CTI Engineers, Inc.
1122 Riverfront Parkway
Chattanooga, TN 37402
Phone 423.267.7613
Fax 423.267.0603
www.ctiengr.com

LETTER OF TRANSMITTAL

TO:	Talley Construction Company, Inc.	ttfountain@talleyconstruction.net
	Brown Bros., Inc.	fgeismar@gamil.com
	Northwest Georgia Concrete, Inc.	rhoughton@northgeorgiaconcrete.com
	Core & Main	steven.curtis@coreandmain.com
	The Blue Book	emcveigh@mail.thebluebook.com
	Dodge Data & Analytics	dodge.bidding@construction.com
	Builders Exchange of Tennessee	heather@bxtn.org
	Associated General Contractors	planroom@agcetn.org
	ConstructConnect	amelia.mcmahan@constructionconnect.com

FROM: Philip Schofield, P.E.

DATE: April 19, 2021

PROJ. NO.: G20001-06

SUBJECT: Addendum No. 1
Catoosa County, GA
Jack Mattox Park Pond Improvements

PAGES: 19 pages to follow

PLEASE RESPOND ➔ ➔ ➔ ➔	**TO CONFIRM RECEIPT OF THIS ADDENDUM NO. 1 PLEASE SIGN AND EMAIL TO CTI** vvisco@ctiengr.com **Company** _____ **Signature** _____ **Title** _____ **Date** _____

ID 667988

ADDENDUM NO. 1
JACK MATTOX PARK POND IMPROVEMENTS
CATOOSA COUNTY, GEORGIA
PROJECT NO. G20001-06

The following changes shall ne made to the Contract Documents, Specifications, and Drawings:

I. CONTRACT DOCUMENTS

A. ***Section 00 11 00, Advertisement for Bids.*** REMOVE Page 00 11 00 - 1 and REPLACE with Page 00 11 00-1.1.

B. ***Section 00 42 00, Bid Schedule.*** REMOVE pages 00 42 00-1 through 00 42 00-3 and REPLACE with the attached Pages 00 42 00-1.1 through 00 42 00-3.1).

C. ***Section 00 43 80, Bidder Acknowledgement of Contract Time.*** REMOVE Page 00 43 80-1 and REPLACE with 00 43 80-1.1.

II. CLARIFICATIONS

A. Refer to Attachment A, for clarifications to bidder questions.

III. DRAWINGS

A. Refer to Attachment B, OUTLET STRUCTURE DETAIL shall REPLACE the detail of the name on DRAWING C201.

IV. SPECIFICATIONS

A. ADD Attachment C Specification for “Centrifugally Cast Concrete Pipe” (CCCPL) by Centripipe.

Date: April 19, 2021

CTI Engineers, Inc.
/s/ Philip R. Schofield, P.E.
Senior Project Manager

ADVERTISEMENT FOR BIDS

Owner: Catoosa County, Georgia

Separate sealed Bids for furnishing of all materials, labor, tools, equipment, and appliances necessary for the Jack Mattox Sport Complex Pond Improvements project will be received by the Owner at the Catoosa County Government Building, 800 Lafayette Street, Ringgold, GA 30736, until 2:30 p.m., local time, on Thursday, May 6, 2021 and then at said office publicly opened and read aloud.

The Project consists of the following major elements: rebuild pond dam, associated outlet structures, storm pipe, headwalls, stone spillways, and associated items at Jack Mattox Park in Catoosa County, Georgia.

Copies of the Contract Documents and Specifications, including bidding documents and requirements and Contract Drawings may be examined at the offices of the Engineer, CTI Engineers, Inc., 1122 Riverfront Parkway, Chattanooga, TN 37402 (phone 423/267-7613, fax 423/267-0603, www.ctiengr.com). Copies may be obtained there upon payment of $100 for each set. This payment is not refundable.

Bidders must be listed on Engineer's list of planholders who have purchased the Contract Documents, Specifications, and Drawings.

Engineer shall be provided with the following information: mailing address for U.S. Postal Service, physical delivery address, telephone and FAX numbers, name of contact person, and email address.

A Bid Bond of 5% of the total project cost is to be included in the proposal package. The successful Bidder will be required to furnish performance and payment bonds with the executed Contract meeting the requirements of the Contract Documents and executed on the forms attached to the Contract. The terms and time for payment are set forth in the Contract.

Surety and insurance companies must have an AM Best rating of A-10 or greater, be listed in the Federal Registry of Companies holding Certificates of Authority and Acceptable Sureties on Federal Bonds and be licensed by the Georgia Insurance Department and the Georgia Secretary of State to do business in the State of Georgia.

Contractor must have minimum Worker's Comp and General Liability Insurance in full force and effect. No proposal will be considered unless it is accompanied by satisfactory evidence that the Bidder holds Georgia State Contractor's License of proper classification and in full force and effect, in compliance with the provisions of O.C.G.A. Sec. 43-14-2 et seq. Pursuant to O.C.G.A. § 13-10-91, all contractors and sub-contractors performing work within the State of Georgia on a contract with a public employer must register and participate in a federal work authorization. Catoosa County will require certification for contractor that this requirement has been met.

Each Respondent shall submit with its proposal a copy of current Business License and/or Occupational Tax Certificate issued in the state it resides. If bidder cannot prove this license, it will be required to obtain one from Catoosa County if it is the Awarded Respondent.

BID SCHEDULE FOR UNIT PRICE
JACK MATTOX PARK POND IMPROVEMENTS
CATOOSA COUNTY, GEORGIA

Note: Unless otherwise stated, all bid items shall be a complete installation as specified and/or shown on the Drawings.

Item No.	Description	Unit	Est. No. of Units	Unit Price	Item Total
	SCHEDULE I				
00 66 13	**Performance and Payment Bonds (Maximum 2 % of Schedule I and Schedule II)**, Including Bonds	LS	1		
01 11 00	**Mobilization (Maximum 2.5%),** Including Submittals, Existing Utilities Location, and General Conditions	LS	1		
03 30 00	**Concrete**				
03 30 00a	**Class B Concrete (3,000 PSI)** for Utility Crossings and Other Areas Not Specified or as Directed by Engineer	CY	8		
03 30 00b	**Class A Concrete** (4,000 psi) for Anti-Seep Collar, Including Excavation, Form Material, Reinforcement Steel, Complete-In-Place	EA	1		
31 00 00	**Earthwork**				
31 11 00	**Clearing and Grubbing**	LS	1		
31 20 00a	**Demolition, Removal, and Disposal of Existing Pipe** Sections and Outlet Structures	LS	1		
31 20 00b	**Site Grading Complete with Earthen Embankment Construction,** Including Elevation Control, Site Layout, Construction Staking for Area Approximately .39 acres, Pond Cleaning and Grading Complete, Earthen Embankment Construction, Bentonite Clay, and Geotextile Matting to Finish Grades as Shown on Drawings	LS	1		
31 20 00c	Gravel Access Road Maintenance	LS	1		
31 25 00	**Erosion Control and Slope Protection**				
31 25 00a	**Silt Fence Type C,** Including Installation of Posts, Filter Fabric, Tie Wire, and Bracing and Removal After Site Stabilization	LF	240		
31 25 00b	**Construction Exit,** Including Installation, Maintenance, and Removal	EA	1		
31 25 00c	**Concrete Washout Structure,** Including Installation, Maintenance, and Removal	EA	1		
31 25 00d	**Erosion Control Matting,** Complete Installation as Shown and/or as Directed by The Engineer	SY	500		
31 25 00e	**Dewatering,** Including Dewater Structures, Pumping, Filtering, Etc.	LS	1		
31 25 00f	**Enhanced Rock Filter Dam,** Including Excavation, Rip Rap Stone Installation, Maintenance, and Re-grading to Outlet Protection upon Project Completion	EA	1		

Item No.	Description	Unit	Est. No. of Units	Unit Price	Item Total
31 37 00a	**6" - 12" Rip Rap Stone (Type 3),** Complete-in-Place Where Shown on Plans for Ditch Construction, Outlet Protection, Slope Protection, Check Dams, and as Directed by the Engineer. Includes Excavation and Filter Fabric Installation.	Tons	300		
31 37 00b	**6" - 12" River Stone /Creek Stone,** Complete-in-Place Where Shown on Plans for Ditch Construction, Outlet Protection, Slope Protection, Check Dams, and as Directed by the Engineer. Includes Excavation and Filter Fabric Installation.	Tons	400		
32 92 19	**Seeding and Mulch**, Including Seed, Fertilizer, Limestone, Mulch, and Water	SY	1,200		
32 93 10	**Landscape Repair Allowance**	LS	1	$ 7,500.00	$ 7,500.00
33 40 00a	**36-inch Diameter Reinforced Concrete Pipe (RCP),** Including Excavation, Disposal of Soil and Debris, Bedding and Backfill; Complete-in-Place	LF	48		
33 40 00b	**Concrete Outlet Structure**, Including Excavation, Bedding, Natural Stone Veneer, Anti-Floatation Block, Frame and Grate, Complete-In-Place	EA	1		
33 40 00c	**Pre-cast Concrete Headwall**, Including headwall for 36-inch RCP, excavation, bedding, and backfill, Complete-in-Place	EA	1		
	TOTAL SCHEDULE I			**$**	
	SCHEDULE II				
33 05 39	**Centrifugally Cast Concrete Pipe (CCCPL) Stormwater Pipe Protective Lining Method**				
33 05 39a	Pre-Installation Pipe Cleaning	LF	250		
33 05 39b	Pre-Installation Video	LF	250		
33 05 39c	CCCPL Lining Installation (48" CMP)	LF	250		
33 05 39d	Post-Installation Video	LF	250		
	TOTAL SCHEDULE II			**$**	
	BID SUMMARY				
	TOTAL SCHEDULE I			**$**	
	TOTAL SCHEDULE II			**$**	
	TOTAL SCHEDULES I AND II			**$**	

Notes:

1. Contractor shall Bid on all Schedules.

2. The Owner may award any combination of Schedules. Contract will be awarded (if it is awarded) to the responsible and responsive Bidder submitting the lowest Bid sum in the selected combination of Schedules.

3. Some schedules may not be awarded.

4. Contractor certifies that he has reviewed the Drawings and Specifications and that all work not specifically listed in the Bid Schedule is included in the prices for various items listed in the Bid Schedule.

BIDDER		**DATE**
BY	**(Signature)**	**TITLE**
ADDRESS		
CITY	**STATE**	**ZIP**
TELEPHONE	**E-MAIL**	

BIDDER ACKNOWLEDGMENT OF CONTRACT TIME

By signature below, Bidder acknowledges and agrees that the 45 consecutive calendar days for contract time for substantial completion of the work included in Schedule I of these Contract Documents is either:

1. Sufficient, barring changed conditions, acts of God, or abnormal weather conditions that would justify time extensions; or

2. Insufficient, in which case the Contractor agrees that the price bid includes an allowance for liquidated damages of adequate magnitude to cover the additional time required to complete the work.

Bidder Name _____

Signature _____

Attest:

_____

ATTACHMENT A
Jack Mattox Sports Complex Pond Improvements Project
Pre-Bid Questions

1. Drawing C002 appears to be the Erosion Control plan. Will the construction access for work be limited to the Gravel Maintenance Road shown on drawings C001 and C002 or will other routes of access be considered?
   BMPs are shown on C002 and C003. The existing gravel maintenance road is the most logical location for ingress/egress to the work site. The selected contractor may coordinate with Catoosa County regarding alternate routes.

2. Please provide a typical section of the Gravel Maintenance Road to beinstalled.
   The gravel maintenance road is existing. Contractor will be required to maintain/restore the gravel as needed. A pay item for gravel road maintenance is being added to the bid schedule. See the revised bid schedule in this addendum.

3. Will the Gravel Maintenance Road remain in place or will contractor be required to remove at the completion of the project?
   Catoosa County's existing road shall remain in place at the conclusion of the project. See answer to question 2 above.

4. The limits of disturbance are shown on drawing C002 only at proposed embankments 1 and 2 and at the existing dam where the CMP's are to be removed, new 36" RCP and control structure to be installed. Is there any clearing, cleaning of the existing pond area or other work expected outside of these 3 areas and within the project location area shown?
   There is no work outside of the delineated areas.

5. Bid Item 31 20 00 b notes "Pond Cleaning". Please provide the limits andextent of this item.
   Pond cleaning is limited to the areas required to install the embankments, dam, and spillway infrastructure. See answer to question 4 above.

6. What is anticipated date of contract award?
   After bids are opened, the engineer will prepare a bid tabulation and an award recommendation for the Catoosa County Board of Commissioners (BOC). The BOC meets the first and third Tuesday of every month at 6:00 pm.

7. On sections on drawing C102 Compacted Select Clay Soil is indicated below the 2" Pondseal bentonite layer. Is the entire embankment section to be this material or only a layer such as 12" in thickness?
   The entire wedge of soil in each embankment is to be select earth backfill covered with a 2" Pondseal layer and river stone. Refer to Specification Section 31 2000 for the definition of Select Earth Backfill.

8. It appears there is not a specification section for furnishing and installation of the bentonite Pondseal product(s) or gradations, etc. for the Select Clay Soil material. Please provide and provide soil/ bentonite mixture ratio.
   Pondseal is a trademarked product that also goes by the name AquaBlock 2080FW. The 2" bentonite layer shall not be amended and shall be Pondseal or approved equivalent.

9. Can we be provided with budget / estimated value of this project?
   Refer to the Georgia Procurement Registry.

10. Will a list of plan holders be provided?
    A list of plan holders can be found at www.ctiengr.com

11. Are there any special disposal requirements for the materials and water inthe existing pond limits?
    Catoosa County ordinances require all access materials not used onsite to be taken to an offsite permitted location.

12. Please provide details and description of the work contractor is to provideat the existing structure on the North end of the existing 48" CMP to be lined.
    See the attached specification for Centrifugally Cast Concrete Pipe (CCCPL) Stormwater Pipe Protective Lining Method.

13. Can the bid date be extended to allow 2 weeks for bid preparation afterthe receipt of answers to all pre-bid questions?
    The bid opening date will be extended to May 6, 2021, at 2:30 p.m.

14. Can the duration be increased from the 45 days? Due to current availability and lead times for materials combined with any permitting durations required 45 days may not be achievable.
    Careful consideration was made when the 45-day contract time was selected. The 45-day duration is for Schedule I work only. The time allotted for Schedule I does not begin until Schedule II is completed.
    Refer to Specification Section 00 43 80 and Section 01 11 01.

15. Summary of work 1.2, A, 5 notes contractor will be required to obtain permits. Please clarify what permits contractor will be required to provideand what permits that Catoosa County will have in place or be obtaining.
Disturbance is estimated to be less than 1-acrre but is also in a sensitive area. While an NPDES Permit and N.O.I. will not be required for this site, erosion controls shall be installed and maintained for the duration of the project in accordance with the Manual for Erosion Sedimentation Control in Georgia. The selected contractor will be required to coordinate work with the Catoosa County Planning & Zoning Office, the Parks & Recreation Department, and CTI RPR.

16. Has there been any soil borings and/or geotechnical investigationsperformed?
No

17. Has there been any hydrology studies performed to provide storm water runoff flow data?
Yes, the improvements have been designed utilizing hydrologic and hydraulic calculations.

18. Information for Bidders Item 12 notes requirement of payment and performance bonds. Please confirm percentage of contract amount. 100%is common?
Refer to Specification Section 00 72 00, Paragraph 22.1

19. Please clarify limits on the scope of work that bid item 32 92 10 Landscapeallowance of $7,500.00 will cover. Will this cover all landscaping repair work or is contractor to include anticipated landscape repair costs in otherbid items?
We do not know the extent of the existing landscaping that is anticipated to be damaged, but we are estimating approximately $7,500 of repairs or replacements to landscaped elements. If bidder anticipates needing more money to take care of the landscaping damage, they need to include that money in other items.

20. The dimensions for the outlet structure on drawing C201 are shown to be 62” x 62”. The top grating is shown as 54” x 54” plus a clearance of ½” on the inside face of the wall. This will provide a concrete wall thickness of only 3-1/2” if the 62” dimension is outside of concrete. The stone veneer thickness of 4” to 5” will increase overall outside dimension to 70” to 72”.Please confirm concrete dimensions.
The top grating should have been labeled as 45” x 45”. See the Attachment B figure titled Outlet Structure Detail in this addendum.

21. Is there a video, inspection report or any additional information on the existing conditions inside and of the existing 48” CMP to be lined?
Existing video and/or inspection reports do not exist. A pay item for video inspection will be included along with the cleaning. See the revised bid schedule in this addendum.

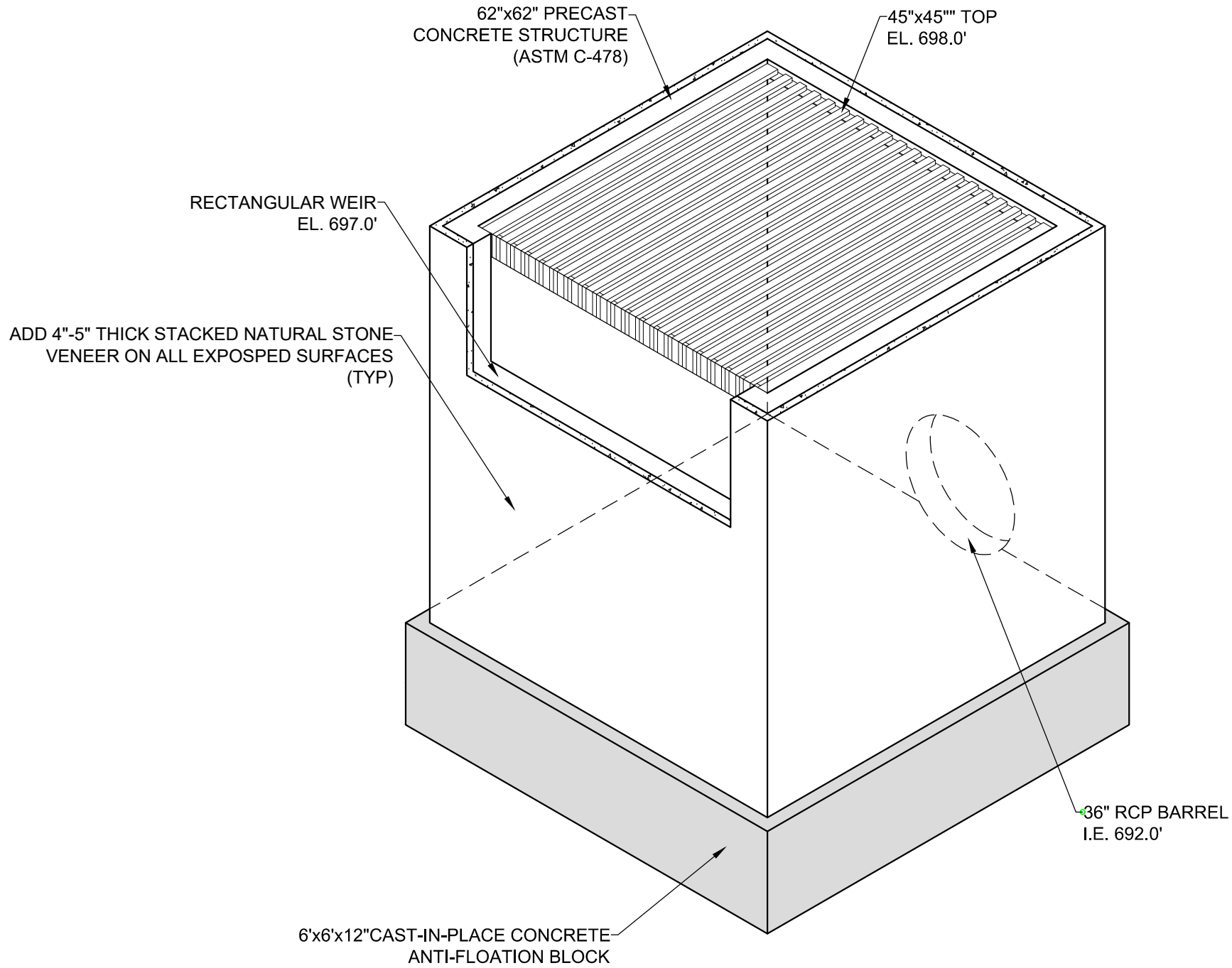
22. On drawing C102 at sections B and C, please provide dimensions of the bentonite clay plugs and the length, if at bottom only, up slopes, etc.
The bentonite clay plug is intended to a keyway for the full width of the embankment. The depth of the plug needs to be at least 12" and the width can the typical backhoe bucket width (2' or 3' wide).

23. Bid Item 03 30 00a; 8 CY of Class B Concrete: Where does this occur?
This pay item is on an as-needed basis in area as directed by the engineer.

24. Will contractor be required to replace areas of existing asphalt walkways damaged or requiring removal at crossings, etc.? Can an additional bid schedule line item be provided accordingly?
The intent is for the contractor to minimize damage to existing asphalt and/or walkways. The cost for repairs to damaged asphalt walkways should be in other pay items.

25. Would a HDPE slip lined method be considered in lieu of the CCCPL on the existing 48" CMP? Perhaps an additional alternate bid item?
HDPE will not be considered. CCCPL is the preferred repair method.

ATTACHMENT B



OUTLET STRUCTURE DETAIL

N.T.S.

ATTACHMENT C

CENTRIFUGALLY CAST CONCRETE PIPE (CCCPL)
STORMWATER PIPE PROTECTIVE LINING METHOD

INSTALLATION SPECIFICATION GUIDELINE

CENTRIFUGALLY CAST CONCRETE PIPE (CCCPL)
STORMWATER PIPE PROTECTIVE LINING METHOD
BY CENTRIPIPE®

1 **Intent:** It is the intent of this specification to provide minimum standards for materials and methods for waterproofing, sealing, structural reinforcement and corrosion protection of existing storm water corrugated metal, concrete, brick/mortar masonry, and clay pipe. The centrifugally cast concrete pipe (CCCPL) **(Centripipe)** should extend over the specified length in a continuous structural concrete pipe within a pipe. This specification offers flexibility in design by offering technologies available for repairing the various defects found in these structures.

2 **Applicability:** These repair means and methods may be engineered for the depth, diameter, shape, traffic loading, groundwater pressures and condition of corrosion.

3 **Referenced Standard**

ASTM C-76	ASTM C-76 - Standard Specifications for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C-109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
ASTM C-157	Modified Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
ASTM C-1609	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
ASTM C-309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C-403	Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
ASTM C-469	Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression
ASTM C-496	Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
ASTM C-666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C-882	Standard Test Method for Bond Strength of Epoxy Systems Used with Concrete by Slant Shear
ASTM A-979	Standard Specification for Concrete Pavements and Linings Installed in Corrugated Steel Structures in the Field
ASTM C-1090	Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout
ASTM C-1202	Standard Test Method for Electrical Indication of Concretes Ability to Resist Chloride Ion Penetration
ASTM C-1315	Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

4 **Preparation**

4.1 Safety: The Local & Federal Safety regulation and Contractor shall carry out his operations in strict accordance with all applicable OSHA standards. Particular attention is drawn to those safety requirements involving entering confined spaces, local and Federal Safety regulation.

4.2 Flow Control: Before CCCPL installation, all laterals and drop inlets must be sealed with a temporary plug. The Contractor, when required, shall provide for the flow of water around the section or sections of main pipe where the rehabilitation is located. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system or similarly suitable method. Pump and bypass lines shall be of adequate capacity to handle the flow. Once the desired liner thickness is met, CCCPL material shall be allowed six hours curing time prior to all plugs being removed from the

laterals and drop inlets and flows re-instated.

4.3 TV Inspection: Inspection of pipelines shall be performed by experienced personnel trained in closed-circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any conditions which may prevent proper installation, and it shall be noted so that these conditions can be corrected. A videotape/CD/DVD and log sheet shall be kept for later reference by the owner.

4.4 Obstruction Removal: It shall be the responsibility of the Contractor to clear the line of obstructions such as debris, dropped joints, roots, protruding lateral or collapsed pipe that will prevent installation. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, then the Contractor shall notify the owner. The owner may instruct the Contractor to make a point repair excavation to remove or repair the obstruction. Such excavation shall be approved in writing by the Owner's Representative prior to the commencement of the work and shall be considered as a separate pay item.

4.5 Infiltration Control: Areas of water seepage shall be sealed off by an approved method. Pools of water shall be removed; however, a dry surface is not required. The Contractor shall patch holes and fill voids in and around existing pipe as directed by the Engineer.

4.6 Cleaning: It shall be the responsibility of the Contractor to remove all debris from the pipe. The interior surface shall be cleaned with a high-pressure water-blast sufficient to remove all laitance and loose material and flush debris from the pipe.

5 Invert Repair Mortar

5.1 PL-12,000 Invert Repair Mortar

1. The material, **CENTRIPIPE® PL-12,000**, is an ultra-high strength, high build, abrasion resistant and corrosion resistant mortar, based on advanced cements and additives including rust inhibitors. When mixed with the appropriate amount of water, a self-consolidating free flowing material will develop with high 24 hour compressive strength and adhesion.

2. The hardened material is dense and highly impermeable. The above performance is achieved by a complex formulation of mineral, organic and densifying agents and sophisticated chemical admixtures. Graded quartz sands are used to enhance particle packing and further improve the fluidity and hardened density. The composition also possesses excellent thin-section toughness, high modulus of elasticity and self-bonding.

3. The water content may be adjusted to achieve consistencies ranging from free flowing to plastic. Despite its workability, the mortar has excellent wet adhesion.

4. Physical Properties

Set Time at 70 °F ASTM C-403	
Initial Set	Approx. 1 hour 30 minutes
Final Set	Approx. 4 hours
Flexural Strength ASTM C-293	
24 hours	min. 800 psi psi
28 days	min.1200 psi
Compressive Strength ASTM C-109	
24 hours	5,000 psi
28 days	11,500 psi
Split Tensile Strength ASTM C-496	700 psi
Shear Bond ASTM C-882	1,720 psi

Modulus of Elasticity ASTM C-469	
28 days	min. 3.48 [10.6]
Freeze Thaw ASTM C-666	300 Cycle Pass
Chloride Permeability ASTM C-1202	<550 Coulombs

6 Centrifugally Cast Concrete Pipe (CCCPL)

6.1 PL-8,000 Pipe Lining Mortar

1. The material, **CENTRIPIPE® PL-8,000**, is a high strength, high build, abrasion resistant and corrosion resistant mortar, based on advanced cements and additives. When mixed with the appropriate amount of water, a paste-like material will develop which may be sprayed, cast or pumped into any area ¼ inch and larger.

2. The hardened liner is dense and highly impermeable. The above performance is achieved by a complex formulation of mineral, organic and densifying agents and sophisticated chemical admixtures including rust inhibitors. Graded quartz sands are used to enhance particle packing and further improve the fluidity and hardened density. The composition also possesses excellent thin- section toughness, high modulus of elasticity and self-bonding. Fibers are added as an aid to casting, for increased cohesion and to enhance flexural strength.

3. The water content may be adjusted to achieve consistencies ranging from plastic to modeling clay. Despite its workability, the mortar has good wet adhesion and does not sag or run after placement. The mortar may be cast against soil, metals, wood, plastic or other normal construction material.

4. Mortar / material **MUST** be specifically designed for the horizontal pipelining process / CCCPL and show 10 years of experience as manufacturer of said process and equipment.

5. Per ASTM C-76, in no case, however, shall the proportion of Portland cement, blended with hydraulic cement, or a combination of Portland cement and supplementary cementing materials, be less than 470 pounds per cubic yard.

6. An admixture shall be included in the precise quantity required to promote the internal growth of a crystalline membrane structure in the otherwise watery pore space of a typical hardened hydrate system. The admixture shall react with unbound water and existing unstable calcium hydroxide hydrates to form a very strong and dense additional component to the Portland cement hydrate matrix. The addition of this specialty mineral enhances the autogenous healing process of the PL-8000 design. This characteristic shall be documented

7. Mortar / material must have a minimum of **five State DOT approvals** and at least one that has done materials testing and evaluation

8. **Materials** must be **cementitious** in origin and any other materials that are not cementitious in nature will not be considered as an equal under any circumstances.

6.1.7 Physical Properties

Set Time at 70 °F ASTM C-403	
Initial Set	Approx. 170 minutes
Final Set	Approx. 300 minutes
Flexural Strength ASTM C-293	

24 hours	min. 1,200 psi
28 days	min.1,530 psi
Compressive Strength ASTM C-109	
24 hours	4,000 psi
28 days	10,000 psi
Split Tensile Strength ASTM C-496	835 psi
Shear Bond ASTM C-882	2,900 psi
Modulus of Elasticity ASTM C-469	
28 days	min. $5.26^{10.6}$
Freeze Thaw ASTM C-666	300 Cycle Pass
Chloride Permeability ASTM C-1202	<50 Coulombs

Approved Products and Manufacturers:

A.) PL 8,000 manufactured by AP/M Permaform, or engineer approved equal
B.) PL 12,000 manufactured by AP/M Permaform, or engineered approved equal

6.2 Design Criteria

1. The wall thickness design shall be based upon the compressive and bending strength of the liner material. The design loading shall be the sum of any changes in the cover depth after the liner's installation and the appropriate highway truck loading for the culvert pipe taking into account the type of soil used for the road's fill and the type of pavement structure (rigid or flexible). The calculated minimum finished thickness of the liner shall be based on a maximum possible crack width of 0.0625-inches with a factor of safety of 2.0.

2. The Liner thickness shall be applied to the thickness specified by the engineer but at no point shall it be less than the required minimum of ½-inch. For structural plate culvert materials, the cover over the projecting bolts shall be a minimum of ½-inch, making the minimum applied thickness for these culverts 1.0-inches. As Per ASTM A979 this thickness is to be measured from the I.D. of the pipe, or the top of the inward corrugation's crest for CMP. For special pipelines a project specific design Sealed by a third party Consulting PE shall be submitted with calculations for thickness and any additives or reinforcement necessary to meet project goals set by the Project Engineer.

3. If additional thickness is desired at any section, simply place the rotating applicator at that section and recommence pumping and retrieval until that area is thickened. Additional layers may be applied at any time after initial set.

6.3 Centrifugally Cast Concrete Pipe (CCCPL) Installation

1. Equipment: Mortar mixers, compressors and pumps are standard commercial models. The high-speed, bi directional rotating applicator device is used to provide a densely compacted liner of uniform thickness and thorough coverage.

2. Mixing

6.3.2.1 Combine 50 pounds of the packaged dry mix with the specified amount of potable water while mixing with a high-speed shear mixer until proper consistency is obtained. Continue to agitate the mortar to prevent thickening beyond the desired fluidity. The

working time is approximately 30 minutes depending upon conditions.

3. Application

6.3.3.1 A bi-directional rotating Spincaster shall be used to ensure even liner thickness. The Spincaster shall be positioned within the center of the pipe and commence pumping the mixed mortar. As the mortar begins to be centrifugally cast evenly around the interior, retrieve the applicator head at the best speed for applying the thickness that has been selected. If flows are interrupted for any reason, simply arrest the retrieval of the applicator head until flows are restored.

6.3.3.2 The retrieval speed can be easily varied to create different thickness as the condition may dictate to provide sufficient strengths. Because of the even application throughout the circumference, thickness may be verified at any point.

6.3.3.3 If additional thickness is desired at any section, simply place the rotating applicator at that level reverse rotation direction and recommence pumping and retrieval until that area is thickened. Built-in bonding agents allow additional layers to be applied at any time.

6.3.3.4 The pressure application from the centrifugal casting of the mortar produces a finely textured surface that requires no additional troweling or finishing

6.3.3.5 CCCPL / Centrifugally spin casting is required on ALL pipes sized 30″ to 120″ in diameter, anything above 120″ pipe diameter will be hand applied.

4. Hot Weather Application (Above 80° F)

6.3.4.1 Do not apply Centripipe mortars when ambient and surface temperatures are 100° F or 35° C and above. Shade the material and prepared the surface to keep it cool.

6.3.4.2 To extend working time, mix the material with cool water or ice-cooled water. Be certain the substrate is saturated surface-dry (SSD) before application begins.

6.3.4.3 Proper curing is always required and is particularly important in hot weather.

5. Cold Weather Application (Above 45° F):

6.3.5.1 Do not apply Centripipe mortars when ambient temperatures are expected to fall below 45°F or 7° C within 72 hours of placement. Both ambient and substrate temperatures must be at least 45° F or 7° C at the time of placement.

6.3.5.2 Low substrate and ambient temperatures slow down rate of set and strength development. At temperatures below 45° F or 7° C, warm the material, water, and substrate. Properly ventilate the area when heating. Protect the new liner from freezing.

7 Submittals

7.1 All submittals shall conform to the requirements of the Contract document.

7.2 In addition, the following items may be required of the installer to be submitted to the engineer at the sole discretion of the engineer. This Contract shall not be considered complete until receipt and acceptance of the following:

1. Reference submittals
   - 7.2.1.1 Contractor shall submit certification from the manufacturer that they are licensed and trained.
   - 7.2.1.2 Material certification, Manufacturer **MUST** have 10 years of experience in cementitious mortar production for centrifugal application specifically designed for horizontal pipe lining process.
   - 7.2.1.3 Contractor shall submit verifiable references showing a minimum of 5,000 lineal feet completed within the past three years or have a competent technical services manager on site to oversee the given project.
   - 7.2.1.4 Contractor shall provide an Engineering Design Guide upon request to prove the authenticity of calculations. In addition, a certified engineer's stamp will be required to approve the final design.
2. Product data
   - 7.2.2.1 Patching and plugging material
   - 7.2.2.2 Cementitious lining material
   - 7.2.2.3 Cementitious lining with admixture
   - 7.2.2.4 Independent third party testing reports less than (3) years old.

8 **Submittal Documents Continued**

8.1 Mortar materials seeking pre-approval as an equal must supply the engineer with documentation that can be used to verify if such status should be granted. The currently approved product is an engineered cementitious mortar material designed specifically for the pipe rehabilitation application. Culvert and storm sewer piping is constructed from a variety of materials including, but not limited to; concrete, brick, corrugated metal pipe (with either a galvanic, bituminous, aluminized, or plastic coating), The proposed equal must be capable of adhering to these materials without compromising its densification until the material has its initial set.

8.2 A description of the proposed proprietary mortar mix in sufficient detail as to convey its uniqueness from an ordinary mortar mix containing sand, fine sand, cement, and water. Further, the submittal should indicate exactly how long the proposed formulation has been used commercially on similar application projects; including a list of reference projects spanning this timeframe to substantiate performance.

8.3 Thixotropy – the cement mortar mix must possess the ability to liquefy (or experience a significant decrease in viscosity) when a stress is applied (i.e. stirred) that creates a fluid mixture that can be transported (i.e. pumped) distances up to 400 feet without separating; and once cast into place on the wall of the host pipe structure quickly revert (experience a dramatic increase in viscosity returning to its pre-stressed viscosity) to the provide sufficient "hang-time" for the mortar applied to take its initial set.

8.4 Permeability – the level of permeability of the hardened liner must be classified as "negligible" per the table in the cited ASTM C-1202. The testing documentation should show that the coulomb values from a statistically significant number of test batches are demonstrated to be below the 50 coulomb threshold values for meeting this classification.

8.5 Modulus of Rupture – given that the owner wants to minimize the need for additional reinforcement beyond the mix of fibers incorporated into the mix design; testing done verifying the MOR for the proposed material must be submitted for review. Said testing reports generated by a third-party lab should also include the stress-strain curves generated by the testing to show the shape of the trailing part of the curve.

8.6 Rate of Compressive Strength Gain – Third-party testing shall be submitted which demonstrates the relationship between the time of placement and the gain in compressive strength of the proposed mortar mix. The results shall be presented in a graphical format to demonstrate the anticipated compressive strength at 1, 3, 8, and 24 hours; and 1, 7, 14, 28, and 56 days. Curves should be fitted to these test values and equations of the fit and the accuracy of the fit (the "R" value) shall be displayed on these two plots.

8.7 Freeze-Thaw Performance – beyond the test results of the ASTM C-666 commonly employed in the industry; where the project is deemed to be susceptible to actual freeze-thaw action, the supplier of the proposed alternative mix design shall submit a reference list of installations in this demanding type of environment. Said list shall also indicate the date of the install and whether or not there have been follow-up inspections to verify this performance parameter.

9 Product Handling

9.1 Special handling is not required for CENTRIPIPE® mortar. Normal precautions for "nuisance dust" shall be observed. Consult Material Safety Data Sheet for details.

9.2 The Contractor shall carry out his operations in strict accordance with all applicable OSHA standards. Particular attention is drawn to those safety requirements involving entering confined spaces.

10 Quality Assurance and Acceptance

10.1 Two test cubes of the **CENTRIPIPE®** material shall be taken randomly as directed by the inspector at owner's expense to verify strengths. Thickness can be verified with a wet gage at any random point of the new interior surface. Any areas found to be thinner than minimum shall immediately receive additional material. Visual inspection should verify a leak-free, uniform appearance. Additionally, must **meet C-109 ASTM** testing standards.