts, suckers, and interfering branches. Healthy lower branches and interior small twigs should not be removed except as necessary to clear walks and roads. In no case should more than one-quarter of the branching structure be removed. Retain the normal or natural shape of the plant.
- All pruning shall be completed using clean, sharp tools. All cuts shall be clean and smooth, with the bark intact with no rough edges or tears.
- Except in circumstances dictated by the needs of specific pruning practices, tree paint shall not be used. The use of tree paint shall be only upon approval of the landscape architect. Tree paint, when required, shall be paint specifically formulated and manufactured for horticultural use.
- Pruning of large trees shall be done from a hydraulic man-lift such that it is not necessary to climb the tree.

IX. Mulching

- All trees, shrubs, and other plantings will be mulched with mulch previously approved by the landscape architect. The mulch on trees and shrubs shall be to the depths shown on the drawing. Mulch must not be placed within 8 cm (3 in.) of the trunks of trees or shrubs.

X. Maintenance of Trees, Shrubs, and Vines

- Maintenance shall begin immediately after each plant is planted and continue until its acceptance has been confirmed by the landscape architect.
- Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, tightening and repairing guys and stakes, resetting plants to proper grades or upright position, restoring of the planting saucer, and furnishing and applying such sprays or other materials as necessary to keep plantings free of insects and diseases and in vigorous condition.
- Planting areas and plants shall be protected at all times against trespassing and damage of all kinds for the duration of the maintenance period. If a plant becomes damaged or injured, it shall be treated or replaced as directed by the landscape architect at no additional cost.
- D. Watering: Contractor shall irrigate as required to maintain vigorous and healthy tree growth. Overwatering or flooding shall not be allowed. The contractor shall monitor, adjust, and use existing irrigation facilities, if available, and furnish any additional material, equipment, or water to ensure adequate irrigation. Root balls of all trees and large shrubs shall be spot watered using handheld hoses during the first four months after planting, as required to ensure adequate water within the root ball.
- During periods of restricted water usage, all governmental regulations (permanent and temporary) shall be followed. The contractor may have to transport water from ponds or other sources, at no additional expense to the owner when irrigation systems are unavailable.

XI. Acceptance

- The landscape architect shall inspect all work for acceptance upon written request of the contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
- Acceptance of plant material shall be for general conformance to specified size, character, and quality and shall not relieve the contractor of responsibility for full conformance to the contract documents, including correct species.
- Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the landscape architect, the landscape architect shall certify in writing that the work has been accepted.

XII. Acceptance in Part

- Work may be accepted in parts when the landscape architect and contractor deem that practice to be in their mutual interest. Approval must be given in writing by the landscape architect to the contractor verifying that the work is to be completed in parts. Acceptance of work in parts shall not waive any other provision of this contract.

XIII. Guarantee Period and Replacements

- The guarantee period for trees and shrubs shall begin at the date of acceptance.
- The contractor shall guarantee all plant material to be in healthy and flourishing condition for a period of one year from the date of acceptance.
- When work is accepted in parts, the guarantee periods extend from each of the partial acceptances to the terminal date of the guarantee of the last acceptance. Thus, all guarantee periods terminate at one time.
- The contractor shall replace, without cost, as soon as weather conditions permit, and within a specified planting period, all plants determined by the landscape architect to be dead or in an unacceptable condition during and at the end of the guarantee period. To be considered acceptable, plants shall be free of dead or dying branches and branch tips and shall bear foliage of normal density, size, and color. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification.
- The guarantee of all replacement plants shall extend for an additional period of one year from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of said extended guarantee period, the landscape architect may elect subsequent replacement or credit for that item.
- At the end of the guarantee, the contractor shall reset grades that have settled below the proposed grades on the drawings.
- The contractor shall make periodic inspections, at no extra cost, during the guarantee period to determine what changes, if any, should be made in the maintenance program. If changes are recommended, they shall be submitted in writing to the landscape architect. Claims by the contractor that the owner's maintenance practices or lack of maintenance resulted in dead or dying plants will not be considered if such claims have not been documented by the contractor during the guarantee period.

XIV. Final Inspection and Final Acceptance

- At the end of the guarantee period and upon written request of the contractor, the landscape architect will inspect all guaranteed work for final acceptance. The request shall be received at least ten calendar days before the anticipated date for final inspection. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the landscape architect at that time, the landscape architect shall certify, in writing, that the project has received final acceptance.

XV. Payment

- Payment shall be made to the contractor as follows:

(Example)

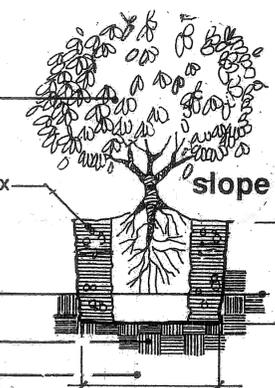
 - 50 percent of contract sum upon receipt and approval of plant materials by the owner
 - 35 percent of the contract sum upon completion of planting of the plant materials
 - 10 percent of contract sum after the replanting of replacement material, if required
 - 5 percent of contract sum after final acceptance.

END OF SECTION

SHRUB

AMENDED BACKFILL MIX

CONTAINER DEPTH
(12" MIN. FOR LINERS)
PLACE ROOTBALL ON
NATIVE SUBGRADE
2X CONTAINER DIA.
(12" MIN. FOR LINERS)



SHRUB PLANTING DETAIL

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KELLY DESIGN GROUP, LLC
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