OPERATION AND MAINTENANCE PLAN

UST Second Year Housing
Saint Paul, MN

City of Saint Paul
Capital Region Watershed District

Facility Owner:
University of St. Thomas
2115 Summit Avenue,
St. Paul, MN 55015
Contact: James Brummer

Prepared by:
Kimley-Horn
767 Eustis Street, Suite 100
St. Paul, MN 55114
Contact: Daniel Elenbaas, P.E.

STORMWATER MAINTENANCE PLANS AND PRACTICES

Stormwater BMP: Underground Infiltration System (CMP System) Contact: James Brummer

BMP Description: CMP Pipe Network located as shown in Exhibit A. The system consists of rows of CMP pipe with access manholes.

Maintenance Tasks and Timeline

Tasks	**Frequency and Comments**
Inspections	Twice annually first two year, once per year following. Access system via risers. Utilize remote cameras as necessary to inspect system. One annual inspection shall be completed to confirm 48 hour drawdown of system. Prior to commencing this inspection, the depth of water in the system shall be measured to confirm the depth of water in the system is 16.8". This can be following a rain even of sufficient depth to reach this depth in the system, or by filling the system. System shall be filled by placing a hose in the upstream manhole, STMH 405.
Sediment and Trash removal* **While it is important to monitor and maintain the infiltration system, it is critical that the pretreatment sumps be maintained to prevent sediment from accumulating in the system. See below for maintenance of the pretreatment sumps.*	Remove trash and sediment when the average depth of sediment at the manholes reaches 3 inches. Utilize a high pressure water nozzle to propel itself down the rows to scour and suspend sediments. As the nozzle is retrieved, the suspended sediments a flushed back into the access manhole for vacuuming. Nozzles shall have rear facing jets with an effective spread of at least 45" to cover the lower portions of the pipe. If entry into the system is required, follow OSHA rules for confined space entry.
Outlet Control Structure	Monitor annually and removed debris and sediment as accumulation occurs
Storm sewer system	Monitor annually and remove sediment as needed

Subsurface CMP Detention System Maintenance Inspection Checklist

Inspector:	
Date:	
Time:	
Weather:	Rainfall over previous 2-3 days? Y / N
Reading from closest NOAA reporting station:____"	

Mark items in the table below using the following key:

- X Needs immediate attention
- _ Not Applicable
- • Okay
- ? Clarification required

BIOFILTRATION COMPONENTS	CHECKED		MAINTENANCE NEDDED	
	Y	N	Y	N
DEBRIS CLEANOUT				
System clean of debris				
System clean of yard waste				
Outlet Control Structure clear of debris				
DEWATERING AND SEDIMENTATION				
System dewaters between storms				
No evidence of standing water				
No evidence of interior surface clogging				
Sedimentation no greater than 20% of basin design depth				
OUTLETS/EMERGENCY OVERFLOW				
Structure not in need of repair				
No evidence of erosion				
No evidence of blockage				

Subsurface CMP Detention System Maintenance Inspection Checklist

Comments:

OVERAL CONDITION OF FACILITY

In accordance with approved design plans?	Y / N
In accordance with As-Built plans?	Y / N
Dimension on as built?	Y / N
Field verified dimensions?	Y / N
Maintenance required as detailed above?	Y / N
Compliance with other consent conditions?	Y / N

Dates by which maintenance must be completed:_____/____/

Dates by which outstanding information as per consent conditions is required y:_____/____/_____

Inspector's signature: _____

Consent Holder/Engineer/Agent's signature: _____

Consent Holder/Engineer/Agent's name printed: _____

Stormwater BMP: Pretreatment Sumps

Contact: James Brummer

BMP Description: Sump manholes located as shown on Exhibit A.

Maintenance/Inspection

1. Visual Inspection - Three times per year for first two years, once per year following
2. Sump Cleaning - Once per year, unless visual inspection indicates more frequent cleanings required

Tools Needed

1. Vacuum truck with jet power washer
2. Measuring tape with attached flat disk
3. Rake or broom

Visual Inspection

Visual inspection needs to take place to ensure the sump is functioning properly and should take place 3 times per year for the first two years.

1. Previous Inspections – When was the last time this structure was inspected?
2. Access - Is the structure accessible? If not, remove obstruction.
3. Debris - Is trash or vegetation in the structure? If so, what types of trash or vegetation are present? Is there so much debris that it is difficult to see water? If so, sump cleaning is required
4. Sediment Accumulation – How much sediment has been captured so far? Use a tape measure with a flat disk attached to the bottom to measure the depth of sediment accumulated. Several measurements should be taken to generate an average sediment depth. If average sediment height is within 1-ft of the bottom of the outlet pipe, sump cleaning is required.

Sump Cleaning

Sump cleaning needs to take place to ensure maximum capture of sediment from stormwater and should be performed at minimum, once per year. The structure is full and needs sump cleaning when sediment is within one foot of the bottom of the outlet pipe. Additional cleanings may be required per year if sediment is consistently filling to one foot below the outlet pipe before a year has passed.

1. Vacuum water, debris, and sediment
2. Jet wash any remaining debris and sediment towards vacuum hose

Sump Maintenance Inspection Checklist – Page 1/2

Inspector:
Date:
Time:
Weather: Rainfall over previous 2-3 days? Y / N Reading from closest NOAA reporting station:____"
Sump Manhole Location/ID:

Mark items in the table below using the following

key: X Needs immediate attention

_ Not Applicable

• Okay

? Clarification required

BIOFILTRATION COMPONENTS	CHECKED		MAINTENANCE NEDDED		INSPECTION FREQUENCY
	Y	N	Y	N	
DEBRIS CLEANOUT					**M**
Grate clean of debris/yard waste					
Chamber clean of debris/yard waste					
SUMP CLEANING					**A, AMS**
Sediment within 1' of outlet pipe					
OUTLETS/EMERGENCY OVERFLOW					**A, AMS**
Structure not in need of repair					
No evidence of erosion					
No evidence of blockage					

Inspection Frequency Key A=Annually M=Monthly AMS=After Major Storm

Sump Maintenance Inspection Checklist – Page 2/2

Comments:

OVERAL CONDITION OF STRUCTURES

In accordance with approved design plans?

In accordance with As-Built plans?

Dimension on as built?

Field verified dimensions?

Maintenance required as detailed above?

Compliance with other consent conditions?

Dates by which maintenance must be completed:_____/____/_____

Dates by which outstanding information as per consent conditions is required :__/_____/_____

Inspector's signature:

_____

Consent Holder/Engineer/Agent's signature:

_____

Consent Holder/Engineer/Agent's name printed:

_____

GREEN ROOF MAINTENANCE PLANS AND PRACTICES

Stormwater BMP: Green Roof

Contact: James Brummer

BMP Description: Green Roof as Shown in Exhibit A

A. Initial Maintenance Service: Provide maintenance by skilled employees of vegetated roof assembly Installer. Maintain as required. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than the following maintenance period:

1. Maintenance Period: 24 months from date of Planting Completion.

B. Continuing Maintenance Proposal: From vegetated roof assembly Installer to Owner, in the form of a standard seasonal maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

C. Documentation

1. Upon email request, LiveRoof, LLC shall provide monthly informational email maintenance protocol, free of charge, that shares current best maintenance practices, seasonal topics related to plant care, and chronologically guides the maintenance contractor though the various steps of the maintenance protocol beginning March 15 and ending Nov. 1 of each year.

2. Record all green roof maintenance events. Include name of person, date and activity.

   a. If soil test, record lab, test, and results.
   If fertilizer, record type and amount applied per 1000sf. Record time needed for bi-weekly walk and drain inspection.

   b. If irrigation, record duration and quantity.

D. Foot Traffic: Limit foot traffic to a random path by one person. Avoid walking in a single path, standing in one place, or trampling plants. If parapet or adjoining wall must be serviced, plants may be covered with plywood or foam sheeting for up to 4 hours intermittently, provided foliage is not wet or frozen and conditions are not too hot or too sunny.

E. Spring Maintenance (March to June)

1. Soil Testing and Fertilization. Approximately 2-3 weeks before spring "growth flush," administer an annual soil test for PH and fertility levels. Growth flush varies by region, consult biweekly maintenance protocol email for specific recommended testing date in project's region.

2. Maintain pH in the range of 6.5 to 8.0. In the event that pH falls below 6.0, consult the testing lab for appropriate recommendations to increase alkalinity. If the soil is above 8.0, it can be made more acidic with elemental sulphur or an application of acidifying fertilizer.

3. Maintain fertility in the normal range using a typical field soil fertility test as provided by A&L labs or equivalent testing lab. Evaluate the various nutrient levels such as Nitrogen (N or NO3N),

4. Potassium (K), Phosphorus (P): If the soil contains a low amounts of these nutrients, conduct a single application of controlled release fertilizer, such as Nutricote® or Osmocote®, at the lab recommended rate. Ensure that the chosen fertilizer contains no Herbicides or Pesticides. Follow the fertilizer labeled directions for application rate and use a rotary spreader to ensure even fertilizer application. Runoff potential does exist and should be evaluated by the applicator in accord with the site specifics; the greater the runoff sensitivity, the lower the application rate. All applications of fertilizer are the sole responsibility of the applicator.

F. Conduct Biweekly Inspections

1. Weed Walk: Pull and dispose of all weeds before they flower and set seed.

2. Displaced Soil: Replace lost soil using only LiveRoof brand engineered green roof soil.

3. Drainage Inspection: Inspect roof drains for any debris, pebbles or leaves and remove to ensure proper drainage.

4. Debris Removal: Remove any debris blown onto the roof immediately to ensure no damage to plants.

5. Pest Control: Monitor pest presence. If pest problems are persistent, use organic and natural biological control agents to restore balance.

G. Summer Maintenance (June to September)

1. Irrigation

a. Additional water beyond the programmed amount may be necessary as a temporary management tool during prolonged hot dry weather to prevent plant thinning or death. Prolonged hot dry weather is generally defined as periods of 75° F weather with less than 1" of rainfall persisting for 2 weeks. This time period will be less if the temperatures are hotter, the climate warmer, on sloping roofs, and roofs exposed to persistent winds or reflected sunlight.

b. Check the plants for wilting in the afternoon. Water thoroughly to runoff to remoisten entire soil profile if the plants show signs of wilting.

H. Fall Maintenance (October to November)

1. Conduct bi-monthly Inspections, unless ice or frost is present. Do not fertilize during the fall.

2. Watering: Do not water within 4 weeks of the expected average frost date.

3. Blow out irrigation system with compressed air no greater than 60 psi prior to reaching freezing temperatures.

4. Rake, bag and remove fallen and matted leaves.

I. Winter Maintenance

1. Avoid walking on frozen plants and roof surfaces.

2. If clear pathways are needed, avoid using salt and other deicing chemicals, which may kill plants. Instead, use sand or cat litter as an anti-slip agent.

3. Avoid piling the snow in a single place. Disperse snow evenly over the green roof plantings as excess snow piling can potentially damage plants by insulating the plants and keeping them warm

Green Roof Maintenance Inspection Checklist

Comments:

OVERAL CONDITION OF FACILITY

In accordance with approved design plans?	Y / N
In accordance with As-Built plans?	Y / N
Dimension on as built?	Y / N
Field verified dimensions?	Y / N
Maintenance required as detailed above?	Y / N
Compliance with other consent conditions?	Y / N

Dates by which maintenance must be completed:_____/____/

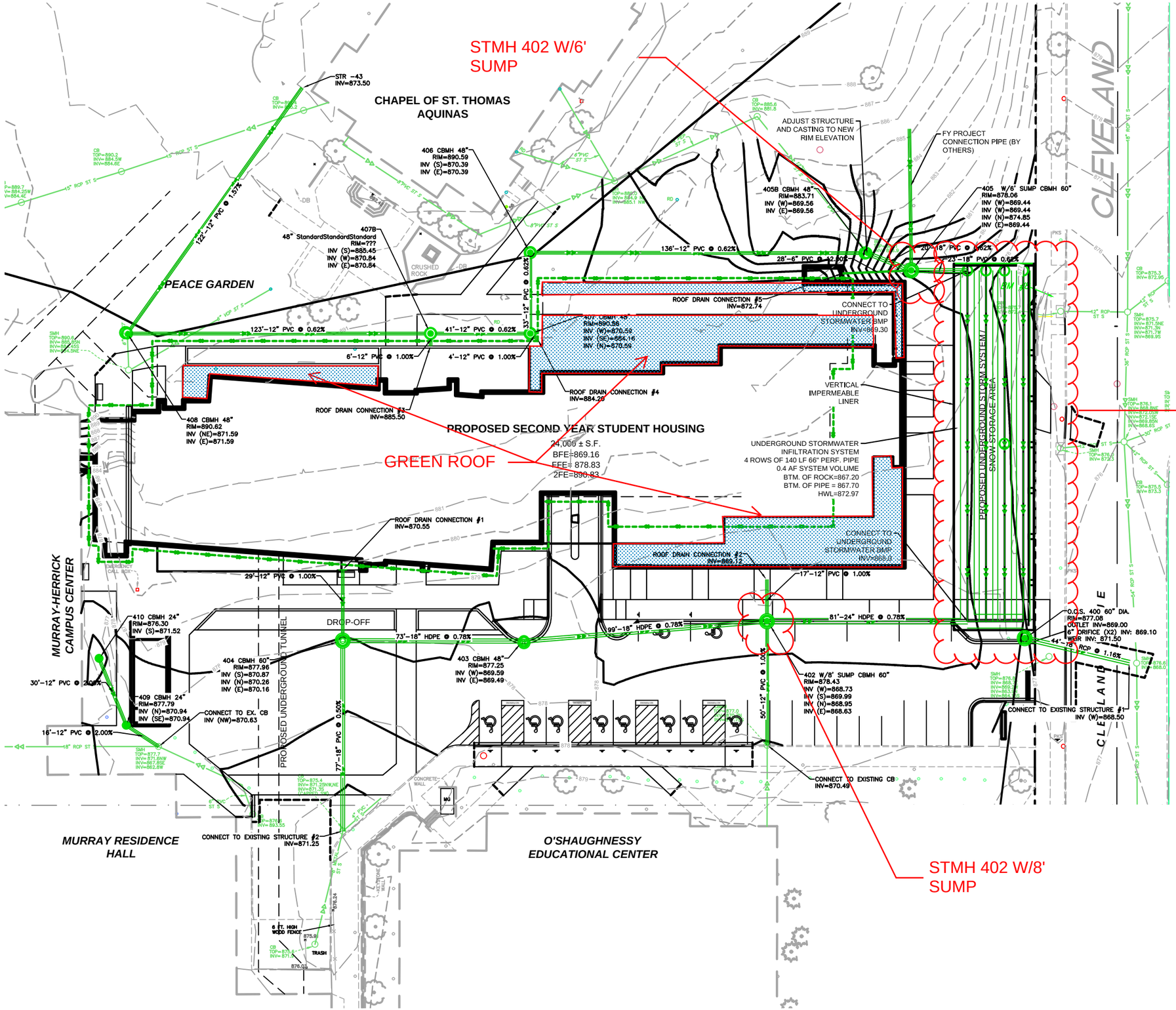
Dates by which outstanding information as per consent conditions is required y:_____/____/_____

Inspector's signature: _____

Consent Holder/Engineer/Agent's signature: _____

Consent Holder/Engineer/Agent's name printed: _____

Exhibits



LEGEND

EXISTING / PROPOSED

- STORM SEWER PIPE
- STORM INLET
- STORM MANHOLE
- PROPERTY LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ADA ROUTE
- PROPOSED SPOT ELEVATION
- PROPOSED HIGH POINT ELEVATION
- PROPOSED LOW POINT ELEVATION
- PROPOSED GUTTER ELEVATION
- PROPOSED TOP OF CURB ELEVATION
- PROPOSED FLUSH PAVEMENT ELEVATION
- MATCH EXISTING ELEVATION
- PROPOSED EMERGENCY OVERFLOW
- PROPOSED DRAINAGE DIRECTION
- PROPOSED ADA SLOPE

NO.	REVISIONS	DATE	BY
A	SPR UPDATE TO CITY	05/22/19	DLE
A	DESIGN DEVELOPMENT SET	04/29/19	DLE
A	PERMIT AND PROCUREMENT SET #1	04/26/19	DLE
A	RESPONSE TO CITY COMMENT	03/29/19	DLE
A	SITE PLAN REVIEW	03/01/19	DLE
A	PRELIMINARY SD PRICING	02/18/19	DLE

Kimley»Horn
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2550 UNIVERSITY AVENUE WEST, SUITE 238N, ST. PAUL, MN 55114
PHONE: 651-645-4197
WWW.KIMLEY-HORN.COM

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

DANIEL L. ELENBAAS — MN LIC. NO. 44614 — DATE: 02/20/2019

KHA PROJECT: 160640013
DATE: 04/26/2019
SCALE: AS SHOWN
DESIGNED BY: DLE
DRAWN BY: RAH
CHECKED BY: DLE

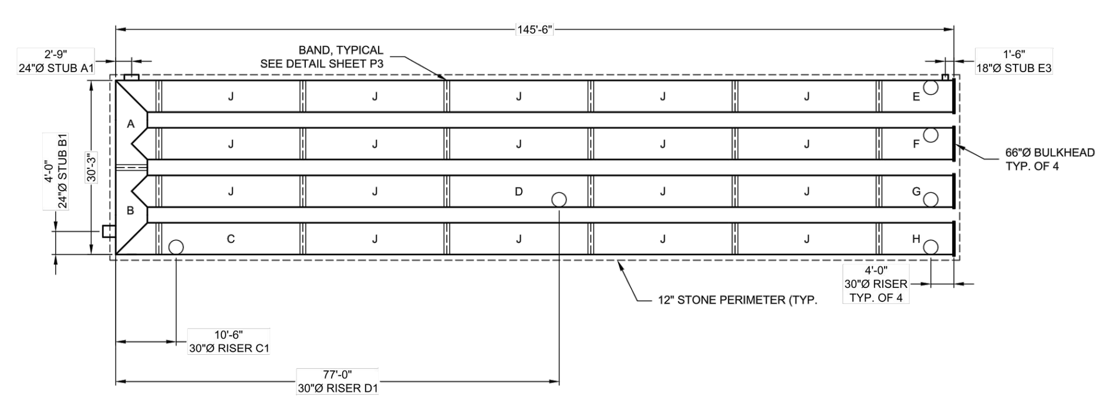
ISSUED FOR PERMIT - NOT FOR CONSTRUCTION

GRADING PLAN

SECOND YEAR HOUSING
PREPARED FOR
RYAN COMPANIES
SAINT PAUL MN

SHEET NUMBER
C500

GRADING DETAILS



STUB INFORMATION

PIECE	STUB INVERT	SYSTEM INVERT
24"Ø STUB A1	868.00	867.70
24"Ø STUB B1	867.70	867.70
18"Ø STUB E3	869.30	867.70

RISER INFORMATION

PIECE	RIM ELEV.	SYSTEM INVERT
30"Ø RISER C1	877.00	867.70
30"Ø RISER D1	877.00	867.70
30"Ø RISER E2	878.11	867.70
30"Ø RISER F2	877.70	867.70
30"Ø RISER G2	876.90	867.70
30"Ø RISER H2	876.50	867.70

THE UNDERSIGNED HEREBY APPROVES THE ATTACHED (5) PAGES INCLUDING THE FOLLOWING:

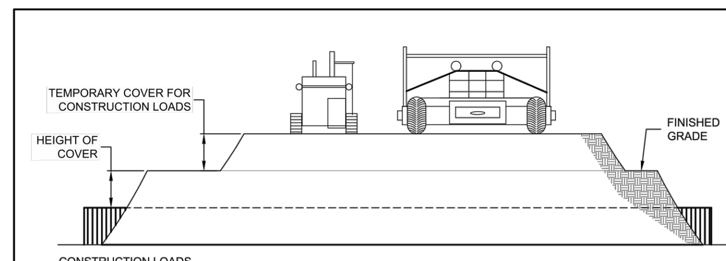
- PIPE STORAGE = 14,023 CF
- MAINLINE PIPE GAGE = 16
- WALL TYPE = PERFORATED
- DIAMETER = 66"
- FINISH = ALT2
- CORRUGATION = 5x1

CUSTOMER DATE

ASSEMBLY
SCALE: 1" = 10'
PIPE STORAGE: 14,023 CF
STRUCTURAL BACKFILL STORAGE: 6,759 CF
TOTAL STORAGE PROVIDED: 20,782 CF
STORAGE VOLUME BELOW LOW INVERT (867.20'-869.10'): 5,385 CF
LOADING: H20
PIPE INV. = 867.70's

NOTES
- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE.
- ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD (EOR) PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE AS REQUIRED, BY CONTRACTOR.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- ALL ACCESS CASTINGS ARE THE RESPONSIBILITY OF THE CONTRACTOR AND ARE NOT SUPPLIED BY CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC — CONTECH CMP DETENTION SYSTEMS — PROPOSAL
66"Ø PERFORATED UNDERGROUND RETENTION SYSTEM - 618534-010
ST. THOMAS DORM (SOPHOMORE)
SAINT PAUL, MN
SITE DESIGNATION: UDS
P1 of 5



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips) 18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM
NOT TO SCALE

SPECIFICATION FOR CORRUGATED STEEL PIPE-ALUMINIZED TYPE 2 STEEL

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE CORRUGATED STEEL PIPE (CSP) DETAILED IN THE PROJECT PLANS.

MATERIAL
THE ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M274 OR ASTM A929.

PIPE
THE CSP SHALL BE MANUFACTURED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF AASHTO M36 OR ASTM A760. THE PIPE SIZES, GAGES AND CORRUGATIONS SHALL BE AS SHOWN ON THE PROJECT PLANS.

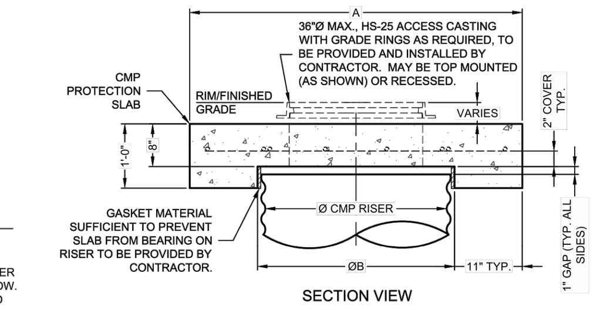
ALL FABRICATION OF THE PRODUCT SHALL OCCUR WITHIN THE UNITED STATES.

HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH RECOMMENDATIONS OF THE NATIONAL CORRUGATED STEEL PIPE ASSOCIATION (NCSPA).

INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II OR ASTM A798 AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

MATERIAL SPECIFICATION
NOT TO SCALE

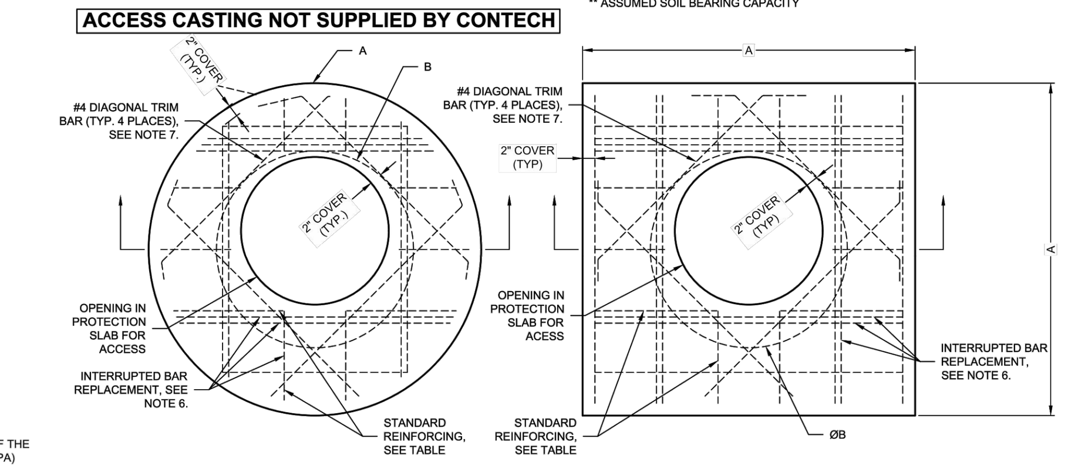


REINFORCING TABLE

Ø CMP RISER	A	B Ø	REINFORCING	**BEARING PRESSURE (PSF)
24"	4'Ø 4'x4'	26"	#5 @ 10" OCEW #5 @ 10" OCEW	2,540 1,900
30"	4'-6"Ø 4'-6" x 4'-6"	32"	#5 @ 10" OCEW #5 @ 9" OCEW	2,260 1,670
36"	5'Ø 5' x 5'	38"	#5 @ 9" OCEW #5 @ 8" OCEW	2,060 1,500
42"	5'-6"Ø 5'-6" x 5'-6"	44"	#5 @ 8" OCEW #5 @ 8" OCEW	1,490 1,370
48"	6'Ø 6' x 6'	50"	#5 @ 7" OCEW #5 @ 7" OCEW	1,210 1,270

** ASSUMED SOIL BEARING CAPACITY

ACCESS CASTING NOT SUPPLIED BY CONTECH

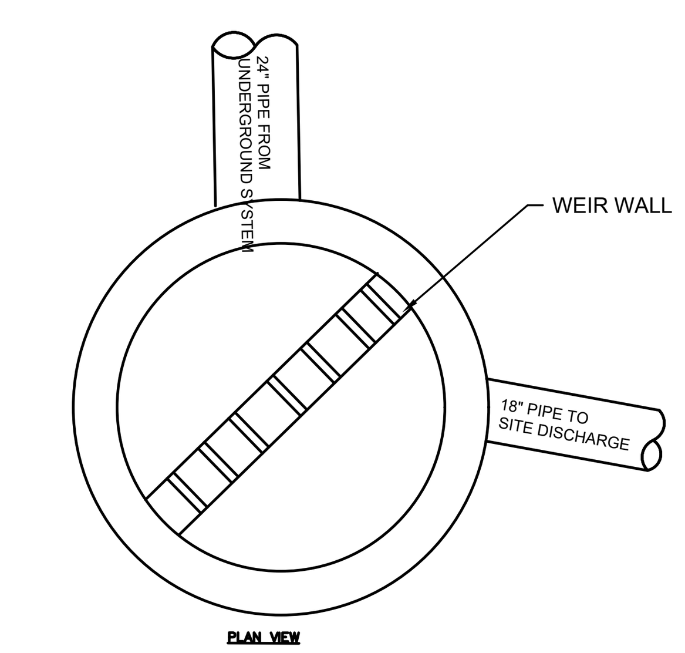


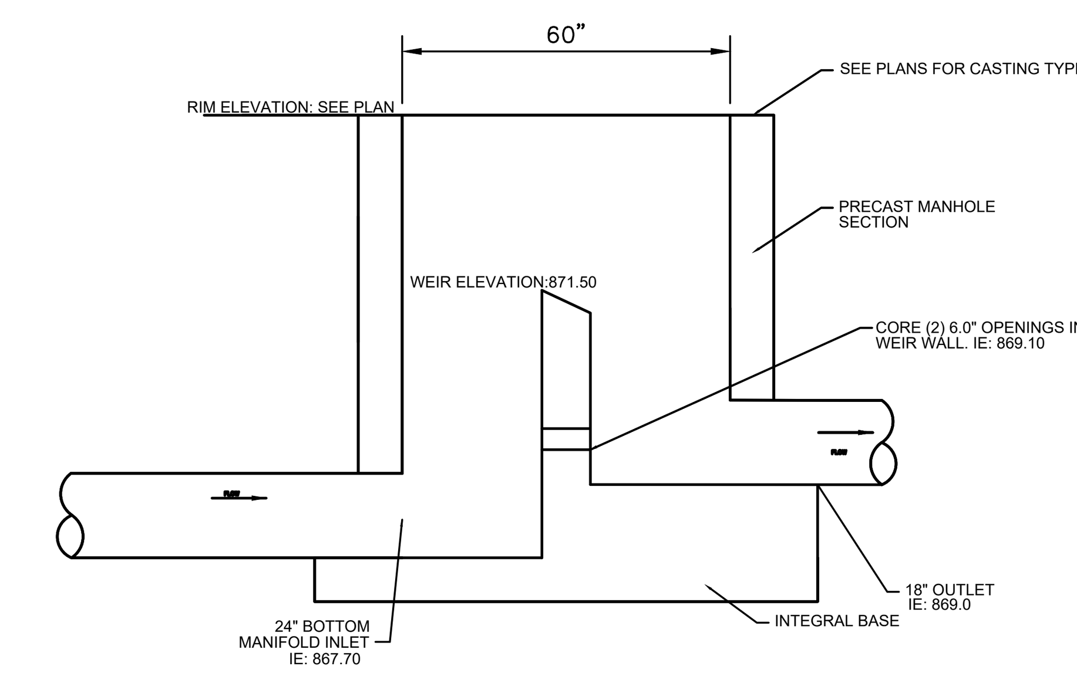
ROUND OPTION PLAN VIEW — SQUARE OPTION PLAN VIEW

NOTES:
1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION AND ACI 350.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 4,000 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERS, ARCHITECTS AND LAND SURVEYORS, ENDWELL, NY.

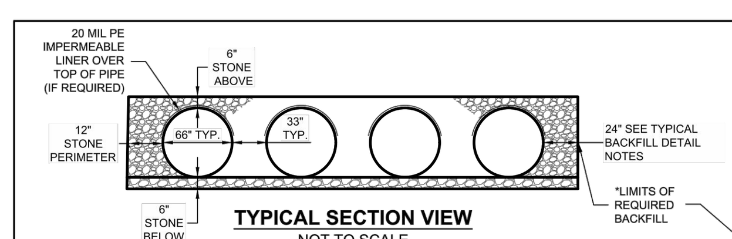
MANHOLE CAP DETAIL
NOT TO SCALE

66"Ø PERFORATED UNDERGROUND RETENTION SYSTEM - 618534-010
ST. THOMAS DORM (SOPHOMORE)
SAINT PAUL, MN
SITE DESIGNATION: UDS
P4 of 5





OCS 400: OUTLET CONTROL STRUCTURE
NO SCALE



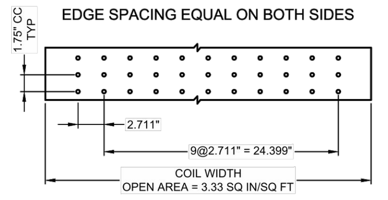
TYPICAL SECTION VIEW
NOT TO SCALE

NOTE: FILTER FABRIC SHALL BE EXCLUDED FROM THE BOTTOM OF THE INFILTRATION PRACTICE

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

*PER EOR
a. Double-washed, angular, uniform (uniformity coefficient of 2 or smaller) aggregate between 1.5 and 3.0-inch diameter.
b. Acceptable rock types: igneous and crystalline metamorphic (granite, rhyolite, gabbro, basalt, quartzite).
c. Unacceptable rock types: carbonate (limestone, dolomite, dolostone) and non-crystalline metamorphic (shale).

EDGE SPACING EQUAL ON BOTH SIDES



COIL WIDTH
OPEN AREA = 3.33 SQ IN/SQ FT

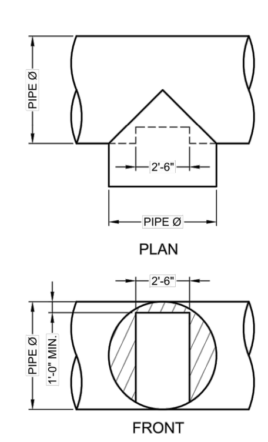
NOTES:
1. PERFORATIONS MEET AASHTO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. DIMENSIONS SUBJECT TO MANUFACTURER'S TOLERANCES.
4. ALL HOLES 3/8"Ø.

EXFILTRATION AREA
STANDARD PERFORATION PATTERNS

APPROXIMATE AREA PER LINEAR FOOT OF PIPE				
PIPE	CORRUGATION PATTERN 2 2/3" x 1/2"	3" x 1"	5" x 1"	ULTRA FLO
66"Ø	67.2 SQ. IN.	71.0 SQ. IN.	69 SQ. IN.	

NOTES:
- GAGE AND COATING LIMITATIONS APPLY. 5" x 1" IS NOT AVAILABLE IN ALUMINUM.
- DIMENSIONS SUBJECT TO MANUFACTURER'S TOLERANCES.

TYPICAL PERFORATION DETAIL
NOT TO SCALE



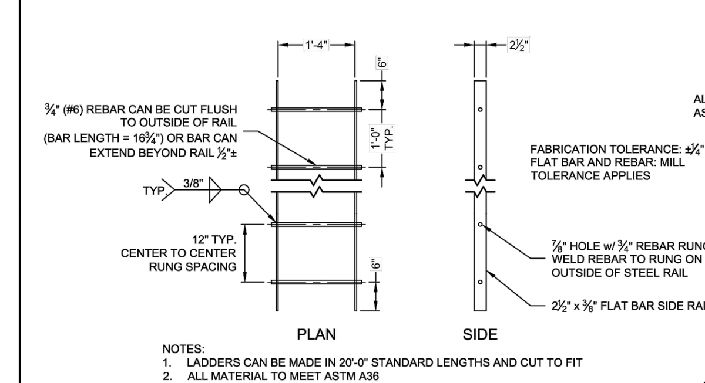
PLAN — FRONT

48"Ø to 90"Ø FITTING REINFORCEMENT MAY BE REQUIRED BASED ON HEIGHT OF COVER AND LIVE LOAD CONDITION

TYPICAL MANWAY DETAIL
NOT TO SCALE

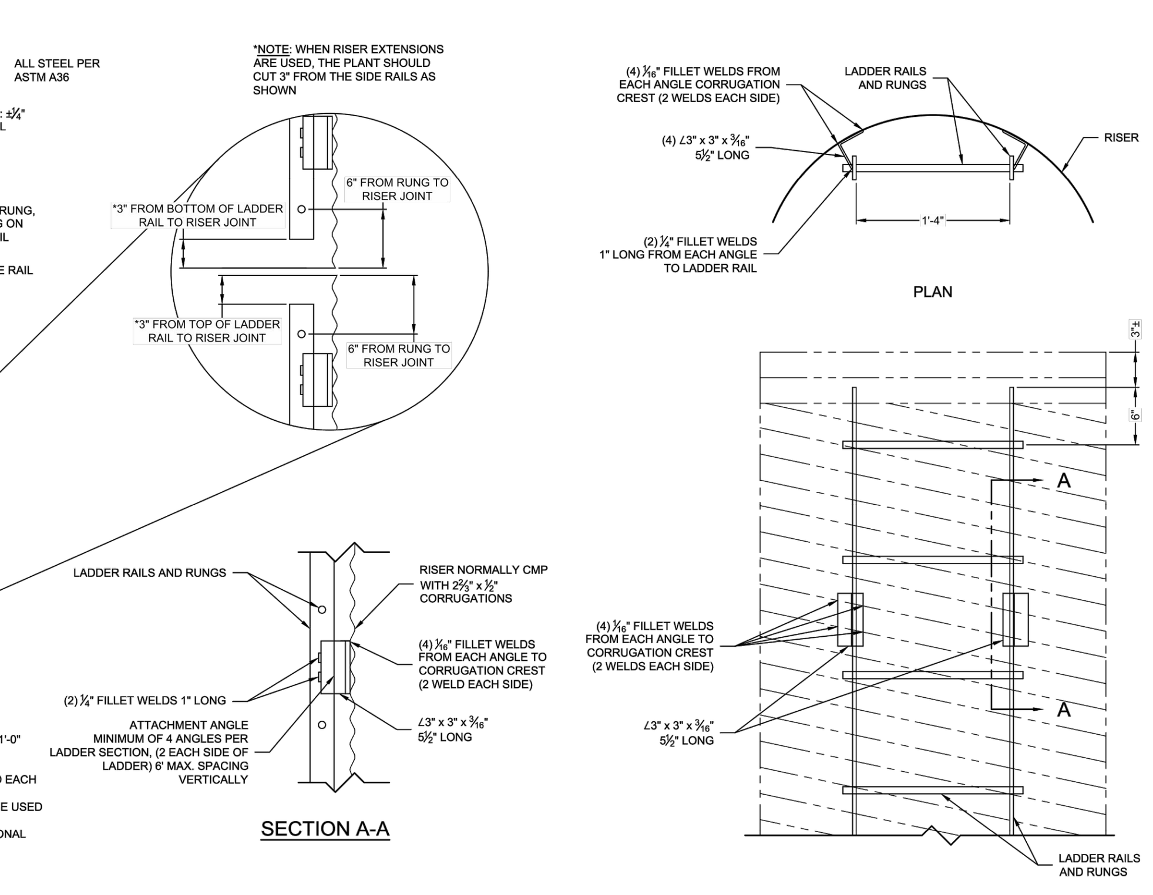
SEE ENGINEERED SITE PLANS FOR BACKFILL DETAIL

66"Ø PERFORATED UNDERGROUND RETENTION SYSTEM - 618534-010
ST. THOMAS DORM (SOPHOMORE)
SAINT PAUL, MN
SITE DESIGNATION: UDS
P2 of 5



NOTES:
1. LADDERS CAN BE MADE IN 20'-0" STANDARD LENGTHS AND CUT TO FIT
2. ALL MATERIAL TO MEET ASTM A36
3. LADDER TO BE HOT DIPPED GALVANIZED PER ASTM A-123 AFTER FABRICATION IS COMPLETE

STANDARD LADDER DETAIL
NOT TO SCALE
PART NO. HALAGVL16

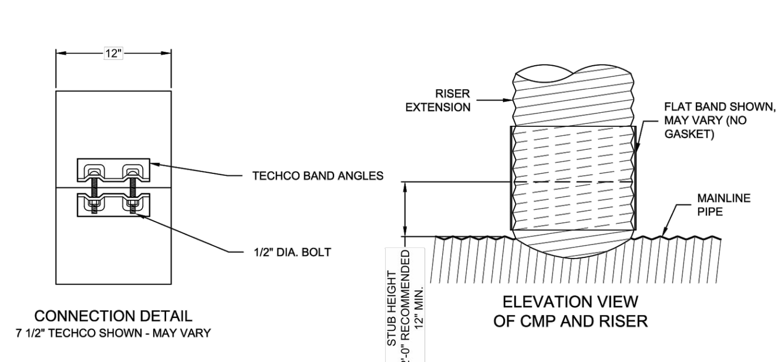


NOTE:
THIS DRAWING IS INTENDED TO APPLY TO LADDERS INSTALLED IN RISERS HAVING A DIAMETER OF 30" OR LARGER. DUE TO SPACE CONSTRAINTS AND LIMITED ACCESSIBILITY, THE PRACTICALITY AND SUITABILITY OF UTILIZING RISERS SMALLER THAN 30" DIAMETER AND/OR INCORPORATING LADDERS IN THESE SMALLER DIAMETER RISERS SHOULD BE ADDRESSED BY THE OWNER AND PROJECT ENGINEER.

SECTION A-A

RISER LADDER DETAIL
NOT TO SCALE

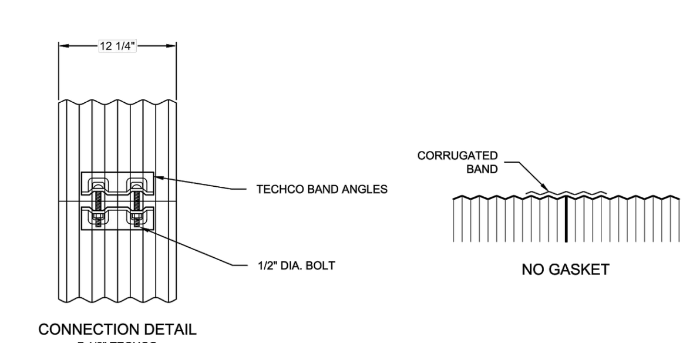
66"Ø PERFORATED UNDERGROUND RETENTION SYSTEM - 618534-010
ST. THOMAS DORM (SOPHOMORE)
SAINT PAUL, MN
SITE DESIGNATION: UDS
P5 of 5



PLAIN END CMP RISER PIPE

GENERAL NOTES:
1. DELIVERED BAND STYLE AND FASTENER TYPE MAY VARY BY FABRICATION PLANT.
2. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
3. BAND MATERIAL AND GAGE TO BE SAME AS RISER MATERIAL.
4. IF RISER HAS A HEIGHT OF COVER OF 10' OR MORE, USE A SLIP JOINT.
5. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" 2-PIECES
6. ALL RISER JOINT COMPONENTS WILL BE FIELD ASSEMBLED.
7. MANHOLE RISERS IN APPLICATIONS WHERE TRAFFIC LOADS ARE IMPOSED REQUIRE SPECIAL DESIGN CONSIDERATIONS.
8. DIMENSIONS SUBJECT TO MANUFACTURING TOLERANCES.

12" RISER BAND DETAIL
NOT TO SCALE



2 2/3"x1/2" RIVETED PIPE

GENERAL NOTES:
1. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
2. BAND MATERIALS AND/OR COATING CAN VARY BY LOCATION. CONTACT YOUR CONTECH REPRESENTATIVE FOR AVAILABILITY.
3. BANDS ARE SHAPED TO MATCH THE PIPE-ARCH WHEN APPLICABLE.
4. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" THRU 96" 2-PIECES
   - 102" THRU 144" 3-PIECES
5. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.
6. ALL CMP IS REROLLED TO HAVE ANNULAR END CORRUGATIONS OF 2 2/3"x1/2".
7. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
8. ORDER SHALL DESIGNATE GASKET OPTION, IF REQUIRED (SEE DETAILS ABOVE).

5-C BAND DETAIL
NOT TO SCALE

66"Ø PERFORATED UNDERGROUND RETENTION SYSTEM - 618534-010
ST. THOMAS DORM (SOPHOMORE)
SAINT PAUL, MN
SITE DESIGNATION: UDS
P3 of 5

No.	REVISIONS	DATE	BY
6	SPR UPDATE TO CITY	05/22/19	DLE
5	DESIGN DEVELOPMENT SET	04/29/19	DLE
4	PERMIT AND PROCUREMENT SET #1	04/26/19	DLE
3	RESPONSE TO CITY COMMENT	03/29/19	DLE
2	SITE PLAN REVIEW	03/01/19	DLE
1	PRELIMINARY SD PRICING	02/18/19	DLE

Kimley»Horn
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PHONE: 651-645-4197
WWW.KIMLEY-HORN.COM

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
FIRST M. LAST
DATE: XX/XX/XXXX LIC. NO. XXXXX

KHA PROJECT 160640013
DATE 04/26/2019
SCALE AS SHOWN
DESIGNED BY DLE
DRAWN BY RAH
CHECKED BY DLE

GRADING DETAILS

SECOND YEAR HOUSING
PREPARED FOR
RYAN COMPANIES
SAINT PAUL MN

ISSUED FOR PERMIT - NOT FOR CONSTRUCTION

SHEET NUMBER
C503