

Highland Township,
Oakland County, Michigan
CONSTRUCTION PLAN DOCUMENTS
Prepared For
Highland Downtown Development Authority

Civil Engineer

NOWAK & FRAUS ENGINEERS
46777 Woodward Ave.
Pontiac, MI 48342-5032
Tel. (844) 416-3364

LEGAL DESCRIPTION

T3N, R7E, SEC 27 PART OF N 1/2 OF NW 1/4 BEG AT PT DIST S 02-00-00 W 30 FT FROM SE COR OF LOT 1 OF 'HAYDEN'S HIGHLAND HOMES', TH N 02-00-00 E 687.55 FT, TH S 88-00-00 E 206 FT, TH S 02-00-00 W 132 FT, TH S 88-00-00 E 231 FT TO CEN LINE OF MILFORD RD, TH SELY ALG SD CEN LINE TO PT ON N 1/8 LINE TH N 88-38-00 W ALG SD LINE TO BEG 8.25 A

PIN: 11-27-109-027



SHEET INDEX

- C-0 Cover Sheet
- C-1 Topographic Survey
- C-2 Demolition
- C-3 Soil Erosion & Sedimentation Control Plan
- C-4 Boardwalk, Paving, & Grading Plan
- C-5 Details
- D-1 OAKLAND COUNTY WRC STORM DRAIN DETAILS
- D-2 Oakland County WRC SESC DETAILS

Concrete Boardwalk Details & Specification Plans

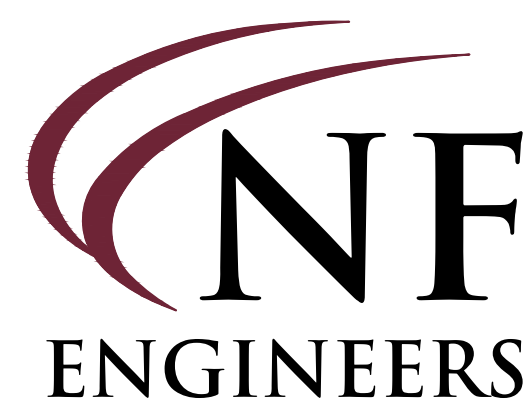
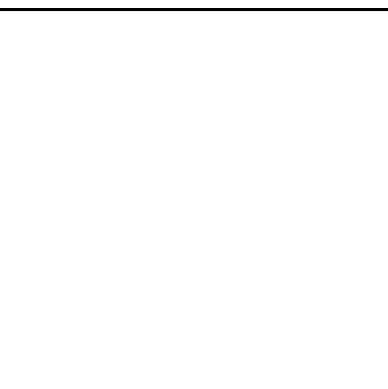
- PT01 Concrete Boardwalk Details
- PT02 Concrete Boardwalk Details
- PT03 Concrete Boardwalk Details
- PT04 Concrete Boardwalk Details
- PS Concrete Boardwalk Specifications

Project Name

-HIGHLAND STREETSCAPE -
BOARDWALK

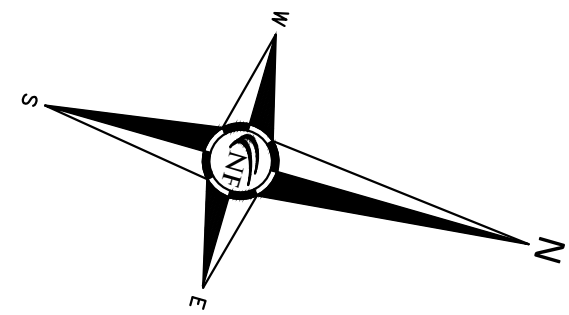


N & F JOB #F803-02



CIVIL ENGINEERS
LAND SURVEYORS
LAND PLANNERS

NOWAK & FRAUS ENGINEERS
46777 WOODWARD AVE.
PONTIAC, MI 48342-5032
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SEAL

PROJECT
Highland Streetscape -
Highland Boardwalk

CLIENT
Highland Downtown
Development Authority
205 West Livingston Road
Highland, MI 48357

Contact:
Mr. Tim Colbeck
P: (248) 887-7700
F: (248) 887-7226

PROJECT LOCATION
Part of the SW 1/4
of Section 27
T. 3 N., R. 7 E.
Highland Township,
Oakland County, Michigan

SHEET
Boundary / Topographic /
Tree Survey



DATE ISSUED/REVISED
2024-11-11 REV

DRAWN BY:
S. Grever

DESIGNED BY:
S. Grever

APPROVED BY:
S. Sutton

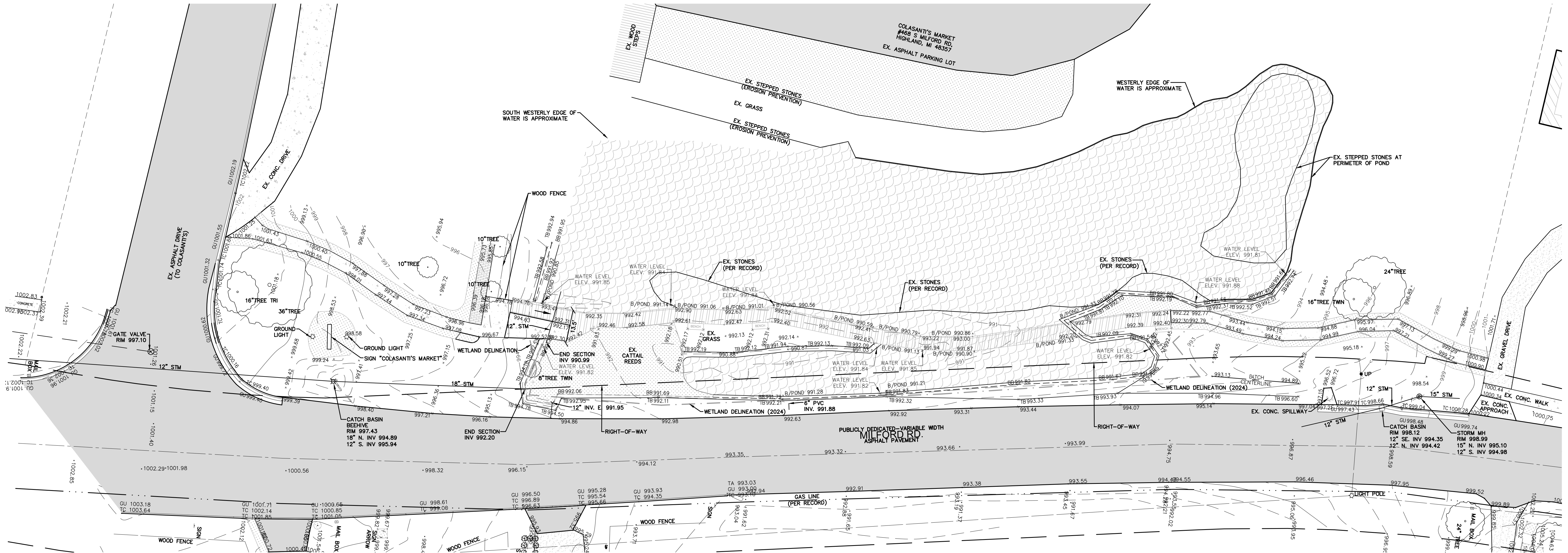
DATE:
SEPTEMBER 18, 2024

SCALE: 1" = 20'

20 10 0 10 20 30

NFE JOB NO.
F803-02

SHEET NO.
C-1



FLOOD HAZARD NOTE

THIS PROPERTY IS NOT LOCATED WITHIN THE FLOOD HAZARD AREA INDICATED BY FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY PANEL NO. 26125C0313F DATED: 12-6-2023

MISS DIG / UTILITY DISCLAIMER NOTE

A MISS DIG TICKET NUMBER 2023110102965, PURSUANT TO MICHIGAN PUBLIC ACT 174 WAS ENTERED FOR THE SURVEYED PROPERTY. DUE TO THE EXTENDED REPORTING PERIOD FOR UNDERGROUND FACILITY OWNERS TO PROVIDE THEIR RECORDS, THE SURVEY MAY NOT REFLECT ALL THE UTILITIES AT THE TIME THE SURVEY WAS ISSUED ON 12-7-2023. THE SURVEY ONLY REFLECTS THOSE UTILITIES WHICH COULD BE OBSERVED BY THE SURVEYOR IN THE FIELD OR AS DEPICTED BY THE UTILITY COMPANY RECORDS FURNISH PRIOR TO THE DATE THIS SURVEY WAS ISSUED. THE CLIENT AND/OR THEIR AUTHORIZED AGENT SHALL VERIFY WITH THE FACILITY OWNERS AND/OR THEIR AUTHORIZED AGENTS, THE COMPLETENESS AND EXACTNESS OF THE UTILITIES LOCATION.

TOPOGRAPHIC SURVEY NOTES

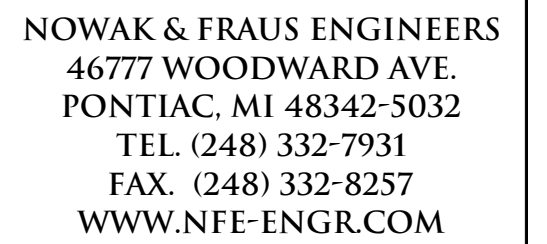
ALL ELEVATIONS ARE EXISTING ELEVATIONS, UNLESS OTHERWISE NOTED.

UTILITY LOCATIONS WERE OBTAINED FROM MUNICIPAL OFFICIALS AND RECORDS OF UTILITY COMPANIES, AND NO GUARANTEE CAN BE MADE TO THE COMPLETENESS, OR EXACTNESS OF LOCATION.

THIS SURVEY MAY NOT SHOW ALL EASEMENTS OF RECORD UNLESS AN UPDATED TITLE POLICY IS FURNISHED TO THE SURVEYOR BY THE OWNER.

LEGEND

MANHOLE	EXISTING SANITARY SEWER
HYDRANT	EXISTING SAN. CLEAN OUT
MANHOLE	EXISTING WATER MAIN
CATCH BASIN	EXISTING STORM SEWER
EX. R.Y. CATCH BASIN	
EXISTING BURIED CABLES	
OVERHEAD LINES	
LIGHT POLE	
SIGN	
EXISTING GAS MAIN	
ASPHALT SURFACE	
BRICK SURFACE	
BRIDGE SURFACE	
CONCRETE SURFACE	
GRAVEL SURFACE	
LANDSCAPED SURFACE	
WATER SURFACE	



PROJECT
Highland Streetscape -
Highland Boardwalk

CLIENT
Highland Downtown
Development Authority
205 West Livingston Road
Highland, MI 48357

Contact:
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P: (248) 887-7700
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PROJECT LOCATION
Part of the SW 1/4
of Section 27
T. 3 N., R. 7 E.
Highland Township,
Oakland County, Michigan

SHEET

Demolition Plan



DATE	ISSUED/REVISED
2024-11-11	REV

DRAWN BY:
S. Grever

DESIGNED BY:
S. Grever

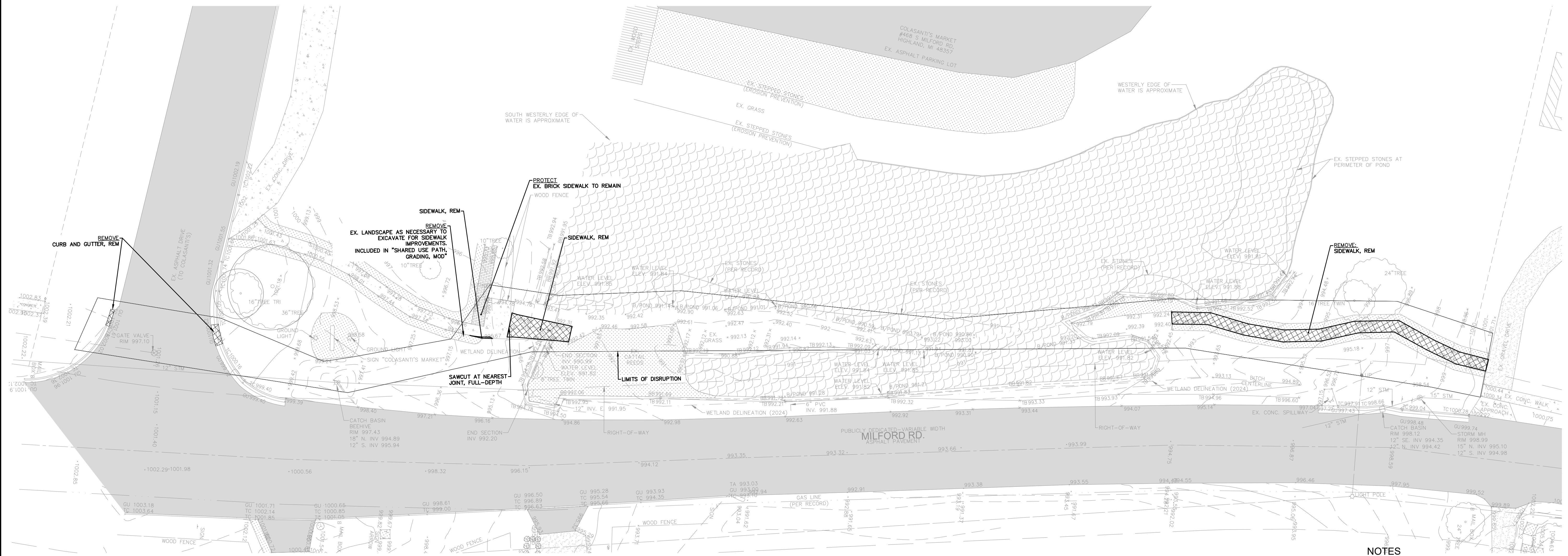
APPROVED BY:
S. Sutton

DATE:
SEPTEMBER 18, 2024

SCALE: 1" = 20'

SCALE: 1" = 20'

NFE JOB NO.	SHEET NO.
F803-02	C-2



NOTES

REFER TO THE WRC SOIL EROSION AND SEDIMENTATION CONTROL
DETAIL SHEET FOR ALL ADDITIONAL NOTES & DETAILS (TYP)

A DISTANCE OF 0 FEET TO THE NEAREST BODY OF WATER
COLASANTI'S POND.



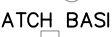


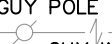


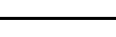
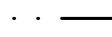

THE TOTAL AREA OF EARTH DISRUPTION IS 0.24 ACRES.

THE SOIL EROSION CONTROLS WILL BE MAINTAINED WEEKLY AND

A SOIL EROSION PERMIT IS REQUIRED FROM OAKLAND COUNTY

LEGEND

LEGEND

	EXISTING SANITARY SEWER
	EXISTING SAN. CLEAN OUT
	EXISTING WATER MAIN
	EXISTING STORM SEWER
	EX. R. Y. CATCH BASIN
	EXISTING BURIED CABLES
	OVERHEAD LINES
	SIGN
	EXISTING UTILITY TO BE REMOVED
	EXISTING UTILITY TO BE ABANDONED
	INDICATES EXISTING TREE TO BE REMOVED

SOIL DATA

THIS SITE CONSISTS OF:
SPINKS LOAMY SAND (15C), 6 TO 12 PERCENT SLOPES
HOUGHTON AND ADRIAN MUCKS (27)

BASED ON DATA PROVIDED BY THE UNITED STATES DEPARTMENT OF
AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE.
ACCESSED 2024-07-08

REMOVAL LEGEND

INDICATES EXISTING BOARDWALK
TO BE DEMOLISHED

INDICATES AREAS OF CONCRETE
PAVEMENT TO BE REMOVED

INDICATES LIMITS OF SOIL
DISRUPTION

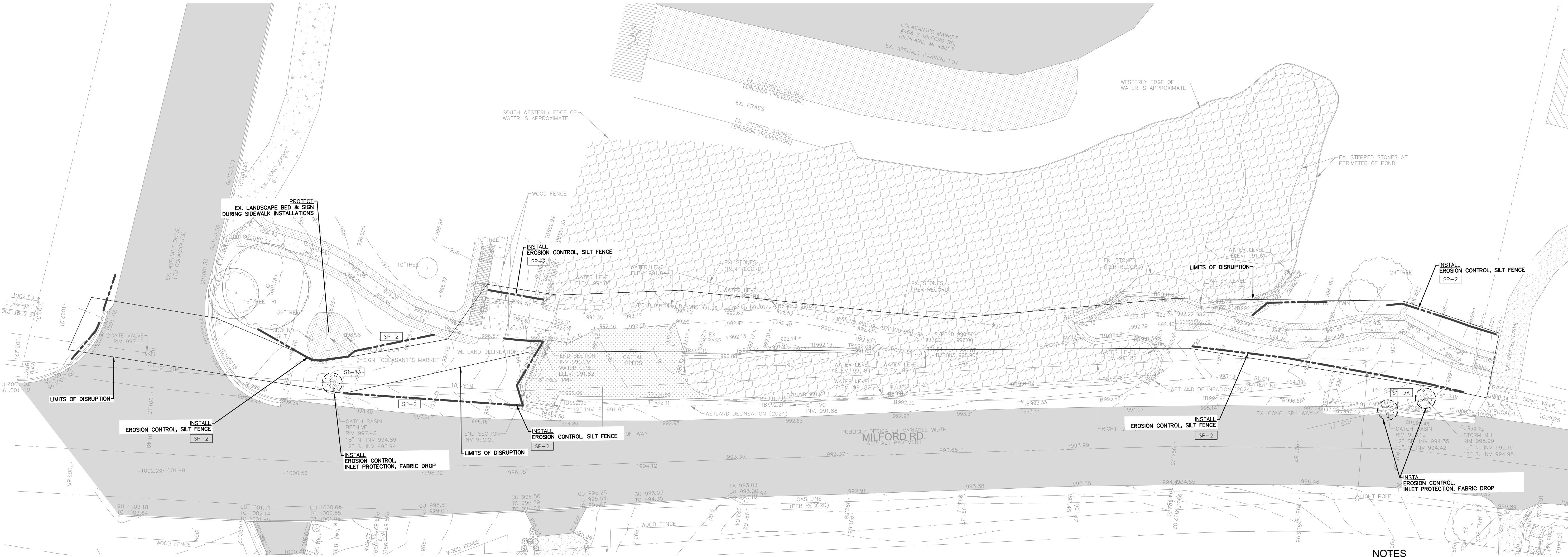
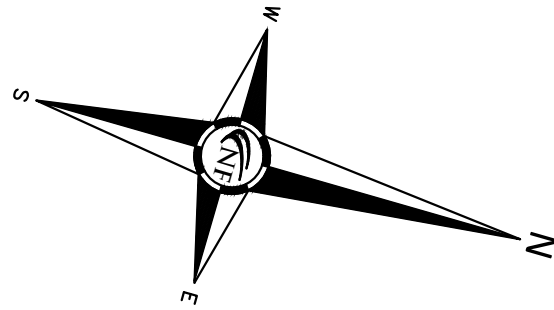
STREET CLEANING SCHEDULE (MINIMUM REQUIREMENT)

TASKS	SUN	MON	TUE	WED	THU	FRI	SAT
SCRAPE STREETS	X	X	X	X	X	X	X
SWEEP STREETS				X			

SOIL EROSION CONTROL SEQUENCE

CONSTRUCTION EVENTS	2024												2025	
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
1. INSTALL SILT FABRIC FENCING AND TEMP. CONSTRUCTION ACCESS PER PLAN.														
2. CONDUCT DEMOLITION AND SITE CLEARING AS REQUIRED PER PLAN.														
3. STRIP AND STOCK PILE OR REMOVE TOPSOIL PER PLAN														
4. COMMENCE MASS GRADING OF SITE.														
5. INSTALL DETENTION & SEDIMENTATION BASINS IF REQUIRED PER PLAN AND SOD.														
6. COMMENCE UNDERGROUND UTILITY INSTALLATIONS.														
7. INSTALL INLET FILTERS ON PROPOSED DRAINAGE INLET STRUCTURES PER PLAN.														
8. FILL IN TEMPORARY SEDIMENTATION TRAPS AND PAVE SITE.														
9. COMPLETE ALL BUILDING CONSTRUCTION, LANDSCAPE ACTIVITY AND SITE RESTORATION.														
10. REMOVE ALL TEMPORARY SOIL EROSION MEASURES.														

NOTE: THE SOIL EROSION CONTROLS WILL BE MAINTAINED WEEKLY AND AFTER EVERY STORM BY CONTRACTOR.



NOTES

REFER TO THE WRC SOIL EROSION AND SEDIMENTATION CONTROL
DETAIL SHEET FOR ALL ADDITIONAL NOTES & DETAILS (TYP)
A DISTANCE OF 0 FEET TO THE NEAREST BODY OF WATER
COLASANTI'S POND.
THE TOTAL AREA OF EARTH DISRUPTION IS 0.24 ACRES.
THE SOIL EROSION CONTROLS WILL BE MAINTAINED WEEKLY AND
AFTER EVERY STORM EVENT BY CONTRACTOR.
A SOIL EROSION PERMIT IS REQUIRED FROM OAKLAND COUNTY.

LEGEND

MANHOLE	EXISTING SANITARY SEWER
HYDRANT	EXISTING SAN. CLEAN OUT
MANHOLE CATCH BASIN	EXISTING WATER MAIN
	EXISTING STORM SEWER
	EX. R. Y. CATCH BASIN
UTILITY POLE	EXISTING BURIED CABLES
GUY POLE	OVERHEAD LINES
GUY WIRE	LIGHT POLE
	SIGN
	EXISTING GAS MAIN
	EXISTING UTILITY TO BE REMOVED
	EXISTING UTILITY TO BE ABANDONED
12" MAPLE	CONSTRUCTION/TREE PROTECTION FENCING
	INDICATES EXISTING TREE TO BE REMOVED

SOIL DATA

THIS SITE CONSISTS OF:
SPINKS LOAMY SAND (15%), 6 TO 12 PERCENT SLOPES
HOUGHTON AND ADRIAN MUCKS (27)

BASED ON DATA PROVIDED BY THE UNITED STATES DEPARTMENT OF
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ACCESSED 2024-07-08

SESC LEGEND

---	INDICATES LIMITS OF SILT FABRIC FENCE
---	INDICATES LIMITS OF SOIL DISRUPTION
	INDICATES LOW POINT INLET FILTER OR PROPOSED DRAINAGE STRUCTURE
SP-XX	OAKLAND COUNTY WATER RESOURCES COMMISSIONER STANDARD DETAIL

SEAL

PROJECT

Highland Streetscape -
Highland Boardwalk

CLIENT

Highland Downtown
Development Authority
205 West Livingston Road
Highland, MI 48357

Contact:

Mr. Tim Colbeck
P: (248) 887-7700
F: (248) 887-7226

PROJECT LOCATION

Part of the SW 1/4
of Section 27
T. 3 N., R. 7 E.
Highland Township,
Oakland County, Michigan

SHEET

Soil Erosion &
Sedimentation Control
Plan



DATE ISSUED/REVISED
2024-11-11 REV

DRAWN BY:

S. Grever

DESIGNED BY:

S. Grever

APPROVED BY:

S. Sutton

DATE:

SEPTEMBER 18, 2024

SCALE: 1" = 20'

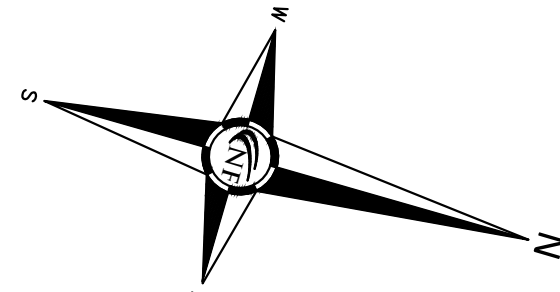
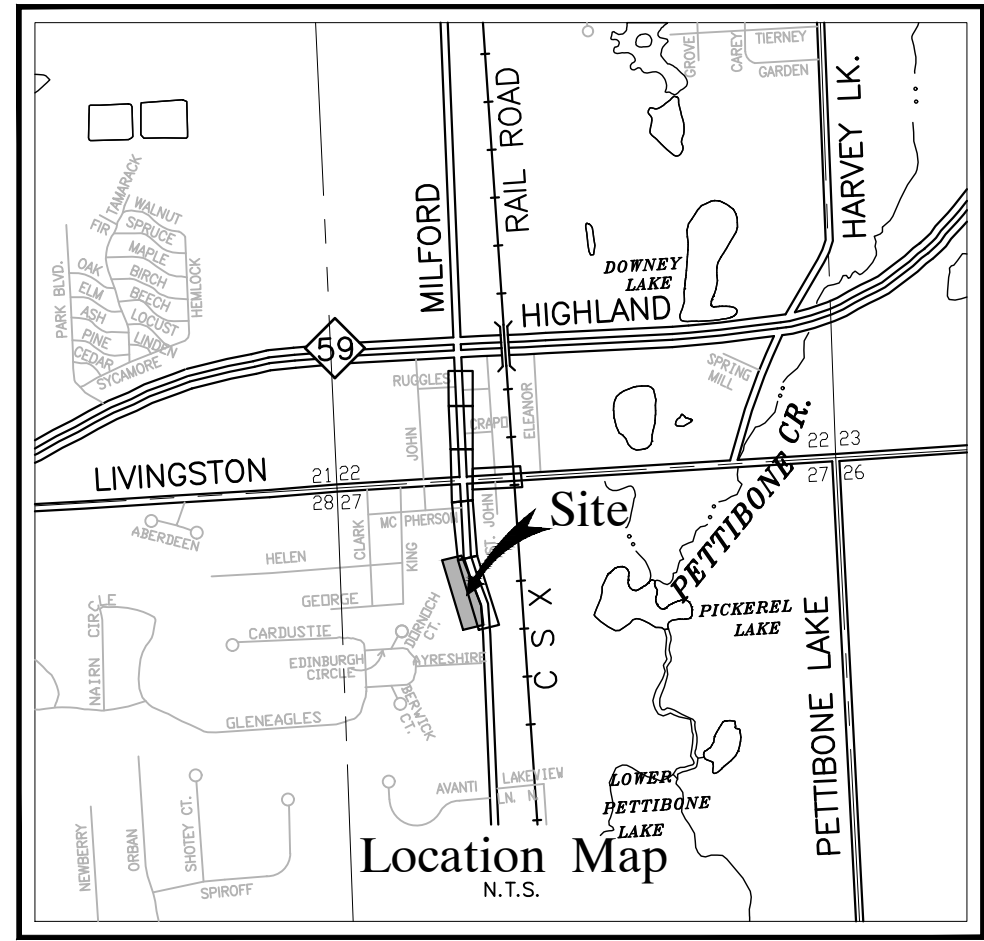
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NFE JOB NO.

F803-02

SHEET NO.

C-3



SEAL

PROJECT
Highland Streetscape -
Highland Boardwalk

CLIENT
Highland Downtown
Development Authority
205 West Livingston Road
Highland, MI 48357

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PROJECT LOCATION
Part of the SW 1/4
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T. 3 N., R. 7 E.
Highland Township,
Oakland County, Michigan

SHEET
Boardwalk, Paving, &
Grading Plan



DATE ISSUED/REVISED
2024-11-11 REV

DRAWN BY:
S. Grever

DESIGNED BY:
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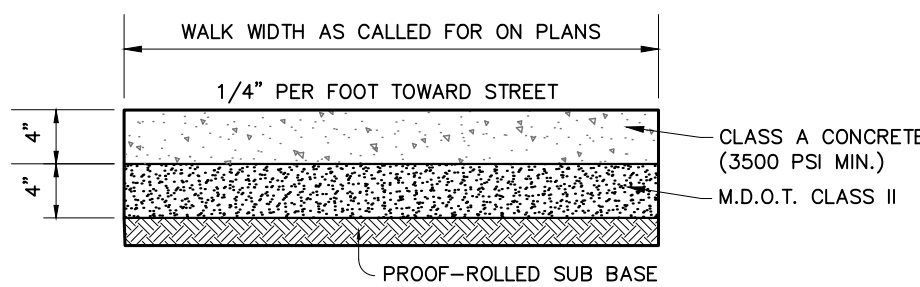
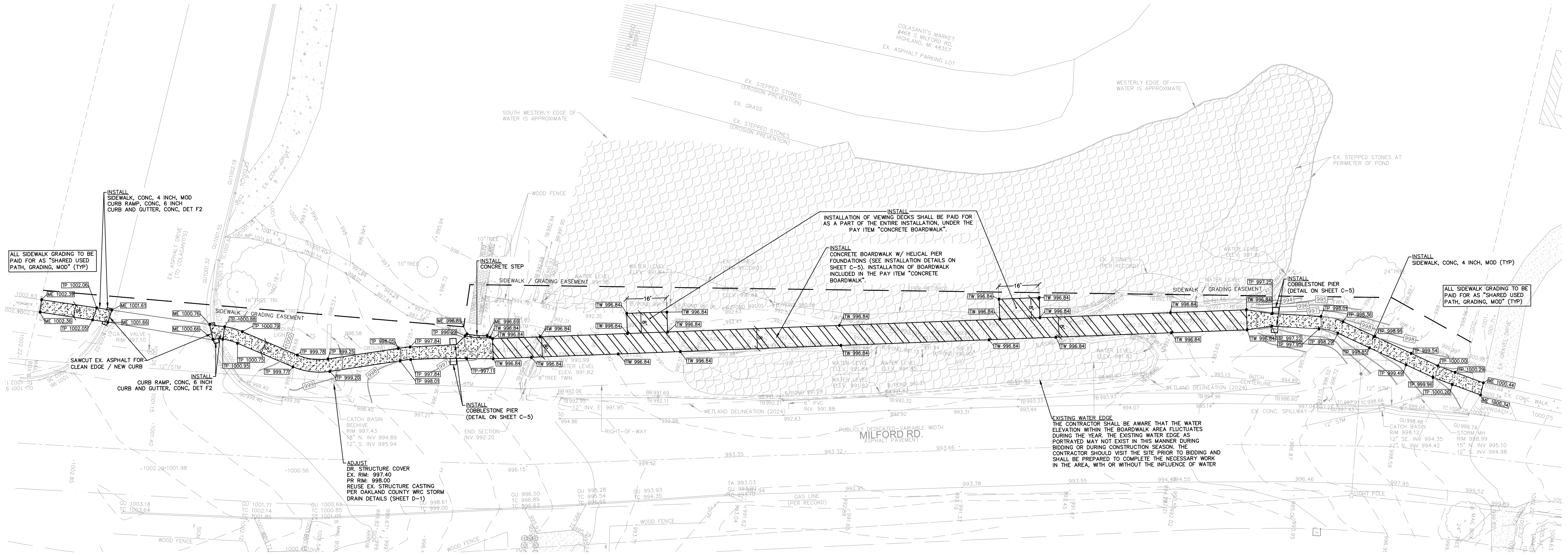
DATE
SEPTEMBER 18, 2024

SCALE: 1" = 20'

20 10 0 10 20 30

NFE JOB NO.
F803-02

SHEET NO.
C-4

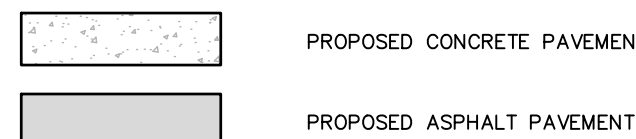


CONCRETE SIDEWALK SECTION
N.T.S.

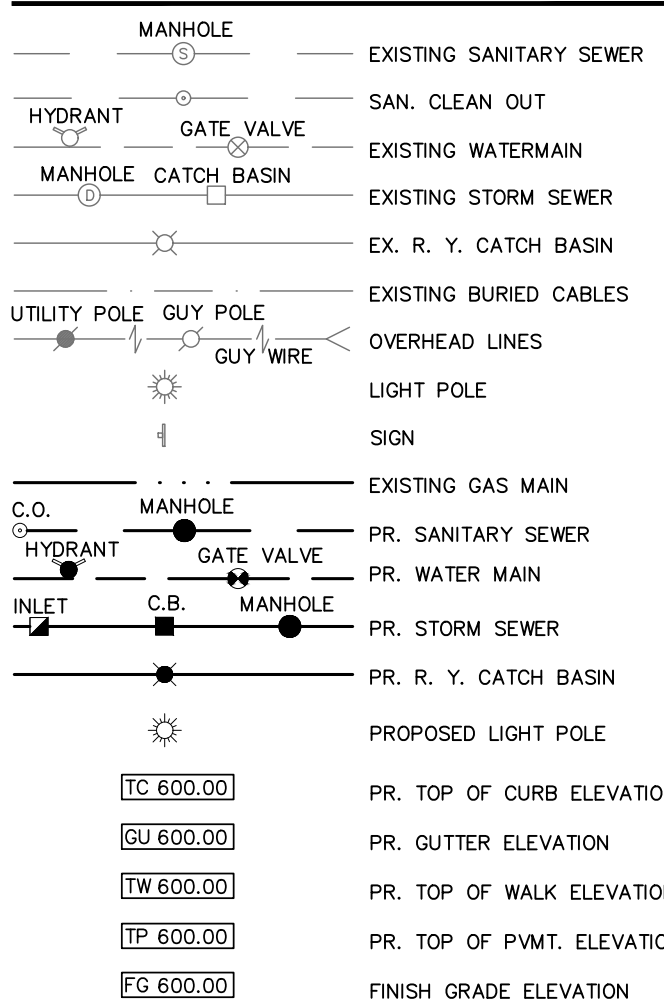
PROJECT RESTORATION

ALL GREENBELT AREAS DISTURBED DURING CONSTRUCTION SHALL INCLUDE RESTORATION WITH 4" SCREEN TOPSOIL AND CLASS A HYDROSEED. ANY RESULTING SLOPES AT OR EXCEEDING 1:4 SHALL INCLUDE PLACEMENT OF A MULCH BLANKET TO DETRER EROSION. ALL PAID FOR AS "PROJECT RESTORATION"

PAVING LEGEND



LEGEND



SEAL

PROJECT

Highland Streetscape -
Highland Boardwalk

CLIENT

Highland Downtown
Development Authority
205 West Livingston Road
Highland, MI 48357

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Oakland County, Michigan

SHEET

DETAILS



DATE ISSUED/REVISED
2024-11-11 REV

DRAWN BY:

S. Grever

DESIGNED BY:

S. Grever

APPROVED BY:

S. Sutton

DATE:

SEPTEMBER 18, 2024

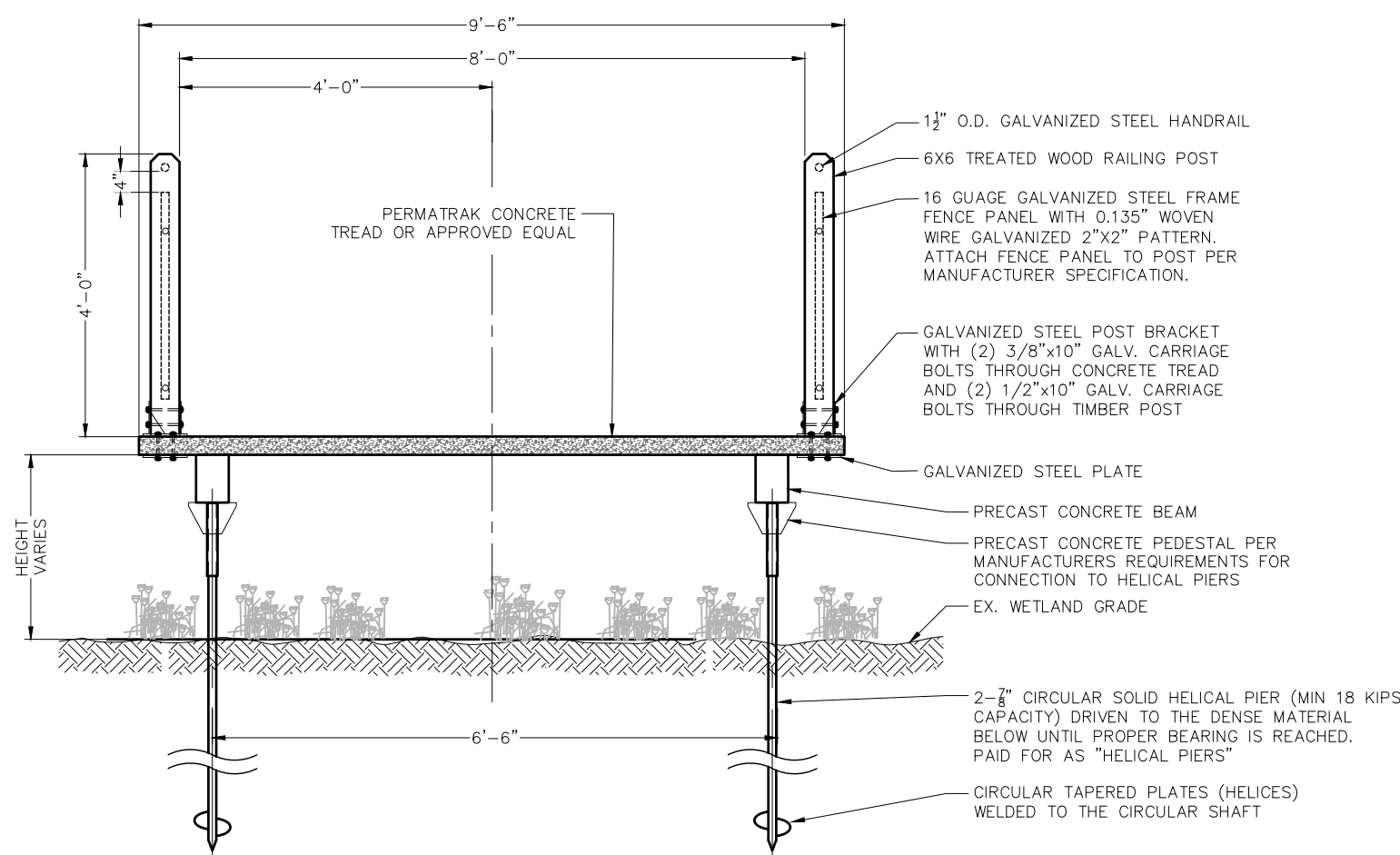
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NFE JOB NO.

F803-02

SHEET NO.

C-5

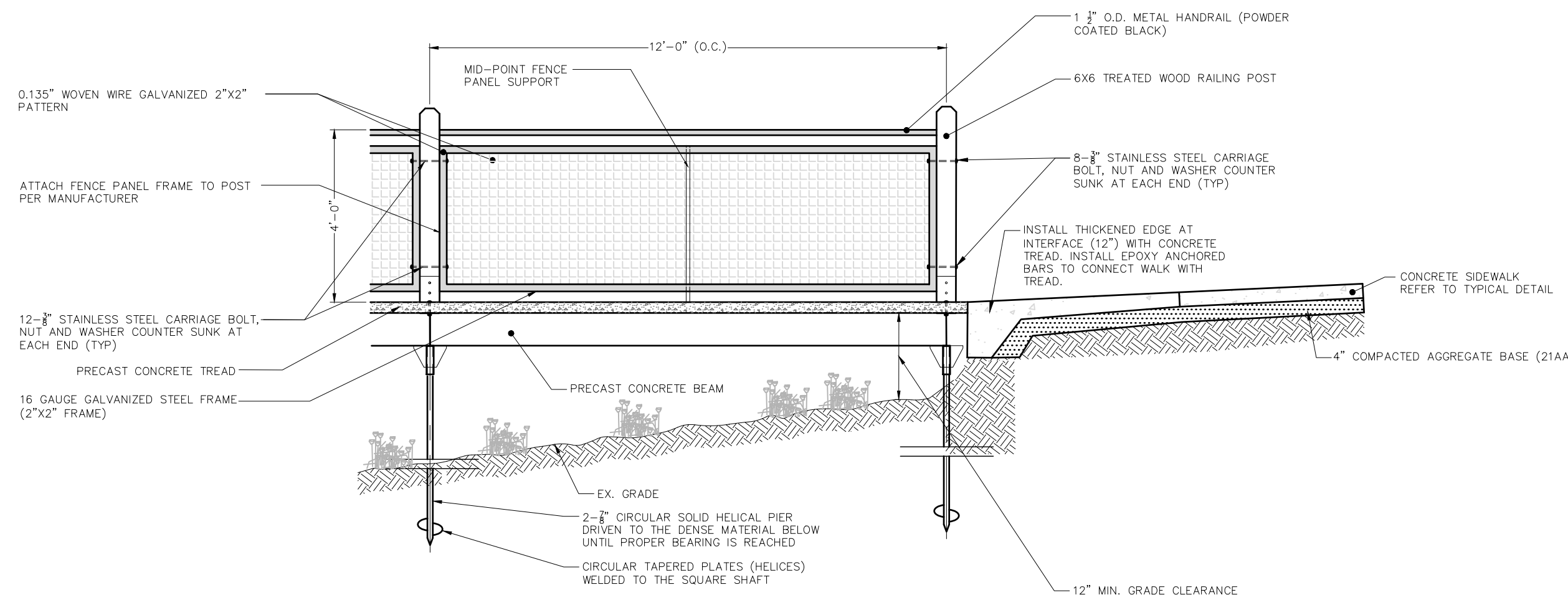


BOARDWALK - SECTION

N.T.S.

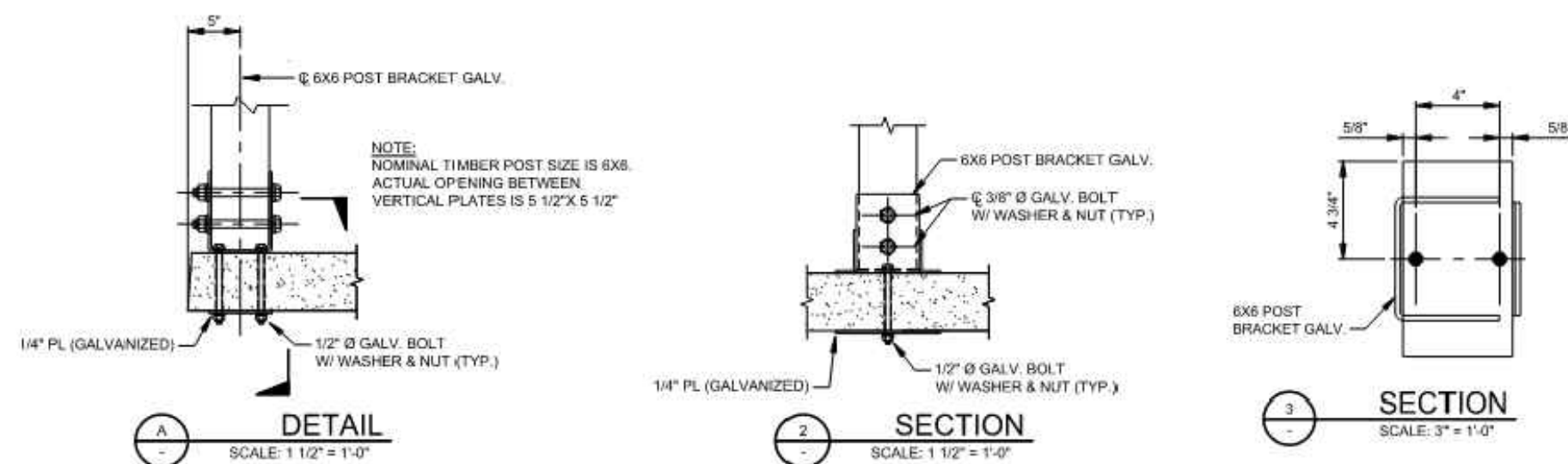
FENCE PANEL/HANDRAIL FABRICATION

THE CONTRACTOR SHALL SUPPLY FABRICATION OR SHOP DRAWINGS FROM VENDORS FOR THE PROPOSED HAND RAIL AND FENCE PANELS, PRIOR TO ORDER, FOR REVIEW AND APPROVAL BY THE OWNER/ENGINEER.



BOARDWALK - SECTION ELEVATION

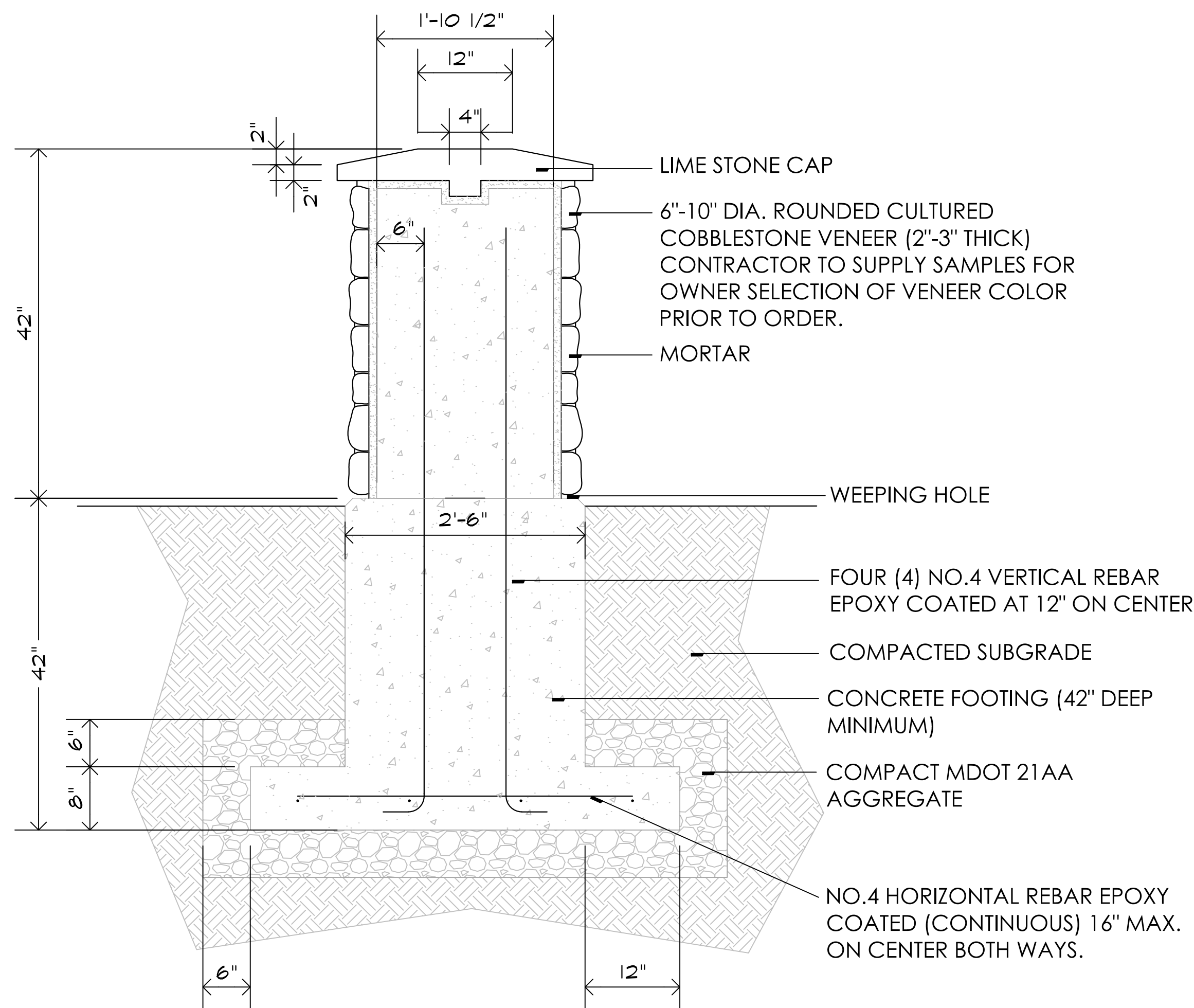
NOT TO SCALE



6X6 POST BRACKET DETAIL

NOT TO SCALE

SEE CONCRETE BOARDWALK DETAIL SHEET PT04 FOR FURTHER INFORMATION



ALL SITE PREPARATION, BASE MATERIALS, REINFORCEMENT, CONCRETE, AND FACADE MATERIALS SHALL BE INCLUDED IN THE ITEM "COBBLESTONE PIER"

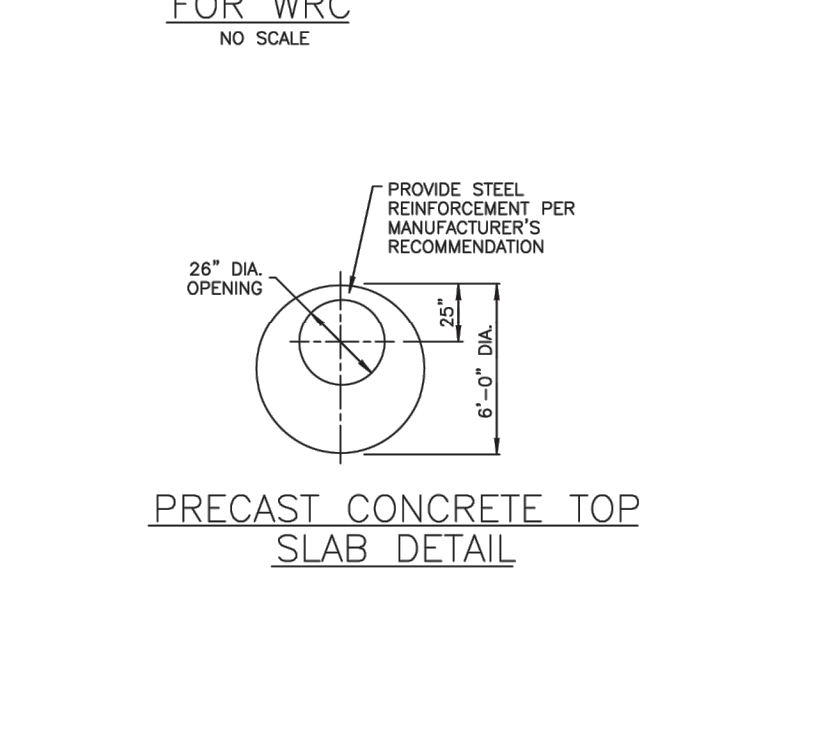
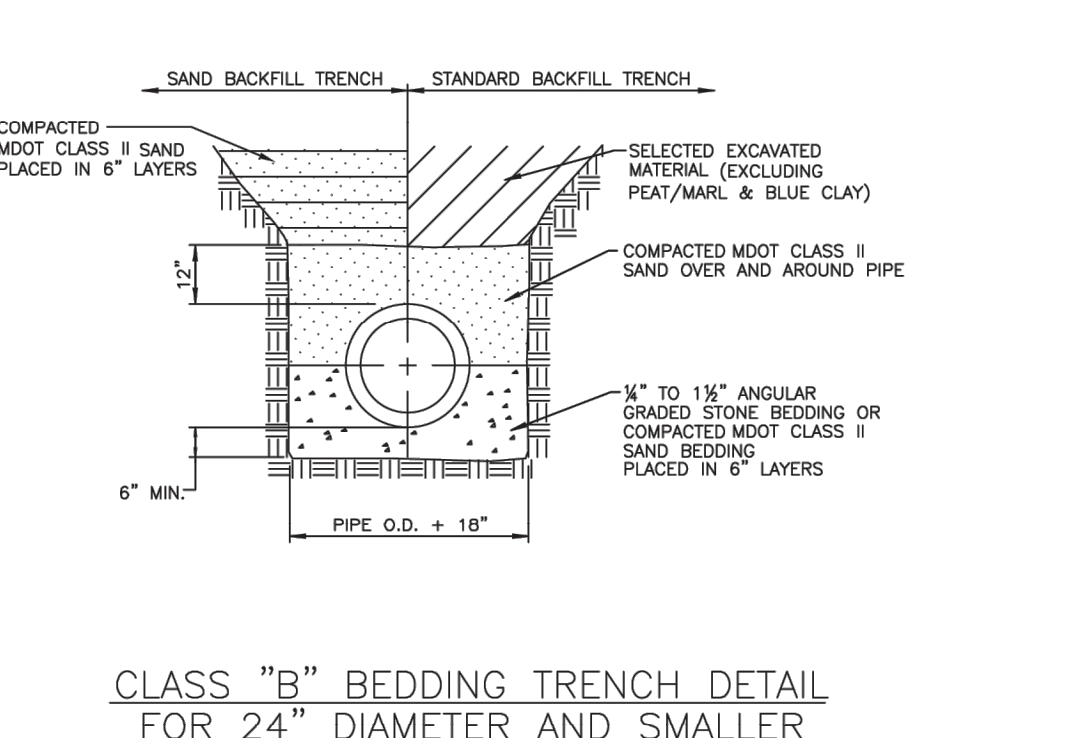
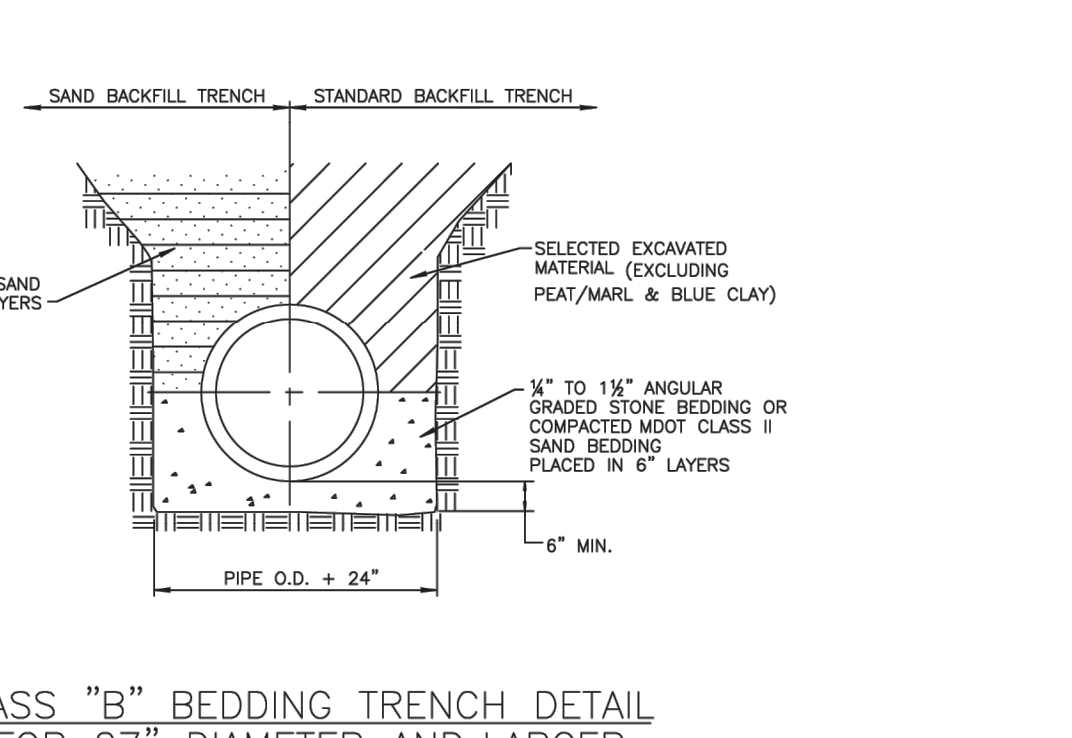
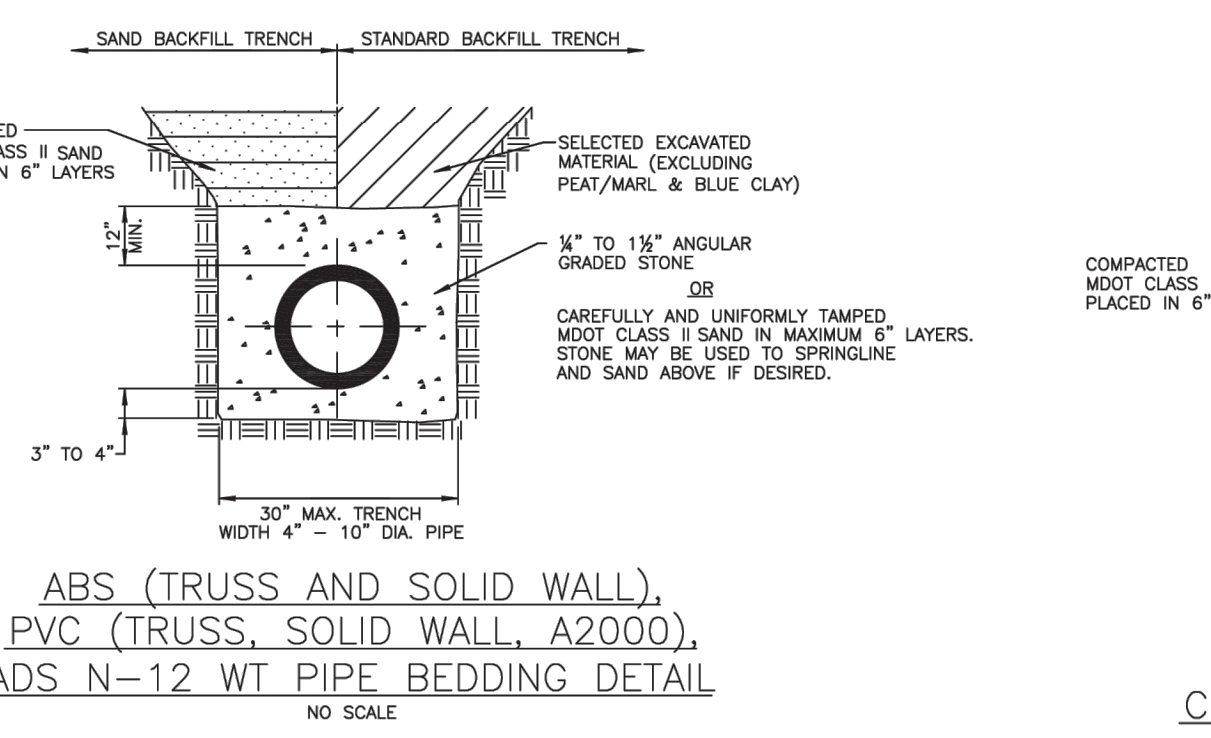
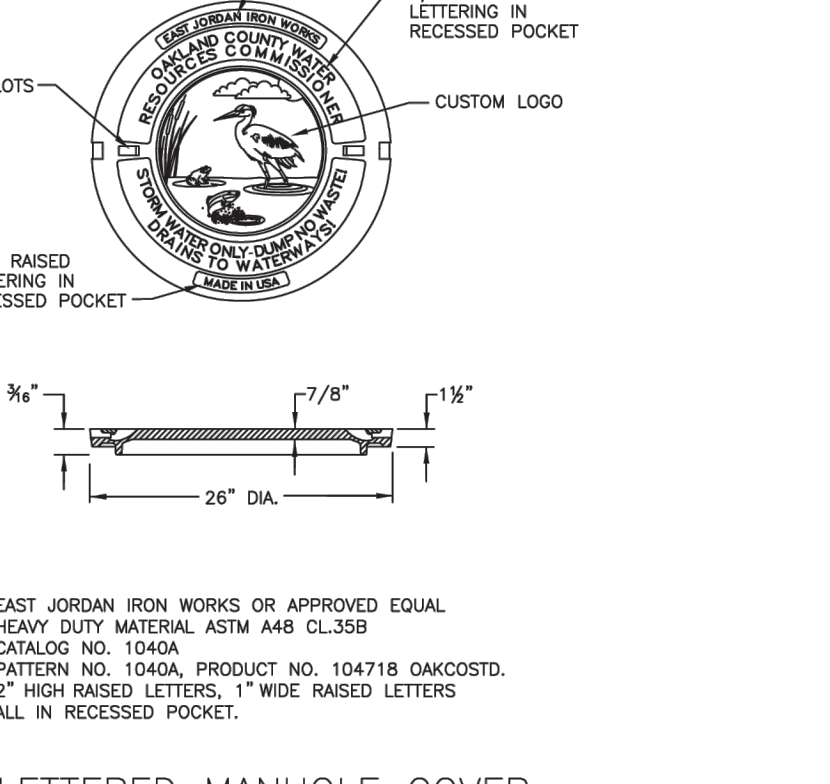
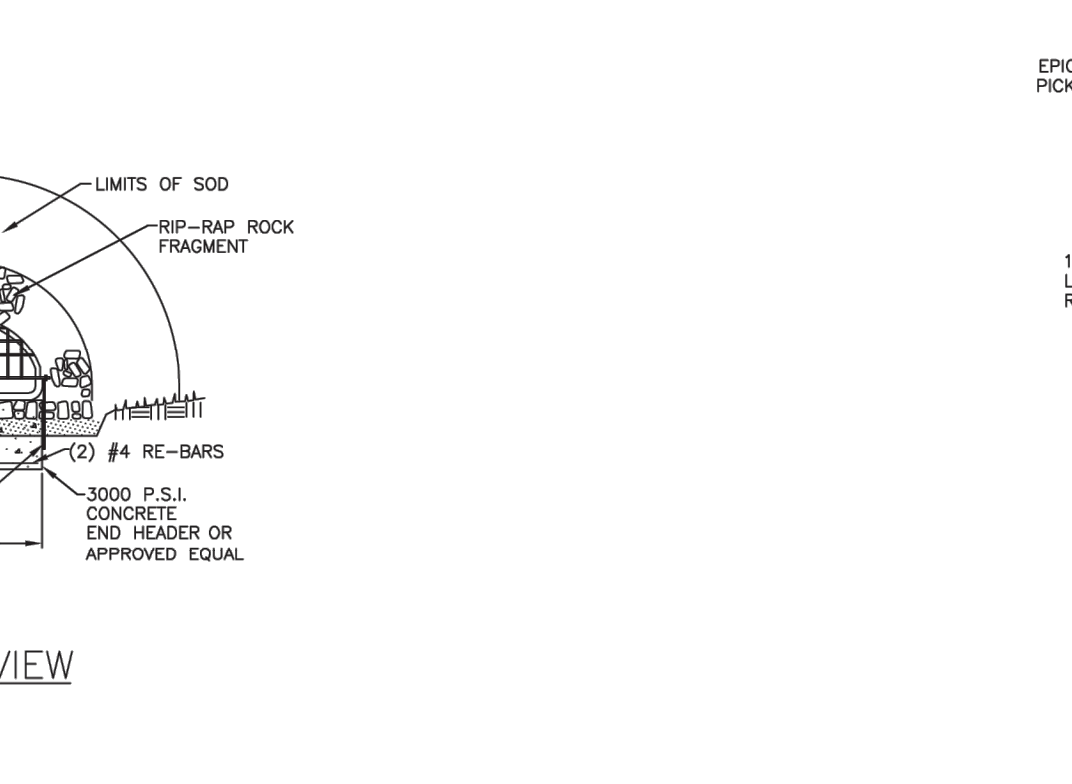
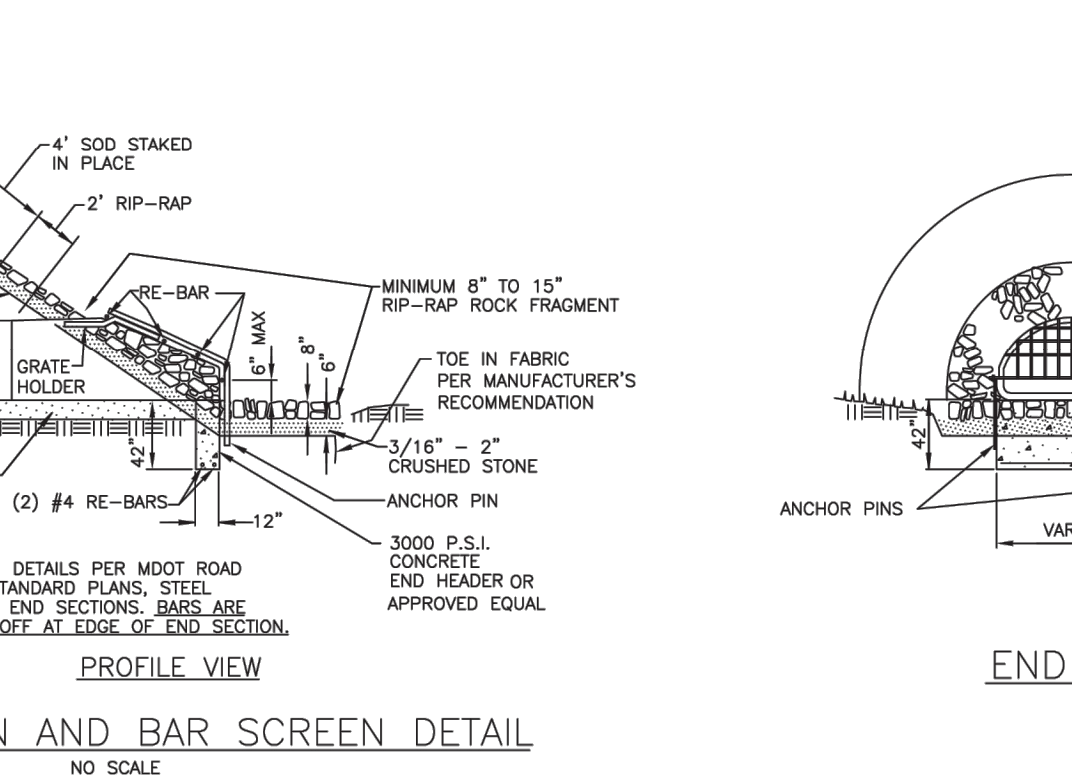
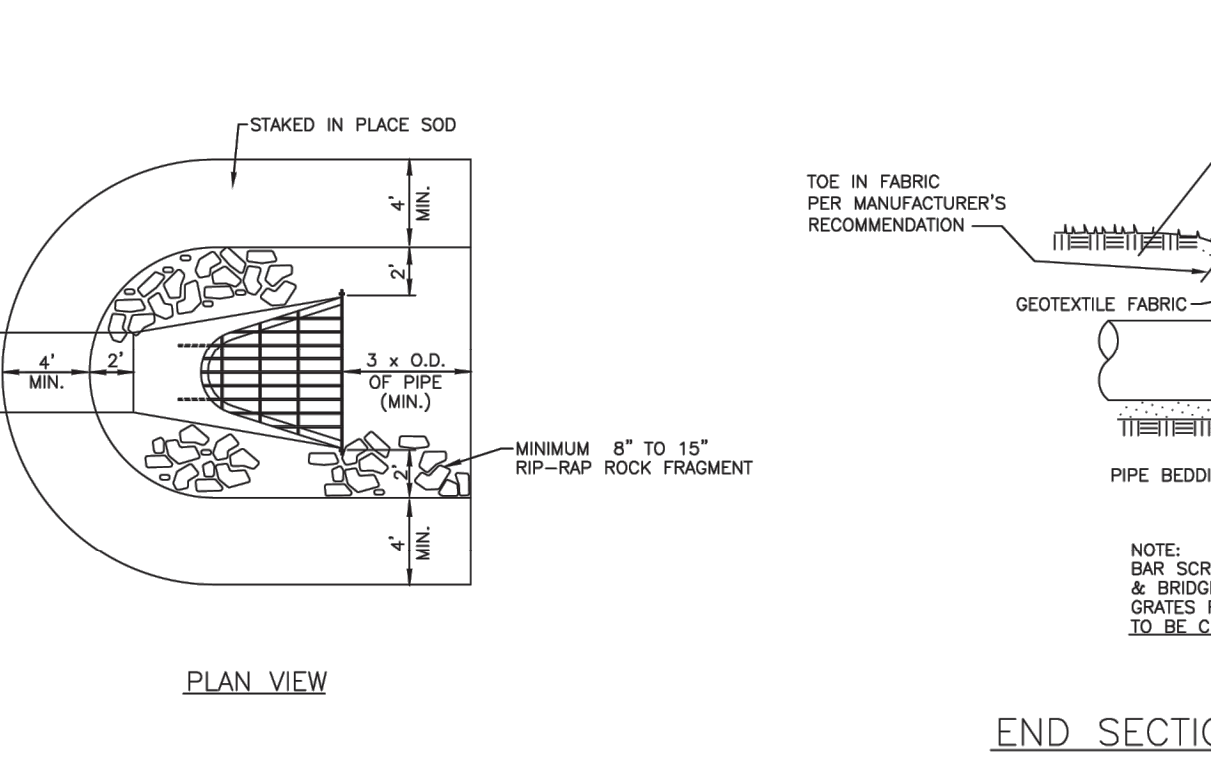
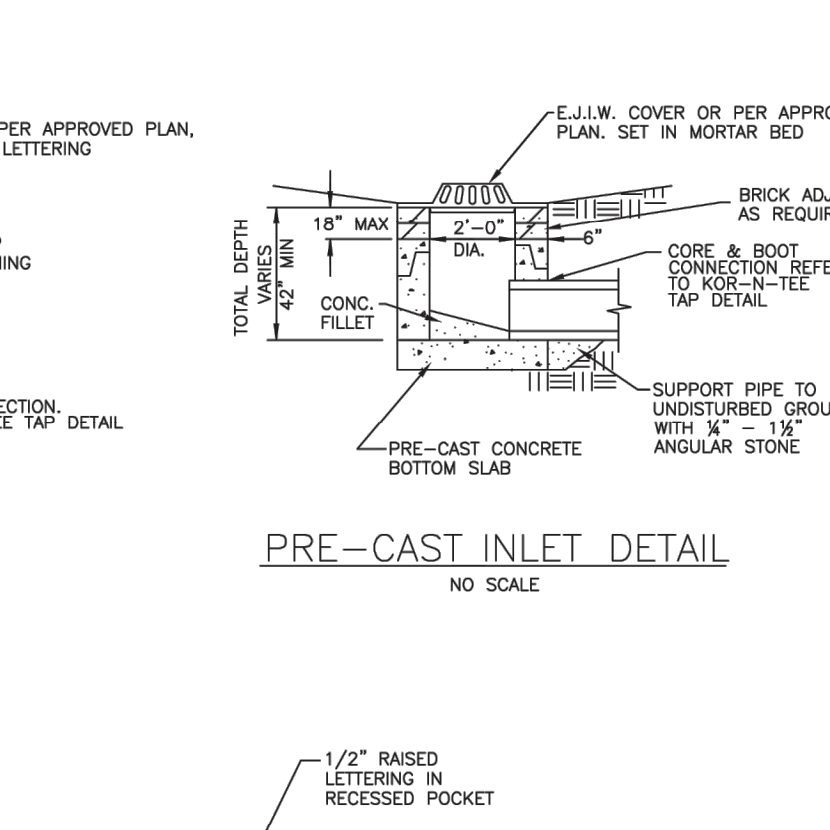
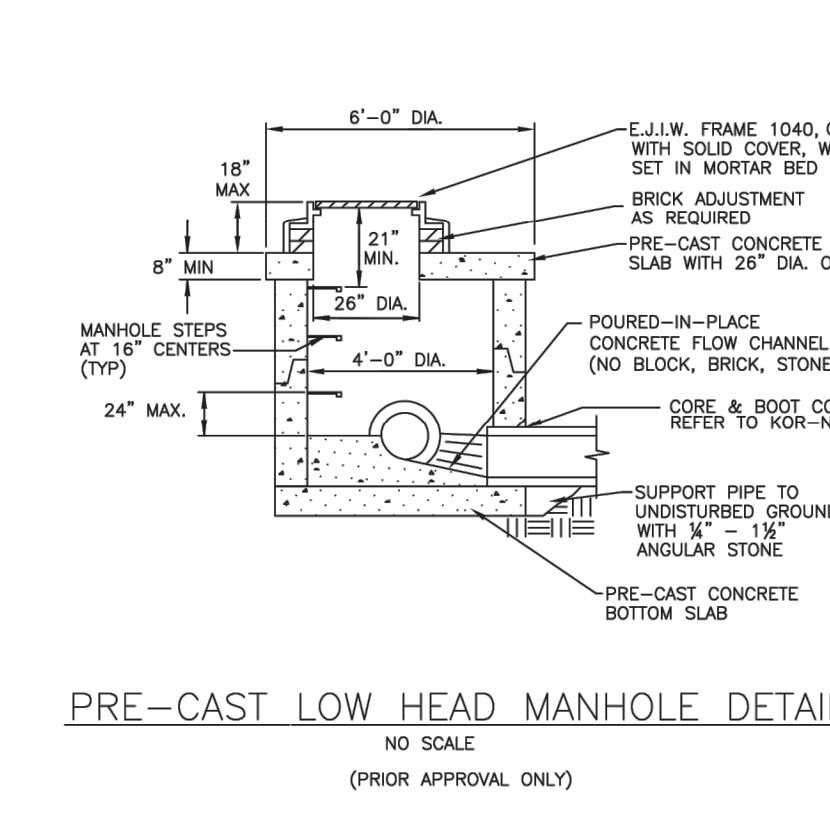
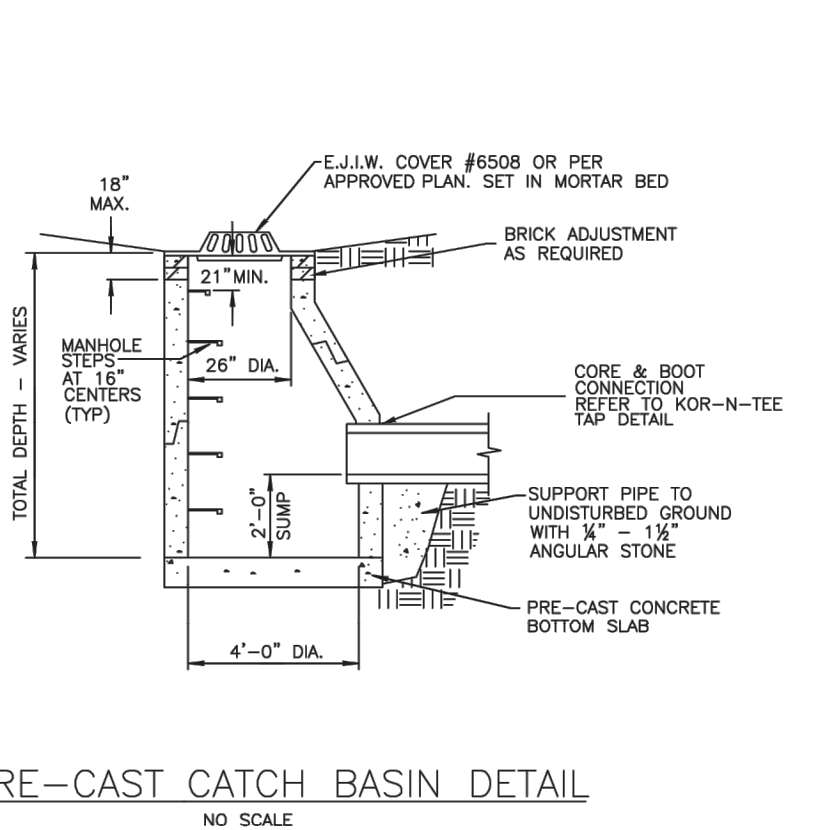
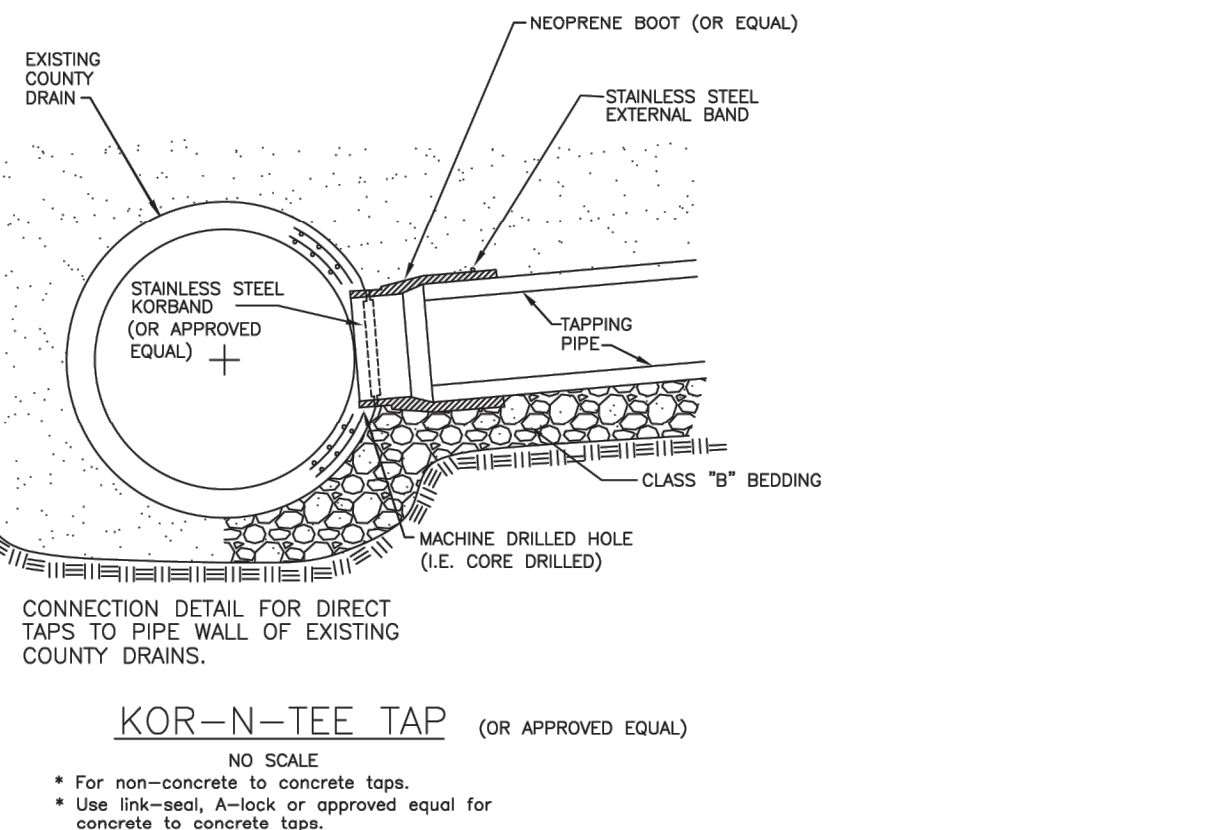
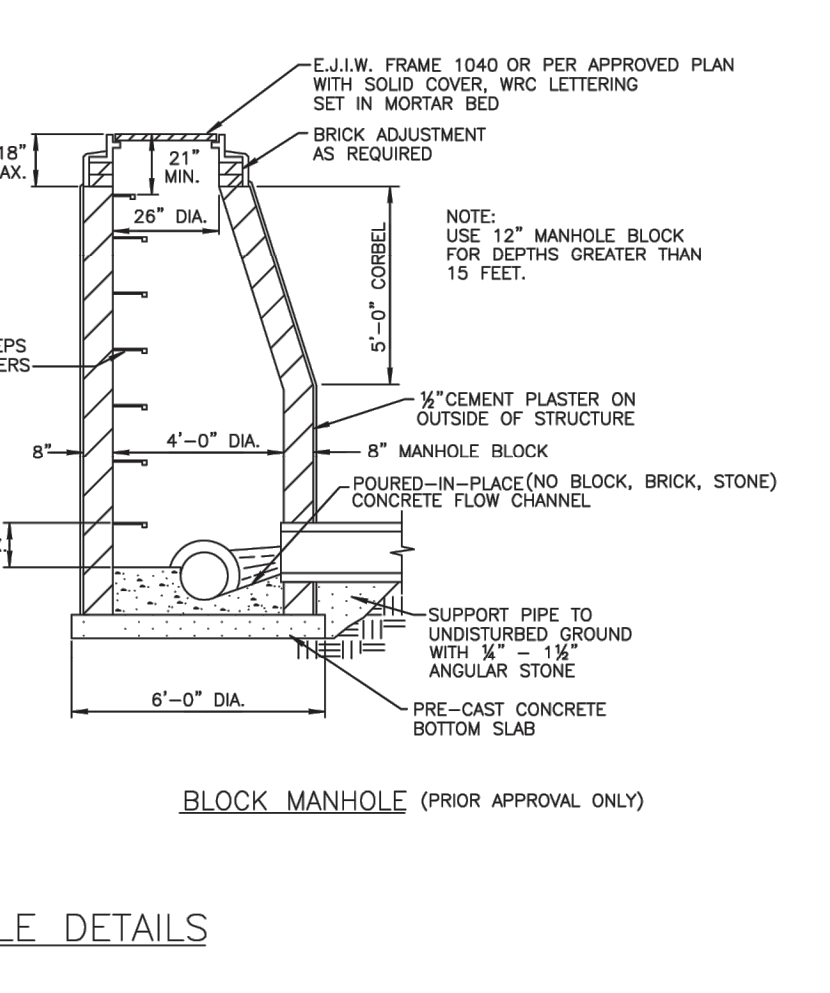
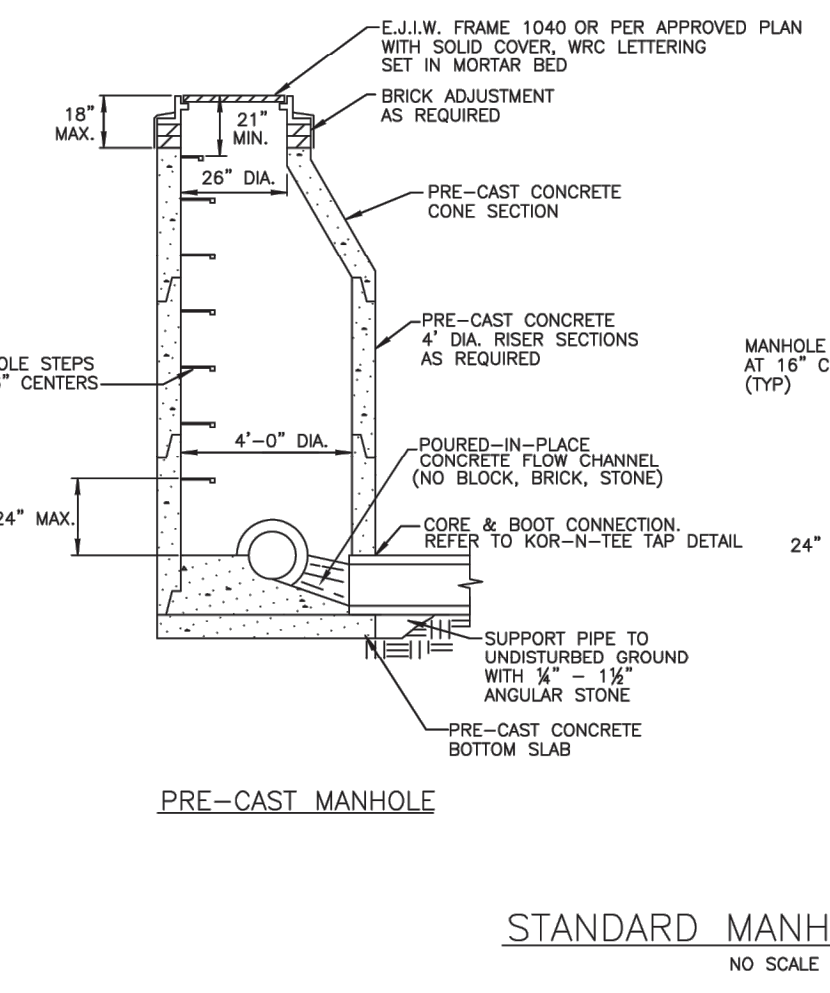
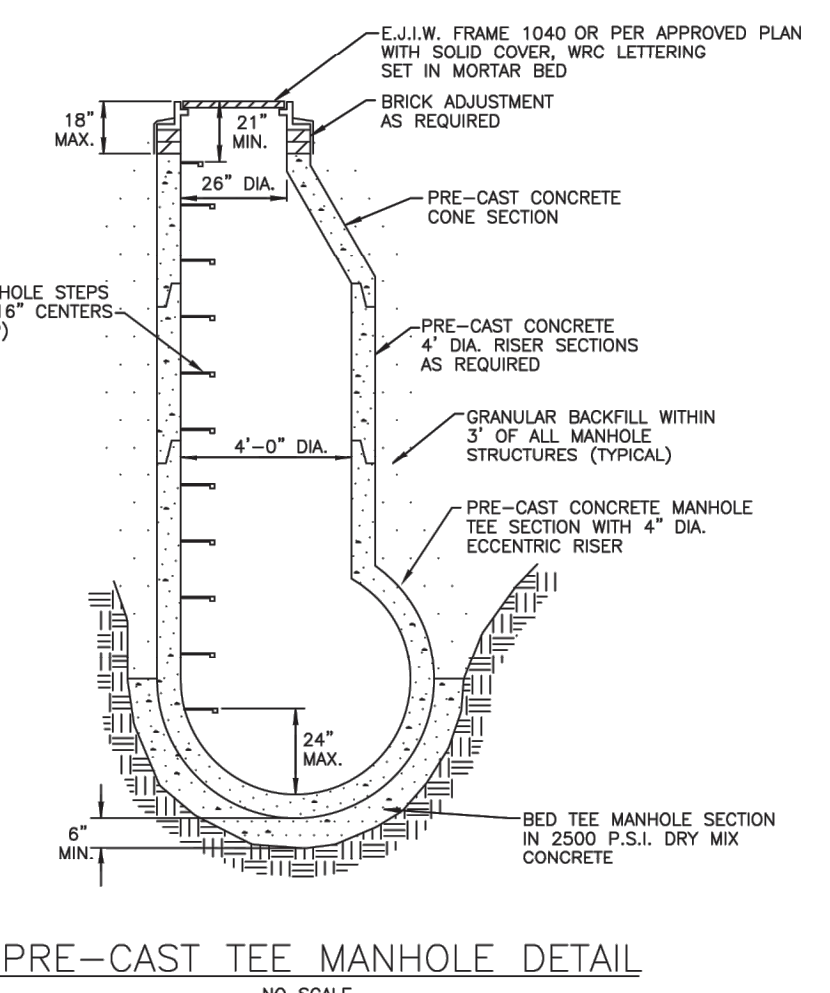
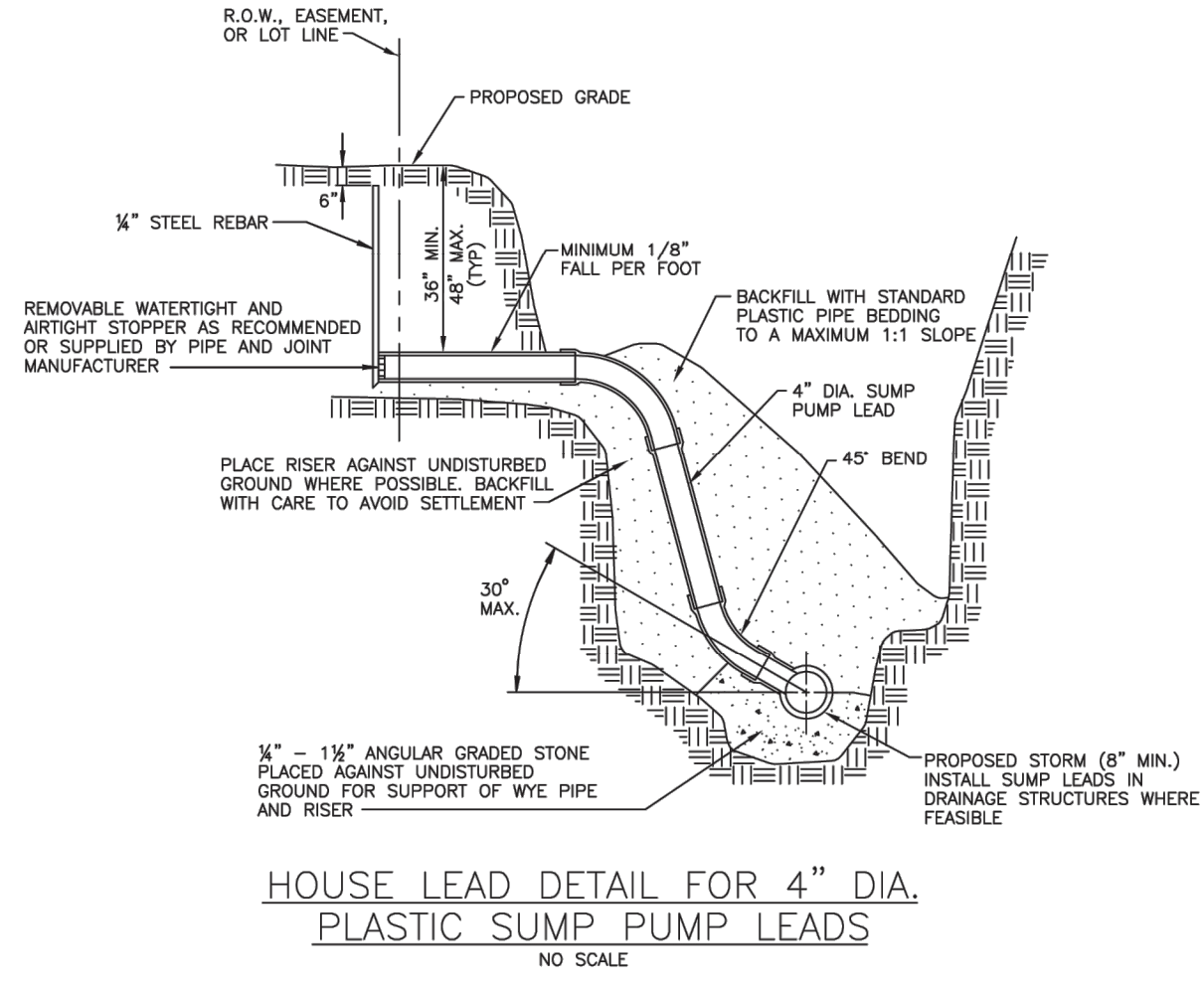
COBBLESTONE PIER

NTS


GENERAL NOTES

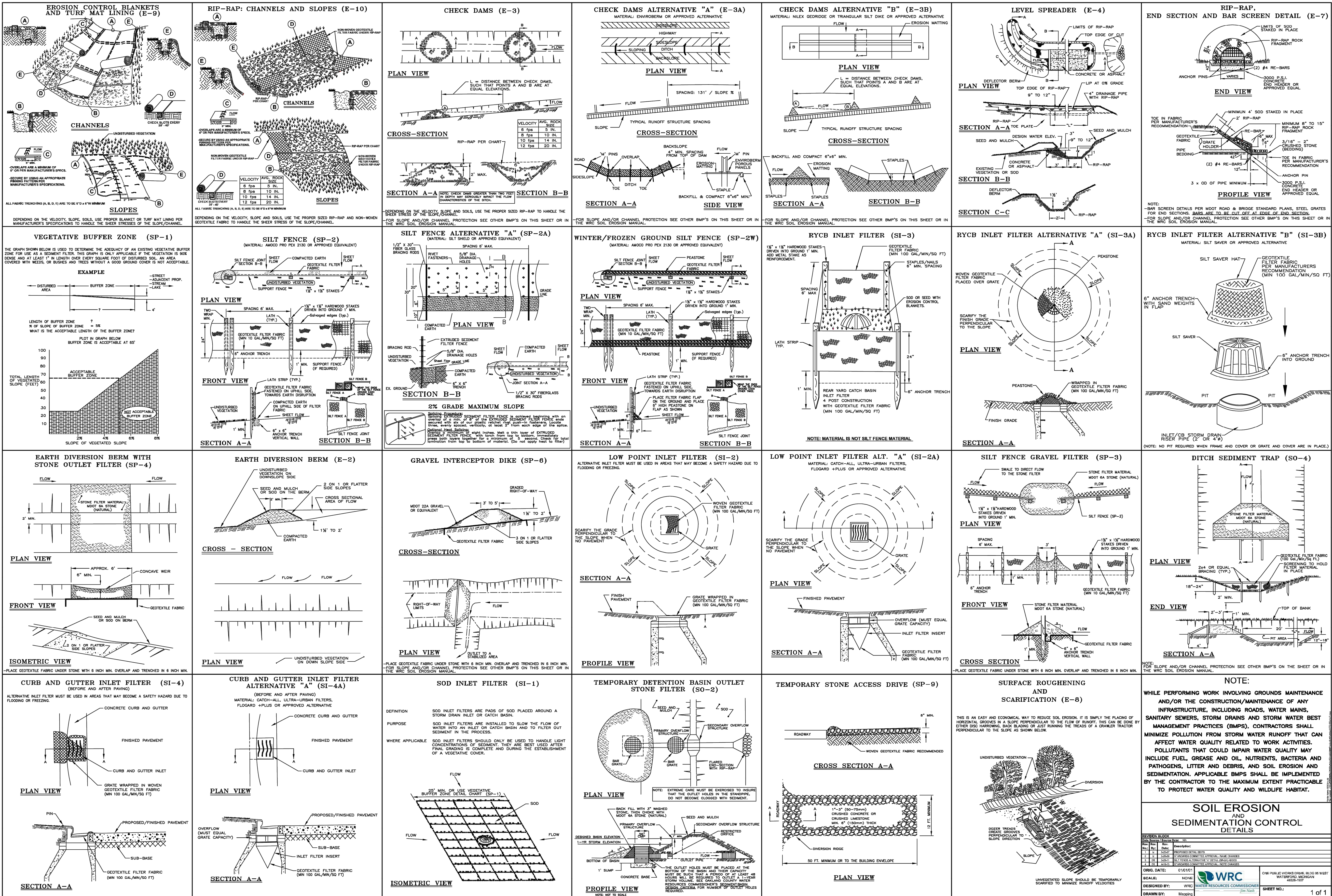
1. Type and class of pipe shall be as specified on plans.
2. Class "B" bedding shall be used throughout, unless otherwise specified on the plan.
3. All end sections 18" and larger shall be provided with a bar screen unless otherwise approved.
4. Standard rip-rap shall be 8"-15" fragmented rock, heavy rip-rap shall be 16"-24" fragmented rock. (No Broken Concrete)
5. MANHOLE REQUIREMENTS:
 - All new catch basins, inlets, and manholes are to be manufactured to ASTM C-478 specifications.
 - All new catch basins, inlets, and manholes shall have WRC approved flexible, watertight seals where pipes pass through walls. Manholes shall be of precast sections with modified groove tongue and rubber gasket type joints. The cast manhole cone sections shall be WRC approved modified eccentric cone type.
 - Taps through manhole joints or cone sections are prohibited unless otherwise approved.
 - Manhole steps to be plastic coated steel meeting the requirements in ASTM D 2146, Type II, Grade 49108, MA, Industries P.S.I. Polypropylene, (or approved equal). Steps to be installed during manhole manufacture. Place at 16" centers 45" from centerline of sewer.
 - Cone section with modified groove tongue joints and with stud inserts cast in place. Top to have flush surface.
 - ASTM C-478 riser section with modified groove tongue joints.
 - Res-seal, link-seal, press wedge II, or kor-n-seal boot (with stainless steel korbard) flexible rubber manhole joints. (or approved equal).
 - The inside joints of manholes, catch basins, and pipe sizes over 42" and larger in diameter shall be pointed up with mortar upon completion of backfilling.
6. CONCRETE PIPE REQUIREMENTS:
 - Concrete pipe to be per ASTM C76 standards.
 - It will be required to TV oil pipe 30 days after installation.
 - The contractor shall provide reinforced concrete pipe as specified on the plans.
 - All reinforced concrete pipe shall have modified grooved tongue joints with e-ring type rubber gasket, per A.S.T.M. specifications C443.
 - The inside joints of manholes, catch basins, and pipe sizes over 42" and larger in diameter shall be pointed up with mortar upon completion of backfilling.
7. SUMP PUMP LEAD REQUIREMENTS:
 - All sump pump leads connected to a County Drain pipe shall be pre-manufactured.
 - Sump pump leads connected to a manhole shall be cored and booted. Refer to Kor-N-Tee Tap Detail.
 - Sump pump mains and leads shall be ABS (truss and solid wall), PVC (truss, solid wall - A2000), ADS N-12 WT with premium joints.
 - Ends of all 4" sump pump leads shall be temporarily capped and their location staked, witnessed and recorded.
 - All sump pump leads to be taken to the property line, easement line or as indicated on the plan.
 - Sump pump mains must have a cleanout with a minimum inside diameter of 24" and be constructed at changes of alignment, ends of sump pump mains or as indicated on the plan.
8. RESTORATION REQUIREMENTS:
 - All disturbed area within the County Drain right-of-way shall be restored as follows:
 - Under roads, sidewalks, driveways and parking areas, backfill material shall be placed loosely into trenches in six (6) inch layers with each layer compacted to not less than 95% of maximum dry density as determined by the ASTM D 1557 Compaction Standard (modified proctor compaction test). All other areas shall have each layer compacted to not less than 90% of maximum dry density.
 - Finish subgrade
 - Place 3" thickness clean topsoil acceptable to the engineer to attain finished grade. Topsoil must not be contaminated and may not be a mixture of natural underlying soils, subbase materials, or other materials. It must consist of natural loam, sandy loam, silty loam or clay loam humus-bearing soil adapted to the sustenance of plant life. Topsoil must be neither excessively acidic nor excessively alkaline. It must be of mineral origin, exclusive of any peat or muck.
 - Apply seed and fertilizer as follows:

Location	Seeding Requirements	Fertilizer Requirement
Slopes and Ditch Banks, Etc.	M.D.O.T. "Roadside Mix" Turf Seed Mixture TGM (10% Kentucky Blue, 20% Perennial Ryegrass, 30% Hard Fescue, 40% Creeping Red Fescue) applied at 220 lb/acre	M.D.O.T. Seeding and Sodding Fertilizers, Class A
Other Areas	M.D.O.T. "Roadside Mix" Turf Seed Mixture THM (30% Kentucky Blue, 20% Perennial Ryegrass, 30% Creeping Red Fescue) applied at 220 lb/acre	M.D.O.T. Seeding and Sodding Fertilizers, Class A
 - Sod is required in maintained lawn areas. Refer to WRC General Specifications for additional requirements and information.
 - apply straw or marsh hay mulch in an air-dry condition to all seeded areas over the surface to a uniform thickness at 2 tons/acre.
 - mulch shall be anchored in place with biodegradable netting, not larger than 1 1/2" by 2" nor smaller than 1/2" by 1/2".
 - The contractor shall be responsible to insure the growth of all seeded areas, and shall re-seed as necessary to accomplish this.
9. The Storm Drain Notes and Details Sheet shall be a supplement to WRC Standards and Specifications, which are available on the WRC website (www.oakgov.com/water).



STORM DRAIN NOTES
AND
DETAILS

REVISION BLOCK			
Rev.	By	Rev.	Description
1	ES	01/10	PROPOSED DETAIL CHANGES - NEW LOAD
2	ES	06/10	APPROVAL PER STANDARDS COMMITTEE
3	ES	02/20	REVISED MANHOLE DETAIL
4	ES	04/21	REVISED GENERAL NOTES
ORIG. DATE: 05/05/97			
SCALE: NONE			
DESIGNED BY: WRC			
DRAWN BY: Mapping			
			ONE PUBLIC WORKS DRIVE, BLDG 66 WEST WATERFORD, MICHIGAN 48328-1907
			SHEET NO.: 1 of 1



HIGHLAND STREETSCAPE - HIGHLAND BOARDWALK

GENERAL NOTES

GENERAL

- THIS STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH THE PROJECT ARCHITECTS PLAN LAYOUT AND GUIDELINES. SUITABILITY FOR ACCESS AND INTENDED USAGE SHALL BE THE RESPONSIBILITY OF THE ARCHITECT.
- VEHICULAR ACCESS LARGER THAN THE DESIGN LIVE LOAD SHALL BE LIMITED BY PERMANENT PHYSICAL MEANS.
- PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL VERIFY ALL ELEVATIONS THROUGH THE PROJECT ARCHITECT. PRIOR TO CONSTRUCTION, ALL FOUNDATION LOCATIONS SHALL BE STAKED BY THE SURVEYOR PER THE APPROVED DRAWINGS MARKED 'FOR CONSTRUCTION'.
- ONLY PERMATRAK NORTH AMERICA MAY PROVIDE THE PRECAST STRUCTURE SHOWN ON THESE PLANS.
- INSTALLER SHALL NOT CUT OR MODIFY ANY PERMATRAK COMPONENTS WITHOUT PERMATRAK'S APPROVAL.
- THE INSTALLER IS RESPONSIBLE FOR THE APPROPRIATE MEANS AND METHODS FOR THIS PROJECT, INCLUDING ENSURING PROPER CONSTRUCTIBILITY OF ALL COMPONENTS SHOWN ON THESE PLANS. NO EQUIPMENT MAY BE OPERATED ON THE STRUCTURE, UNLESS NOTED OTHERWISE IN THE DESIGN DATA ON THIS SHEET.
- A MATERIAL CHANGE TO THE BOARDWALK SYSTEM IS NOT ALLOWED AND NOT CONSIDERED AN EQUAL.
- PRIOR TO CONSTRUCTION, ALL EXISTING UTILITIES, BUILDING LOCATIONS, EXISTING FOUNDATIONS AND TREE ROOTS (AS APPLICABLE) SHALL BE LOCATED TO VERIFY NO CONFLICTS EXIST WITH THE STRUCTURES SHOWN ON THESE PLANS.

DESIGN DATA

- BOARDWALK SHALL BE DESIGNED IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND THE LRFD GUIDE SPECIFICATION FOR THE DESIGN OF PEDESTRIAN BRIDGES.
- DESIGN LIVE LOAD: PEDESTRIAN LOADING - 90 PSF UNIFORM VEHICULAR LOADING - H-5 (10,000 LBS. DESIGN VEHICLE)

ASSUMED CONSTRUCTION EQUIPMENT LOADING -
TAKEUCHI TB260 COMPACT EXCAVATOR WEIGHING 12,645 LBS.

FOUNDATIONS SHALL BE DESIGNED FOR THE FOLLOWING.

APPLIED PIER/PILE LOADS:
COMPRESSION: 18.0 KIPS (SERVICE)
LATERAL: = 1.0 KIP (SERVICE)

- A HYDRAULIC ANALYSIS, INCLUDING SCOUR EVALUATION, HAS NOT BEEN PERFORMED BY PERMATRAK. THIS SCOPE IS THE RESPONSIBILITY OF THE DESIGN CONSULTANT.
- THE RAILING SUPPLIER IS RESPONSIBLE FOR THE ENGINEERING OF THE DETAILED RAILING IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

- HELICAL PIERS SHOWN ON THESE PLANS SHALL BE DESIGNED BY THE HELICAL PIER SUPPLIER.

MATERIAL

- FASTENERS, BOLTS AND HARDWARE SHALL BE GALVANIZED, FIBER REINFORCED POLYMER (FRP) OR GRADE 316 STAINLESS STEEL.
- ALL REINFORCING SHALL BE UNCOATED GRADE 60 CONFORMING TO ASTM A615.

NOTES FOR CONSTRUCTION EQUIPMENT LOADING:

PERMATRAK HAS DESIGNED THE BOARDWALK FOR THE ASSUMED EQUIPMENT (NOTED IN NOTE #2) TO BE USED TO CONSTRUCT THE PRECAST BOARDWALK VIA TOP-DOWN METHODS. THE CONTRACTOR SHALL ABIDE BY THE FOLLOWING NOTES AND SHALL CONTACT PERMATRAK PRIOR TO SHOP DRAWING CREATION FOR ANALYSIS OF EQUIPMENT TO BE USED.

- EQUIPMENT MAY CARRY A MAXIMUM (4,000 LB. MAX PICK) (1) ONE TREAD OR BEAM AT A TIME WHILE OPERATING ON THE STRUCTURE.
- EQUIPMENT SHALL RUN PARALLEL TO THE BEAMS AND REMAIN TOWARDS THE BOARDWALK CENTERLINE DURING CONSTRUCTION.
- CONTRACTOR SHALL PROVIDE 1/2" THICK PLYWOOD UNDER VEHICLE, SPANNING THE LENGTH OF (3) TREADS OR 6'-0" MINIMUM.
- THE CONTRACTOR SHALL NOT STOCKPILE PRECAST MATERIALS ON THE BOARDWALK.
- BEAMS SHALL BE SECURED PER THE APPROVED INSTALLATION DRAWINGS PRIOR TO LOADING OF CONSTRUCTION EQUIPMENT.
- TRAVEL WITH ARM FACING FORWARD AT ALL TIMES.
- TRAVEL IN A SMOOTH AND HARMONIOUS MANNER WITH A EQUIPMENT SPEED NOT TO EXCEED 5 MPH.
- THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THE SAFETY ON THE JOB-SITE THROUGHOUT THE CONSTRUCTION PROCESS, AND SHALL ABIDE BY ALL RELEVANT GUIDELINES REGARDING THE HEALTH AND SAFETY OF ALL PARTIES PRESENT ON THE JOB SITE, ESPECIALLY IN REGARDS TO OPERATING ANY EQUIPMENT ON THE TOP OF THE STRUCTURE DURING INSTALLATION.

APPROXIMATE NUMBER OF COMPONENTS REQUIRED*:

STRUCTURE	APPROXIMATE LENGTH FT. (ALONG CENTERLINE)	APPROXIMATE AREA	# PIERS
BOARDWALK #1	300.00 FT +/-	3106 SQ. FT. +/-	60

*INCLUDES VIEWING DECKS

PROJECT COMPONENTS

SUPPLIED BY PERMATRAK

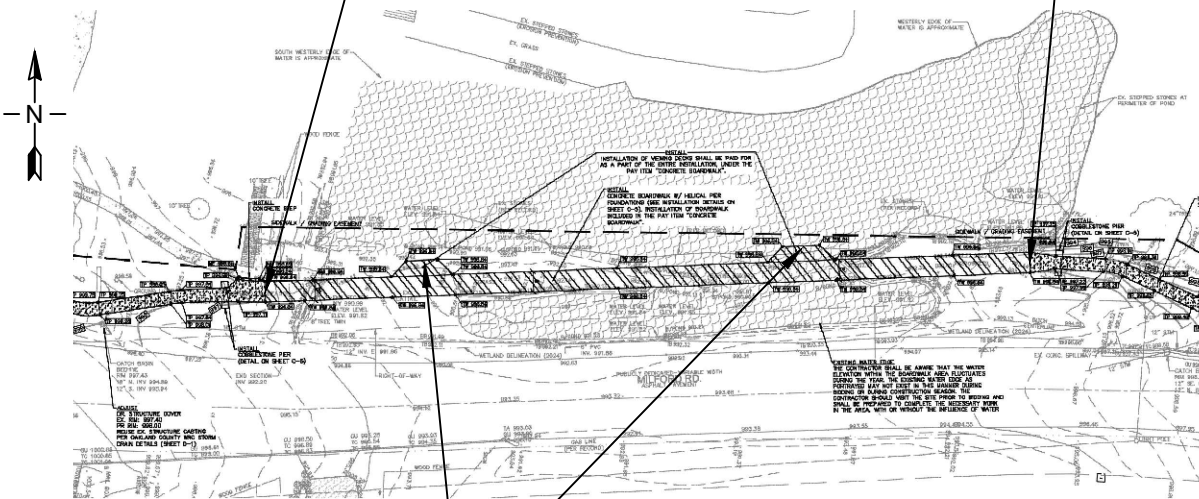
PRECAST CONCRETE TREADS
PRECAST CONCRETE BEAMS
3/4" Ø X 1'-6" LONG THREADED BARS WITH NUTS AND WASHERS (BEAM TO PIER CONNECTION)
ELASTOMERIC BEARING PADS
RUBBER SPACER PADS (BETWEEN TREADS)
RUBBER LEVELING PADS
CLIP ANGLE KITS
SIKAFLEX SELF LEVELING SEALANT
SHIMS (LEVELING FOR PRECAST COMPONENTS)
6X6 TIMBER POST BRACKETS AND CONNECTION HARDWARE
PATCHING MATERIAL

SUPPLIED BY CONTRACTOR

CAST-IN-PLACE CONCRETE
TIMBER RAILING AND CONNECTION HARDWARE
HELICAL PIERS, FLAT PLATES AND CONNECTION HARDWARE
EXPANSION JOINT MATERIAL

BEGIN PERMATRAK BOARDWALK

END PERMATRAK BOARDWALK



PERMATRAK VIEWING DECK (2 REQ'D)

PERMATRAK BOARDWALK LOCATION PLAN

SCALE = N.T.S.

Patented Product: U.S. Patent #5,906,084 #8,302,362 #8,522,505 #8,839,588 #9,096,975

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PREPARED FOR:

NOWAK & FRAUS
ENGINEERS

FOR BIDDING PURPOSES
NOT FOR CONSTRUCTION



www.permatrak.com TEL: 877-332-7862

OFFICE LOCATIONS

FLORIDA

TEXAS

LOUISIANA

NORTH CAROLINA

OHIO

PROJECT TITLE:

HIGHLAND STREETSCAPE -
HIGHLAND BOARDWALK

HIGHLAND, MI

JOB NUMBER: 2024-2381

DATE: 11/06/2024

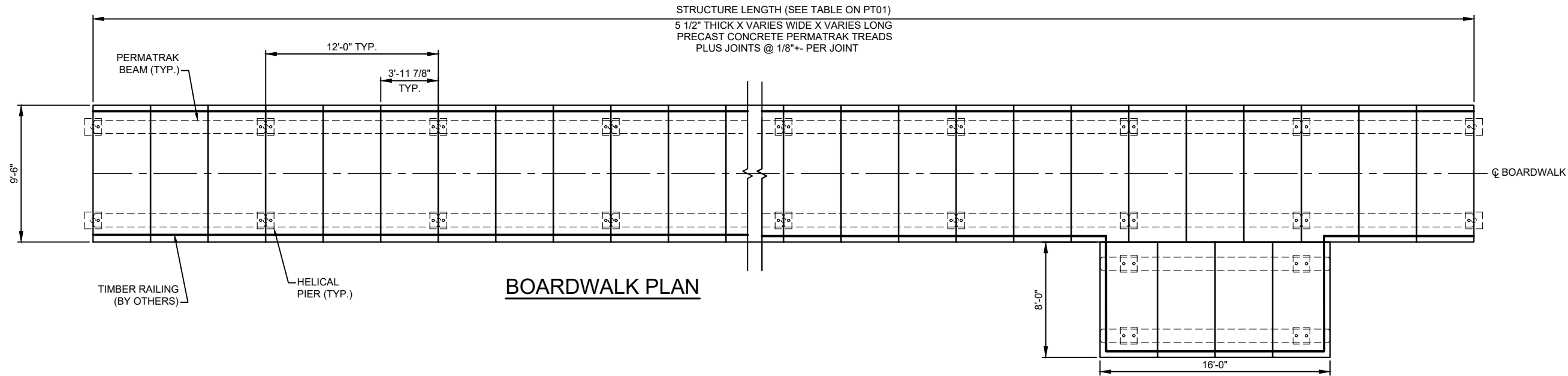
DESIGNED BY: KAS

DRAWN BY: KAS

CHECKED BY: KAS

SHEET NO.

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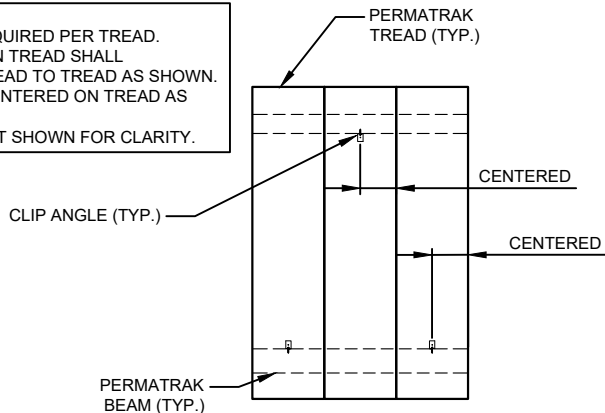


BOARDWALK PLAN

TYPICAL VIEW DECK PLAN

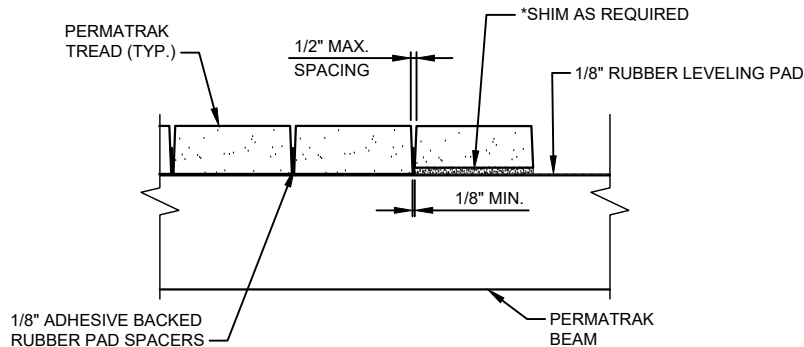
(2 REQUIRED)

NOTES:
1) ONE (1) CLIP ANGLE IS REQUIRED PER TREAD. LOCATION OF CLIP ANGLE ON TREAD SHALL ALTERNATE SIDES FROM TREAD TO TREAD AS SHOWN.
2) CLIP ANGLES SHALL BE CENTERED ON TREAD AS SHOWN.
3) RAILING AND/OR CURB NOT SHOWN FOR CLARITY.



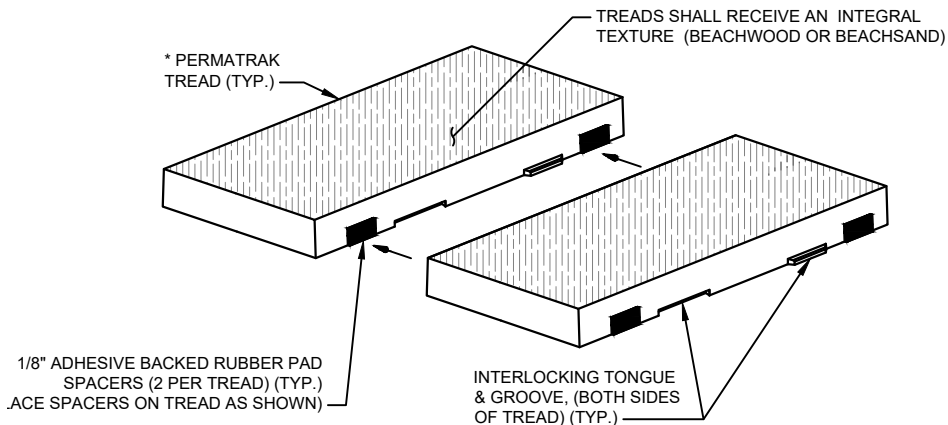
TYPICAL CLIP ANGLE LOCATION PLAN

APPLIES TO ALL TREADS



TYPICAL SHIM (UNDER TREAD) & TREAD SPACING DETAIL


SCALE: NOT TO SCALE



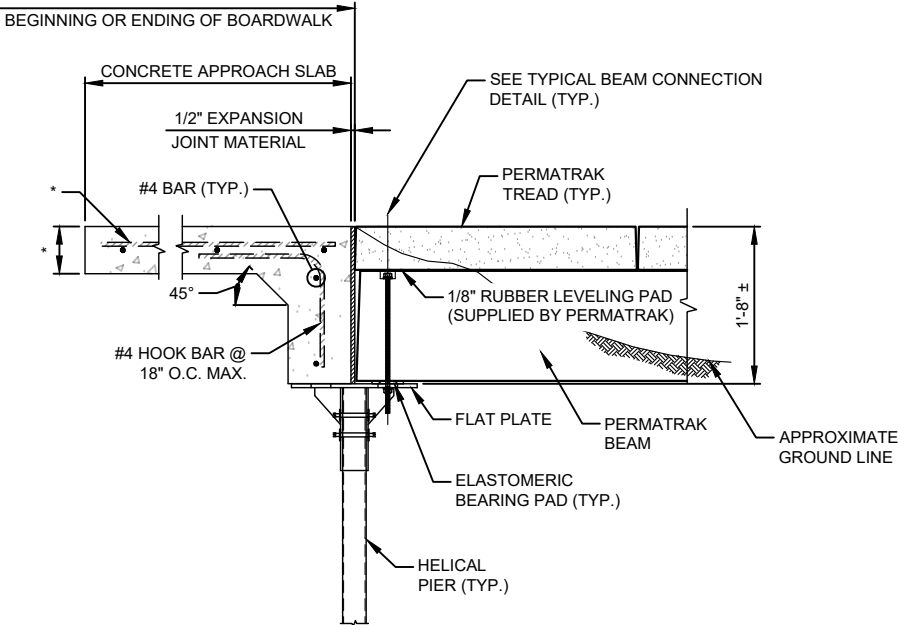
TYPICAL TREAD RUBBER SPACING DETAIL

SCALE: NOT TO SCALE

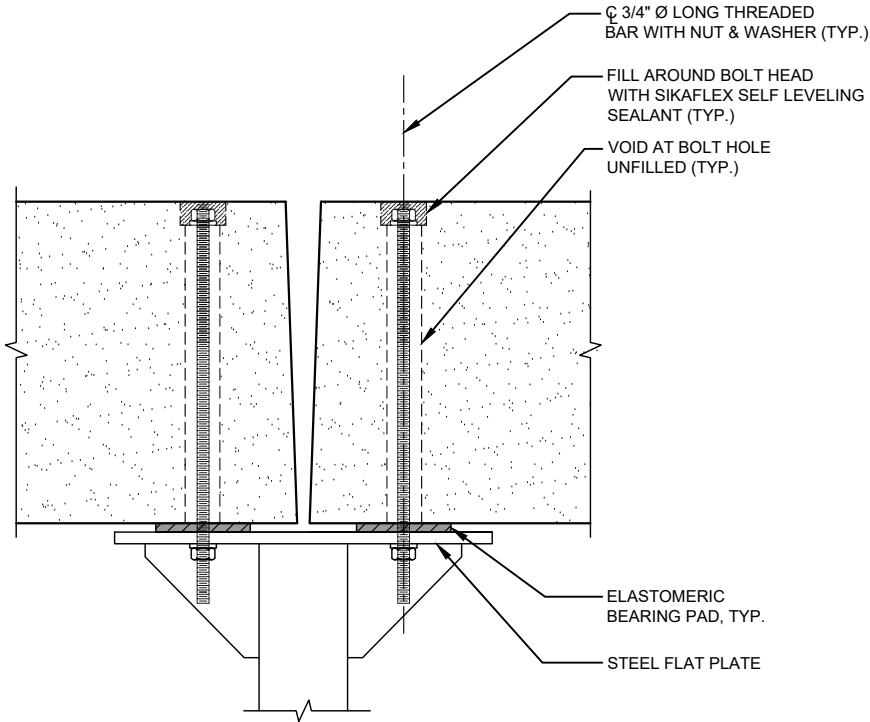
Patented Product: U.S. Patent #5,906,084 #8,302,362 #8,522,505 #8,839,588 #9,096,975

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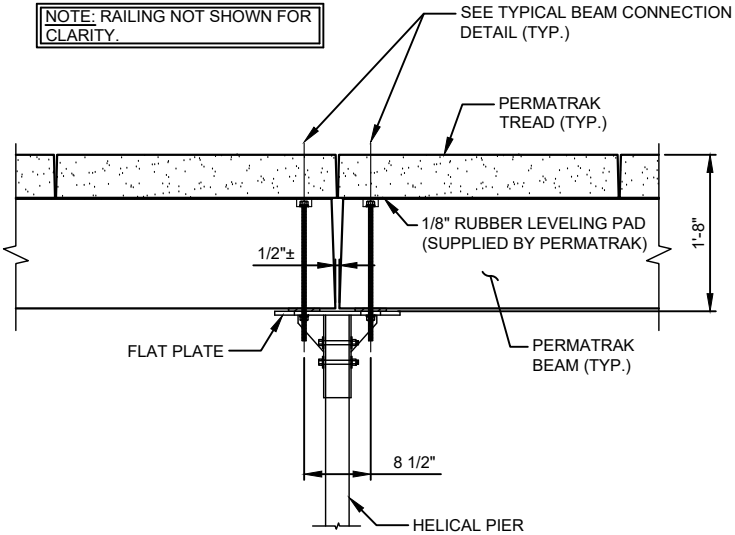
* SEE SITE DRAWINGS FOR DIMENSIONING, REINFORCEMENT, AND CONCRETE MATERIAL REQUIREMENTS OF APPROACH SLAB.



TYPICAL APPROACH DETAIL
SCALE: 1" = 1'-0"

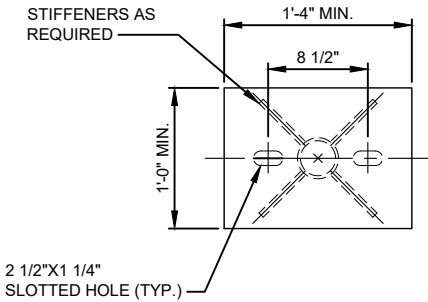


TYPICAL BEAM TO STEEL PLATE CONNECTION DETAIL
SCALE: NOT TO SCALE

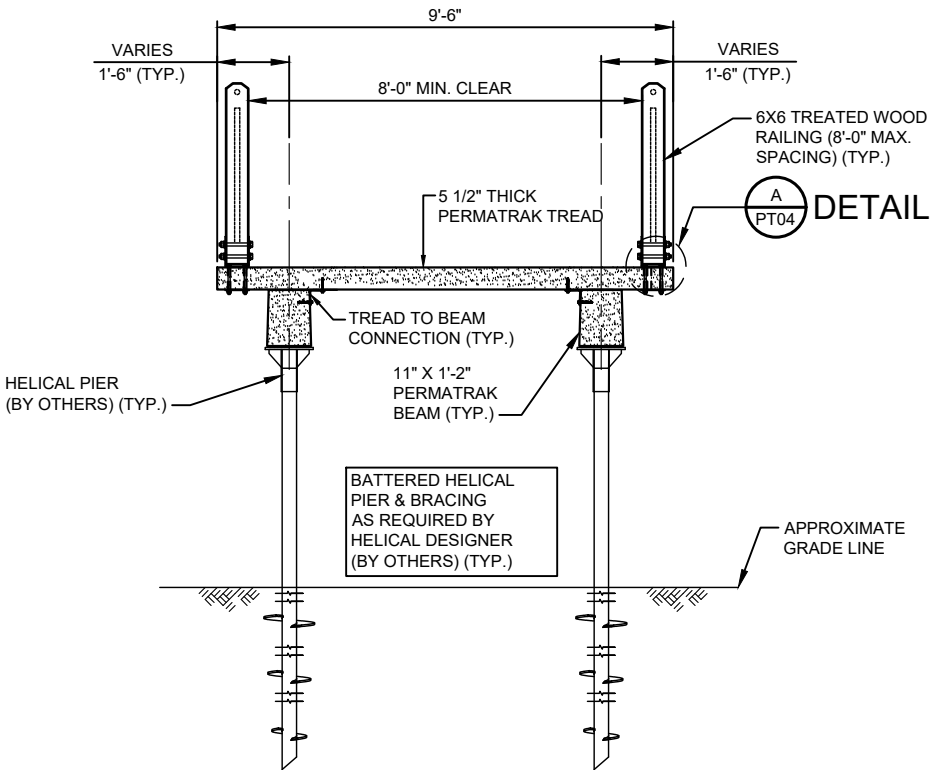
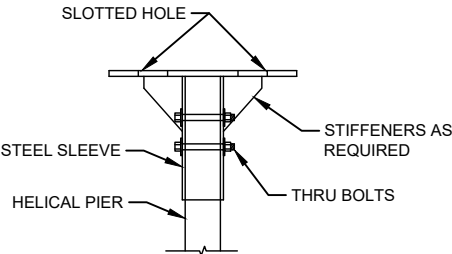


TYPICAL PIER CONNECTION DETAIL
SCALE: 1" = 1'-0"

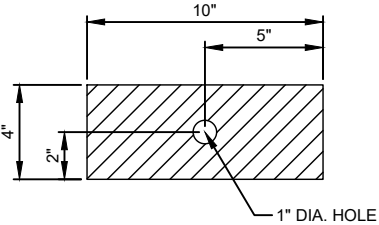
- HELICAL PIER NOTES:**
1. DESIGN OF HELICAL PLATE ASSEMBLY IS BY OTHERS. (SEE PTO1 FOR LOADS). PLATE DIMENSIONS AND SLOTTED HOLES SHALL BE AS SHOWN.
 2. HELICAL PIER, FLAT PLATE ASSEMBLY, STIFFENER PLATES, AND HARDWARE SHALL BE HOT-DIPPED GALVANIZED.
 3. DEPTH OF HELICAL PIER TO BE DESIGNED BY THE HELICAL PIER ENGINEER.
 4. CROSS BRACING OF HELICAL PIERS MAY BE REQUIRED FOR STABILITY AND SHALL BE DETAILED BY HELICAL PIER ENGINEER.
 5. IF STEEL SLEEVE EXCEEDS 6" O.D., CONTACT PERMATRAK FOR ADDITIONAL COORDINATION.



HELICAL PIER FLAT PLATE DETAIL
SCALE: NOT TO SCALE



TYPICAL SECTION



ELASTOMERIC PAD PLAN
SCALE: 3" = 1'-0"

Patented Product: U.S. Patent #5,906,084 #8,302,362 #8,522,505 #8,839,588 #9,096,975

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PREPARED FOR:

**NOWAK & FRAUS
ENGINEERS**

**FOR BIDDING PURPOSES
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PermaTrak®
The Concrete Boardwalk Company
www.permatrak.com TEL: 877-332-7862

OFFICE LOCATIONS

FLORIDA
TEXAS
LOUISIANA
NORTH CAROLINA
OHIO

PROJECT TITLE:

**HIGHLAND STREETSCAPE -
HIGHLAND BOARDWALK**
HIGHLAND, MI

JOB NUMBER: 2024-2381

DATE: 11/06/2024

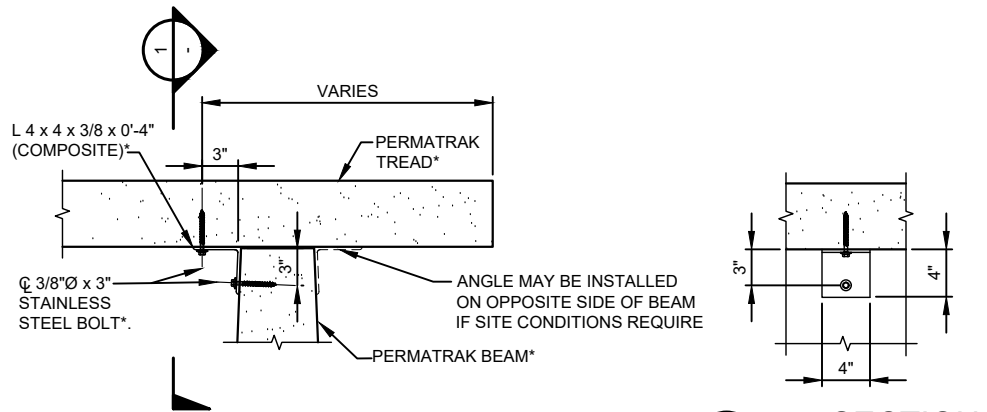
DESIGNED BY: KAS

DRAWN BY: KAS

CHECKED BY: KAS

SHEET NO.

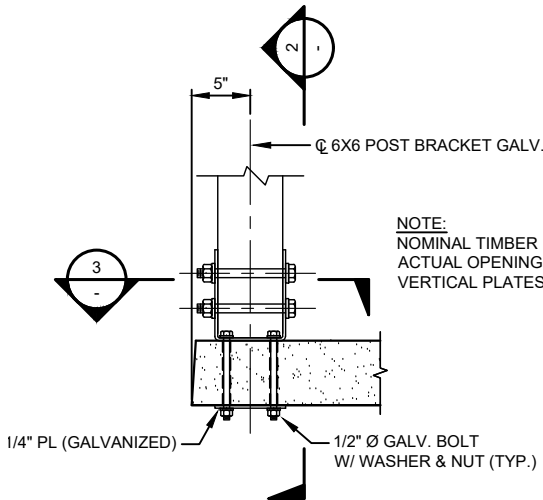
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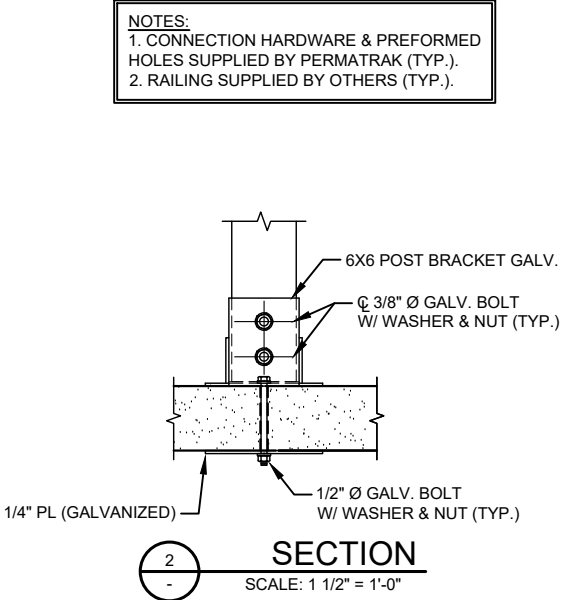
- NOTES:
1. ALL HOLES IN PRECAST SHALL BE DRILLED BY CONTRACTOR.
 2. DRILLED HOLES IN PRECAST SHALL BE 3/8"Ø AND INSTALLED PER MANUFACTURER INSTALLATION REQUIREMENTS.
 3. * INDICATES SUPPLIED BY PERMATRAK.
 4. ONE (1) CLIP ANGLE IS REQUIRED PER TREAD. LOCATION OF CLIP ANGLE ON TREAD SHALL ALTERNATE SIDES FROM TREAD TO TREAD. (SEE PLAN VIEW ON PT03).

TREAD TO BEAM CONNECTION
SCALE: NOT TO SCALE

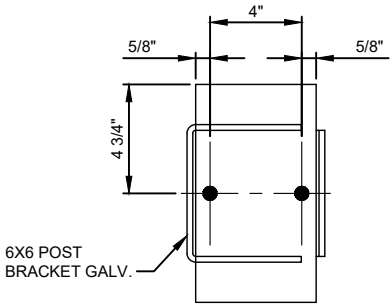
SECTION
SCALE: 1 1/2" = 1'-0"



DETAIL
SCALE: 1 1/2" = 1'-0"




SECTION
SCALE: 1 1/2" = 1'-0"



SECTION
SCALE: 3" = 1'-0"

- NOTES:
1. CONNECTION HARDWARE & PREFORMED HOLES SUPPLIED BY PERMATRAK (TYP.).
 2. RAILING SUPPLIED BY OTHERS (TYP.).

Patented Product: U.S. Patent #5,906,084 #8,302,362 #8,522,505 #8,839,588 #9,096,975

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ELEVATED PRECAST CONCRETE BOARDWALK

PROJECT SPECIFICATIONS

V4.1 UPDATED SEPTEMBER 2023

PRECAST CONCRETE BOARDWALK SYSTEM

PART 1-GENERAL

1.1 SUMMARY

- A. These specifications are for a precast concrete boardwalk and shall be regarded as minimum standards for this project. These specifications are based upon products designed and supplied by:

PermaTrak North America LLC
Ph: (864) 354-4870
Ph: 877-332-7862
www.permatrak.com
Contact: Mr. John Pyle
jpyle@permatrak.com

This item shall also include the design, specification, and construction of a railing and foundation system that is attached to the proposed boardwalk system.

- 1.2 MINIMUM STANDARDS: The selected boardwalk shall have the following minimum characteristics:

- A. The precast system shall be designed as a modular flexible system allowing a prescribed settlement at pier locations. Joints shall be designed for such movement to occur without damage to the structural integrity of the system.
- B. Boardwalk system (beams, treads, and curbs if applicable) must be reinforced precast concrete. A material change, including cast-in-place concrete, is not considered an equal to the design shown on the bid documents.
- C. Walking surface (treads) shall be made of reinforced precast concrete, and supported by reinforced precast concrete beams. Where applicable, edges of treads will receive precast concrete curbs.
- D. Walking surface (finish) of top surface of treads shall have a formliner finish with one of PermaTrak's standard textures. Texture must be integral with the concrete and shall not be an applied post pour wearing surface.
- E. Precast concrete treads shall be structural load bearing elements and shall interlock with one another via a "tongue and groove" connection.
- F. All precast shall consist of integrally colored concrete in a color selected by the owner from one of PermaTrak's "standard colors". All color pigment shall meet ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete.

- G. DESIGN LOADS: See PT01 for pedestrian and vehicular design live loads.

- H. Treads shall maintain a "boardwalk appearance", specifically meaning each tread shall have a width: length ratio ranging from a minimum of 3:1 to a maximum of 14:1. Width is defined as the tread dimension perpendicular to the normal direction of travel. Length is defined as the tread dimension measured in the direction of travel.

- I. Tread width shall be as noted on the contract drawings. Alignment should follow the horizontal and vertical alignment shown on the contract plans.

- J. Connectors for curbs (if applicable) to treads shall not be visible to boardwalk users while viewed from the top of the walkway.

- K. All tread-to-beam connectors shall be non-corrosive, and hidden from view. Metallic tread-to-beam connectors are not acceptable for this project.

- L. Boardwalk supplier shall provide a field representative on site for a minimum of 2 days. Field representative shall be knowledgeable in the installation of precast concrete boardwalks.

1.3 QUALITY ASSURANCE

- A. The contractor performing the installation of the pile foundations shall have installed piles of size and length similar to those shown on the plans for a minimum of three (3) years prior to the bid date for this project. The contractor shall submit a list containing at least three (3) projects completed in the last three (3) years on which the contractor has installed piles of a size and length similar to those shown on the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects.

- B. Manufacturer Qualifications: Not less than 10 years experience in the actual production of precast products as described below.

- Components shall be factory fabricated and engineered by single entity. This entity shall be registered to do business in the State of the project location.
- Boardwalk supplier (Precaster) for the boardwalk shall have in-house color mixing facilities for color pigmentation.
- Boardwalk supplier (Precaster) shall have either a minimum experience of 5 years or 50 boardwalk projects in design, production, and field consultation.
- Boardwalk supplier (Precaster) must be certified by PCI or NPCA.
- Precast components must be manufactured with the use of hot rolled steel skin in reinforced steel forms. Temporary (i.e., Timber) and/or single use forms are unacceptable unless approved in writing by the Boardwalk Engineer.

- C. Acceptability Criteria for Treads and Curbs (if applicable): The finished visible (in the final installed position) surface shall have no obvious imperfections other than minimal color or texture variations from the approved samples or evidence of repairs when viewed in good typical daylight illumination with the unaided naked eye at a 20 ft. viewing distance. Appearance of the surface shall not be evaluated when light is illuminating the surface from an extreme angle as it tends to accentuate the minor surface irregularities. The following is a list of finish defects that shall be properly repaired, if obvious when viewed at a 20 ft. distance. Patching (by a trained skilled concrete repair person) is an acceptable repair method.

- Ragged or irregular surfaces.
- Excessive air voids (commonly called bug holes) larger than ¼ in. evident on the top surface of the tread or curbs (if applicable).
- Adjacent flat and return surfaces with greater texture and/or color differences than the approved samples or mockups.
- Casting and/or aggregate segregation lines evident from different concrete placement lifts and consolidation.
- Visible mold joints or irregular surfaces.
- Rust stains on exposed surfaces.
- Units with excessive variation in texture and/or color from the approved samples, within the unit or compared with adjacent units.
- Blocking stains evident on exposed surfaces.
- Areas of backup concrete bleeding through the facing concrete.
- Foreign material embedded in the surface.
- Visible repairs at a 20 ft. viewing distance.
- Reinforcement shadow lines.
- Cracks visible at a 20 ft. viewings distance.

- D. Installer Qualifications: Firm with 3 years experience in installation of systems similar in complexity to those required for this Project.

- E. Mock-Up: Provide, if required by Architect/ Engineer, a mock-up for evaluation of the boardwalk showing the surface preparation techniques and application workmanship.

- Finish areas designated by Architect / Engineer.
- Do not proceed with remaining work until mock-up is accepted by Architect / Engineer.
- Refinish mock-up area as required to produce acceptable work.

1.4 DESIGN

- A. For applications requiring minimum disturbance due to tree roots or other existing objects specified by the Owner to be avoided during construction, the Boardwalk Manufacturer requires the Contractor or Engineer/Architect to provide a survey of the proposed boardwalk location identifying items of interest including tree roots that cannot be disturbed per the Owner.

- B. The designer of the boardwalk, foundation and railing system shall be a qualified registered Professional Engineer licensed in the State of the project location and having a minimum of 20 years of experience in the design of concrete structures, foundation and railing systems.

- C. The foundation design shown on the boardwalk drawings are based recommendations found in the geotechnical report entitled referenced on PT01 (if applicable).

- A. DESIGN CRITERIA: The design of the boardwalk and railing system shall comply with the following guidelines:

- AASHTO LRFD Guide Specifications for The Design of Pedestrian Bridges, 2nd Edition with 2015 Interim Revisions.
- Latest Version of AASHTO LRFD Bridge Design Specifications for Highway Bridges.
- Latest Version of American Concrete Institute - Building Code and Commentary.
- In addition to the dead loads of the system, the structure shall be designed for the live loads defined in Section 1.2 G above.

- 1.5 SUBMISSIONS: Prior to the start of fabrication or construction, the Contractor shall submit to the Engineer a design package, which shall include, but is not limited to, the following:

- A. FOR APPROVAL SUBMISSIONS: Prior to the start of fabrication or construction, the Contractor shall submit to the Engineer a design package, which shall include but not limited to the following:

- DETAILED PLANS:
 - PLAN VIEW: Full plan view of the boardwalk, foundation and railing system drawn to scale. The plan view must reflect the proposed horizontal alignment as shown on the design plans.
 - PARTIAL ELEVATION VIEW (IF REQUESTED): Full elevation view of the boardwalk, railing and foundation system drawn to scale which reflect the actual vertical alignment. Elevation views shall indicate the elevation at the top and bottom of the boardwalk and foundation system components.
 - DETAILS: Details of all boardwalk and railing system components and their connections such as the length, size and where changes occur; connections; etc.
 - CODE REFERENCE: Design parameters used along with AASHTO references.

2. CONSTRUCTION SPECIFICATIONS:

- Construction methods specific to the boardwalk vendor chosen. Submittal requirements such as certification, quality and acceptance/rejection criteria shall be included. Details on connection of boardwalk units and foundation system such that assurance of uniform load transfer shall be checked.

- B. FINAL SUBMISSION: Once a boardwalk, foundation and railing system design has been reviewed and accepted by the Owner, the Contractor shall submit the final plans. The designer of the boardwalk, foundation and railing system is responsible for the review of any drawings prepared for fabrication. One set of all approved shop drawings shall be submitted to the Engineer's permanent records.

- C. SUBMITTALS: Product Data: Submit Manufacturer's technical product data for railing components and accessories.
Manufacturer to supply submittal drawings for approval to include the following:

- Section-thru details.
- Mounting methods.
- Typical Elevations.
- Key plan layout.

- D. SHOP DRAWINGS: Shop drawings shall:

- Be stamped by a licensed Professional Engineer in the State of the project location.
- Show actual field conditions and true elevation and location supplied after field verification.
- Clearly detail reinforcement in beams, treads and curbs including clear dimension from concrete edge, size and amount of rebar.
- Clearly state concrete compressive strength, steel type and strength, and a listing of all component weights including lifting locations.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

- B. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings:

- Where field measurements cannot be made without delaying the railing fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products so as not to delay fabrication, delivery and installation.

- C. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

- Air entrained composed of Portland cement, fine and course aggregates, admixtures and water. The air-entraining feature may be obtained by the use of either an air entraining Portland cement or an air entraining admixture. The entrained air-content shall be not less than four percent or more than seven percent.

1.7 WARRANTY:

- A. Contractor will be responsible for installation defects associated with the boardwalk and abutment components, foundation system, and railings for a period of 12 calendar months from the date of final acceptance by the Owner.

- B. Boardwalk manufacturer shall warranty all precast concrete components against defects in material and workmanship for a period of 10 years.

- C. Railing manufacturer shall warranty the railing against defects in materials and workmanship for a period of 12 months.

1.8 MEASUREMENT AND PAYMENT

- A. Precast concrete boardwalk, railings, and foundations shall be paid for at the contract lump sum price as listed in the bid proposal for "Precast Concrete Boardwalk". This price shall include all materials, equipment, labor and work necessary for and incidental to the design, construction, delivery, unloading, assembly, and placement of the boardwalk and foundation as shown in the contract plans including all railings on the superstructure.

PART 2-MATERIALS & TESTING

2.1 PRECAST CONCRETE: shall conform to the following:

- The minimum compressive strength of the concrete shall be 4000 psi measured at 28 days.
- All precast concrete shall contain structural steel reinforcement as designed by the Engineer of record.
- All precast concrete components shall be air entrained composed of Portland cement, fine and course aggregates, admixtures and water. The air-entraining feature may be obtained by the use of either an air entraining Portland cement or an air entraining admixture. The entrained air-content shall be not less than four percent or more than seven percent.
- All reinforcing steel shall be standard uncoated steel conforming to ASTM A615

PART 3 - EXECUTION

1.1 PRECAST CONCRETE BOARDWALK

- A. Installation of the precast concrete boardwalk system and railings, if applicable, shall be performed in accordance to the approved plans and manufacturers installation instructions. Boardwalk manufacturer shall provide a field representative to review installation instructions with the Contractor and Engineer and to certify that the installation has been performed according to the approved drawings and manufacturer's instructions.

Patented Product: U.S. Patent #5,906,084 #8,302,362 #8,522,505 #8,839,588 #9,096,975

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