

VILLAGE OF DOWNERS GROVE

Report for the Village

SUBJECT:	SUBMITTED BY:
Award of Contract – Design/Build 11’ Diameter Pipe Rehabilitation and Repair	Scott Vasko Director of Engineering

SYNOPSIS

A resolution has been prepared authorizing execution of a three-year contract to Vortex Lining Systems LLC of Houston, TX, in the amount of \$8,502,000.72 for Design/Build Services for the 11’ Diameter Pipe Rehabilitation and Repair.

STRATEGIC PLAN ALIGNMENT

The goals for 2024 to 2026 include *Top Quality Infrastructure*.

FISCAL IMPACT

The FY25 budget includes \$3,000,000 in the Stormwater Fund for this Design/Build repair and rehabilitation. The FY26, FY27, and FY 28 projected budgets include \$3,000,000 each.

RECOMMENDATION

Approval on the April 8, 2025, active agenda.

BACKGROUND

An 11’ diameter pipe carries the flow from St Joseph Creek through (under) the Downtown Business District (DBD) – beneath street pavement, yards, parking lots, and building structures. The condition and functioning of this pipe is critical not only to the proper operation of the Village’s drainage system, but also the safety and economic vitality of the DBD.

The pipe was installed in the 1960’s and requires maintenance and rehabilitation to maintain the viability of the pipe. A detailed assessment was completed in 2016 to determine the condition of the pipe and document repairs and rehabilitation necessary to ensure the pipe will continue to function.

On August 20, 2021, a Request for Qualifications was issued. Three firms responded and all were deemed qualified. On October 22, 2021, a Request for Proposals was issued to the three firms. Responses were received from all three. However, the project was put on hold until sufficient funding could be made available. On October 10, 2024, a request was sent to the three firms to provide updates to their RFP response. Vortex Lining LLC was the only firm to submit a response to the October 10, 2024 RFP.

Staff has selected Vortex Lining LLC to perform this work based on their understanding of the project, capability to perform the work, familiarity with the project, experience with similar projects, recommendation from a local municipality, and the proposed fee.

ATTACHMENTS

Resolution
Contract Documents

RESOLUTION NO. ____**A RESOLUTION AUTHORIZING EXECUTION OF AN AGREEMENT
BETWEEN THE VILLAGE OF DOWNERS GROVE
AND VORTEX LINING SYSTEMS, LLC**

BE IT RESOLVED by the Village Council of the Village of Downers Grove, DuPage County, Illinois, as follows:

1. That the form and substance of a certain Agreement (the "Agreement"), between the Village of Downers Grove (the "Village") and Vortex Lining Systems, LLC (the "Contractor"), for design build services relative to the repair and rehabilitation of an 11" diameter pipe, as set forth in the form of the Agreement submitted to this meeting with the recommendation of the Village Manager, is hereby approved.

2. That the Village Manager and Village Clerk are hereby respectively authorized and directed for and on behalf of the Village to execute, attest, seal and deliver the Agreement, substantially in the form approved in the foregoing paragraph of this Resolution, together with such changes as the Manager shall deem necessary.

3. That the proper officials, agents and employees of the Village are hereby authorized and directed to take such further action as they may deem necessary or appropriate to perform all obligations and commitments of the Village in accordance with the provisions of the Agreement.

4. That all resolutions or parts of resolutions in conflict with the provisions of this Resolution are hereby repealed.

5. That this Resolution shall be in full force and effect from and after its passage as provided by law.

Mayor

Passed:

Attest: _____

Village Clerk

AGREEMENT

This Agreement is made this ____ day of _____, 2025 by and between Vortex Lining Systems, LLC ("Contractor") and the Village of Downers Grove, Illinois, an Illinois municipal corporation with offices at 850 Curtiss St., Downers Grove, Illinois 60515, ("Village").

WHEREAS, the Village wishes to retain the services of the Contractor to provide certain design build services relative the repair and rehabilitation of a 11’ diameter pipe, as identified further in this Agreement (“Project”); and

WHEREAS, the Contractor is willing to perform these services for compensation and in accordance with the terms and conditions described in this Agreement.

NOW, THEREFORE, in consideration of the mutual benefits that will result to the parties in carrying out the terms of this Agreement, it is agreed as follows:

I. PROJECT SCOPE

Project Description:

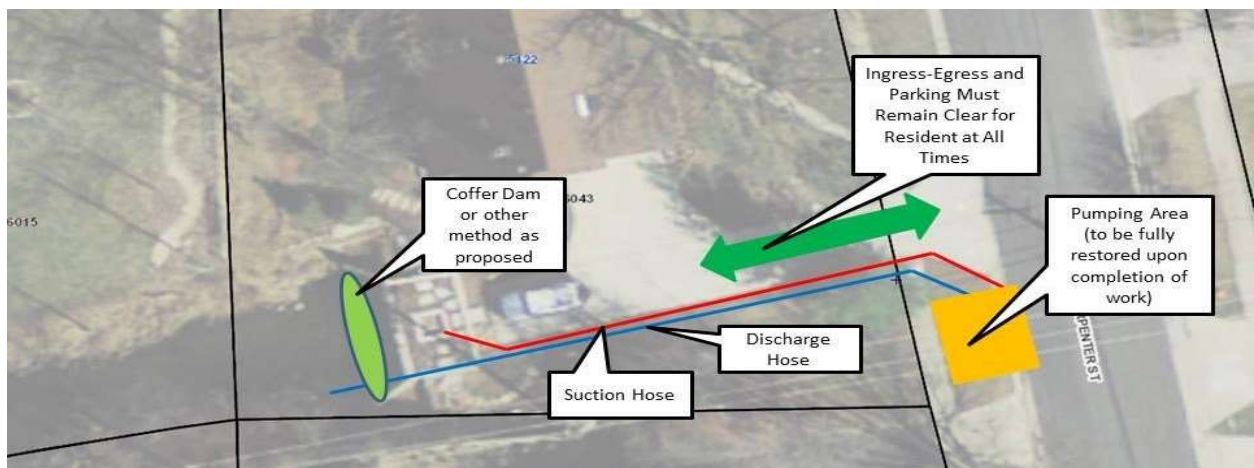
An 11’ diameter pipe carries flow from St. Joseph’s Creek through the Downtown Business District (approximately 2,200 feet), beneath street pavement, parking lots, and building structures. As such, the condition of this pipe is critical to not only the on-going proper function of the Village’s drainage system, but also the safety and economic vitality of the Downtown Business District (“DBD”). This Project generally includes rehabilitation and repair of the 11’ diameter pipe on a Design/Build basis.

Project Location:



Means and Methods – Contractor shall be entirely responsible for the means and methods utilized for the Project. The easements available to the Village for dewatering at the downstream structure, are limited to the area immediately surrounding the large structure west of Carpenter Street, and do not extend downstream far enough to allow for a sediment removal system (e.g., lined jute channel). As such, all sediment removal will have to be accomplished within the public ROW and allow for at least one lane of traffic to remain open.

When dewatering is performed at the downstream end of the pipe, west of Carpenter Street, ingress, egress and parking must remain open at all times for the resident of 5122 Carpenter Street (see below). A coffer dam and suction/discharge hoses are the only items that shall be allowed on the property at 5122. Any coffer dams proposed must be constructed of nonpermanent and completely removable materials that can be carried into the site by hand or with a skid-steer loader, such as an inflatable coffer dam or sand bags, and existing landscaping, driveway pavement, etc. shall not be disturbed. Should Contractor feel it is absolutely necessary to provide a jute lined discharge trough along the southerly line of the driveway and/or a sediment bag at the end of the discharge hose to facilitate sediment removal, a plan must be prepared depicting how ingress-egress will not be impeded and any landscaping that will need to be restored. Any items that are inadvertently disturbed must be immediately restored to the satisfaction of the Village Engineer. If one or more lanes of traffic must be closed, flaggers must be provided at all times. The proper removal and legal disposal of all sediment removed from the discharge water shall be the responsibility of the Contractor. Any pumps used for dewatering shall be low-decibel pumps and will only be allowed to operate during normal hours of construction, unless otherwise approved by the Village.



Dewatering Limitations at 5122 Carpenter Street

Any application information necessary for permits and an allowance for permit fees (the permit from the Village of Downers Grove will not have a fee) necessary for the dewatering of the pipe into the creek channel are the responsibility of the Contractor, the cost of which is included in the Contract Price, a copy of which is attached hereto as Exhibit A, inclusive of all permit fees, bonds, insurance, etc.

While the specific means and methods are the responsibility of the Contractor, all work shall comply with the appropriate confined space entry requirements, and the Contractor shall supply any/all labor, equipment and materials necessary to comply with said requirements.

The Contractor shall gather all required permits (on behalf of the Village) and construct the improvements. If more than one alternative is proposed by the Contractor, the Contractor shall permit and construct the alternative chosen by the Village.

It is the responsibility of the Contractor to carefully examine the specifications and the terms of this Agreement, and to be familiar with all of the requirements, stipulations, provisions, and conditions surrounding the proposed services.

The Contractor represents that it has inspected the site of the proposed Project in detail, investigated and become familiar with all the local conditions affecting the Project and become fully acquainted with the detailed requirements of the Project. Contractor's signature below shall be a conclusive assurance and warranty that the Contractor has made these examinations and that the Contractor understands all requirements for the performance of the Work. Contractor shall be responsible for all errors resulting from its willful or neglectful failure to comply with the PROJECT SCOPE.

IN NO CASE WILL THE VILLAGE BE RESPONSIBLE FOR ANY COSTS, EXPENSES, LOSSES OR CHANGES IN ANTICIPATED MARGINS OF PROFIT RESULTING FROM THE WILLFUL OR NEGLECTFUL FAILURE OF THE CONTRACTOR TO MAKE THESE EXAMINATIONS. THE VILLAGE WILL NOT BE RESPONSIBLE FOR ANY COSTS, EXPENSES, LOSSES OR CHANGES IN ANTICIPATED MARGINS OF PROFIT RESULTING FROM THE WILLFUL OR NEGLECTFUL FAILURE OF THE CONTRACTOR TO PROVIDE THE KNOWLEDGE EXPERIENCE AND ABILITY TO PERFORM THE WORK REQUIRED BY THE CONTRACT. No changes in the prices, quantities or provisions of this Agreement shall be made to accommodate the inadequacies of Contractor. Contractor shall take no advantage of any error or omission in the Contract Documents nor shall any error or omission in the Contract Documents serve as the basis for an adjustment of the amounts paid to Contractor.

When the Contract Documents include information pertaining to subsurface explorations, borings, test pits, and other preliminary investigations, such information is included solely for the convenience of Contractor. The Village assumes no responsibility whatsoever with respect sufficiency of the information, and does not warrant, neither expressly nor by implication, that the conditions indicated represent those existing throughout the Work, or that unanticipated developments may not occur.

Any information shown in the Contract Documents regarding the locations of underground utility facilities is included solely for the convenience of Contractor. The Village assumes no responsibility whatsoever with respect to the sufficiency, accuracy or inadequacy of such information. It shall be Contractor's responsibility to obtain detailed information from the respective utility companies relating to the location of their facilities and the work schedules of the utility companies for removing or adjusting them. Utilities whose facilities may be affected by the work include, but may not be limited to, the following: Nicor, ComEd, SBC, Comcast Cable, Downers Grove Sanitary District, and Village water, storm sewer, and street lighting systems.

Notwithstanding anything herein to the contrary, Contractor's TECHNICAL PROPOSAL dated October 31, 2024, attached hereto as Exhibit B, is hereby incorporated herein by reference, and made a material part of this Agreement.

II. TERMS AND CONDITIONS

1. VILLAGE ORDINANCES

Contractor will strictly comply with all ordinances of the Village of Downers Grove and laws of the State of Illinois.

2. USE OF VILLAGE'S NAME

Contractor is specifically denied the right of using in any form or medium the name of the Village for public advertising unless the Village grants express permission.

3. HOURS OF WORK

Contractor shall do no work between the hours of 7:00 p.m. and 7:00 a.m., nor on Sundays or legal holidays. Contractor shall do no work on Saturdays, unless otherwise approved in writing by the Village. If approved by the Village, allowed work hours on Saturdays shall be between the hours of 8:00 a.m. and 3:00 p.m. However, such work may be performed at any time if necessary, for the proper care and protection of work already performed, or in case of an emergency. All after-hour work is still subject to the permission of the Village. Any work, including the starting and/or idling of vehicles or machinery, or a congregation of workers prior to starting work, which may cause any noise level that can be heard by adjacent residents, performed outside of these hours of work and not authorized by the Village shall be subject to a fine of \$250 per day, per violation, which shall be deducted from the value of work completed.

4. PERMITS AND LICENSES

Contractor shall obtain all necessary permits and licenses required to complete the Work. The cost of acquisition of all necessary permits, bonds, insurance and services as specified herein shall be considered INCLUDED IN THE TOTAL COST, and no additional compensation will be allowed the Contractor.

5. INSPECTION

The Village shall have a right to inspect, by its authorized representative, any material, components or workmanship as herein specified. Materials, components or workmanship that have been rejected by the Village as not in accordance with the terms of the contract specifications shall be replaced by the Contractor at no cost to the Village.

6. DELIVERIES

All materials shipped to the Village must be shipped F.O.B. designated location, Downers Grove, Illinois.

7. SPECIAL HANDLING

Prior to delivery of any product that is caustic, corrosive, flammable or dangerous to handle, Contractor will provide written directions as to methods of handling such products, as well as the antidote or neutralizing material required for its first aid before delivery. Contractor shall also notify the Village and provide material safety data sheets for all substances used in connection with this Agreement which are defined as toxic under the Illinois Toxic Substances Disclosure to Employees Act.

8. NONDISCRIMINATION

Contractor shall, as a party to a public contract:

- (a) Shall refrain from unlawful discrimination in employment and undertake affirmative action to assure equality of employment opportunity and eliminate the effects of past discrimination;

- (b) Certifies that it is an "equal opportunity employer" as defined by Section 2000(e) of Chapter 21, Title 42, U.S. Code Annotated and Executive Orders #11246 and #11375, which are incorporated herein by reference. The Equal Opportunity clause, Section 6.1 of the Rules and Regulations of the Department of Human Rights of the State of Illinois, is a material part of any contract awarded on the basis of this Bid.
- (c) Acknowledges that is unlawful to discriminate on the basis of race, color, religion, sex, marital status, national origin or ancestry, age, physical or mental disability unrelated to ability, military status, order of protection status, sexual orientation, sexual identity, or an unfavorable discharge from military service. Contractor shall comply with standards set forth in Title VII of the Civil Rights Act of 1964, 42 U.S.C. Secs. 2000 *et seq.*, The Human Rights Act of the State of Illinois, 775 ILCS 5/1-101 *et seq.*, and The Americans with Disabilities Act, 42 U.S.C. Secs. 12101 *et seq.*

9. SEXUAL HARASSMENT POLICY

Contractor, as a party to a public contract, shall have a written sexual harassment policy that:

- (a) Notes the illegality of sexual harassment;
- (b) Sets forth the State law definition of sexual harassment;
- (c) Describes sexual harassment utilizing examples;
- (d) Describes the Contractor's internal complaint process including penalties;
- (e) Describes the legal recourse, investigative and complaint process available through the Illinois Department of Human Rights and the Human Rights Commission and how to contact these entities; and
- (f) Describes the protection against retaliation afforded under the Illinois Human Rights Act.

10. EQUAL EMPLOYMENT OPPORTUNITY

In the event of Contractor's non-compliance with the provisions of this Equal Employment Opportunity Clause, the Illinois Human Rights Act or the Rules and Regulations of the Illinois Department of Human Rights ("Department"), Contractor may be declared ineligible for future contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations, and the contract may be canceled or voided in whole or in part, and such other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulation. During the performance of this Contract, Contractor agrees as follows:

- (a) That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, marital status, national origin or ancestry, age, physical or mental disability unrelated to ability, military status, order of protection status, sexual orientation, sexual identity, or an unfavorable discharge from military service; and further that it will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any such underutilization.
- (b) That, if it hires additional employees in order to perform this Contract or any portion thereof, it will

determine the availability (in accordance with the Department's Rules and Regulations) of minorities and women in the area(s) from which it may reasonably recruit and it will hire for each job classification for which employees are hired in such a way that minorities and women are not underutilized.

- (c) That, in all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, marital status, national origin or ancestry, age, physical or mental disability unrelated to ability, military status, order of protection status, sexual orientation, or an unfavorable discharge from military services.
- (d) That it will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising such labor organization or representative of the Contractor's obligations under the Illinois Human Rights Act and the Department's Rules and Regulations. If any such labor organization or representative fails or refuses to cooperate with the Contractor in its efforts to comply with such Act and Rules and Regulations, the Contractor will promptly so notify the Department and the contracting agency and will recruit employees from other sources when necessary to fulfill its obligations thereunder.
- (e) That it will submit reports as required by the Department's Rules and Regulations, furnish all relevant information as may from time to time be requested by the Department or the contracting agency, and in all respects comply with the Illinois Human Rights Act and the Department's Rules and Regulations.
- (f) That it will permit access to all relevant books, records, accounts and work sites by personnel of the contracting agency and the Department for purpose of investigation to ascertain compliance with the Illinois Human Rights Act and the Department's Rules and Regulations.
- (g) That it will include verbatim or by reference the provisions of this clause in every subcontract it awards under which any portion of the contract obligations are undertaken or assumed, so that such provisions will be binding upon such subcontractor. In the same manner as with other provisions of this Contract, the Contractor will be liable for compliance with applicable provisions of this clause by such subcontractors; and further it will promptly notify the contracting agency and the Department in the event any subcontractor fails or refuses to comply therewith. In addition, the Contractor will not utilize any subcontractor declared by the Illinois Human Rights Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivision or municipal corporations.

11. DRUG FREE WORK PLACE

Contractor, as a party to a public contract, certifies and agrees that it will provide a drug free workplace by:

- (a) Publishing a statement:
 - (1) Notifying employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance, including cannabis, is prohibited in the Village's or Contractor's workplace.
 - (2) Specifying the actions that will be taken against employees for violations of such prohibition.
 - (3) Notifying the employee that, as a condition of employment on such contract or grant, the

employee will:

- (A) abide by the terms of the statement; and
 - (B) notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five (5) days after such conviction.
- (b) Establishing a drug free awareness program to inform employees about:
 - (1) the dangers of drug abuse in the workplace;
 - (2) the Village's or Contractor's policy of maintaining a drug free workplace;
 - (3) any available drug counseling, rehabilitation and employee assistance programs;
 - (4) the penalties that may be imposed upon employees for drug violations.
 - (c) Providing a copy of the statement required by subparagraph (a) to each employee engaged in the performance of the contract or grant and to post the statement in a prominent place in the workplace.
 - (d) Notifying the contracting or granting agency within ten (10) days after receiving notice under part (3)(B) of subparagraph (a) above from an employee or otherwise receiving actual notice of such conviction.
 - (e) Imposing a sanction on, or requiring the satisfactory participation in a drug abuse assistance or rehabilitation program by, any employee who is so convicted as required by section 5 of the Drug Free Workplace Act.
 - (f) Assisting employees in selecting a course of action in the event drug counseling, treatment and rehabilitation is required and indicating that a trained referral team is in place.
 - (g) Making a good faith effort to continue to maintain a drug free workplace through implementation of the Drug Free Workplace Act.

12. SUBSTANCE ABUSE PREVENTION ON PUBLIC WORKS PROJECTS ACT

Contractor agrees to comply with the Substance Abuse Prevention on Public Works Projects Act , 820 ILCS 265/1 *et seq.*, and further agrees that all of its subcontractors shall comply with such Act.. As required by the Act, Contractor agrees that it will file with the Village prior to commencing work its written substance abuse prevention program and/or that of its subcontractor(s) which meet or exceed the requirements of the Act.

13. PREVAILING WAGE ACT

Contractor agrees to comply with the Illinois Prevailing Wage Act, 820 ILCS 130/1 *et seq.*, for all work completed under this Contract. Contractor agrees to pay the prevailing wage and require that all of its subcontractors pay prevailing wage to any laborers, workers or mechanics who perform work pursuant to this Contract or related subcontract. For applicable rates, go to the State of Illinois – Department of Labor website (www.state.il.us/agency/idol/rates/rates.HTM) and use the most current DuPage County rate. The Department revises the prevailing wage rates and the Contractor or subcontractor has an obligation to check the Department's website for revisions to prevailing wage rates throughout the duration of this Contract.

Contractor and each subcontractor shall keep or cause to be kept accurate records of all laborers, mechanics and other workers employed by them on the public works project, which records must include each worker's name, address, telephone number when available, the last four digits of the worker's social security number, gender, race, ethnicity, veteran's status, skill level, classification, hourly wage paid

(including itemized hourly cash and fringe benefits paid in each pay period), number of hours worked each day, the starting and ending times of work each day, the worker's hourly wage rate, the worker's hourly overtime wage rate, the worker's hourly fringe benefit rates, the name and address of each fringe benefit fund, the plan sponsor of each fringe benefit, if applicable, and the plan administrator of each fringe benefit, if applicable. These records shall be open to inspection at all reasonable hours by any representative of the Village or the Illinois Department of Labor (IDOL) and must be preserved for five (5) years from the date of the last payment on the public work.

Since this is a contract for a public works project, as defined in 820 ILCS 130/2, Contractor agrees to post at the job site in an easily accessible place, the prevailing wages for each craft or type of worker or mechanic needed to execute the contract or work to be performed.

Because this is a public works project as defined under the Prevailing Wage Act, 820 ILCS 130/2, any and all contractors and subcontractors shall submit certified payroll records to IDOL no later than the fifteenth (15th) day of each calendar month for the immediately preceding month in which construction on a public works project has occurred. Contractor shall then provide an IDOL certification and case number to the Village. **WITHOUT THIS PAPERWORK, NO INVOICE SHALL BE PAID BY THE VILLAGE.** Filing false records is a Class A misdemeanor.

In the event that this is a construction project where Motor Fuel tax monies or state grant monies are used in the construction, maintenance and extension of municipal streets, traffic control signals, street lighting systems, storm sewers, pedestrian subways or overhead crossings, sidewalks and off-street parking facilities, and the like, the Village will require an Apprenticeship and Training Certification, attached.

Any bond furnished as security for performance shall include a provision that guarantees faithful performance of the Illinois Prevailing Wage Act, 820 ILCS 130/1 *et seq.*

14. PATRIOT ACT COMPLIANCE

The Contractor represents and warrants to the Village that neither it nor any of its principals, shareholders, members, partners, or affiliates, as applicable, is a person or entity named as a Specially Designated National and Blocked Person (as defined in Presidential Executive Order 13224) and that it is not acting, directly or indirectly, for or on behalf of a Specially Designated National and Blocked Person. The Contractor further represents and warrants to the Village that the it and its principals, shareholders, members, partners, or affiliates, as applicable are not, directly or indirectly, engaged in, and are not facilitating, the transactions contemplated by this Contract on behalf of any person or entity named as a Specially Designated National and Blocked Person. The Contractor hereby agrees to defend, indemnify and hold harmless the Village, and its elected or appointed officers, employees, agents, representatives, engineers and attorneys, from and against any and all claims, damages, losses, risks, liabilities and expenses (including reasonable attorney's fees and costs) arising from or related to any breach of the foregoing representations and warranties.

15. INSURANCE REQUIREMENTS

Prior to starting the Project, Contractor and any Subcontractors shall procure, maintain and pay for such insurance as will protect against claims for bodily injury or death, or for damage to property, including loss of use, which may arise out of operations by the Contractor or Subcontractor or any Sub-Sub Contractor or by anyone employed by any of them, or by anyone for whose acts any of them may be liable. Such insurance shall not be less than the greater of coverages and limits of liability specified below or any

coverages and limits of liability specified in the Contract Documents or coverages and limits required by law unless otherwise agreed to by the Village.

Workers Compensation	\$500,000	Statutory
Employers Liability	\$1,000,000	Each Accident
	\$1,000,000	Disease Policy Limit
	\$1,000,000	Disease Each Employee
Comprehensive General Liability	\$2,000,000	Each Occurrence
	\$2,000,000	Aggregate
		<i>(Applicable on a Per Project Basis)</i>
Commercial Automobile Liability	\$1,000,000	Each Accident
Professional Errors & Omissions	\$2,000,000	Each Claim
(pursuant to section.9 below)	\$2,000,000	Annual Aggregate
Umbrella Liability	\$ 5,000,000	

Comprehensive General Liability Insurance required under this paragraph shall be written on an occurrence form and shall include coverage for Products/Completed Operations, Personal Injury with Employment Exclusion (if any) deleted, Blanket XCU and Blanket Contractual Liability insurance applicable to defense and indemnity obligations and other contractual indemnity assumed under the Contract Documents. The limit must be on a “Per Project Basis”.

Commercial Automobile Liability Insurance required under this paragraph shall include coverage for all owned, hired and non-owned automobiles.

Workers Compensation coverage shall include a waiver of subrogation against the Village.

Comprehensive General Liability, Employers Liability and Commercial Automobile Liability Insurance may be arranged under single policies for full minimum limits required, **or** by a combination of underlying policies with the balance provided by Umbrella and/or Excess Liability policies.

Contractor and all Subcontractors shall have their respective Comprehensive General Liability (including products/completed operations coverage), Employers Liability, Commercial Automobile Liability, and Umbrella/Excess Liability policies endorsed to add the “Village of Downers, its officers, officials, employees and volunteers” and the “Downers Grove Sanitary Distric” as “additional insureds” with respect to liability arising out of operations performed; claims for bodily injury or death brought against the Village by any Contractor or Subcontractor employees, or the employees of Subcontractor’s subcontractors of any tier, however caused, related to the performance of operations under the Contract Documents. Such insurance afforded to the Village shall be endorsed to provide that the insurance provided under each policy shall be ***Primary and Non-Contributory***.

Contractor and all Subcontractors shall maintain in effect all insurance coverages required by the Contract Documents at their sole expense and with insurance carriers licensed to do business in the State of Illinois and having a current A. M. Best rating of no less than A- VIII. In the event that the Contractor or any Subcontractor fails to procure or maintain any insurance required by the Contract Documents, the Village may, at its option, purchase such coverage and deduct the cost thereof from any monies due to the Contractor or Subcontractor, or withhold funds in an amount sufficient to protect the Village, or terminate this Contract pursuant to its terms.

All insurance policies shall contain a provision that coverages and limits afforded hereunder shall not be canceled, materially changed, non-renewed or restrictive modifications added, without thirty (30) days prior written notice to the Village. Renewal certificates shall be provided to the Village not less than five (5) days prior to the expiration date of any of the required policies. All Certificates of Insurance shall be in a form acceptable to the Village and shall provide satisfactory evidence of compliance with all insurance requirements. The Village shall not be obligated to review such certificates or other evidence of insurance, or to advise Contractor or Subcontractor of any deficiencies in such documents, and receipt thereof shall not relieve the Contractor or Subcontractor from, nor be deemed a waiver of the right to enforce the terms of the obligations hereunder. The Village shall have the right to examine any policy required and evidenced on the Certificate of Insurance.

If the Work under the Contract Documents includes design, consultation, or any other professional services, Contractor or the Subcontractor shall procure, maintain, and pay for Professional Errors and Omissions insurance with limits of not less than \$2,000,000 per claim and \$2,000,000 annual aggregate. If such insurance is written on a claim made basis, the retrospective date shall be prior to the start of the Work under the Contract Documents. Contractor and all Subcontractors agree to maintain such coverage for three (3) years after final acceptance of the Project by the Village or such longer period as the Contract Documents may require. Renewal policies during this period shall maintain the same retroactive date.

Any deductibles or selfinsured retentions shall be the sole responsibility of the Insured. At the option of the Village, either: the insurer shall reduce or eliminate such deductibles or selfinsured retentions as respects the Village, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

16. INDEMNITY AND HOLD HARMLESS AGREEMENT

To the fullest extent permitted by law, Contractor shall indemnify, keep and save harmless the Village and its agents, officers, and employees, against all injuries, deaths, strikes, losses, damages, claims, suits, liabilities, judgments, costs and expenses, which may arise directly or indirectly from any negligence or from the reckless or willful misconduct of the Contractor, its employees, or its subcontractors.

Contractor shall, at its own expense, appear, defend and pay all charges of attorneys and all costs and other expenses arising therefrom or incurred in connection therewith, and, if any judgment shall be rendered against the Village in any such action, Contractor shall, at its own expense, satisfy and discharge the same. This agreement shall not be construed as requiring Contractor to indemnify the Village for its own negligence. Contractor shall indemnify, keep and save harmless the Village only where a loss was caused by the negligent, willful or reckless acts or omissions of the Contractor, its employees, or its subcontractors.

17. SUBLETTING OF CONTRACT

No contract awarded by the Village shall be assigned or any part subcontracted without the written consent

of the Village. In no case shall such consent relieve the Contractor from its obligation or change the terms of this Contract.

All approved subcontracts shall contain language which incorporates the terms and conditions of this Contract.

18. TERMINATION OF CONTRACT

The Village reserves the right to terminate the whole or any part of this Contract, upon written notice to Contractor, for any reason.

The Village further reserves the right to terminate the whole or any part of this Contract, upon written notice to the Contractor, in the event of default by Contractor. Default is defined as failure of Contractor to perform any of the provisions of this Contract or failure to make sufficient progress so as to endanger performance of this Contract in accordance with its terms. In the event that Contractor fails to cure the default upon notice, and the Village declares default and termination, the Village may procure, upon such terms and in such manner as it may deem appropriate, supplies or services similar to those so terminated. The Village may also contact the issuer of the Performance Bond to complete the Work. Contractor shall be liable for any excess costs for such similar supplies or services. Any such excess costs incurred by the Village may be set off against any monies due and owing by the Village to Contractor.

19. BILLING AND PAYMENT PROCEDURES

Payment will be made upon receipt of an invoice referencing Village purchase order number. Once an invoice and receipt of materials or service have been verified, the invoice will be processed for payment in accordance with the Village's payment schedule. The Village will comply with the Local Government Prompt Payment Act, 50 ILCS 505/1 *et seq.*, in that any bill approved for payment must be paid or the payment issued to Contractor within 60 days of receipt of a proper bill or invoice. If payment is not issued to Contractor within this 60-day period, an interest penalty of 1.0% of any amount approved and unpaid shall be added for each month or fraction thereof after the end of this 60-day period, until final payment is made.

The Village shall review each bill or invoice in a timely manner after its receipt. If the Village determines that the bill or invoice contains a defect making it unable to process the payment request, the Village shall notify Contractor as soon as possible after discovering the defect pursuant to rules promulgated under 50 ILCS 505/1 *et seq.* The notice shall identify the defect and any additional information necessary to correct it.

As this Contract is for work defined as a "fixed public work" project under the Illinois Prevailing Wage Act, 820 ILCS 130/2 and pursuant to section 13 of this Agreement, the Contractor shall provide an IDOL certification and case number to the Village along with the invoice. No invoice shall be paid without said records.

Please send all invoices to the attention of: Village of Downers Grove, Public Works, 5101 Walnut Ave., Downers Grove, IL 60515.

20. COMPLIANCE WITH OSHA STANDARDS

Equipment supplied to the Village must comply with all requirements and standards as specified by the Occupational Safety and Health Act. All guards and protectors as well as appropriate markings will be in place before delivery. Items not meeting any OSHA specifications will be refused.

21. CERCLA INDEMNIFICATION

Contractor shall, to the maximum extent permitted by law, indemnify, defend, and hold harmless the Village, its officers, employees, agents, and attorneys from and against any and all liability, including without limitation, costs of response, removal, remediation, investigation, property damage, personal injury, damage to natural resources, health assessments, health settlements, attorneys' fees, and other related transaction costs arising under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 42 U.S.C.A. Sec. 9601, *et seq.*, as amended, and all other applicable statutes, regulations, ordinances, and under common law for any release or threatened release of the waste material collected by the Contractor, both before and after its disposal.

If Contractor encounters any waste material governed by the above Act, it shall immediately notify the Village and stop working in the area until the above requirements can be met.

22. COPYRIGHT or PATENT INFRINGEMENT

Contractor agrees to indemnify, defend, and hold harmless the Village against any suit, claim, or proceeding brought against the Village for alleged use of any equipment, systems, or services provided by the Contractor that constitutes a misuse of any proprietary or trade secret information or an infringement of any patent or copyright.

23. BUY AMERICA

Contractor agrees to comply with 49 U.S.C.5323(j), the Federal Transportation Administration's (FTA) Buy America regulations at 49 C.F.R. Part 661, and any amendments thereto, and any implementing guidance issued by the FTA, with respect to this Contract, when financed by Federal funds (through a grant agreement or cooperative agreement).

24. CAMPAIGN DISCLOSURE

Contractor shall submit an executed Campaign Disclosure Certificate, attached hereto as Exhibit ____.

By signing this Agreement, Contractor agrees to refrain from making any campaign contributions as defined in Section 9-1.4 of the Election Code (10 ILCS 5/9-1.4) to any Village Council member and any challengers seeking to serve as a member of the Downers Grove Village Council.

25. GUARANTEE PERIOD

Contractor guarantees all work and shall provide a maintenance bond for the full amount of this Agreement, covering a minimum period of one (1) year after approval and acceptance of the Work. The bond shall be in such form as the Village may prescribe, unless otherwise noted in the Specifications, and shall be submitted before receiving final payment. If longer guarantee periods are required, they will be noted in the Special Provisions for this Project.

26. SUCCESSORS AND ASSIGNS

The terms of this Agreement will be binding upon and inure to the benefit of the parties and their respective successors and assigns; provided, however, that neither party will assign this Agreement in whole or in part without the prior written approval of the other. Contractor will provide a list of key staff, titles, responsibilities, and contact information to include all expected subcontractors.

27. WAIVER OF BREACH OF CONTRACT

The waiver by one party of any breach of this Agreement or the failure of one party to enforce at any time,

or for any period of time, any of the provisions hereof will be limited to the particular instance and will not operate or be deemed to waive any future breaches of this Agreement and will not be construed to be a waiver of any provision except for the particular instance.

28. CHANGE ORDERS

At any time additional work is necessary or requested, and price is increased thereby, all parties must agree to any change, addition or price increase in writing.

Change orders for public works projects which authorize an increase in the contract price that is 50% or more of the original contract price or that authorize or necessitate any increase in the price of a subcontract under the contract that is 50% or more of the original subcontract price must be resubmitted for bidding in the same manner by which the original contract was bid. (50 ILCS 525/1)

29. SEVERABILITY OF INVALID PROVISIONS

If any provisions of this Agreement are held to contravene or be invalid under the laws of any state, country or jurisdiction, contravention will not invalidate the entire Agreement, but it will be construed as if not containing the invalid provision and the rights or obligations of the parties will be construed and enforced accordingly.

30. GOVERNING LAW AND VENUE

This Agreement will be governed by and construed in accordance with the laws of the State of Illinois. Venue is proper only in the County of DuPage for state cases or the Northern District of Illinois for federal cases.

31. NOTICE

Any notice will be in writing and will be deemed to be effectively served when deposited in the mail with sufficient first class postage affixed, and addressed to the party at the party's place of business. Notices shall be addressed to the Village as follows:

**Village Manager
Village of Downers Grove
850 Curtiss St.
Downers Grove, IL 60515**

And to the Contractor as designated on the Contract Form.

32. AMENDMENT

This Agreement will not be subject to amendment unless made in writing and signed by all parties.

33. COOPERATION WITH FOIA COMPLIANCE

Contractor acknowledges that the Freedom of Information Act does apply to public records in possession of the Contractor or a subcontractor. Contractor and all of its subcontractors shall cooperate with the Village in its efforts to comply with the Freedom of Information Act. 5 ILCS 140/1 *et seq.*

34. EMPLOYMENT OF ILLINOIS WORKERS ON PUBLIC WORKS ACT

If the Project is funded or financed in whole or in part with State Funds or funds administered by the State, Contractor agrees to comply with the terms of the Employment of Illinois Workers on Public Works Act by employing at least 90% Illinois laborers on the project. 30 ILCS 570/1 *et seq.* Contractor agrees further

to require compliance with this Act by all of its subcontractors.

35. DISADVANTAGED BUSINESS ENTERPRISE (DBE) CERTIFICATION

52.1 Pursuant to 35 ILCS 200/18-50.2, Contractor and all subcontractors are required to complete and submit a Vendor DBE certification, regardless of DBE status. Contractor shall complete and require all its subcontractors to complete the DBE certification for this project at www.downers.us/vss. The information necessary for the Contractor and all subcontractors to complete the certification includes the following: DBE Classification (minority-owned, women-owned, persons with disabilities-owned, veteran-owned, or none); if DBE, whether the company holds a certificate or self-certifies; if self-certifying, whether the company qualifies as a small business under the U.S. Small Business Administration standards; the company's name, address, city, state and zip code; company's contact person's name, title, telephone number and email address. NO PAYMENTS WILL BE MADE TO THE CONTRACTOR BY THE VILLAGE UNLESS AND UNTIL ALL OF THE CERTIFICATIONS FOR THE CONTRACTOR AND SUBCONTRACTORS HAVE BEEN COMPLETED.

III. GENERAL PROVISIONS

1. STANDARD SPECIFICATIONS

1.1 The following standards shall govern the construction of the proposed improvements:

1.1.1 Standard Specifications for Water and Sewer Main Construction in Illinois, Eight Edition, 2020 (the Water & Sewer Specs.); and

1.1.2 Standard Specifications for Road and Bridge Construction as adopted by the Illinois Department of Transportation, January 1, 2022; along with Supplemental Specifications and Recurring Special Provisions as adopted by the Illinois Department of Transportation, January 1, 2025 (collectively the “SSRBC”); and

1.1.3 Water Distribution Specifications, Village of Downers Grove, Illinois, revised January 2017.

1.1.4 Standard Detail Drawings, Village of Downers Grove, Illinois revised January, 2019.

1.2 These Contract Documents shall take precedence whenever there are conflicts in the wording or statements made by the above specifications and these Contract Documents.

1.3 Unless otherwise referenced herein, Division I of the Water and Sewer Specs and Section 102 and Articles 104.03, 104.07, 107.02, 107.27, 107.35, 108.10, 108.11, and 108.12 of the SSRBC are hereby ineffective and not a part of this Contract.

2. COOPERATION OF CONTRACTOR

2.1 The Contractor will be supplied with a minimum of 2 sets of approved plans and contract assemblies including Special Provisions, one set of which the Contractor shall keep available on the work site at all times. The Contractor shall give the work site constant attention necessary to facilitate the progress thereof, and shall cooperate with the Village in every way possible.

2.2 The Contractor shall assign a superintendent for the work per Sections 105.06 and 108.06 of the SSRBC and as amended herein. The Contractor’s superintendent shall be involved in the work to the extent necessary to prosecute the work per the Contract. Furthermore, the superintendent shall be required to attend weekly progress meetings, provide two-week schedules of expected construction activities, provide updated overall construction schedules and, if required by the Engineer, acknowledge and sign IDOT Form BC-239 Weekly Report of Resident. The Contractor shall not replace the superintendent without prior written notification to the Village.

3. LEGAL REGULATIONS AND RESPONSIBILITY TO THE PUBLIC

3.1 Section 107 of the SSRBC shall govern the Contractor’s legal regulations and responsibility to the public, with the following additions:

3.1.1 PROJECT SAFETY. Add the following to Article 107.28:

3.1.1.1 The Contractor shall conduct its work in such a manner as to provide an environment consistent with the safety, health and well-being of those engaged in the completion of the Work specified in this Contract.

3.1.1.2 The Contractor shall comply with all State and Federal Safety Regulations as outlined in the latest revisions of the Federal Construction Safety Standards (Series 1926) and with applicable provisions and/or regulations of the Occupation Safety and Health Administration (OSHA) and Standards of the WilliamsStelger Occupational Health Safety Act of 1970 (Revised). SPECIAL ATTENTION SHALL BE PAID TO COMPLIANCE WITH OSHA'S SUBPART P – EXCAVATIONS STANDARD.

3.1.1.3 The Contractor and Village shall each be responsible for their own respective agents and employees.

3.1.1.4 The Contractor shall, prior to performing any work, request information from the Village regarding any existing confined spaces owned by the Village that may be entered in the course of the work, and shall obtain all required confined space entry permits prior to entering any confined spaces. Contractor shall follow all current laws and regulations with regard to confined space entry. Contractor shall maintain and, upon request, provide full documentation of compliance with the appropriate confined space permits for each separate confined space entered on the project.

3.1.2 BACKING PRECAUTIONS. Any motor vehicle which has an obstructed view to the rear and is to be operated at any time in reverse gear on the public streets of the Village by the Contractor or any subcontractor shall either be equipped with a reverse signal alarm (backup alarm) audible above and distinguishable from the surrounding noise level, or shall provide an observer to signal that it is safe to back up.

3.1.3 OVERWEIGHT, OVERWIDTH AND OVERHEIGHT PERMITS. The Village has and supports an overweight truck enforcement program. Contractors are required to comply with weight requirements and safety requirements as established by Illinois Law or Village Ordinance, for vehicles, vehicle operators and specialty equipment. In some instances, specialty equipment for road repairs or construction projects requires the movement of overweight, overwidth, or overheight loads utilizing a Village roadway. Such movement will require obtaining a permit from the Village Police Department's Traffic Supervisor.

3.1.4 BARRICADES AND WARNING SIGNS. The Contractor shall provide the Village with a telephone number of a person or company who is available 24 hours per day, seven days per week, to erect additional barricades or signs. If the Village or its representative deems it necessary for the Public's safety to erect additional barricades or signs during normal working hours, the Contractor will furnish the necessary barricades or signs, and have them in place within 30 minutes. If, after normal working hours, the requested signs are not in place within three hours after the request is made, the Village reserves the right to have the barricades and signs erected. The cost of erecting the barricades and signs shall be deducted by the Village from any payments due the Contractor.

4. PROSECUTION AND PROGRESS

4.1 Section 108 of the SSRBC shall govern the prosecution and progress of the work, with the following additions:

4.1.1 The Contractor shall schedule the work such that the Project and all improvements shall be complete by **December 31, 2026 (Option B) or December 31, 2027 (Option C) in accordance with the Village's option to select pricing in accordance with Section V. PRICING of this Agreement.** The completion date will remain binding throughout the duration of the Contract unless revised in writing by the Village.

4.1.2 The total duration of disturbance for work related to means of public egress through the project site or access to private property (e.g. removal and replacement of curb and gutters, sidewalks, driveway entrances, etc.) must not exceed ten (10) calendar days. The Contractor may use high-early strength concrete, meeting all specifications herein, **at its own expense** to help meet this requirement.

4.1.3 The Contractor shall also make special note of the following work schedule requirements:

4.1.4 Should the Contractor fail to complete the work on or before the specified completion dates set forth in Sections 4.1.1, 4.1.2, 4.1.3, or within such extended time as may be allowed, the Contractor shall be liable for liquidated damages in accordance with the applicable sections of Article 108.09 of the SSRBC. In addition, the Contractor shall be liable for additional costs incurred by the Village due to the delay for construction engineering services, which shall be deducted from the value of work completed.

4.1.5 Upon substantial completion of the project, the Engineer will deliver to the Contractor a punch list as well as a due date for completion of the punch list. If the Contractor fails to complete the punch list by the stated punch list completion date, the Contractor shall be liable for liquidated damages in accordance with the applicable sections of Article 108.09 of the SSRBC.

4.1.5 Prior to commencing construction, a meeting will be held with the Contractor and the Village. Any questions concerning procedures, general conditions, special provisions, plans or specific items related to the project shall be answered and clarified. No Pre-Construction meeting shall be scheduled until submittals, performance bonds, and certificates of insurance are delivered to, and approved by, the Village.

4.1.6 Weekly progress meetings may be required by the Village. If required, the Contractor shall have a capable person, such as a site superintendent or project manager, attend such meetings and be prepared to report on the prosecution of the Work according to the progress schedule. The Village reserves the right to require adjustments to scheduling of work.

5. MEASUREMENT AND PAYMENT

5.1 Section 109 of the SSRBC shall govern measurement and payment, with the following additions:

5.1.1 Modifies Article 109.07 - Partial payments will be made per Section 36 of Part II of this document (Billing and Payment Procedures.)

5.1.2 The Village will require that partial and final affidavits for all labor, materials and equipment used on the Project and certified payroll records, be submitted with the partial and final payment requests. Such waivers shall indicate that charges for all labor, materials and equipment used on the project have been paid. Partial waivers from suppliers and subcontractors may be submitted after the first payment to the Contractor, and before the subsequent payment to that which they apply. However, partial waivers from the Contractor must accompany the invoice of the payment to which it applies. All final waivers, from all suppliers and subcontractors **MUST** accompany the Contractor's invoice upon submittal for final payment. A sworn statement by the Contractor shall accompany full waivers. Such requirement for full waivers is solely for the benefit of the Village and shall not be construed to benefit any other person. Partial payment for work done shall in no way imply acceptance of the work to that date.

5.1.3 For each progress payment made to the Contractor prior to acceptance of the Work by the Village, the Village shall have the right to retain ten percent (10%) of the amount due to the Contractor for each such payment. The Village may, in its sole discretion, reduce the amount to be retained at any time.

Typically, upon completion of 50% of the work, as determined by the Engineer, retainage may be reduced to 5%. Upon substantial completion, as determined by the Engineer, retainage may be reduced to 2%. Additionally, the Village has the right to withhold an amount of money equivalent to complete unfinished work and/or work that may need to be redone.

6. SCOPE OF WORK

6.1 In addition to the Special Provisions in the Detailed Specifications Section below, Section 104 of the SSRBC shall govern scope of work, with the following revisions:

6.1.1 Modify Article 104.02 as follows:

104.02 Alterations, Cancellations, Extensions, Deductions, and Extra Work.

The Department reserves the right to make, in writing, at any time during work, changes in quantities, alterations in work, and the performance of extra work to satisfactorily complete the project. Such changes in quantities, alterations, and extra work shall not invalidate the contract nor release the surety, and the Contractor agrees to perform the work as altered.

If the alterations or changes in quantities significantly change the character of the work under the contract, whether or not changed by any such different quantities or alterations, an adjustment, excluding loss of anticipated profits, will be made to the contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If a basis cannot be agreed upon, then an adjustment will be made either for or against the Contractor in such amount as the Engineer may determine to be fair and equitable.

If alterations or changes in quantities do not significantly change the character of the work to be performed under contract, the altered work will be paid for as provided elsewhere in the contract. The term "significant change" shall be construed to apply only when the character of the work as altered differs materially in kind or nature from that involved or included in the original proposed construction ~~or when a major item, defined as an item whose total original contract cost plus any additions exceeds ten percent of the total original contract amount, is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity.~~

All alterations, cancellations, extensions, and deductions shall be authorized in writing by the Engineer before work is started. Such authorizations shall set up the items of work involved and the method of payment for each item. The Contractor shall accept payment for alterations which result in an increase or decrease in the quantities of work to be performed according to the following.

(a) All increases in work of the type which appear in the contract as pay items accompanied by unit prices will, except as provided under paragraph (d) herein, be paid for at the contract unit prices. Decreases in quantities included in the contract will be deducted from the contract at the unit bid prices. No allowance will be made for delays or anticipated profits.

(b) Major items of work for which the quantities are increased ~~by not more than 125 percent or reduced to not less than 75 percent of the original contract quantities~~ OR DECREASED will be paid for as specified in paragraph (a) above. ~~Any adjustments for increased quantities for major items of work increased more than 125 percent shall only apply to that portion in excess of 125 percent of original contract quantities. Any adjustments made for major items of work which are decreased to less than 75 percent of the original contract quantities shall apply to the actual amount of work performed.~~

(c) Extra work which is not included in the contract as pay items at unit prices and is not included in other

items of the contract will be paid for according to Article 109.04.

(d) Extra work for which there is a pay item at unit price in the contract which for any one or more of the following reasons materially increases or decreases the cost of the pay item as bid and which is not included in the prices bid for other items in the contract will be paid for according to Article 109.04. This includes:

(1) Work involving a substantial change of location.

(2) Work which differs in design.

(3) Work requiring a change in the type of construction.

(e) In cases where the Department cancels or alters any portion of the contract items, items which are partially completed will be paid for as specified in Article 109.06.

Claims for extra work which have not been authorized in writing by the Engineer will be rejected.

IV. SPECIAL PROVISIONS

1. GENERAL CONSTRUCTION REQUIREMENTS

The following general requirements are intended to govern the overall priority for the performance of the work described in this contract. As general requirements, they are not intended to dictate to the Contractor the precise method by which these tasks shall be performed.

No more than three hundred linear feet (300 LF) of pavement may be open-cut and closed to use by the motoring public. Access to all individual drives within the current work zone must be restored at the end of each workday except when access is subject to placement of and curing of concrete pavement, sidewalk and/or curb and gutter. In such case, the Contractor shall provide the Engineer a daily schedule of construction activities impacting access.

The Contractor shall maintain traffic flow on ALL STREETS during the day in accordance with the applicable special provision, unless stated otherwise by a Village-approved traffic control plan. Adequate signing and flagging is of particular importance for safe travel of all residents.

Protection of Work

The Contractor shall be responsible to provide personnel to protect its work from third party damage. Should any of the new work be damaged, it shall be removed and replaced at the Contractor's expense. The Contractor shall schedule its work so that the concrete placed, takes its initial set during daylight hours. Claims of darkness shall not be reason to relieve the Contractor from responsibility.

Cleaning Up

The Contractor shall, at all times, keep the premises free from an accumulation of waste material or rubbish caused by its employees or work. At the end of the day, he shall remove all its rubbish from and about the streets and sidewalks. All its tools, form boards, and surplus materials shall be removed and relocated to any temporary on-site storage location assigned by the Village or its Engineer, and shall leave its work "broom clean" or its equivalent, unless more precisely defined. Upon completion of the work called for by the contract, and upon final inspection and acceptance, the Contractor shall remove any of its remaining rubbish, tools, form boards, and surplus materials completely from the work site. In case of dispute, the Village may remove the rubbish and any other materials and charge the cost to the Contractor.

Private Access and Water Shut-Off Notification

If access to a driveway will be blocked, or water will be turned off, the Contractor shall give that resident or business proper written notification at least 24 hours in advance. The Contractor must provide them the opportunity to remove their cars from the drive or make other arrangements, and prepare for any shutdown of the water system. Samples of written notices shall be submitted to the Engineer for approval. In addition, the Contractor shall be responsible for notifying the resident or business verbally on the morning of any driveway closure, to ensure awareness of the lack of access.

2. CONSTRUCTION RECORDS

Section 5-7 of the Water and Sewer Specs shall be replaced in its entirety by the following:

The Contractor shall record all field notes in standard survey field notebooks and those books shall become the property of the Village at the completion of the Project. All notes shall be neat, orderly and in an accepted format.

Prior to final payment and within 28 calendar days of substantial completion, as determined in section III.4.1.1, the Contractor shall provide the Village documentation of the repairs including:

- station and location within the pipe of each repair; all survey-related work shall be supervised by a licensed Illinois Land Surveyor
- type and size of each repair
- before and after photos of each repair

3. EROSION AND SEDIMENTATION CONTROL

Throughout each and every phase of the project, the downstream end of the 11'-diameter pipe or any other portion of the Village's storm sewer system shall be protected from any and all construction debris, materials and contaminants. This work shall consist of constructing erosion and sedimentation control systems as agreed upon by the Village and Contractor and in compliance with applicable permit regulations. The work shall be placed by methods and with materials in accordance with Sections 280, 1080 and 1081 of the SSRBC, except as amended herein.

All erosion and sedimentation control measures shall be installed on the project site prior to beginning any construction activities which will potentially create conditions subject to erosion. Erosion control devices shall be in place and approved by the Engineer as to proper placement and installation prior to beginning other work. Erosion control protection for Contractor equipment storage sites, plant sites, and other sites shall be installed by the Contractor and approved by the Engineer prior to beginning construction activities at each site.

The Contractor is responsible for all compliance with the General NPDES Permit (No. ILR10) for Storm Water Discharges from Construction Site Activities. This shall include, but not be limited to, preparation and submittal of all required forms such as the NOI, ION, NOT, SWPPP, etc. The Contractor is responsible for performing all soil erosion and sediment control inspections, maintaining inspections, reports, logs, etc. and for keeping an up to date SWPPP on site at all times.

4. TRAFFIC CONTROL, MAINTENANCE OF TRAFFIC, DETOURS

This item shall include the furnishing, installing, maintaining, relocating and removing of all traffic control devices and personnel used for the purpose of regulating, warning, or directing traffic during the construction of this project. Placement and maintenance of all traffic control devices shall be in accordance with the applicable parts of Article 107.14 and Section 701 of the Standard Specifications and included Highway Standards. All traffic control devices used on this project shall conform to the Standard Specifications for Traffic Control Devices and the Illinois Manual on Uniform Traffic Control Devices and as indicated on the Traffic Control Plan. No waiving of these requirements will be allowed without prior written approval of the Engineer.

The Contractor shall protect all workers engaged in the project, and shall provide for safe and convenient public travel by providing adequate traffic control under all circumstances. Such circumstances may

include, but not be limited to work performed along the route under construction, road closures for construction operations of any type, or when any section of the road is opened to traffic prior to completion of all work. The Contractor shall ensure that work zone in question is properly signed, barricaded and otherwise marked.

The Contractor will be responsible for the proper location, installation, and arrangement of all traffic control devices during the period of construction. All open excavations shall be protected by Type I barricades equipped with working bi-directional flashing lights at each end of the excavation, as well as at 50-foot intervals between ends for excavations greater than 50 feet in length and weighted down by one sandbag per each barricade. All street closures shall be protected by Type III barricades equipped with working bi-directional flashing lights and weighted down by eight sandbags per each barricade.

The Contractor shall plan the work not to leave any open excavations during non-working hours and that all barricades not necessary have been removed from the pavement during non-working hours.

In the event that one direction of vehicular travel must be closed, the Contractor shall use certified flaggers (minimum of two) to direct traffic around the work area. The Engineer shall approve proper signing and barricading of the lane closures, and shall issue written authorization prior to closure. Presence of certified flaggers shall be required anytime the contractor's activities may impede the designated flow of traffic.

In the event that both directions of vehicular travel must be closed, the Contractor shall set up a detour route to direct traffic around the work area. The Engineer shall approve proper signing and barricading of the detour route and shall issue written authorization prior to closure. Where it is necessary to establish a temporary detour, all the requirements of the Standard Specifications and MUTCD shall be met.

The Contractor shall maintain its operations in a manner such that traffic flow shall not be substantially impeded during the construction of the proposed improvements. Where traffic must cross open trenches during a given work day, the Contractor shall provide steel plates at street intersections and driveways. Prior to the end of a given work day, the pavement surface shall be temporarily restored.

No open excavation may be left overnight or on the weekend without the express written permission of the Engineer.

As the condition and location of the work changes, the Contractor shall maintain all traffic control devices and personnel engaged in traffic control, in a manner that will accommodate the changing particulars of the work at any given time. Advance warnings, detour and directional information and other controls or directions necessary for safe passage of traffic around the work site shall be reviewed and changed, if necessary, to meet the needs of the situation. Signage erected, but not necessary or proper for the situation ahead shall be covered or taken down. Barricading and signage shall be monitored by the Contractor on a daily basis to ensure that it meets the requirements for work zone safety for the conditions of the particular work being performed.

In the event public sidewalk must be closed, the Contractor shall provide SIDEWALK CLOSED AHEAD signs adjacent to the closure and at the nearest intersections to the closure. If the closure occurs

an intersection, the Contractor shall provide SIDEWALK CLOSED USE OTHER SIDE signs at the corner(s) opposite the closed sidewalk.

Access to all properties shall remain open at all times unless work is taking place in the immediate vicinity, requiring that access be restricted on a temporary basis. Full access must be restored immediately upon the completion of any work blocking said access, and full access must be restored to all properties over weekends and legal holidays unless approved by the Engineer. Special consideration to hours and location of work near school shall be made to allow for full and safe access during normal student arrival and departure schedules. The Contractor is responsible for all traffic control and this item is incidental to the cost of the overall contract work.

The Contractor shall provide a name and phone number of a responsible party capable of providing emergency service, 24 hours per day, for the duration of the Project.

5. DEFICIENCY CHARGE:

The primary concern of the Village is to maintain a safe travel way for the public and a safe environment for the work in the construction zone. The Contractor is expected to comply with the Standard Specifications, contract plans, the Special Provisions and directions from the Engineer concerning traffic control and protection. The Contractor shall provide a telephone number where a responsible individual can be contacted on a 24-hour-a-day basis to receive notification of any deficiencies regarding traffic control and protection. The Contractor shall immediately respond correcting traffic control deficiencies by dispatching workers, materials and equipment to correct such deficiencies.

Failure to comply with the Contract or as directed by the Engineer as it relates to corrections or modifications to the traffic control and protection will result in a deduction of either \$1,000 or 0.05 percent of the awarded contract value, whichever is greater, in accordance with Article 105.03. This charge is separate from the cost of any corrective work ordered. The Contractor shall not be relieved of any contractual responsibilities by the Village's actions.

6. STREET SWEEPING AND DUST CONTROL

All roadway surfaces shall be kept free of dirt, mud, dust and debris of any kind throughout every phase of the project. Dirt, mud, dust and debris of any kind shall be removed from the roadway surface to the satisfaction of the Engineer by approved mechanical sweeping equipment.

Whenever directed by the Engineer, the Contractor shall mechanically sweep the pavement adjacent to the work site.

7. IEPA CLEAN CONSTRUCTION OR DEMOLITION DEBRIS

The Contractor shall be responsible for satisfactory removal and disposal of all waste material, asphalt, concrete, stone, dirt, and debris generated or discovered in the course of the work. Removal and disposal of excavation items being disposed of at a clean construction and demolition debris (CCDD) facility, meeting the requirements of Public Act 96-1416, or to an acceptable landfill.

The temporary storing of excavated materials within the public right-of-way or project limits shall not be allowed unless approved by the Engineer. It shall be the Contractor's responsibility to find an approved dumpsite for debris and any excavated materials. The Village will not provide one.

All additional work to satisfy these requirements, including but not limited to, all required testing, lab analysis, and certification by a licensed professional engineer (PE) or licensed professional geologist (PG), shall be the responsibility of the Contractor.

8. EXPLORATORY TRENCHING

This item shall consist of excavating an area for the purpose of locating existing utilities within the construction limits of the proposed improvements. The Contractor shall perform exploratory trenching for all existing utilities potentially in conflict with the proposed improvements. The Contractor shall proactively perform exploratory trenching in a timely fashion to help mitigate delays, if any, caused by conflicts with existing utilities. The Contractor shall also perform exploratory trenching as directed by the Engineer. It shall be the responsibility of the Contractor to immediately inform the Engineer of any conflicts with existing utilities in conflict with the proposed improvements.

After the excavation has been inspected, it shall be backfilled as directed by the Engineer. If it is located within 2' of a paved area (existing or proposed), the excavation shall be backfilled with Trench Backfill as specified herein. Otherwise, the excavation shall be backfilled with excavated material compacted to the satisfaction of the Engineer. Any excess material shall be disposed of in accordance with Article 202.03 of the IDOT Standard Specifications.

V. Pricing:

The price for the Project shall be as set forth in the attached Exhibit A, subject to the Village's option to select Option B or Option C in accordance with this Section V. Pricing.

Pricing for Year 1 shall be \$2,642,019.63.

The Village shall notify Contractor in writing as to whether it will be selecting to proceed with "Option B" or "Option C" by November 1, 2025.

VI. CONTRACT FORM

CONTRACTOR:

<u>Vortex Lining Systems</u>	<u>2/26/2025</u>
Company Name	Date
<u>18150 Imperial Valley Dr.</u>	<u>rcooke@vortexcompanies.com</u>
Street Address of Company	E-mail Address
<u>Houston, TX 77060</u>	<u>BJ Kerstiens</u>
City, State, Zip	Contact Name (Print)
<u>713-750-9081</u>	<u>713-750-9081</u>
Business Phone	24-Hour Telephone
<u></u>	<u>B.J. Kerstiens</u>
Business Fax	Signature of Officer, Partner or Sole Proprietor
<u></u>	<u>B. J. Kerstiens SVP</u>
ATTEST: if a Corporation	Print Name & Title
<u></u>	
Signature of Corporation Secretary	

We hereby agree to furnish the Village of Downers Grove all necessary materials, equipment, labor, etc. to complete the project within the timeframe specified herein and in accordance with the provisions, instructions and specifications for the unit prices shown on the Schedule of Prices.

VILLAGE OF DOWNERS GROVE:

ATTEST:

Authorized Signature

Village Clerk

Title

Date

Date

SUBCONTRACTORS LIST

The Contractor hereby states the following items of work will not be performed by its organization. (List items to be subcontracted as well as the names, addresses and phone numbers of the subcontractors.)

1) Traffic Control Company Type of Work Traffic Control

Addr: 3019 East End Avenue City Chicago State IL Zip 60411

2) Basic Engineering Type of Work Grouting and GPR

Addr: 2601 E 7th Ave City Tampa State FL Zip 33605

3) CCS Type of Work Cleaning

Addr: 5842 W. Montrose Ave City Chicago State IL Zip 60634

4) _____ Type of Work _____

Addr: _____ City _____ State _____ Zip _____

5) _____ Type of Work _____

Addr: _____ City _____ State _____ Zip _____

6) _____ Type of Work _____

Addr: _____ City _____ State _____ Zip _____

7) _____ Type of Work _____

Addr: _____ City _____ State _____ Zip _____

8) _____ Type of Work _____

Addr: _____ City _____ State _____ Zip _____

Apprenticeship and Training Certification

Contractor certifies that it is a participant, either as an individual or as part of a group program, in the approved apprenticeship and training programs applicable to each type of work or craft that the Contractor will perform with its own forces. The Contractor further certifies for work that will be performed by subcontract that each of its subcontractors submitted for approval either (a) is, at the time of such bid, participating in an approved, applicable apprenticeship and training program; or (b) will, prior to commencement of performance of work pursuant to this Contract, begin participation in an approved apprenticeship and training program applicable to the work of the subcontract. The Village of Downers Grove, at any time before or after award, may require the production of a copy of each applicable Certificate of Registration issued by the United States Department of Labor evidencing such participation by the contractor and any or all of its subcontractors. Applicable apprenticeship and training programs are those that have been approved and registered with the United States Department of Labor. The Contractor shall list in the space below, the official name of the program sponsor holding the Certificate of Registration for all of the types of work or crafts in which the Contractor is a participant and that will be performed with the Contractor's forces. Types of work or craft work that will be subcontracted shall be included and listed as subcontract work. The list shall also indicate any type of work or craft job category that does not have an applicable apprenticeship or training program. **The Contractor is responsible for making a complete report and shall make certain that each type of work or craft job category that will be utilized on the project is listed below. Return this with the Bid. This Certification will be used to determine the lowest responsible Contractor in accordance with the Village Council Policy regarding Purchasing Procedures.**

The requirements of this certification and disclosure are a material part of the Contract, and the Contractor shall require this certification provision to be included in all approved subcontracts. In order to fulfill this requirement, it shall not be necessary that an applicable program sponsor be currently taking or that it will take applications for apprenticeship, training or employment during the performance of the work of this Contract.

Certificate of Compliance

The Contractor hereby certifies that it and its subcontractors participate in an applicable apprenticeship program.

Signature _____

Company Name _____

Title _____

Date _____

Certificate of Non-Compliance

The Contractor hereby certifies that it or its subcontractors do not participate in an applicable apprenticeship program.

Signature B.J. Kuntz Jr.

Company Name Vortex Lining Systems

Title SVP

Date 2/26/2025

BUY AMERICA CERTIFICATION

Certification requirement for procurement of steel, iron, or manufactured products when Federal funds (Grant Agreement or Cooperative Agreement) are used.

Instructions:

Contractor to complete the Buy America Certification listed below. Contractor shall certify EITHER COMPLIANCE OR NON-COMPLIANCE (not both). This Certification MUST BE submitted with the Contractor's bid response.

Special Note: Make sure you have signed only one of the above statements – either Compliance OR Non-Compliance (not both).

Certificate of Compliance

The Contractor or offeror hereby certifies that it **will meet** the requirements of 49 U.S.C. 5323(j)(1), as amended, and the applicable regulations in 49 CFR Part 661.

Signature B.J. Kuntz Jr.

Company Name Vortex Lining Systems

Title SVP

Date 2/26/2025

Certificate of Non-Compliance

The Contractor or offeror hereby certifies that it **cannot comply** with the requirements of 49 U.S.C. 5323(j)(1), as amended, and 49 C.F.R. 661, but it may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(A), 5323(j)(2)(B), or 5323(j)(2)(D), and 49 C.F.R. 661.7.

Signature _____

Company Name _____

Title _____

Date _____

AFTER THIS CERTIFICATE HAS BEEN EXECUTED, CONTRACTOR MAY NOT SEEK A WAIVER.

Note: The U.S/Canadian Free Trade Agreement does not supersede the Buy America requirement.

Suspension or Debarment Certificate

Non-Federal entities are prohibited from contracting with or making sub-awards under covered transactions to parties that are suspended or debarred or whose principals are suspended or debarred. Covered transactions include procurement for goods or services equal to or in excess of \$100,000.00. Contractors receiving individual awards for \$100,000.00 or more and all sub-recipients must certify that the organization and its principals are not suspended or debarred.

By submitting this offer and signing this certificate, the Contractor certifies to the best of its knowledge and belief, that the company and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from covered transactions by any federal, state or local governmental entity, department or agency;
2. Have not within a three-year period preceding this Bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction, or convicted of or had a civil judgment against them for a violation of Federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (2) of this certification; and
4. Have not within a three-year period preceding this application/proposal/contract had one or more public transactions (Federal, State or local) terminated for cause or default.

If the Contractor is unable to certify to any of the statements in this certification, Contractor shall attach an explanation to this certification.

Company Name: Vortex Lining Systems, LLC

Address: 18150 Imperial Valley Dr.

City: Houston. TX Zip Code: 77060

Telephone: (713) 750-9081 Fax Number: ()

E-mail Address: rcooke@vortexcompanies.com

Authorized Company Signature: B.J. Kerstiens

Print Signature Name: B.J. Kerstiens Title of Official: SVP

Date: 2/26/2025

Any contractor, proposer, bidder or vendor who responds by submitting a bid or proposal to the Village of Downers Grove shall be required to submit with its bid submission, an executed Campaign Disclosure Certificate.

Said Campaign Disclosure Certificate requires any individual or entity bidding to disclose campaign contributions, as defined in Section 9-1.4 of the Election Code (10 ILCS 5/9-1.4), made to current members of the Village Council within the five (5) year period preceding the date of the bid or proposal release.

By signing the bid documents, contractor/proposer/bidder/vendor agrees to refrain from making any campaign contributions as defined in Section 9-1.4 of the Election Code (10 ILCS 5/9-1.4) to any Village Council member and any challengers seeking to serve as a member of the Downers Grove Village Council.

Under penalty of perjury, I declare:

☒ Contractor/vendor has not contributed to any elected Village position within the last five (5) years.

B.J. Kerstin Jr.
Signature

BJ Kerstiens
Print Name

☐ Contractor/vendor has contributed a campaign contribution to a current member of the Village Council within the last five (5) years.

Print the following information:

Name of Contributor: _____
(company or individual)

To whom contribution was made:

Year contribution made: _____ Amount: \$ _____

Signature

Print Name

EXHIBIT A

EXHIBIT A

		YR 1	YR 2	YR 3	TOTAL
Option B - Complete in two years		\$2,642,019.63	\$5,668,183.02		\$8,310,202.65
Option C - Complete in three years		\$2,642,019.63	\$2,984,192.99	\$2,875,788.10	\$8,502,000.72
				savings	(\$191,798.07)
Project #	208725-3				Date: 1/27/2025
Project Name:	IL - Downers Grove - Design Build 11' Pipe Rehab Remix				
2 YEAR OPTION					
Item #	Description	Bid Qty.	UM	Unit Bid Price	Total Bid Price
1	Mobilization	1	EACH	\$105,000.00	\$105,000.00
2	Engineering - Review And Design / Soil Erosion And Sediment Control Plan	0.33	EACH	\$95,000.00	\$31,350.00
3	Permitting & Associated Submittals	0.33	LS	\$50,000.00	\$16,500.00
4	Traffic Control	1	EACH	\$28,000.00	\$28,000.00
5	Cleaning & CCTV	985	LF	\$137.00	\$134,945.00
7	Installation Of GeoKrete Geopolymer At 1.0" Thickness (985LF) On Existing Concrete 132" Pipe	985	LF	\$960.00	\$945,600.00
9	MH Rehabilitation - Install GeoKrete Geopolymer At 1.0" Thickness (Composite Design)	3	EACH	\$7,125.00	\$21,375.00
10	Bypass & Flow Control	1	EACH	\$112,000.00	\$112,000.00
13	Restoration Of Any Disturbed Areas	0.33	LS	\$74,000.00	\$24,420.00
14	Disposal	253	TON	\$1,150.00	\$290,950.00
15	I&I Guard - Fast Curing Polyurethane Grout For Leak Stoppage (1,200ml Per Each) Will Bill As Needed	31	EACH	\$195.00	\$6,045.00
	Surface Patching - Crown Of The Pipe - Spall With Exposed Rebar Additional Surface Prep Of Host Pipe				
	(Beyond Defects Identified In 2016 HBK Report, Will Bill As Needed)	50	CF	\$250.00	\$12,500.00
17	ALT: Ground Penetrating Radar(GPR)	1	LS	\$30,000.00	\$30,000.00
18	ALT: Design And Install Of Concrete Steps/access At Upstream Of The 11' Diameter Pipe	1	LS	\$175,000.00	\$175,000.00
19	ALT: Curtain Grouting Of Pipe	1	LS	\$545,000.00	\$545,000.00
20	ALT: Multi-Sensor Inspection (MSI)	4143	LF	\$30.00	\$124,290.00
21	Separate 20% Contingency	1	LS	\$0.00	\$0.00
	P&P Bond	1.5%			\$39,044.63
					\$2,642,019.63
22	Mobilization	1	EACH	\$93,150.00	\$93,150.00
23	Engineering - Review And Design / Soil Erosion And Sediment Control Plan	0.67	EACH	\$98,325.00	\$65,877.75
24	Permitting & Associated Submittals	0.67	LS	\$51,750.00	\$34,672.50
25	Traffic Control	2	EACH	\$201,825.00	\$403,650.00
26	Cleaning & CCTV	3158	LF	\$141.80	\$447,804.40
27	Installation Of GeoKrete Geopolymer At 1.0" Thickness (1,650LF) On Existing Concrete 132" Pipe	3158	LF	\$993.60	\$3,137,788.80
28	MH Rehabilitation - Install GeoKrete Geopolymer At 1.0" Thickness (Composite Design)	4	EACH	\$7,374.38	\$29,497.52
29	Bypass & Flow Control	2	EACH	\$155,250.00	\$310,500.00
30	Restoration Of Any Disturbed Areas	0.67	LS	\$76,590.00	\$51,315.30
31	Disposal	810	TON	\$1,190.25	\$964,102.50
32	I&I Guard - Fast Curing Polyurethane Grout For Leak Stoppage (1,200ml Per Each) Will Bill As Needed	100	EACH	\$201.83	\$20,183.00
	Surface Patching - Crown Of The Pipe - Spall With Exposed Rebar Additional Surface Prep Of Host Pipe				
	(Beyond Defects Identified In 2016 HBK Report, Will Bill As Needed)	100	CF	\$258.75	\$25,875.00
34	Separate 20% Contingency	1	LS	\$0.00	\$0.00
	P&P Bond	1.5%			\$83,766.25
					\$5,668,183.02
					\$8,310,202.65

10 VORTEX		Option B - Complete in two years	YR 1	YR 2	YR 3	TOTAL
		Option C - Complete in three years	\$2,642,019.63	\$5,668,183.02		\$8,310,202.65
			\$2,642,019.63	\$2,984,192.99	\$2,875,788.10	\$8,502,000.72
					savings	(\$191,798.07)
Project #	208725-3					Date: 1/27/2025
Project Name:	IL - Downers Grove - Design Build 11' Pipe Rehab Remix					
3 YEAR OPTION						
Item #	Description	Bid Qty.	UM	Unit Bid Price	Total Bid Price	
1	Mobilization		1 EACH	\$105,000.00	\$105,000.00	
2	Engineering - Review And Design / Soil Erosion And Sediment Control Plan	0.33	EACH	\$95,000.00	\$31,350.00	
3	Permitting & Associated Submittals	0.33	LS	\$50,000.00	\$16,500.00	
4	Traffic Control		1 EACH	\$28,000.00	\$28,000.00	
5	Cleaning & CCTV	985	LF	\$137.00	\$134,945.00	
7	Installation Of GeoKrete Geopolymer At 1.0" Thickness (985LF) On Existing Concrete 132" Pipe	985	LF	\$960.00	\$945,600.00	
9	MH Rehabilitation - Install GeoKrete Geopolymer At 1.0" Thickness (Composite Design)	3	EACH	\$7,125.00	\$21,375.00	
10	Bypass & Flow Control		1 EACH	\$112,000.00	\$112,000.00	
13	Restoration Of Any Disturbed Areas	0.33	LS	\$74,000.00	\$24,420.00	
14	Disposal	253	TON	\$1,150.00	\$290,950.00	
15	I&I Guard - Fast Curing Polyurethane Grout For Leak Stoppage (1,200ml Per Each) Will Bill As Needed	31	EACH	\$195.00	\$6,045.00	
	Surface Patching - Crown Of The Pipe - Spall With Exposed Rebar Additional Surface Prep Of Host Pipe					
16	(Beyond Defects Identified In 2016 HBK Report, Will Bill As Needed)	50	CF	\$250.00	\$12,500.00	
17	ALT: Ground Penetrating Radar(GPR)		1 LS	\$30,000.00	\$30,000.00	
18	ALT: Design And Install Of Concrete Steps/access At Upstream Of The 11' Diameter Pipe		1 LS	\$175,000.00	\$175,000.00	
19	ALT: Curtain Grouting Of Pipe		1 LS	\$545,000.00	\$545,000.00	
20	ALT: Multi-Sensor Inspection (MSI)	4143	LF	\$30.00	\$124,290.00	
21	Separate 20% Contingency		1 LS	\$0.00	\$0.00	
	P&P Bond	1.5%			\$39,044.63	
					\$2,642,019.63	
22	Mobilization		1 EACH	\$93,150.00	\$93,150.00	
23	Engineering - Review And Design / Soil Erosion And Sediment Control Plan	0.33	EACH	\$98,325.00	\$32,447.25	
24	Permitting & Associated Submittals	0.33	LS	\$51,750.00	\$17,077.50	
25	Traffic Control		1 EACH	\$201,825.00	\$201,825.00	
26	Cleaning & CCTV	1650	LF	\$141.80	\$233,970.00	
27	Installation Of GeoKrete Geopolymer At 1.0" Thickness (1,650LF) On Existing Concrete 132" Pipe	1650	LF	\$993.60	\$1,639,440.00	
28	MH Rehabilitation - Install GeoKrete Geopolymer At 1.0" Thickness (Composite Design)		2 EACH	\$7,374.38	\$14,748.76	
29	Bypass & Flow Control		1 EACH	\$155,250.00	\$155,250.00	
30	Restoration Of Any Disturbed Areas	0.33	LS	\$76,590.00	\$25,274.70	
31	Disposal	423	TON	\$1,190.25	\$503,475.75	
32	I&I Guard - Fast Curing Polyurethane Grout For Leak Stoppage (1,200ml Per Each) Will Bill As Needed	52	EACH	\$201.83	\$10,495.16	
	Surface Patching - Crown Of The Pipe - Spall With Exposed Rebar Additional Surface Prep Of Host Pipe					
33	(Beyond Defects Identified In 2016 HBK Report, Will Bill As Needed)	50	CF	\$258.75	\$12,937.50	
34	Separate 20% Contingency		1 LS	\$0.00	\$0.00	
	P&P Bond	1.5%			\$44,101.37	
					\$2,984,192.99	
35	Mobilization		1 EACH	\$96,410.25	\$96,410.25	
36	Engineering - Review And Design / Soil Erosion And Sediment Control Plan	0.34	EACH	\$101,766.38	\$34,600.57	
37	Permitting & Associated Submittals	0.34	LS	\$53,561.25	\$18,210.83	
38	Traffic Control		1 EACH	\$208,888.88	\$208,888.88	
39	Cleaning & CCTV	1508	LF	\$146.76	\$221,314.08	
40	Installation Of GeoKrete Geopolymer At 1.0" Thickness (1,508LF) On Existing Concrete 132" Pipe	1508	LF	\$1,028.38	\$1,550,797.04	
41	MH Rehabilitation - Install GeoKrete Geopolymer At 1.0" Thickness (Composite Design)		2 EACH	\$7,632.48	\$15,264.96	
42	Bypass & Flow Control		1 EACH	\$160,683.75	\$160,683.75	
43	Restoration Of Any Disturbed Areas	0.34	LS	\$79,270.65	\$26,952.02	
44	Disposal	387	TON	\$1,231.91	\$476,749.17	
45	I&I Guard - Fast Curing Polyurethane Grout For Leak Stoppage (1,200ml Per Each) Will Bill As Needed	48	EACH	\$208.89	\$10,026.72	
	Surface Patching - Crown Of The Pipe - Spall With Exposed Rebar Additional Surface Prep Of Host Pipe					
46	(Beyond Defects Identified In 2016 HBK Report, Will Bill As Needed)	50	CF	\$267.81	\$13,390.50	
47	Separate 20% Contingency		1 LS	\$0.00	\$0.00	
	P&P Bond	1.5%			\$42,499.33	
					\$2,875,788.10	
					\$8,502,000.72	

EXHIBIT B



REQUEST FOR PROPOSAL

For Downtown Business
District 11' Diameter
Pipe Rehabilitation and
Maintenance

DESIGN/BUILD
SW-090

TECHNICAL PROPOSAL





OCTOBER 31, 2024

JULIE LOMAX
STORMWATER ADMINISTRATOR
VILLAGE OF DOWNERS GROVE
5101 WALNUT AVE.
DOWNERS GROVE, IL 60515

RE: Village of Downers Grove – RFP for Downtown Business District 11’ Diameter Pipe Rehabilitation and Maintenance – Design/Build SW-090

SUBJECT: Vortex Lining Systems, LLC – Request for Proposal (Professional Services)

Dear Ms. Lomax:

Vortex Lining Systems, LLC (Vortex) is pleased to submit our Technical Proposal for the Village of Downers Grove – Downtown Business District 11’ Diameter Pipe Rehabilitation and Maintenance – Design/Build. As you will see throughout our RFP package, our experience drives a best-in-class approach to addressing the critical components of the project while delivering a cost-effective solution, on time and on budget. Coupled with the addition of a locally lead WDBE design firm familiar with complex design/build infrastructure projects, our team is built to deliver on every aspect of the project.

IN SHORT, WE BUILT A TEAM TO BUILD THIS PROJECT!

At Vortex, our operating philosophy is to internally control and execute as much of the project scope as possible. As both the product manufacturer and installer, it is this robust service and product offering that further differentiates our firm from the competition and optimized accountability to our clients. Our ability to self-perform a high percentage of the project improves overall work quality, safety awareness and operational continuity. Additionally, Vortex is the only company that provides both manufacturing and installation of a Geopolymer under one roof. This dynamic structure affords us the opportunity to pass along a stringent QAQC process from manufacturing to execution.

Ultimately, our commitment is to provide a best-value approach focused on environmental solutions, transparency, and accountability. Our mission is to deliver cost-effective solutions that extend the operating life of critical assets. It is our hope that this proposal allows us to secure the opportunity to work with the Village of Downers Grove and deliver a successful project that both Vortex and the Village can be proud of!

Vortex acknowledges receipt of Addendums 1, 2 and 3. Should you have any questions regarding our proposal, please feel free to contact me at (864) 918-7951 or rcooke@vortexcompanies.com.

All the best,

A handwritten signature in blue ink, appearing to read "B. Ross Cooke".

B. Ross Cooke
Regional Vice President
Vortex Lining Systems



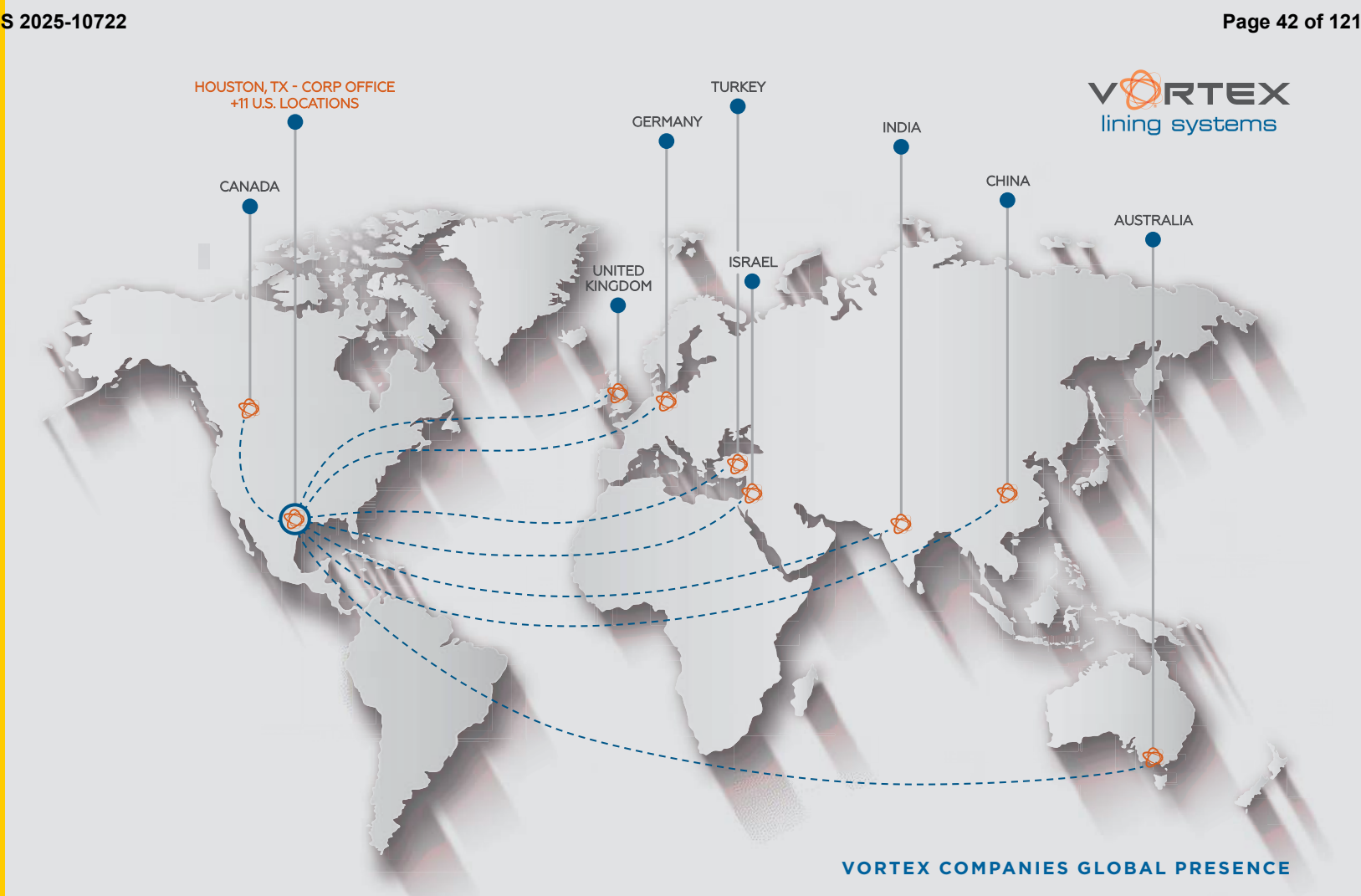
I Table of Contents

- 1 Company Background & Information _____
- 2 Project and Design Team _____
 - i. Organization Chart _____
 - ii. Engineering Team _____
 - iii. Sub-Contractors _____
 - iv. Key Résumés _____
 - v. Sub-Contractors and Design Support Résumés _____
- 3 Proposed Means and Methods _____
- 4 Proposed Design of Improvements _____
- 5 Proposed Alternative Design of Improvements _____
- 6 Proposed Project Schedule _____
- 7 Letter of Capability of Acquiring Performance Bond _____



| Company Background & Information





VORTEX COMPANIES GLOBAL PRESENCE

Vortex Lining Systems, LLC

Vortex Lining Systems, LLC is a division within the Vortex family and operates in conjunction with our Vortex Services division. Founded in 2015, the Vortex Companies is a collection of business segments with both a national and international footprint. As both a horizontally and vertically integrated business, the Company executes on its vision of providing a comprehensive suite of solutions that deliver quality engineered solutions, products and services that improve the efficiency, safety and long-term reliability of its client's assets. This unique approach allows the Company to effectively design, develop, manufacture and/or commercialize a wide variety of products and services for its broad customer base. The business segments, which represent the broader Vortex family, have origins dating back to 1972, and include some of the most respected, experienced and driven staff in each of their respective industry focuses. The following table outlines the business segments operating under the Vortex family of Companies, including Vortex Lining Systems.

VORTEX COMPANIES

- | | |
|------------------------------|------------------------------------|
| • Vortex Lining Systems, LLC | • Vortex Services, LLC |
| • Vortex Products | • Vortex Industrial Solutions, LLC |
| • Schwalm USA | • Vortex Europe |
| • Quadex®, LLC | |

GENERAL CONTRACTING LICENSES

The Vortex family of companies are registered General Contractors in 20 states. A list of state licenses for specific license information is available upon request.

NUMBER OF YEARS IN BUSINESS

Vortex was founded in 2015. Over the last 6+ years Vortex has grown tremendously both organically and through several strategic acquisitions. Through our acquisitions Vortex has acquired companies that were established as far back as 1972. Thus, while Vortex as a whole was founded in 2015, an overwhelming majority of the personnel and companies that are represented underneath the broader Vortex portfolio have the experience that far outdate 2015.



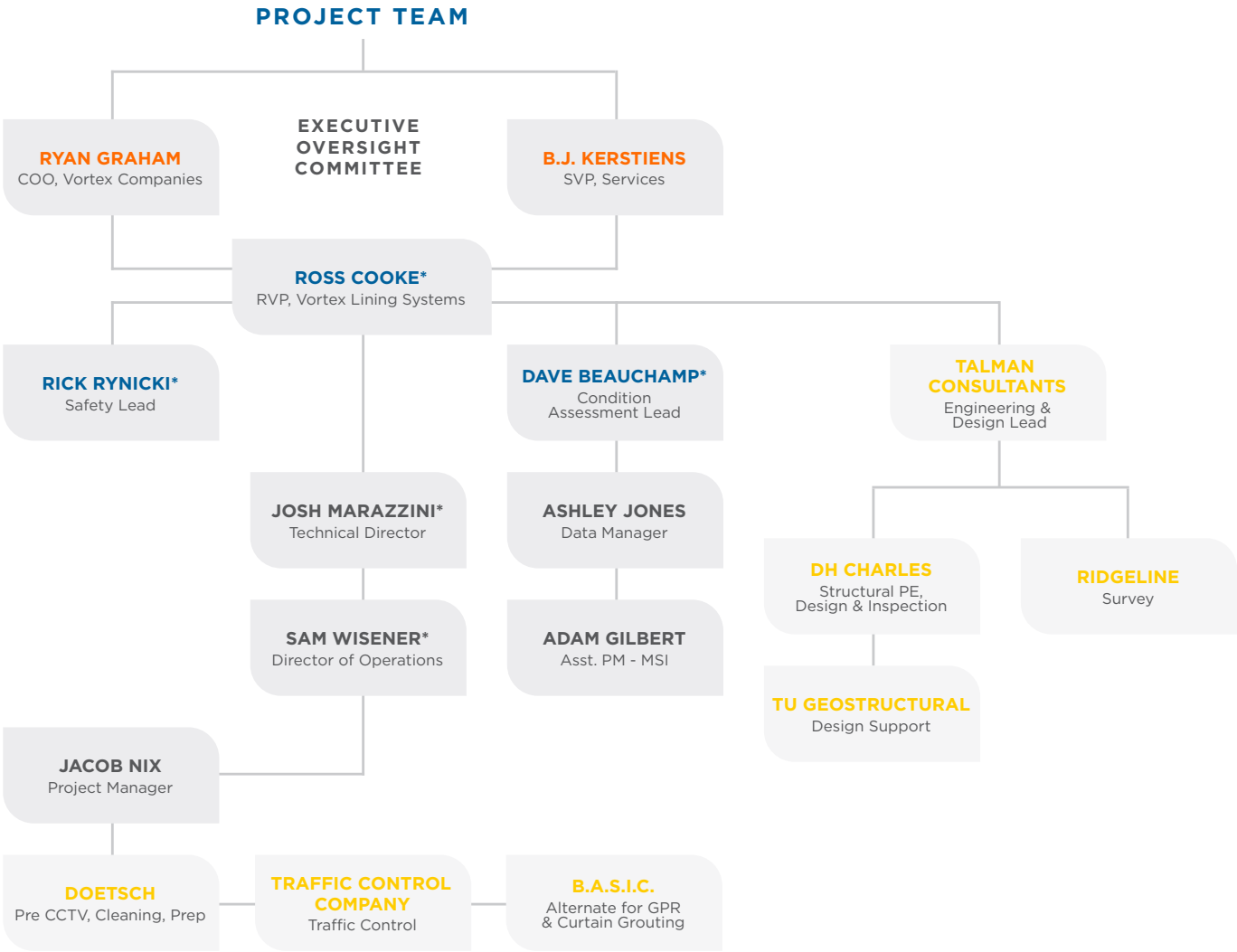
| Project & Design Team



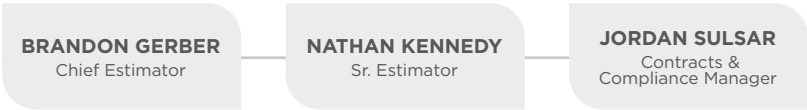


Organization Chart





PRE-CONSTRUCTION PHASE SUPPORT TEAM



- Executive Management
- Project Management
- Sub-Contractor and Design Support

*Résumés are included in this section.



Engineering Team

TALMAN CONSULTANTS, LLC

Engineering and Design Lead

RIDGELINE CONSULTANTS, LLC

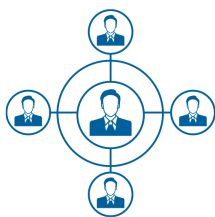
Pipe Surveying

D.H. CHARLES

Structural P.E., Design and Inspection

TU GEOSTRUCTURAL

Design Support



Operating under the Vortex Companies umbrella, GeoKrete® geopolymer material Manufacturer (Quadex®, LLC) and rehabilitation specialty contractor (Vortex Lining Systems, LLC) will lead the project execution team in conjunction with the proposed design support team partners lead by local WBE firm **TALMAN CONSULTANTS, LLC** (WBENC/WDBE) to collectively provide the Village of Downers Grove with a project execution and support team with the technical aptitude necessary to provide optimized design solutions for the successful execution of the project. As a home grown leader in Civil design, Talman Consultants was chosen for their ability to successfully lead design teams with a diverse skill set through projects with varying degrees of complexity. Supported by local Surveyor,

RIDGELINE CONSULTANTS, LLC (DBE/MBE), International Structural design firm, **D.H. CHARLES** and specialty underground design firm **TU GEOSTRUCTURAL**, the team offers unmatched technical expertise and project understanding. While with his previous employer, D.H. Charles lead engineer **ANDREW J. SCHWARZ, P.E., S.E.** brings previous experience on the project, leading the preparation of the Downtown Business District Pipe Assessment Report. While with his previous employer, TU GeoStructural lead engineer **MOHAMED GOMAL** was personally responsible for the preparation of hundreds of designs successfully executed on large diameter culvert and pipe rehabilitations making use of the GeoKrete geopolymer material proposed for this project.



141 W. JACKSON BLVD.
STE. 1600A
CHICAGO, IL 60604

773.825.6261
TALMANCONSULTANTS.COM



NAVIGATING THE COMPLEX INFRASTRUCTURE MARKET

Talman Consultants, LLC (WBENC & WDBE) serves as a strategic partner for utility and infrastructure leaders looking to make smarter investment decisions and to secure a competitive advantage. Our full range of consulting and engineering services are built from a wealth of experience in planning, design, and construction.

No matter our role, Talman takes a 360 view of the entire project lifecycle, uncovering opportunities and anticipating problems that often are missed. Our collaborative model uniquely connects all infrastructure stakeholders to shared goals, optimizing speed to market and return on investment.

Our team leverages extensive experience with leading telecom and broadband utilities on large scale, complex projects. We understand clients' business strategies and work to deliver streamlined project life cycles that support them. We integrate well with larger project teams applying best practices, transparent reporting, and accurate, timely forecasts.

MODERN INFRASTRUCTURE REQUIRES MODERN PLANNING

Shifting conditions in complex markets make it more challenging than ever to ensure infrastructure projects are designed to build. Unfortunately, traditional siloed planning practices come up short as stakeholders look to minimize risk and maximize opportunity. That's why Talman developed RAMP™, our proprietary continuous planning approach that makes sure your unique business objectives are in sync with current market realities.

TALMAN'S RAMP™ METHODOLOGY		
CUSTOM	COMPREHENSIVE	CONTINUOUS
We start with a deep understanding of your unique goals and challenges and how the success of every project fuels growth and satisfies stakeholders.	We take a 360-degree view, stress testing your project against an exhaustive range of real-world pressure points key to your success.	Analysis continues throughout the project life cycle navigating shifting conditions, anticipate disruptions, and capture competitive advantages.

RAMP™ IN ACTION: DELIVERING THE NEXT GENERATION OF WIRELESS

RAMP powered our multi-year project with Crown Castle to bring next generation 5G wireless service to market, deploying an unprecedented 2.6 million feet of fiber and 3,600+ small cells.

Whether the work involved engineering design and review, regulatory compliance, project life cycle optimization, project management or permit acquisition, RAMP continuously leveraged our team's deep knowledge and best practices to ensure all projects were delivered within budget and well ahead of schedule.

Using RAMP's comprehensive approach to project management, we built consensus with other stakeholders to anticipate conflicts, mitigate disruptions, and capture efficiencies for maximum ROI and competitive impact.



141 W. JACKSON BLVD.
STE. 1600A
CHICAGO, IL 60604

773.825.6261
TALMANCONSULTANTS.COM



SERVICES: WE GET THINGS DONE

RAMP™ powers everything we do. Large or small. Urban or rural. We can leverage our expertise in a wide range of complex infrastructure projects in any market.

CONSULTING SERVICES

Infrastructure Planning	Providing a trusted assessment of how your infrastructure investments can provide maximum value for all public and private stakeholders.
Utilities Planning	Harnessing the strength of our best practices in working with municipalities and utilities to achieve their goals.
Fiber Technology & Deployment Planning	Applying a precision mindset and 360 view of a project's lifecycle to ensure even the most complex challenges are designed to build.
Project Management Oversight	Leveraging our proprietary continuous planning methodology to ensure projects of any scale are delivered on time and within budget.

ENGINEERING SERVICES

Utility Engineering & Design	Designing practical, cost-effective solutions that respond to the always-evolving rules and municipality processes.
Permit Acquisition	Ensuring total compliance while expediting submittals and approvals to secure permits with various City, County and Municipal entities.
Traffic Control	Leveraging Traffic Control best practices with custom designs that align your project goals with the myriad of federal, state, and local regulations.
Restoration Services	Analyzing schedules and work planned by others to develop an optimized restoration strategy centered on using your resources most efficiently.
Construction Oversight	Monitoring all on-site construction during the installation of designs, from meetings with contractors to field change requests and sketches.

CLIENT PARTNERS

AT&T	Everstream	MasTec Network Solutions
Comcast	Kinder Morgan	RCN
ComEd (Exelon Corporation)	Ledcor	Verizon (Business & Wireless)
Crown Castle	Lumen	WOW!



141 W. JACKSON BLVD.
STE. 1600A
CHICAGO, IL 60604

773.825.6261
TALMANCONSULTANTS.COM



LICENSED IN:

Illinois	Massachusetts	South Carolina
Indiana	Michigan	Tennessee
Iowa	Minnesota	Texas
Florida	Missouri	Washington
Georgia	Nevada	Wisconsin
Kentucky	North Carolina	
Maryland	Ohio	

DUN & BRADSTREET

DUNS #08-029-2557

NAICS CODES

541330 Engineering Services

541511 General Management Consulting Services, Site Location and Selection Services

SIC CODES

8711 Engineering Services

8748 Management Consulting, Engineering Services

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Background

Ridgeline Consultants, LLC (RC) is a professional design firm registered in State of Illinois for Professional Engineering and Surveying Service. Currently RC is staffed by two Illinois registered professional land surveyors and two Illinois registered professional engineers with thirteen full-time technical staff.

Ridgeline Consultants, LLC is prequalified by IDOT in the following categories relevant to Topographic Surveying Services required to facilitate various Village projects.

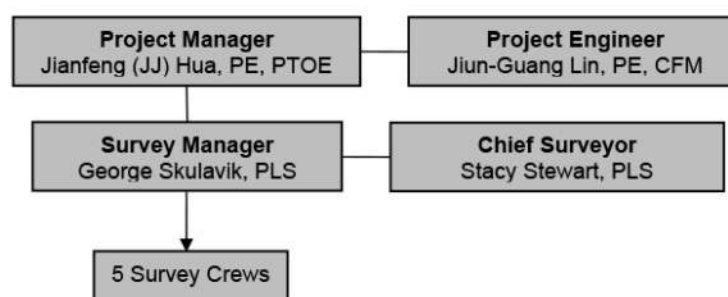
- **Route Survey**
- **Land Survey**

Ridgeline Consultants, LLC is also certified as a Disadvantaged Business Enterprise (DBE) by IDOT. This certification allows us to participate as a DBE on federal aided contracts let by the Illinois Department of Transportation (IDOT), City of Chicago, CTA, Metra and Pace. Also, Ridgeline Consultants, LLC has been certified as a minority business enterprise (MBE) with the Illinois Department of Central Management Services.

Ridgeline Consultants, LLC is located in Montgomery, IL. Our team members are capable and proficient in performing the work and are experienced in the applicable specifications and requirements. Through the implementation of our QA/QC process and combined with our past professional experience, education and trainings, we will ensure quality products within the time frame and budget assigned to the project.



Key Staff



A. Project Manager – Jianfeng (JJ) Hua, P.E., PTOE, Ph.D.



Mr. Hua is responsible for the general administration and plan review, quality assurance/quality control of this project. His other function is to control the progress of the project and insure that necessary information is received in a timely manner. He will be the primary contact. Also Mr. Hua will direct and review the work of the project engineer, surveyors and other technical personnel.

B. Project Engineers – Jiun-Guang Lin, P.E., CFM



Mr. Lin is responsible for the calculations, design/engineering and plan review of this project.

C. Survey Manager – George Skulavik, P.L.S.



Mr. Skulavik will be responsible for coordinating with the survey crews in performing land survey, topographic survey and construction staking. Mr. Skulavik will also be responsible for the preparation of plats and boundaries. He is also responsible for the QA/QC of the topographic and boundary survey.

D. Chief Surveyor- Stacy L. Stewart, P.L.S.



Mr. Stewart will be responsible for directing the survey crews in performing land survey, topographic survey and construction staking. He will also field check the work of the survey crews.

November 30, 2021
File No.: 000000-000

Stormwater Administrator
Village of Downers Grove
5101 Walnut Avenue
Downers Grove, IL 60515

Statement of Qualifications – Tu GeoStructural

Dr. Gamal's career spanning 33 year involves a wide array of expertise covering the areas of geotechnical, structural, underground engineering, forensic analysis and construction management. He has been involved in the design of more than 300 trenchless pipe rehabilitation and HDD (Horizontal Directional Drilling) projects utilizing different materials such as Geopolymer, shotcrete, spiral wound (SPR) and CIPP. The use of different rehabilitation materials/methods necessitated the use of different design approaches utilizing standards such as ASTM F1216 or using more advanced techniques that consider the soil/host/soil interaction which allow for taking into consideration the impact of flexibility ratio on the design. Dr. Gamal routinely performs computational studies on large pipes and culverts, underground structures, deep shafts and tunnels under static and seismic loadings.

During the course of his career, he designed and implemented Finite Element Modeling for analyzing numerous tunnels ranging in size from 10 ft to 58 ft with latter being the largest transportation tunnel built in the USA (Bertha 99 - Seattle). Dr. Gamal was involved in numerous tunneling projects and most recently served as the Engineer of Record (EOR) for a \$650 Million North East Boundary Tunnel in DC. Other underground work included the design of deep strategic gas storage caverns with some of these caverns more than 3000 ft deep. Prior to starting GeoStructural, Dr. Gamal served as Brierley Associates Abandoned Mine Lands Sector Leader and has been retained as Brierley's Project Manager for ongoing work with Wyoming Office of Abandoned Mine Lands. During the course of his career, he has been involved in numerous mine subsidence studies to assess subsidence risk and to evaluate subsidence mechanics associated with the subjacent mine conditions. Additionally, Dr. Gamal has worked as a design and field engineer on numerous projects, including foundations for high rise concrete structures and bridges.

Sample Conduits Rehabilitation Projects

(1). 144-in Circular Conduit Rehabilitation, Wayne County, MI (2021)

Role: Designer

Client: Vortex Companies

Submitted a design for the minimum thickness of a GeoKrete new liner for the rehabilitation of 144-in conduit. The conduit was 67 ft deep. To optimize the design for such deep conduits, two design approaches were investigated. In the first approach, an approach similar to that used in ASTM F1216, which is typically used for CIPP, but after modifying it to fit the failure and material characteristics of geopolymer and the major drawback of this approach is the assumption that the full height of the overburden has to be supported by the conduit. An alternative and more accurate approach was investigated using the design approach typically used for designing tunnel liner. The tunnel analysis considers the soil/liner interaction taking into considerations the relative stiffness of the liner to the soil or surrounding medium and depending on the relative stiffness, only a fraction of the overburden height is assumed to be supported by the liner and that allows for optimizing the liner thickness.

(2). 137-in Arched (with flat invert) Conduit Rehabilitation, Washington DC (2021)

Role: Designer

Client: Vortex Companies

The design of the arched pipe, with 17 ft of cover, that has a flat invert was performed using tunnel analysis. The design approach is based on evaluating the flexibility of the new liner system, comprised of the GeoKrete liner, relative to the

TU GEOSTRUCTURAL, LLC

November 30, 2021
Qualifications Statement
Page 2 of 2

surrounding media, comprised of the host and the surrounding ground outside the host. This approach allows for better estimation of acting loads and the induced moments and axial forces with a larger degree of accuracy. To further optimize the design of the flat invert the axial force acting on the invert slab was taken into consideration when investigating the flexural stresses at the invert and special thrust-moment interaction diagram was developed to optimize the thickness at the invert.

(3). Wilket Creek and N. York 118" CMP Storm Trunk, Toronto, Canada (2020)

Role: Designer

Client: Vortex Companies

To optimize the thickness, the tunnel analysis approach was used in the design. The tunnel analysis considers the soil/liner interaction taking into considerations the relative stiffness of the proposed new liner to the soil or surrounding medium and depending on the relative stiffness, only a fraction of the overburden height is assumed to be supported by the liner and that allows for optimizing the liner thickness.

(4). Summit Sewer Conduit Rehabilitation, Lower Des Plaines River Watershed, Chicago, IL (2015/2016)

Role: Designer

Client: SAK

Designed a reinforced shotcrete liner for fully deteriorated sections of gravity sewer conduits that ranged in size from 66-in to 86-in, with some of these conduits being circular. The total length of rehabilitated conduits exceeded 1,600-ft. To maximize flow capacity, the design had to minimize the new liner thickness by using tunnel design approach which takes into consideration the relative stiffness of the liner to that of the host and surrounding medium. This was achieved by evaluating the flexibility of the liner relative to the surrounding media. The thrust and moment developed in the liner are dependent upon the stiffness of the lining relative to that of the medium and on the depth of the tunnel. The final design called for a 3.0-in thick shotcrete liner reinforced with W8XW8- 4X4 welded wire fabric to resist different loading scenarios.

(5). Harlem Baden Relief Phase IV (Hebert) Trunk Sewer Rehabilitation, St. Louis, MO (2019)

Role: Designer

Client: Vortex Companies

Determined the minimum thickness requirements using Geopolymer to rehabilitate several existing storm culverts. The culverts had different shapes including circular, horseshoe and boxes and ranged in span from 48" to 144". As requested, we have reviewed the data provided by you for the minimum thickness design for circular conduits, the design was based upon the failure theories provided in ASTM F1216 after modifying it to fit Geopolymer. For horseshoe and box shaped culverts, they were all designed considering soil-structure interaction developed by Burns and Richard (1964) and Peck et al (1971)]. Thrust-Moment interaction diagrams were used to confirm the design thickness.

(6). Borden Avenue Interceptor Sewers, Queens, NY (2016/2017)

Role: Designer

Client: Vortex Companies

Dr. Gamal completed the rehabilitation design for over 4,000 LF of 60-in to 84-in RCP sewers which were rated as fully deteriorated. Geopolymer was selected as the best rehabilitation option for these sewers.

TU GEOSTRUCTURAL, LLC
7924 S. Grand Baker Way, Aurora, Colorado 80016



Sub-Contractors

DOETSCH

Pre-CCTV, Cleaning and Prep

B.A.S.I.C. ENGINEERING

Alternate for GPR and Curtain Grouting

TRAFFIC CONTROL COMPANY

Traffic Control



Doetsch

ENVIRONMENTAL SERVICES

Company History

Doetsch Industrial Services is an environmental service company based in the Detroit Metropolitan area. The company was established as Doetsch Bros. in 1898 as a plumbing company, always with an emphasis on sewer cleaning. The business provided service to residential, commercial and industrial clients. Our experience in the industrial sector, contributed to our evolution into a full service environmental company, providing our traditional services of Industrial Cleaning, Hazardous Waste Removal, Sewer Cleaning and CCTV Sewer Inspection. Incorporated in 1980 as Doetsch Industrial Services, we continue our efforts to provide our clients with superior service. We have since created the dba Doetsch Environmental Services to better associate ourselves with our focus of services.

As the fifth generation takes the helm of the company we continue to develop innovative ways of servicing our customer and their specific needs. Over the past ten years, we have expanded our services to include Hydro-Excavation and Soil Erosion Control Measures, enabling us to be a comprehensive source of service for our clients as their needs constantly change. In recent years our commitment to innovation has been called upon with regards to large diameter sewer cleaning. The need for effective cleaning of large sewers has increased directly as result of the diminishing storage capacity of these sewers. This has forced system managers to demand better performance from their crew or contractor to verify actual debris removal rather than removal based on assumptions. We have developed an effective and efficient method of cleaning which we will describe in the methodology section of this proposal.

Doetsch Environmental currently employs (70) full time employees including our project managers and operators. Our project management staff has an average industry experience of 23.5 years and our operator staff has an average 11 years of experience.

1) Doetsch Main Office

21221 Mullin Avenue
Warren, Michigan 48089
Office: 586.755.2090
Fax: 586.755.2099

2) Primary Contact

Joseph G. Schotthoefer IV
Vice President of Operations
Email: joe@doetschenv.com
Mobile: 810.499.9233

3) Doetsch Industrial Services was established in 1898 with a single office location based in Warren, Michigan. Diann Regelbrugge is the President of Doetsch Industrial Services and has an active role in the day-to-day operations of the business.



EXCELLENCE AND SKILL

Bay Area Sinkhole Investigation & Civil (B.A.S.I.C.) Engineering has a company-dedication to excellence backed by our skilled geologists, engineers, environmental specialists and technicians. Our personnel is uniquely qualified to identify and explain environmental liabilities. Our rigorous in-house training, state-of-the-art testing equipment and proven drilling performance ability gives our customers the best service available.



B.A.S.I.C. Engineering will carefully assess your project needs and objectives before the work actually begins; providing you, our customer, only the services necessary and ultimately saving you considerable time and expense. Then our dedicated team proposes and implements sensible, cost-effective corrective measures to reach a solution.

B.A.S.I.C. Engineering is dedicated to staying abreast of industry trends through active participation in professional trade organizations and industry meetings in order offer the latest technology and methods to our customers.

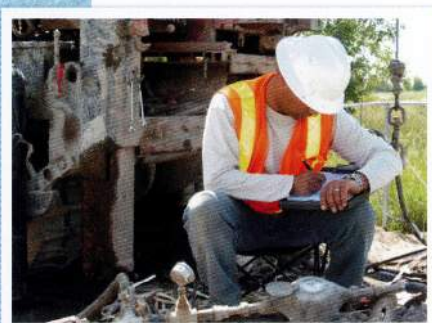


www.basic-engineering.com



THOROUGH AND CONSISTENT METHODOLOGY

Our staff is dedicated to following insurance guidelines. Thorough unbiased, scientifically credible, evaluations are made as to the cause(s) of the damage that has resulted in a sinkhole claim. Our standard methods in investigations are thorough and consistent to ensure withstanding the evidentiary competence tests required for admission in state and federal court.



Founded in 2004, **Bay Area Sinkhole Investigation & Civil (B.A.S.I.C.) Engineering** is a multi-disciplined organization. Our organization is comprised of registered engineers, geologists, surveyors, field & laboratory technicians, and administrative personnel who combine their technical capabilities, experience, dedication, and enthusiasm to offer the best service available in geotechnical studies.

OUR INSURANCE INVESTIGATION SERVICES INCLUDE:

Construction Monitoring:



Our team has managed hundreds of projects and have years of experience working with residential and commercial contractors to make sure the insured's remediation efforts are

done properly. The technical staff is supported and supervised by professional engineers that are always available to assist in solving field problems. Therefore field issues are resolved promptly allowing construction to continue on schedule and within budget.

Subsidence Investigations:

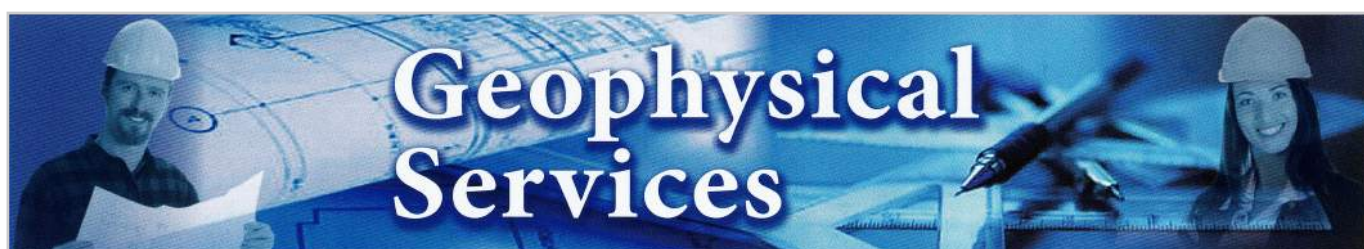


Soil borings (with the latest in drilling machinery and equipment), Ground Penetrating Radar (GPR), Hand Auger Borings, state of the art Laboratory Testing, High Quality

Logs & Samples, Engineering Analysis and Sinkhole Remediation Recommendations. Our reports are comprehensive, yet easy to understand for the insurance adjusters as well as the insured and contractors.



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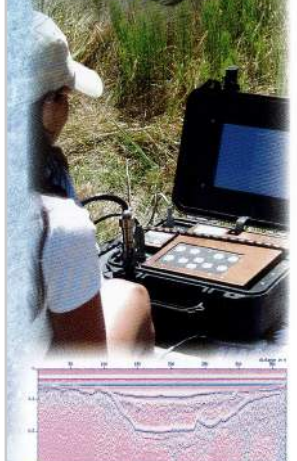
Bay Area Sinkhole Investigation & Civil (B.A.S.I.C.) Engineering provides full service geophysical investigations using state-of-art equipment and technology. These investigations provide timely, cost effective results without disturbing the site or environment. Geophysical study results are most commonly used in determining soil resistivity and locating underground utilities, storage tanks, rebar, sinkholes, voids, water tables, buried artifacts, graves, and debris.



Ground Penetrating Radar is recognized as one of the most powerful remote sensing instruments available today, ground penetrating radar (GPR) is a safe, non-invasive geophysical investigation method for "looking" underground to image subsurface features. GPR utilize a short burst of radio-frequency energy to detect metallic and non-metallic, natural and man-made underground features.



Electrical Resistivity Imaging or vertical electric sounding, measure earth resistivity by driving a direct current (DC) signal into the ground and measuring the resulting potentials (voltages) created in the earth. From that data the electrical properties of the earth (the geolectric section) can be derived and the geologic properties inferred.



Electromagnetics EM equipment consists of a very low frequency transmitter and a receiver coil. The transmitter induces an electrical current into the subsurface, which produces secondary fields. These secondary fields are sensed and recorded by the receiver coil. Continuous data readings recording subsurface conductivity interpreted and are logged into a data logger at one second intervals. The files in the data logger are then downloaded for data interpretation and presentation.

Geophysical Study Advantages

- Cost Effective
- Can be performed quickly
- Does not disturb the site

Call us today for more information on our geophysical services or to schedule an appointment.



www.basic-engineering.com



Key Résumés



BJ KERSTIENS | SVP, SERVICES



As Senior Vice President of Services, BJ oversees all responsibilities related to managing the planning and personnel driving the growth of Vortex’s extensive line of trenchless services. Behind BJ is a team highly motivated and experienced professionals that include operations management, product managers, and business development personnel located in strategic regions of the US. Through this team, BJ implements critical sales processes to support company growth. With an emphasis on pipeline rehabilitation experience, throughout his 20 year career, BJ has been an efficient leader and team builder, with a proven track record in project and operations management. Previously he has held roles such as Operations Manager, Business Development Manager, and Senior Project Manager for national level contracting firms.

CERTIFICATIONS

- OSHA 10-Hour Construction
- OSHA Competent Person
- ACI level 1 Flatwork
- ACI level 1 Concrete Field Testing

INDUSTRY EXPERIENCE

11+ years

EDUCATION

Middle Tennessee State

University

Bachelors of Applied Science
Murfreesboro, TN
2002- 2006

- Concrete Industry Management (Major)
- Business Management (Minor)

Basic Combat Engineer

School

Courthouse Bay, NC
1998 - 1999
Concentration in demolitions, bridging, and concrete

Relevant Projects

Storm Sewer Rehabilitation (Fulton Ave.) — City of Houston, TX

Project Date: 2019-Present

Project Description:

Work is currently under way on the rehabilitation of just under 6,000 LF of 60-inch RCP using Quadex’s GeoKrete® Geopolymer material. Existing pipe is located parallel to and in places under the Metro light rail line servicing north Houston and had suffered heavy degradation resulting from high levels of H₂S. Crews are installing a minimum of 1.5-inch of GeoKrete as they build back the lost host material and add a fully structural liner to these pipes.

Client Contact:

Mary F. Bac
Supervising Engineer
832-395-4992
mary.bac@houstontx.gov

Relevant Projects

Harlem-Baden Relief Phase IV, Trunk Sewer Rehabilitation — St. Louis, MO

Project Date: 11/2019-Ongoing

Project Description:

Rehabilitation of approximately 7,000 LF of large diameter pipe under approximately 20 VF of cover including 60 and 72-inch circular, 4'x4' and 6'x6' boxes, and 5', 6', 7', 8' and 12' horseshoe pipes. Host materials included a combination of reinforced concrete and brick. Work was completed on schedule by the combined VLS/SAK team proposed for the subject project.

Client Contact:

US Army Corp of Engineers

88" & 120"x115" Pipe Relining — St. Joseph, MO

Project Date: 04/2020-04/2020

Project Description:

The SAK/VLS team proposed for the subject project successfully carried out the rehabilitation and lining of 390 LF of 120"Wx115"H cast in place reinforced concrete arch pipe with the installation of 2.25- inch of GeoKrete®. The same team also completed rehabilitation and lining of an additional 534 LF of 88-inch circular pipe. The pipe had originally been installed as a 96-inch RCP and had previously been lined with shotcrete, which was now failing. Prior to lining the team addressed infiltration and made repairs to the host surface in preparation for the final GeoKrete liner.

Client Contact:

Cory Street

Sr. Project Manager

SAK Construction

cstreet@sakcon.com

602-750-8163

ROSS COOKE | RVP, VORTEX LINING SYSTEMS



As the Regional Vice President for Vortex Lining Systems, Ross oversees the management of personnel, budgets, and equipment. He also handles the assignment of all VLS projects and project duties. Ross brings a detail-oriented approach to his work and uses strategic thinking to execute projects in the most efficient way possible.

Ross's 14 years of distinguished military leadership experience have enabled him to successfully plan and lead complex operations and manage large organizations. Prior to joining Vortex, Ross also managed and estimated projects in the construction industry, ensuring successful completion within both time and budget. Ross previously worked as an Estimator in the Southeast region for Vortex Services, where he oversaw the region's budgets and equipment.

CERTIFICATIONS

- OSHA 10
- OSHA 30

INDUSTRY EXPERIENCE

7+ years

EDUCATION

Clemson University

B.S., Construction Science and Management

2010

Relevant Projects

Lombard, IL - Large Diameter. Combined Sewer - 108 in. Rehab

Start/Finish: 07/2024 - Active/Ongoing

Client Contact:

Ray Schwab - Civil Engineer - Village of Lombard

630-620-5979

schwabr@villageoflombard.org

Virginia Beach, VA - Groveland Park - 84 in. Rehab

Start/Finish 06/2024 - Active/Ongoing

Client Contact:

Connor Mathis - Project Manager - Tri-State Utilities

757-366-950

connorm@tristateutilities.com

Austin, TX - MOPAC Skunk Hollow 9-6 in. Rehab

Start/Finish 03/2024 - 05/2024

Client Contact:

Valentin Gomez - Austin Underground

325-226-8820

alentin@austin-underground.com

ROSS COOKE | CONTINUED**Relevant Projects****Austin, TX – TXDOT – 96 in. Pipe Rehab**

Start/Finish: 02/2024 – 03/2024

Client Contact:

Andre Tornatore – COPASA, Inc.

737-386-0337

atornatore@copasagroup.com

Topeka, KS – KDOT- 96 in. CMP Rehab

Start/Finish: 11/2023 – 05/2024

Client Contact:

Ken Burkhead – Project Manager – BRB Contractors

785-290-1123

kenburkhead@brbcontractors.com

Chandler, AZ – Bank of America- 96 in.

Start/Finish: 12/2023 – 04/2024

Client Contact:

Jason Phelps – IFCM, Inc.

480-719-3009

jason@ifcmcorp.com

Scottsdale, AZ – Scottsdale Quarter Tank Rehab – 96 in.

Client Contact:

Scott Fox – Director of Construction – WPG US

614-202-7251

sfox@wpgus.com

Chandler, AZ – Pecos & Promenade- 96 in. CMP Tanks

Client Contact:

Michael Parrish – Whitestone REIT

480-397-1908

mparrish@whitestonereit.com

JOSH MARAZZINI, PE* | TECHNICAL DIRECTOR



Josh is a licensed Professional Engineer with over 18 years of experience in the inspection, assessment, modeling, planning, designing, permitting, management and construction execution of water, wastewater and storm collection, conveyance and treatment infrastructure. After 15 years as a design professional, Mr. Marazzini now serves as the Technical Director for the Vortex family of companies. In this role, he is responsible for ensuring appropriate application and use of Vortex Companies line of rehabilitation products available through subsidiary Quadex®, LLC. Further, Mr. Marazzini is responsible for ensuring that Licensed and Certified Applicators of Quadex Products as well as in-house crews operating under the Vortex Companies umbrella (Vortex Lining Systems and Vortex Services) are supported with an understanding of industry best practices, technical product information, specifications and other supporting information. Mr. Marazzini also supports projects making use of Quadex materials with preliminary application thicknesses and, upon award, supports third party independent designs for Quadex products.

*TX #106156

CERTIFICATIONS

- Professional Engineer:
Texas #106156, 2010
- NASSCO – PACP, LACP &
MACP #U-1216-070R03119,
2012

INDUSTRY AFFILIATIONS

- NASSCO Committee Member
– International Relations,
Manhole Rehab, Pipe Rehab
and Pipe Rehab CIPP Sub
Committee, 2019
- ASTM F36 Committee
Member, 2019
- Water Environment
Association of Texas (WEAT),
President 2012-2013, San
Antonio State Section
Rep 2013-2014, State
Scholarship Committee
Secretary, 2013-2016
- Society of American Military
Engineers (SAME),
Scholarship Committee 2009
-2012

Relevant Projects

Storm Sewer Rehabilitation (Fulton Ave.) — City of Houston, TX

Project Date: 2019-Present

Project Description:

Work is currently under way on the rehabilitation of just under 6,000 LF of 60-inch RCP using Quadex's GeoKrete® Geopolymer material. Existing pipe is located parallel to and in places under the Metro light rail line servicing north Houston and had suffered heavy degradation resulting from high levels of H₂S. Crews are installing a minimum of 1.5-inch of GeoKrete as they build back the lost host material and add a fully structural liner to these pipes.

Client Contact:

Mary F. Bac
Supervising Engineer
832-395-4992
mary.bac@houstontx.gov

JOSH MARAZZINI, PE* | CONTINUED



PUBLICATIONS

Vergara, Marisa, Marazzini, Josh, Wouters, Jeff, and Young, Wesley. "Innovative Interconnect." Civil Engineering Magazine, Oct. 2013

AWARDS/RECOGNITIONS

WEAT Emerging Leader, 2013

INDUSTRY EXPERIENCE

15 years

EDUCATION

Texas A&M University
B.S. in Civil Engineering

Relevant Projects

Harlem-Baden Relief Phase IV, Trunk Sewer Rehabilitation — St. Louis, MO

Project Date: 11/2019-Ongoing

Project Description:

Rehabilitation of approximately 7,000 LF of large diameter pipe under approximately 20 VF of cover including 60 and 72-inch circular, 4'x4' and 6'x6' boxes, and 5', 6', 7', 8' and 12' horseshoe pipes. Host materials included a combination of reinforced concrete and brick. Work was completed on schedule by the combined VLS/SAK team proposed for the subject project.

Client Contact:

US Army Corp of Engineers

Sewer Main Lining Program (South) - Chicago, IL

Project Date: 06/2019 -12/2019

Project Description:

Rehabilitation of 1,360 LF of aging 102-inch circular brick pipe in downtown Chicago for the Department of Water Management – Sewer Section. Pipe was cleaned and infiltration locations patched prior to lining with 2.0-inch of GeoKrete® Geopolymer.

Client Contact:

Ralph Bonanotte
Kenny Construction
ralph.bonanotte@gcinc.com
708-417-3369

SAM WISENER | DIRECTOR OF OPERATIONS

Sam has over 15 years of experience in the sewer rehabilitation industry; covering a wide range capacities. For the last five years, his focus has been overseeing equipment development, operations and installation and post-installation inspections on projects involving manhole rehabilitation, pump station rehabilitation and large diameter sanitary/storm sewer lining.

While Sam spends much of his time in the field, he is charged with daily responsibilities that include coordinating, training and scheduling QA/QC visits on behalf of project managers, applicators, inspectors and engineering to ensure product and installation quality is maintained. He is also responsible for equipment training, innovation, maintenance and inspection.

INDUSTRY EXPERIENCE

15 years of sales, testing and installation of Quadex® Repair Materials, products and equipment

EDUCATION

University of Arkansas at Monticello

B.A. in Science
2005

Relevant Projects**Sewer Main Lining Program (South) - Chicago, IL**

Project Date: 06/2019 -12/2019

Project Description:

Rehabilitation of 1,360 LF of aging 102-inch circular brick pipe in downtown Chicago for the Department of Water Management – Sewer Section. Pipe was cleaned and infiltration locations patched prior to lining with 2.0-inch of GeoKrete® Geopolymer.

Client Contact:

Ralph Bonanotte
Kenny Construction
ralph.bonanotte@gcinc.com
708-417-3369

Harlem-Baden Relief Phase IV, Trunk Sewer Rehabilitation — St. Louis, MO

Project Date: 11/2019-Ongoing

Project Description:

Rehabilitation of approximately 7,000 LF of large diameter pipe under approximately 20 VF of cover including 60 and 72-inch circular, 4'x4' and 6'x6' boxes, and 5', 6', 7', 8' and 12' horseshoe pipes. Host materials included a combination of reinforced concrete and brick. Work was completed on schedule by the combined VLS/SAK team proposed for the subject project.

Client Contact:

US Army Corp of Engineers

Kiewit CDOT Lining Project — Denver, CO

Project Date: 05/2019 -In Progress

Project Description:

Rehabilitation of just under 2,800 LF of RCP pipe ranging from 48 to 120-inch diameter located under new highway. Similar to this project, the highway work included elevation increase which had to be accounted for in the liner designs. Work was completed on schedule and included winter operations.

Client Contact:

Matt Ceresa
Utilities & Drainage Manager
Central District
303.886.3939
matt.ceresa@kiewit.com

DAVE BEAUCHAMP | OPERATIONS MANAGER



Experience

Dave Beauchamp is the Operations Manager and Senior Project Manager at Vortex Services. Prior to working for Vortex, he spent ten years in a lumber production facility managing day to day mobile equipment operations. Arriving at Vortex Companies, Dave started as an entry level Technician and has spent many hours in the field performing various tasks offered by the company primarily focused on underground infrastructure cleaning and inspection.

Dave Currently holds a PACP/MACP certification for pipeline inspection as well as a Stalking University Underground Utility Locating certificate and has completed BAMIs, CTAM 100 and 200 certification in asset management

Dave is an active member and participant of many industry associations and is an active Executive member of the Maine Water Environment Association (MEWEA). He attends and facilitates many courses throughout the year locally and nationally to increase knowledge and stay current in the water and wastewater fields.

Dave is dedicated to upholding the company values, quality customer service, and superior work performance while moving forward to be a leader in the municipal industrial and trenchless utility markets.

Education

Dave is a 1996 Graduate of Mount Blue High School in Farmington, Maine. He is now furthering his education by attending business management courses as well as ongoing water wastewater and underground utility courses throughout the country.

INDUSTRIAL ASSOCIATIONS

NTA
MRWA
MEWEA
NHWPCA
GSRWA
NASSCO
IPBA
AGC Maine
APWA
MWUA

Certifications

- NASCCO PACP/MACP U-6099004
- NASTT CIPP Good practices course (Louisiana Tech University)
- Underground utility locating Certification (Stalking University)
- PermaLiner Industries CIPP Installers' certification
- BABI CTAM 100 and 200 certificates in asset management

RICK RYNICKI | SAFETY LEAD



Rick is a proven HSE executive leader and brings more than 24 years of experience to Vortex. His multi-industry background spans, oil & gas, civil construction, power, mechanical, and heavy industrial organizations. In addition to overseeing Vortex’s HSE program, Rick and his regional safety team’s day-to-day responsibilities include working with regional vice presidents, and operations personnel to educate, evaluate, train and implement safety processes at all facilities and in the field.

Throughout his career, Rick has built a portfolio of successful results and key contributions in HSE program development, implementation, and modification. These outcomes include time, cost, safety, productivity, and quality improvements, both for immediate and long-term goals. I balance innovation with risk management in creating HSE strategies that can be applied to multiple functional areas, with a heavy emphasis on protecting a company’s key assets.

Rick is a passionate advocate for continuous improvement through engaging teams at all levels, ensuring that safety remains a top priority at Vortex Companies.

HIGHLIGHTS

- Bilingual - Fluent in both English and Spanish
- Six years of military experience

INDUSTRY EXPERIENCE

24+ years

EDUCATION

Arizona State University
BS Construction Management
1999

Certifications

- CHST – ASSP, Board of Certified Safety Professionals
- Emergency Response Certification, FEMA
- Oil & Gas Manager Certificate, OSHA Academy
- Veriforce OQ Evaluator
- NCCER OQ Evaluator
- ISO 45001
- Member, Houston Safety Council



Sub-Contractors and Design Support Résumés



TALMAN CONSULTANTS
KATHERINE LATHAM | JAMES D. NORTON, P.E.

VORTEX
 lining systems



141 W. JACKSON BLVD.
 STE. 1600A
 CHICAGO, IL 60604

773.825.6261
 TALMANCONSULTANTS.COM

OUR LEADERSHIP

With three decades of combined experience in the engineering space, Talman Consultants Managing Partner Katherine Latham and Partner James D. Norton, PE have built a multi-disciplined team of designers, engineers and project managers. Under their guidance, the firm continues to innovate the tools, processes and best practices to provide end-to-end support on even the most complex projects. The result is a repeat award-winning workplace that champions team members in their careers and value-based results for its clients.



KATHERINE LATHAM MANAGING PARTNER

As Managing Partner, Katie is responsible for business operations, client relationships as well as project management oversight and coordination for all large and small-scale utility projects. She is a design engineer with experience in program management and field operations. Katie earned a BS in Civil Engineering from the University of Illinois, Urbana-Champaign in 2011.

PROFESSIONAL AFFILIATIONS

- Young Entrepreneur Council (YEC)
- Forbes Chicago Business Council
- American Society of Civil Engineers (ASCE)
- Women's Transportation Seminar (WTS)/Greater Chicago Chapter

SAFETY TRAINING/CERTIFICATIONS

- Confined Space Entry Certification

JAMES D. NORTON, PE PARTNER

As Partner, Jim directs all engineering design projects and is continually expanding Talman's client base into new categories and markets. A licensed Professional Engineer, he has experience overseeing large scale engineering design projects in Chicago and across the country. Jim received a BS in Mechanical Engineering from the University of Illinois, Urbana-Champaign in 2000.

PROFESSIONAL AFFILIATIONS

- Forbes Chicago Business Council
- American Society of Civil Engineers (ASCE)
- Illinois Society of Professional Engineers (ISPE)
- National Society of Professional Engineers (NSPE)

SAFETY TRAINING/CERTIFICATIONS

- Amtrak Roadway Worker Protection Safety Training
- Kenny Construction Company Construction Site Safety Training
- Confined Space Entry Certification
- American Red Cross Adult CPR/AED

ENGINEER LICENSE NUMBER

IL 062-Q58771





141 W JACKSON BLVD
STE 1600A
CHICAGO, IL 60604
PHONE 773.825.6261

WWW.TALMANCONSULTANTS.COM



Andrew Barber, P.E.

LICENSURE: Professional Engineer, IL

EDUCATION: Purdue University, BS in Civil Engineering

TRAINING CLASSES: Confined Space Entry Certification, Safety Training

SOCIETIES AND ORGANIZATIONS: American Society of Civil Engineers (ASCE), National Society of Professional Engineers (NSPE)

Andrew Barber is an accomplished project engineer. He has been involved in a variety of power, telecommunication and water designs. These include underground infrastructure inspections and surveying, underground and overhead distribution electrical design, large-scale conduit installations, project management and construction support.

Elgin O'Hare Western Access, DuPage County, Illinois

Owner: Illinois Tollway

Client: Commonwealth Edison & Various Telecommunications

Utility coordination on the Elgin O'Hare Western Access. Completed designs for relocations of several utilities including ComEd, Zayo, Level(3), AT&T, MCI and XO. Coordinate with the Illinois Tollway, and DSEs to design a conceptual relocation plan for the entire corridor for all utilities. Coordinated outage schedules, estimates and relocation plans with the Illinois Tollway and private utility companies. Updated existing profiles drawings and created profiles for directional drilling. Acted as client representative for the utilities and attended meetings to coordinate with clients and provided field assistance.

Jane Addams Memorial Tollway (I-90), Cook County, Illinois

Owner: Illinois Tollway

Client: Commonwealth Edison & Various Telecommunications

Senior Project Management for utility coordination on the I-90 Corridor. Completion of relocation designs for several utilities including ComEd, Zayo, Level(3), AT&T, MCI and XO. Coordination with the Illinois Tollway, and DSEs to design a conceptual relocation plan for all utilities within the corridor. Coordinated on behalf of utility companies with the Illinois tollway for outage schedules, estimates and relocation plans.

22nd Street Relocation Project, Oak Brook, Illinois

Owner: Illinois Department of Transportation

Client: Abovenet, Level(3), XO, Sunesys, Comcast, MCI-Verizon

Lead PE and PM responsible for route design, utility coordination, cost estimate and overseeing all design plans required to relocate 6 separate utility companies within existing infrastructure on 22nd Street between Butterfield Road (IL Route 56) and Kingery Boulevard (IL Route 83). Responsible for securing all IDOT, Oak Brook and other necessary permits for the project for the installation of fiber optic conduit via directional drilling. The project scope included approximately 5,000 linear feet of directional boring.

ComEd Taft Avenue Installation, Franklin Park, Illinois

Owner: Commonwealth Edison

Client: Commonwealth Edison

Responsible for the completion of this high-profile project on an aggressive time line. The project included an Illinois Department of Transportation design of an overpass near O'Hare International Airport to relocate any above ground utilities underground. The design and construction of the connection acted to relieve the load on the O'Hare feed from ComEd's Franklin Park Substation. Communicated with client and contractor on design, project budget and permitting acquisition. Oversaw field personnel to ensure the timely completion of this project.

Illinois I-90 Tollway Expansion New Business Connections, Hoffman Estates, IL

Oversight of primary feed electrical designs to customer owned secondary transformer locations.

Illinois Department of Transportation, Schaumburg, IL

Responsible for field measurements and calculations to verify contract quantities for payment on an I-290 exit ramp repair project and other IDOT projects. Inspected and estimated plan pay item quantities of future State contracts.

UI Labs "Smart Cities" Underground Infrastructure Mapping Initiative, Chicago, IL

Oversight of field data collection and processing for the UI Labs "Smart Cities" initiative for underground infrastructure mapping. Tasked with comparing traditional survey and data collection methods to cutting edge technologies. Methods used included stationary & mobile LiDAR, ground penetrating radar (GPR) and photogrammetry. The consortium includes UI Labs, Accenture, Microsoft, Siemens, Commonwealth Edison, Chicago Department of Water Management, University of Illinois at Urbana/Champaign.

Key Staff Resumes



JIANFENG (JJ) HUA, P.E., PTOE, PH.D.

Professional Engineer

Education

MSCE (1998) Civil Engineering
Purdue University, West Lafayette, Indiana

Ph.D. (2000) Civil Engineering
Purdue University, West Lafayette, Indiana

Professional Registration

Professional Engineer: IL 2007, No. 062-059586
Professional Engineer: OH 2001, No. 66158
Professional Traffic Operations Engineer (PTOE):
2007, ITE

NHI Certificate of Training

HEC-RAS (Advanced) – October 12, 2001
Urban Drainage Design – December 12, 2002
Introduction to Highway Hydraulics – April 1, 2004

Relevant Project Experience

- **Various Routes, Project Plans, Specifications and Quantity Calculations, McDonough County, District Four, PTB 106-16, D-94-071-94**

Phase II work consisted of the preparation of final roadway contract plans and other related contract documents for three bridge replacements in McDonough County in District 4. US Rte. 67 over Camp Creek (S.N. 055-0006) and over Carter Creek (S.N. 055-0007), and US Rte. 136 over Camp Creek Tributary (S.N. 055-0023). The work included roadway widening and surfacing up to 4,000 feet, including related earthwork, service drive connections, guardrails, special drainage ditches and pipe culverts, and erosion control.
- **Phase II Services of Dirksen Parkway (FAP 668), Sangamon County, District Six, PTB 113-36, D-96-543-00**

Phase II engineering services are performed for this urban roadway 3R project. The project consists of widening and resurfacing of the existing three-lane section to five-lanes of Dirksen Parkway between Ridge Avenue and Clear Lake Avenue in Springfield, IL. The work also included drainage study to determine existing drainage patterns, the design of proposed storm sewer systems and other related tasks.
- **Plans for Rail Splitter Rest Areas along I-55 in Springfield, IL, IDOT District Six, PTB No. 113-34, D-96-542-00**

Prepared proposed plans for ramp overlay along the northbound and southbound Rail splitter Rest Areas along I-55 north of Springfield, IL. Also prepared plans for the proposed parking lots and drainage to accommodate the new rest area buildings. Maintenance of Traffic, Specifications and Quantity Calculations were also prepared.
- **Phase II Design of Old IL Route 4 over Hurricane Creek, Macoupin County, IL; Phase II Design of IL Route 26 over Lime Creek, Bureau County, IL; Phase II Design of IL Route 40 over Winnebago ditch, Whiteside County, IL**

Prepared construction plans and specifications for the approach roadway improvements for one structure replacement, including a revised profile, drainage, guardrail, detour routing, entrances, culvert extensions, resurfacing, and erosion control.

Andrew J. Schwarz, P.E., S.E.

805 Greenwood Street, Suite 300, Evanston, IL 60201
 PHONE (872)-240-8033 • FAX (707)-537-8338 • E-MAIL andys@dhcharles.com

PROFESSIONAL LICENSING

Illinois Licensed Structural Engineer, License No. 081-006389

Illinois Licensed Professional Engineer, License No. 062-057205
 Additionally, licensed in CO, DC, NV, PA, IA, MD, NY

WORK EXPERIENCE

- | | |
|--|---|
| <p>Branch Manager, D.H. Charles Engineering, Inc.
 Chicago, IL</p> <ul style="list-style-type: none"> ▪ Responsible for managing engineering and drafting operations for branch office. ▪ Lead recruiting effort for local branch ▪ Lead Marketing effort for local market and assist company wide marketing efforts nationwide and in Canada ▪ Work with clients to collect information for new projects in order to estimate design fees, schedule, and feasibility of contractor's approach/equipment ▪ Prepare site-specific design plans and calculations for various types of excavation shoring systems ▪ Prepare contractor requested permanent design works such as steel/concrete repairs, spread footings, pile and reinforced CIP pile cap design, reinforced CIP retaining wall ▪ Perform structural engineering design and training consistent with a Senior Engineer <p>Division Manager, HBK Engineering
 Chicago, IL</p> <ul style="list-style-type: none"> ▪ Manage twelve-person structural / geotechnical engineering group in support of Subsurface Utility, Civil, and Telecommunications Engineering and Construction Support Services ▪ Oversee all structural and geotechnical engineering projects for entire company ▪ Provide Quality Assurance and Quality Control over all facets of company-wide structural and geotechnical engineering activities including design, plan preparation, detailing construction administration, client advocacy and shop drawing review ▪ Control project budget, revenue forecasting, project invoicing and client interaction ▪ Serve as member of 10-person leadership team responsible for day-to-day operation of 400+ member engineering consulting firm. Responsibilities include resource management, company revenue forecasting, business development, QA/QC, hiring new employees ▪ Projects types include underground concrete structures, inspections of existing utility structures, earth retention systems, crane placement design, utility support structures, equipment and building foundations, equipment mounting design, tunnel design <p>Structural Project Engineer, Nayyar & Nayyar International
 Chicago, IL</p> <ul style="list-style-type: none"> ▪ Lead project engineer on building projects consisting of renovations, additions, and new construction ▪ Collaborated with five to six person cross-functional teams (owners/architects/mechanical engineers/electrical engineers/etc.) ▪ Developed complete structural design, plan preparation and detailing for all building projects ▪ Oversight of project budget and two to three person CAD staff per project ▪ Responsible for construction administration, client advocacy and shop drawing review <p>Structural Project Engineer, CTE ENGINEERS (now AECOM)
 Chicago, IL</p> | <p>August 2020 – Present</p> <p>April 2010 – August 2020</p> <p>August 2005 – April 2010</p> <p>June 2002 – June 2005</p> |
|--|---|

- Lead project structural engineer on streetscape project; coordinated structural inspections for City of Chicago with building tenants and performed design of all structural details
- Collaborated with cross-functional team on projects (civil engineers/architects/owners, etc.) and performed seismic analysis of bridges
- Developed complete structural design, plan preparation and detailing for all bridge and retaining wall projects
- Managed modeling and structural analysis of complex bridges and ramps

Structural Engineer, STV Incorporated
Tel Aviv, Israel

June 2001 – April 2002

- Conducted analysis and design of post-tensioned concrete box girder bridges

Structural Engineer, STV Incorporated
Chicago, IL

August 1998 – August 2000

- Designed all components of permanent transportation projects including bridges and retaining walls.

EDUCATION

B.S. in Civil Engineering, structural emphasis, June 1998
Purdue University

Masters in Structural Engineering, December 2005
Illinois Institute of Technology

MOHAMED GAMAL, PH.D, P.E.**PROJECT ROLE: LINER AND OPTIONAL SOIL STABILIZATION DESIGN**

Dr. Gamal's career spanning 33 year involves a wide array of expertise covering the areas of geotechnical, structural, underground engineering, forensic analysis and construction management. He has been involved in the design of more than 300 trenchless pipe rehabilitation and HDD (Horizontal Directional Drilling) projects utilizing different materials such as Geopolymer, shotcrete, spiral wound (SPR) and CIPP. The use of different rehabilitation materials/methods necessitated the use of different design approaches utilizing standards such as ASTM F1216 or using more advanced techniques that consider the soil/host/soil interaction which allow for taking into consideration the impact of flexibility ratio on the design. Dr. Gamal routinely performs computational studies on large pipes and culverts, underground structures, deep shafts and tunnels under static and seismic loadings.

During the course of his career, he designed and implemented Finite Element Modeling for analyzing numerous tunnels ranging in size from 10 ft to 58 ft with latter being the largest transportation tunnel built in the USA (Bertha 99 - Seattle). Dr. Gamal was involved in numerous tunneling projects and most recently served as the Engineer of Record (EOR) for a \$650 Million North East Boundary Tunnel in DC. Other underground work included the design of deep strategic gas storage caverns with some of these caverns more than 3000 ft deep. Prior to starting GeoStructural, Dr. Gamal served as Brierley Associates Abandoned Mine Lands Sector Leader and has been retained as Brierley's Project Manager for ongoing work with Wyoming Office of Abandoned Mine Lands. During the course of his career, he has been involved in numerous mine subsidence studies to assess subsidence risk and to evaluate subsidence mechanics associated with the subjacent mine conditions. Additionally, Dr. Gamal has worked as a design and field engineer on numerous projects, including foundations for high rise concrete structures and bridges.

RELEVANT PROJECTS – TRENCHLESS PROJECTS**144-in Circular Conduit Rehabilitation, Wayne County, MI (2021)****Role: Designer****Client: Vortex Companies**

Submitted a design for the minimum thickness of a GeoKrete new liner for the rehabilitation of 144-in conduit. The conduit was 67 ft deep. To optimize the design for such deep conduits, two design approaches were investigated. In the first approach, an approach similar to that used in ASTM F1216, which is typically used for CIPP, but after modifying it to fit the failure and material characteristics of geopolymer and the major drawback of this approach is the assumption that the full height of the overburden has to be supported by the conduit. An alternative and more accurate approach was investigated using the design approach typically used for designing tunnel liner. The tunnel analysis considers the soil/liner interaction taking into considerations the relative stiffness of the liner to the soil or surrounding medium and depending on the relative stiffness, only a fraction of the overburden height is assumed to be supported by the liner and that allows for optimizing the liner thickness.

137-in Arched (with flat invert) Conduit Rehabilitation, Washington DC (2021)**Role: Designer****Client: Vortex Companies**

The design of the arched pipe, with 17 ft of cover, that has a flat invert was performed using tunnel analysis. The design approach is based on evaluating the flexibility of the new liner system, comprised of the GeoKrete liner, relative to the surrounding media, comprised of the host and the surrounding ground outside the host. This approach allows for better estimation of acting loads and the induced moments and axial forces with a larger degree of accuracy. To further optimize the design of the flat invert the axial force acting on the invert slab was taken into consideration when investigating the flexural stresses at the invert and special thrust-moment interaction diagram was developed to optimize the thickness at the invert.

University Of South Carolina Chemical Grouting for Soil Stabilization, Columbia, SC (2021)**Role: Designer****Client: Vortex Companies**

Realizing the importance of stabilize the soil surrounding a tunnel subjacent to the university campus, a soil stabilizing program was requested by the university. Portions of the tunnel started to show distress and were in a state of progressive collapse due to the weakness and potential voids in the surrounding soil. A key aspect of the rehabilitating the tunnel was stabilizing the soil and filling potential voids surrounding the tunnel liner using chemical grout. Erosion voids may develop around buried infrastructures due to several reasons including water infiltration

**Years of Experience: 33****Education**

Ph.D., Civil Engineering,
University of Illinois at
Urbana-Champaign, 1999.
M.S. Civil Engineering,
Colorado State University,
1989
B.S. Civil Engineering, Ain
Shams University at Cairo,
Egypt, 1984





Mohamed Gamal, Ph.D., P.E.
 Liner Design, Underground Structure
 Page 2 of 2

into leaking joints leading to soil washout into the tunnel, dissolution of Karst limestone, and dynamic loading caused by construction related activities. As voids spatially grow, significant change in thrust forces and bending moments in the lining. Depending on the flexibility ratio between the lining and the surrounding soil, the void size can have a significant impact on the circumferential stresses in the tunnel lining. For all these reasons, an extensive chemical grouting program was designed by Dr. Gamal. The grouting program was a great success as it reflected by the findings from comparing the blow counts before and after grouting and on average the blow counts tripled or quadrupled.

Wilket Creek and N. York 118" CMP Storm Trunk, Toronto, Canada (2020)

Role: Designer

Client: Vortex Companies

To optimize the thickness, the tunnel analysis approach was used in the design. The tunnel analysis considers the soil/liner interaction taking into considerations the relative stiffness of the proposed new liner to the soil or surrounding medium and depending on the relative stiffness, only a fraction of the overburden height is assumed to be supported by the liner and that allows for optimizing the liner thickness.

Nicor Gas Utility Tunnel Inspection, Lemont, Illinois (2012/2013)

Role: Inspector with other members

Client: HBK

Provided detailed structural inspection and evaluation of 440 ft long, cast-in-place concrete lined tunnel having a 7-ft high by 10.5-ft wide horse-shoe shaped section; and two reinforced concrete lined circular riser/access shafts, each approximately 75-ft deep by 10.5-ft diameter. The shafts and tunnel carry a 36-inch diameter high pressure natural gas pipeline underlying the Chicago Sanitary and Ship Canal. The tunnel and shafts are permanently flooded and required careful dewatering over several days to mitigate stresses acting on the liner, and to monitor for excessive seepage or infiltration of groundwater through possible defects in the concrete lining. The inspection consisted of detailed visual examination and mapping, photo-documentation, and hammer-sounding of the concrete lining in the each of the shafts and tunnel; inspection of the concrete pedestal carrier-pipe supports; and inspection of steel pipe supports and access ladders in each riser shaft. A detailed report was prepared with recommendations for repairs as necessary.

Zoo Interchange Tunnel Extensions – Blue Mound and Zoo Tunnel, Milwaukee, WI (2013)

Role: Finite Element Modeling and Tunnel Design

Client: HBK

Performed a 3D model developed for the subject project to investigate the soldier pile penetration of the roof and the invert slab. Additionally, did support of excavation and detailed tunneling design for a proposed box tunnel to be constructed beneath the existing Adler Tunnel.

People Gas - Utility Crossing Grand Ave and St Clair, Chicago, IL

Role: Support of Deep Excavation Designer

Client: HBK

Completed the design for support of excavations at utility crossings and submitted a design package for the client.



JOSEPH G. SCHOTTHOEFER, IV

1993 to Present

Doetsch Industrial Services, Inc.
21221 Mullin Ave
Warren, Michigan 48089
586-755-2090

Vice-President of Operations

Oversees all specialty service operations. Implementation of new service sectors. Responsible for all specialty job fabrication. Attends Corporate Steering meetings and takes active role in quality implementation.

Education

Grosse Pointe North HS, Grosse Pointe Woods, MI. 1990

Lawrence Technological University, Southfield, MI. 1997
B.S. Mechanical Engineering

Additional Education

ASE Certified Truck Mechanic
First Aid / CPR
ISO 9000 Lead Auditing
ISO 14000 Overview Certification
Dale Carnegie Course L-2025
Federal Hazardous Materials Regulations
Federal Motor Carrier Safety Regulations
National Tank Truck Carriers Registered Insp

Fall Arrest Safety
Confined Space Non-Entry Rescue
Confined Space Atmospheric Testing
Confined Space Entry
Confined Space Ventilation
Lockout / Tag out
Qualified Motor Carrier Inspector
NASSCO Executive Board Member

JUSTIN D. JAMES, P.E.

PRESIDENT
 B.A.S.I.C. Engineering

2601 E. 7th Avenue, Tampa, FL 33605 | Ph: 813-885-4144 | Fax: 813-885-416
www.basic-engineering.com

Justin James graduated Magna Cum Laude from the University of Colorado at Boulder in 1996 with a Bachelor of Science in Civil Engineering (Geotechnical emphasis). Mr. James is a registered Professional Engineer (P.E.) in the state of Florida.

Mr. James' professional experience includes the preparation and oversight on all aspects of the geotechnical testing involved in a complete subsidence investigation report in accordance with Florida Geological Survey Special Publication No. 57 and Florida Statutes. Mr. James has worked on hundreds of DOT, Municipal and Private projects to determine the appropriate remediation for failing roadways due to subsidence, failing infrastructure and failing utilities. In addition, he has performed assessments and engineering recommendations with contactors, engineers, insurance companies and attorneys on the remediation of over 2,000 residential and commercial properties in Florida and other states. Methods of remediation and construction have included the use of pressure piers, compaction grouting, grout piers, pressure grout, chemical grout, helical piers, tie-backs, foundation rehabilitation and combinations of these methods. A full project list is available upon request. Mr. James has provided engineering and construction on commercial developments, foundation design and DOT roadway projects using chemical grouting, geosynthetics, geogrids, base reinforcement and sub grade improvement.

Mr. James is certified by Mala Geo Sciences as an operator/interpreter of Ground Penetrating Radar. Mr. James has worked with the Florida Department of Transportation's Pipe Advisory Committee in establishing specifications and standards used on underground pipe installations throughout the state of Florida.

EDUCATION AND PROFESSIONAL ASSOCIATIONS

- Florida Engineering Society (FES)
- Underground Contractor's Association
- National Society of Professional Engineers (NSPE)
- American Society of Civil Engineering
- B.S. – Civil Engineering – University of Colorado
- Registered Professional Engineer – Florida P.E. #60886
- Registered Professional Engineer – Tennessee P.E. #00114797
- Certified Neutral Evaluator—State of Florida

EMPLOYMENT HISTORY

- | | |
|----------------|-------------------------------|
| ▪ 2004-Present | B.A.S.I.C. Engineering |
| ▪ 2003-2004 | HANTECH Engineering |
| ▪ 1999-2010 | CONTECH Construction Products |
| ▪ 1996-1998 | Hensel Phelps Construction |



| Proposed Means and Methods



Proposed Means and Methods



1. SITE SAFETY

First priority on any project is safety. All personnel involved with the project will receive jobsite specific training to understand that nothing is more important than safety. As such, site setup of equipment and material staging is to be laid out with safety of the crew and the public in mind. Additionally, before any entry is made, a safety meeting is held, confined space permit discussed and filled out, air monitoring and ventilation systems put in place and all appropriate entry equipment and PPE put into use. We will also coordinate with Downers Grove Dept. of Public Works, The Police Dept., and the Fire Dept. to ensure everyone is aware of the traffic flow and the confined space requirements.

2. PRE-CONSTRUCTION

- Submittals
- Subcontracts
- Preconstruction Meetings
- Permitting
- Community Outreach
- Coordination with Businesses
- Scheduling

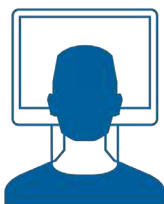
3. MOBILIZATION

- 1st Doetsch Environmental - Cleaning, Debris Removal, Pre CCTV, Initial Pipe Prep
- 2nd Vortex Lining Systems – MSI Crew
- 3rd Vortex Lining Systems – Surface Prep and Rehabilitation Crews



4. TRAFFIC CONTROL

Condition Assessment, Pipeline Cleaning, Surface Preparation, and Geopolymer Lining operations will require traffic control at the identified locations. We have chosen to work with a local traffic control company named, The Traffic Control Company (not kidding) to set up traffic control and perform flagging. We intend to only have the traffic control in place when it is needed in order to cause minimal disruptions to the business and residents. We intend to utilize a lane shift at Structure No. 3 at approximately 5201 Washington St. pushing traffic to the middle lane. Doing this will allow for work to be performed while maintaining both directions of traffic. We also intend to shut down a lane at Structure No. 7 at approximately 1101 Curtiss St. With this lane closure, we will utilize flaggers in order to maintain traffic on both directions. These two locations are our main concern for traffic control. There are two other locations, the intersection of Mackie Pl & Curtiss and Curtiss St. & Belden Ave., that will require signage and cones. VLS will also communicate and work with several business to eliminate disruption to their business. We have determined that we will need communication and coordination with the following business: Richard Pateldi, D.D.S, Claritas Property Management, Cocomoero Frozen Yogurt, Bank Financial, Cellar Door, The Family Therapy Clinic, and the 1st Church of Christ Science. We will communicate with all these businesses and any others that may be in the project "zone" to ensure that we do not cause any disruption.



5. CLEANING, DEBRIS REMOVAL AND PRE-CCTV

Cleaning of the Pipe: Vortex Lining Systems plans to team and subcontract with Doetsch Environmental Services to perform the Cleaning and Debris Removal. VLS has chosen Doetsch to perform this scope due to their experience and expertise in cleaning large diameter pipe. Once the proper traffic control is in place, Doetsch will mobilize a clean and cctv crew to perform the cleaning. Doetsch's cleaning system operates on 100% recycled water. The operation begins by vacuuming water at the work site and then filtering to make it usable. Therefore, water lines will not be crossing traffic lanes. This system also operates while the system is live, so by-pass pumping is not necessary. Special care is taken to prevent material from passing downstream. Inherent to the design of this equipment is the ability to continuously vacuum. This allows for constant removal of liquid and debris, which aids to capture suspended solids. Also, by mapping the pipe segment(s) to be cleaned, we use a step cleaning process to not overload the access point. This is also achieved by communication between the jet operator and the vacuum boom operator. The efficient removal of material is so important that the vacuum boom is always manned – not just when the cleaning head is “at the hole”. Interceptors properly operating always have debris in motion. We will also employ the use of a mechanical screen to catch the unknown – pieces of large concrete, roots or rocks that may have been dislodged during cleaning.



Vortex intends to approach the Cleaning, Debris Removal and Pre-CCTV sequencing as follows:

- i. Intersection of Mackie Pl & Curtiss St.**
Set up at Structure #1 Cleaning U/S towards Structure #0 and also cleaning D/S toward Structure #2.
- ii. Intersection of Curtiss St. & Belden Ave.**
Set up at Structure #3 Cleaning U/S towards Structure #2 and also cleaning D/S toward Structure #4.
- iii. Washington St.**
Set up at Structure #4 Cleaning U/S towards Structure #3 and also cleaning D/S toward Structure #5.
- iv. Parking lot at 5150 Main St.**
Set up at Structure #6 Cleaning U/S towards Structure #5 and also cleaning D/S toward Structure #7.
- v. Curtiss St.**
Set up at Structure #7 Cleaning U/S towards Structure #6 and also cleaning D/S toward Structure #8.

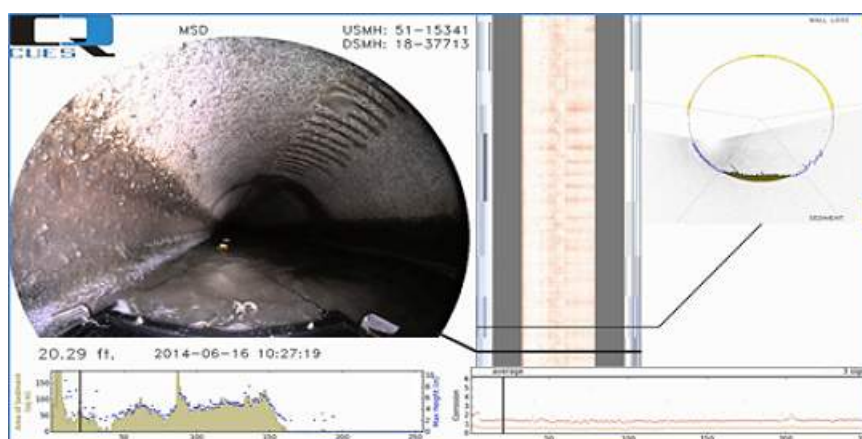


6. MULTI SENSOR INSPECTION (MSI)

Multi Sensor Inspection (MSI): Once the Pre-Cleaning is complete, we will mobilize our in-house MSI crew to perform the multi sensor inspection. They will set up at and perform this scope of work from each of the 5 set up locations we have mentioned. MSI or multi-sensor inspection is used to describe the process of collecting multiple types of inspections at one time and generally includes the following technologies that are configured together to give the highest and most pertinent level of inspection for a pipeline.

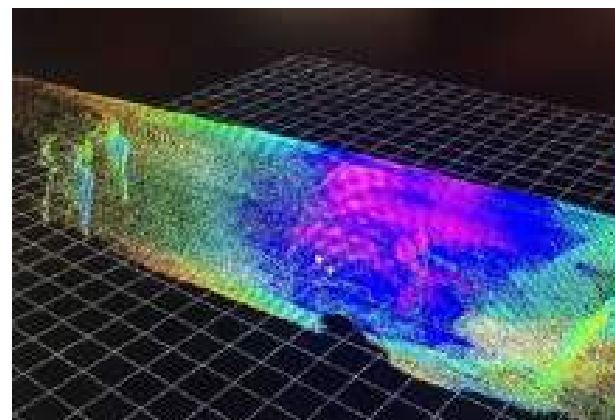
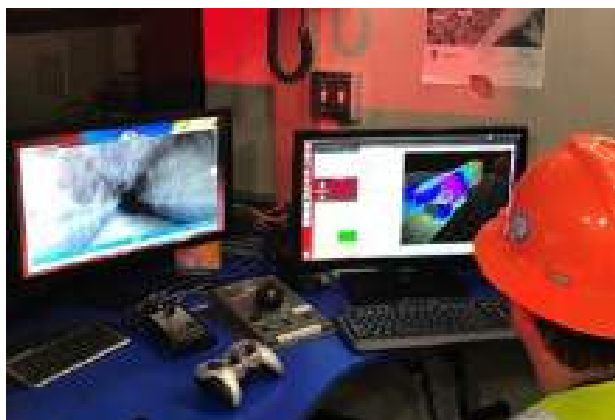
The MSI technology is presented in the field in a simultaneous presentation of the multi-sensor data and provides comprehensive back-end processing of data for visual and analytical review by engineer and the contractor to help ensure the best method of rehabilitation.

- a) CCTV inspection is performed above the water level to provide a NASSCO PACP condition assessment of structural and O&M conditions inside the visible area of the pipe.
- b) Sonar is used in pipes with high flow where flow control, isolation, or bypass pumping would be too expensive to include as part of the condition assessment and collects data below the water level to provide owner with the amount of debris that exists in a pipe, identify any voids or loss of invert, and is primarily a hydraulic condition assessment tool not a pipe structural condition assessment tool. When Sonar data is collected it is done via a floating MSI or wheeled Mudmaster platform and when it is collected the pipe beneath the water level is not inspected by Digital CCTV or LIDAR. Sonar data can only be collected when adequate flow is in the pipeline.
- c) Laser profiling uses LIDAR (light detection and ranging) to provide a true profile of the pipe wall and is used in conjunction with the visual CCTV inspection to provide a greater condition assessment tool that can identify wall loss (corrosion measurements), give true pipe internal diameter, as well as pipe geometry. Laser profiling is effective above the water or flow level only. Laser profiling can be done in 2D or 3D configurations depending on the need of the owner.
 1. 2D LIDAR is MSI technology that collects data and can see and measure features and defects in the cross section.



Sample data from the MSI inspection viewer that simultaneously presents live HD CCTV (top left), cross sectional LIDAR and Sonar view (top right), integrated LIDAR/Sonar pipe flat view (top center), sediment graph (lower left), and corrosion graph (lower right).

2. SFX-2D Multi-Sensor Report: Condition Assessment Report (example will be provided) produced from SFX-2D LIDAR data, SONAR data and CCTV. Resultant reports include 4:1 video showing time synchronized multi-sensor data including LIDAR and SONAR sensor cross sections and data graphs. Additional MSI report (PDF Document) showing same information along with select distributed cross sections and summary tables.



Vortex Services MSI Team performing large diameter assessment project for MWRA (Boston, MA).

Vortex intends to approach the MSI condition assessment sequencing as follows:

- vi. Intersection of Mackie Pl & Curtiss St.**
Set up at Structure #1 inspect U/S towards Structure #0 and also D/S toward Structure #2.
- vii. Intersection of Curtiss St. & Belden Ave.**
Set up at Structure #3 inspect U/S towards Structure #2 and also D/S to Structure #4.
- viii. Washington St.**
Set up at Structure #5 inspecting U/S towards Structure #4 and also D/S toward Structure #6.
- ix. Curtiss St.**
Set up at Structure #7 inspecting U/S towards Structure #6 and also D/S to Structure #8.



7. ENGINEERING - DATA REVIEW AND DESIGN

For Engineering, inspection, design, and review, Vortex has chosen to partner with Talman Consultants. Talman Consultants, LLC is a Chicago based WBENC & WDBE firm that offers Consulting Services in Utility Engineering & Design, Permit Acquisition, Traffic Control, Surveying, and Construction Oversight.

Once the Cleaning and Inspection scope of the project has been completed, Talman will review the data obtained by the CCTV, Visual inspections, and MSI inspections to validate our approach to geopolymer rehabilitation.

8. DEWATERING/ BYPASS

Based on the information provided in HBK Engineering's report and our site visits, for the majority of the project we plan to perform all flow control/bypass internally utilizing cofferdams, internal pumps, pipes, and hoses. This will allow for rehabilitation to occur without creating greater disruption to surrounding businesses, traffic and residents. We will bypass each section as we are rehabilitating it. Using this approach, we will be able to stop rehabilitation in the case of an adverse weather event or heavy rainstorm.

- We intend to utilize (2) 6" pumps at identified suction manholes
- We will build a coffer dam on both the up and down stream sides of the segment being rehabilitated.
- We will use the upstream side of the cofferdam to create a suction point and the downstream side of the 2nd coffer dam to create a discharge point.
- Along with the internal piping used for the bypass, we will also plan to create a flow relief point. We will build in an 8-inch pipe in each cofferdam and set a flow through plug that will allow for additional gravity fed flow through the segment of pipe being rehabilitated.
- Utilizing the (2) 6" pumps and the 8" gravity flow, we will be able to manage the flow diversion internally.

- On the most downstream segment at 5122 Carpenter Street When dewatering is performed, we intend to utilize an inflatable aqua dam on the downstream exterior of the pipe structure. We will also utilize the 6" pumps and 8" gravity line internally. As needed during normal business hours, we intend to dewater the "spill pool" utilizing an addition low-decibel pump to keep the area between the pipe and the aqua dam dried out to a point that it doesn't back up into the pipe.
- Vortex will take special precaution when dealing with 5122 Carpenter Street, as we are aware that this is a sensitive area.

9. SURFACE PREPARATION, INFILTRATION CONTROL, AND PATCHING/REPAIRS

Surface Preparation

Once the flow is controlled, we will perform a more focused cleaning of the patch locations, pressure washing with up to 5,000-psi water blasting, removing any loose debris and deposit accumulation while achieving a Surface Saturated Dry (SSD) substrate.

Infiltration Control

Once the surface is prepared, we will treat active points of infiltration utilizing Quadex's I&I Guard (chemical grout), Quad-Plug (cementitious grout), Hyperform (fast set concrete) or other Quadex approved products as required.



Surface Patching and Repair

We will use cementitious grout and other Quadex approved products to build back and address spot repairs, joints, cracks, spalled material and exposed reinforcing steel as needed. Through these efforts we will bring the existing surface back to its original installed thickness in a condition that is ready for installation of the proposed structurally enhancing and protective 1.0-inch GeoKrete geopolymer application.

After review of the reporting provided, we understand that the following repairs are to be anticipated:

• Crown of the Pipe

- Joints: 90 locations where concrete spalling with exposed reinforcing steel.
- Pipe Inlets: 17 locations were noted with varying degrees of deterioration.
- Holes: 2 holes were observed in the crown of the pipe.

• Pipe Walls

- Joints: 116 locations with deterioration or instances of spalling/exposed reinforcing steel.
- Pipe Inlets: 42 locations were noted with varying degrees of deterioration.

• Pipe Invert

No details were provided on the invert as the invert was not visible during inspection.

10. MATERIAL DELIVERY, STORAGE, AND HANDLING

- a. Delivery: Deliver materials in original containers/sacks and labels intact and free of moisture. We will not use materials that have been directly exposed to moisture or if there is visible damage to the packaging.
- b. Receipt Process: All materials must be inspected by VLS Crew upon receipt and the Bill of Lading reviewed to confirm it properly documents amount(s) and type(s) of material(s) received, date and time of delivery as well as the shipping company delivering the material. Completed/signed Bill of Lading and material batch numbers shall be logged by the Superintendent or Foreman upon receipt of the material(s) and stored in project files for possible future reference. Receipt of material should also be noted in Daily Activity Log.
- c. Storage: Materials may be stored offsite, such as in a yard, for a period of time prior to use on the project. Prior to delivery to the project, we will designate a specific space at the project site for staging and mixing materials. Regardless of storage location, Geopolymer Lining System products are to be kept dry, protected from weather and stored under cover within the temperature ranges recommended by the Manufacturer. Products are to be stored and handled according to their SDSs or appropriate classification. Damaged or unsuitable products shall be promptly removed from the job site and shall be replaced with suitable materials.
- d. There are several locations within this project zone that we have recognized as potential material storage areas. We will communicate with any property owners to determine where we will be allowed to store material.



11. EQUIPMENT DELIVERY

- a. Manufacturer approved equipment shall be used in the application of the specified Geopolymer Liner. The following outlines the equipment that is to be used on application to Horizontal Infrastructure. Such equipment may also be used on Vertical Infrastructure at the installer's discretion.
- b. Major equipment components consist of a generator, an air compressor, a high-pressure washer, a high shear mixer, a high output pump, a gyroscopic high-speed spin cast delivery assembly, an electronic retraction system capable of +/- 5% repeatability, and high-pressure hoses and couplings.
- c. Application equipment shall include a high shear mixer and high output swing tube pump. In addition, the application equipment will have safety sensors that monitors specific operation parameters. This system ensures proper water to material ratios and material consistencies.
- d. Application equipment shall have visible display for the rate of water addition. This will ensure water/ material ratios are known and controlled. Water/ material ratio must be maintained per Manufacturers' recommendations.
- e. Application equipment shall measure the back pressure on the discharge side of the pump. The change in pressure will alert the operator to any potential changes in flow rates. Backpressures must not exceed the system providers' recommendations.
- f. Spinner head shall be attached to a gyroscopic mechanism to layer the materials. The gyroscopic mechanism can adjust the spinner head pattern and frequency. The multiple layering process allows more uniform application of the product and achieves higher thickness levels, in a single pass.
- g. Retraction system shall be capable of pulling the sled assembly with no more than +/-5% tolerance.
- h. Retraction system shall have a visible display that monitors the controlled rate of retraction.
- i. The rate of retraction, dry material usage and length of application covered should be monitored and recorded in the Daily Application Log.

12. GEOPOLYMER REHABILITATION AND EXECUTION

Once a design is obtained, submitted, and approved; we will mobilize TWO geopolymer rehabilitation crews. We plan to execute the project with these two crews working concurrently as listed below.

a. VLS Crew No. 1 – Set up No. 1

At Structure No. **1** Intersection of Mackie Pl & Curtiss St.

From this set up Crew No. 1 will line 505 LF back towards Structure No. 0 and down 185 LF to Structure No. 2.

b. VLS Crew No. 2. – Set up No. 2

At Structure No. **4** at 5201 Washington St.

From this set up, Crew No. 2 will line 450 LF back towards Structure No. 3 and then 415 LF towards Structure No. 5.

c. VLS Crew No. 1. – Set up No. 3

At Structure No. **3** Intersection of Curtiss St. & Belden Ave.

From this set up Crew No. 1 will line 300 LF back towards Structure No. 2 and down 450 LF back toward Structure No. 4.

d. VLS Crew No. 2. – Set up No. 4

At Structure No. **6** Parking lot at 5150 Main St.

From this set up, Crew No. 2 will line 335 LF back towards Structure No. 5 and then 500 LF towards Structure No. 7.

e. VLS Crew No. 1 - Set up No. 5

At Structure **7** at 1101 Curtiss St.

From this set up Crew No. 1 will line 227 LF back towards Structure No.  2 and down 776 LF back toward Structure No. 8.

These five (5) set up locations will allow for us to rehabilitate the entire run of 11' diameter pipe.

While performing the pipeline rehabilitation, we will also rehabilitate the associated manholes. Rehabilitating each manhole along with the pipe segments will create a monolithic structure and a bond between each vertical and horizontal structure.

Each segment listed above will follow the same rehabilitation process as described below.

13. MIX AND APPLY GEOKRETE

Once the surface is brought to a condition that is acceptable for Geopolymer rehab, the crews will follow these steps:

- Mix and apply the new layer of GeoKrete geopolymer following manufacturers recommendations. Work may include multiple passes as needed to achieve the full build of specified/design thickness.
- Perform specified QA/QC testing throughout installation. At minimum, manufacturer recommends taking nine sample cylinders for Compression Testing (ASTM C39) the more frequent of every 44,000 lbs. of material or as directed in the plans and specifications (first and last day of construction and more frequent of every 10 MHs or once every 40,000 lbs. for MHs and every 40,000 lbs. or every other application day for Pipe). Three samples are to be broken at each of 7 and 28-Days, with the remaining cylinders to be broken at 56-Days, or as directed dependent upon 28-Day results.
- Allow liner to cure per manufacturer's instructions. Reinstate all laterals and connecting pipes. Ensure termination points with all MHs, Junctions, Bends, Inlets, Outlets, Obstructions, Shafts, and other Structures are appropriately sealed, and a smooth interface is achieved.
- Perform final cleanup of the work site and equipment.
- Final Inspection – Review the infrastructure with the Owner/Engineer's inspection representative and finalize any punch-list items. Upon agreed completion, seek representatives sign-off on the completion of the work. Document Post-lining condition of the host infrastructure. Examples include GoPro Video for Pipe, culverts and other horizontal infrastructure and Video or photos for MHs, Wet Wells, Structures, and other vertical infrastructure.



14. RECOMMENDATIONS FOR ANY ON-GOING MAINTENANCE

It was requested that we provide recommendations for any on-going maintenance. After rehabilitation of this pipe is complete utilizing GeoKrete, the Village of Downers Grove will not need to take any special maintenance measures. Maintenance of this pipe should resume on your standard maintenance and inspecting schedule. There is no specific on-going maintained required.

15. PRODUCT WARRANTY STATEMENT

As both the manufacturer and installer of GeoKrete®, Vortex warrants our Quadex GeoKrete Geopolymer pipe liner product to be free from manufacturing defects and to meet or exceed the physical properties as stated on our current technical data sheet, for a period of one (1) year, from the initial date of product installation. This project specific warranty is exclusively limited to the 11' Diameter Pipe Repairs/Rehabilitation – Design/Build project which falls under the jurisdiction of The Village of Downers Grove. A formal at length Warranty Statement will be provided to the Village upon execution of contracts.



| Proposed Design of Improvements



Proposed Design of Improvements



At the inspection and investigation phase of the project, the project design team will begin following the cleaning and CCTV operations with an onsite project walk, completed while the culvert is under partial bypass. The objective of this walk is to identify and assess localized degradation, determine root-cause, contributing factors and resolution of areas of distress within the culvert, while confirming whether conditions have worsened since the last inspection was completed five years ago. The most critical of these areas will be identified for follow-up core sampling and testing where remaining strength and thickness of the asset will be determined. An elevation survey (top of MH

and invert) will be performed on the seven MHs along the project alignment and invert and top of ground of the upstream and downstream ends of the culvert. A Multi-Sensor Inspection of the asset will also be performed to determine the level of degradation in the host infrastructure relative to the original size/shape.

This existing infrastructure's performance information will be collected and used by the design team at the design phase, along with the teams understanding of the municipalities expectations and overall installation and working GeoKrete® product knowledge, to prepare a Composite design. The design team will seek to use its extensive knowledge of the various rehabilitation approaches and technologies available to optimize the investment already made in the host infrastructure renewing its useful life and extending it for another 75+ years. Rehabilitation design is anticipated to be comprised of patch and repair the host structure returning the asset to its original fully structural condition followed by a proposed 1.0-inch installation of GeoKrete which will enhance the structural integrity of the asset providing additional protection from common forms of degradation while providing the long-term performance of GeoKrete geopolymer. **Preliminary designs for the project have been included at the end of this section for review and consideration.**

The design team will support the team with the preparation of conceptual plans and necessary subsequent design phases as needed. The team has anticipated the use of previously completed plan sheets and CAD files, if available, from previously completed assessments to limit unnecessary cost impact on the project. The team foresees a need for sheets to include a project overview, general notes, plan and profile, cross sections and repair details. The design team will remain available should needs arise and will continue to support the project through the construction phase, providing site walks at the completion of the preparation work, prior to the installation of the structural enhancement and protective layer as well as final project walk, performed at project completion.



The project execution and design team's involvement early in the project planning phase has ultimately resulted in cost savings and an accelerated construction schedule. The design team has extensive experience with geotechnical investigation and design, directly related to underground structures. Members of the design team have performed the roles of both designer and owner's representative on past design/build projects, within the construction and quality management disciplines, for new conduit construction and rehabilitation work, providing a strong base for a

successful design. This collective and wide base of underground experience provide a team that is uniquely qualified to implement the most favorable technical design solution available to meet the project's needs as design-build partners.

ATTACHMENT
Design Calculations

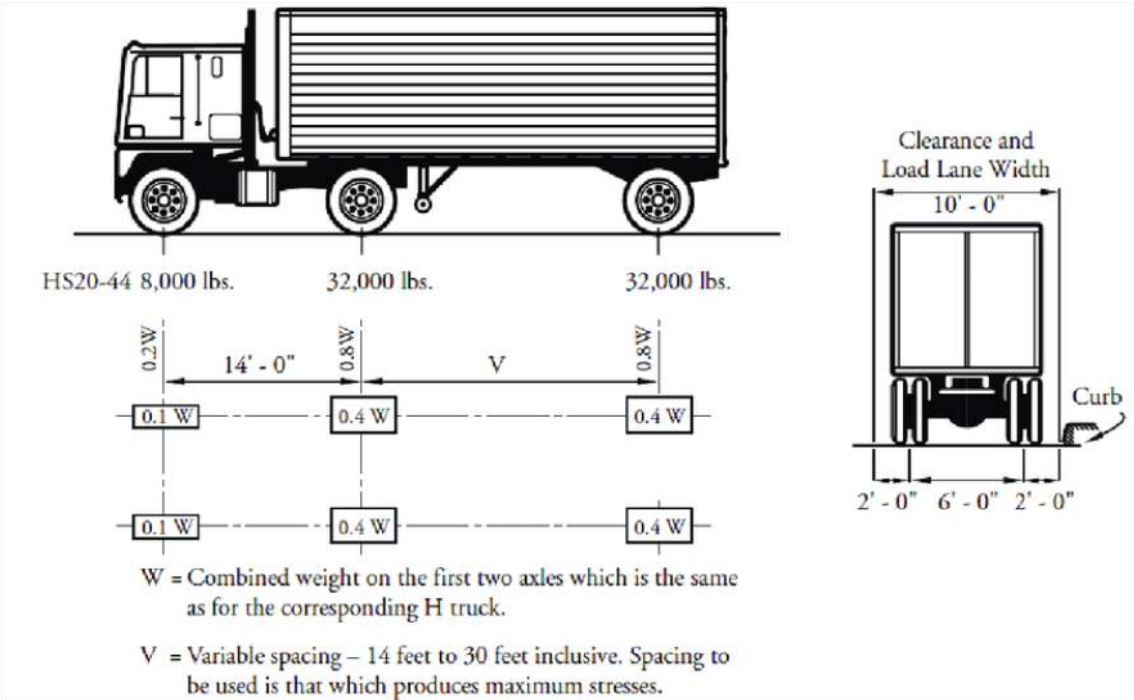
TRAFFIC LOAD CALCULATIONS

Calcs By:SB
Chk By:MG

Inputs for Size and Depth of the Pipe

Soil Height above top of pipe=	$H_{sc} := 10 \cdot ft$	$H_{sc} = 3.05 \cdot m$
Inside Ovaled diameter of host pipe=	$D_i := 161in$	$D_i = 4089.4 \cdot mm$

Inputs for HS-20 Truck



Axle load	=	$P_{Axle} := 8000lbf$	$P_{Axle} = 4 \cdot tonf$
Load on each wheel (half of axle load)	=	$P_{wheel_each} := \frac{P_{Axle}}{2} = 4000lbf$	
Wheel spacing in transverse direction	=	$s_w := 6.0ft$	$s_w = 1828.8 \cdot mm$
Axle spacing in perpendicular (or longitudinal) direction	=	$s_a := 6ft$	$s_a = 1828.8 \cdot mm$
Tire patch width (transverse direction)	=	$w_t := 7in$	$w_t = 177.8 \cdot mm$
Tire patch length (perpendicular or longitudinal direction)	=	$l_t := 7in$	$l_t = 177.8 \cdot mm$

Calcs By:SB
Chk By:MG

Other Inputs

Live load distribution factor=

$$LLDF := 1.15$$

Multiple presence factor=

$$m_{Lane} := 1.2$$

Calculation as per AASTHO LRFD Bridge Design Specifications, Seventh Edition, 2014

Wheel interaction depth in transverse direction=

$$H_{int_t} := \frac{(s_w - w_t - 0.06 \cdot D_i)}{LLDF} = 4.01 \text{ ft}$$

Wheel interaction depth perpendicular or longitudinal direction =

$$H_{int_p} := \frac{(s_a - l_t)}{LLDF} = 4.71 \text{ ft}$$

Liveload patch width at top of buried pipe
(i.e. transverse direction)=

$$w_w := \begin{cases} w_t + LLDF \cdot H_{sc} + 0.06 \cdot D_i + s_w & \text{if } H_{sc} \geq H_{int_t} \\ w_t + LLDF \cdot H_{sc} + 0.06 \cdot D_i & \text{otherwise} \end{cases}$$

$$w_w = 18.89 \text{ ft}$$

Liveload patch length at top of buried pipe
(i.e. perpendicular or longitudinal direction)=

$$l_w := \begin{cases} l_t + LLDF \cdot H_{sc} + s_a & \text{if } H_{sc} \geq H_{int_p} \\ l_t + LLDF \cdot H_{sc} & \text{otherwise} \end{cases}$$

$$l_w = 18.08 \text{ ft}$$

Rectangular area at the top of the buried pipe=

$$A_{LL} := w_w \cdot l_w = 341.56 \text{ ft}^2$$

Dynamic load allowance=

$$IM := \begin{cases} 33 \cdot \left(1 - 0.125 \cdot \frac{H_{sc}}{1 \text{ ft}} \right) \cdot 1\% & \text{if } 33 \cdot \left(1 - 0.125 \cdot \frac{H_{sc}}{1 \text{ ft}} \right) \cdot 1\% \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

$$IM = 0$$

Calcs By:SB
Chk By:MG

Liveload applied at surface on all interacting wheel=

$$P_{\text{wheels}} := \begin{cases} P_{\text{wheel_each}} & \text{if } H_{\text{sc}} < H_{\text{int_t}} \\ 2 \cdot P_{\text{wheel_each}} & \text{if } H_{\text{int_p}} \geq H_{\text{sc}} \geq H_{\text{int_t}} \\ 4 \cdot P_{\text{wheel_each}} & \text{if } H_{\text{sc}} > H_{\text{int_p}} \end{cases}$$

$$P_{\text{wheels}} = 16000 \text{ lbf}$$

Liveload vertical crown pressure=

$$P_{\text{Liveload}} := \left(\frac{P_{\text{wheels}}}{A_{\text{LL}}} \right) \cdot (1 + \text{IM}) \cdot m_{\text{Lane}} = 0.39 \text{ psi}$$

$$P_{\text{Liveload}} = 0.39 \text{ psi}$$

$$P_{\text{Liveload}} = 2.69 \cdot \text{kPa}$$

LINER THICKNESS CALCULATIONS

The design is based on the assumption of using 1" of GeoKrete and the remaining thickness is a contribution from the existing liner. To be conservative the compressive strength for the GeoKrete and the existing liner was assumed to be 3000 psi.

GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure InteractionCalcs By : MG
Chk By : MG**Stresses Around Lined Underground Arched Opening**

Based on work by Burns and Richard (1964) and Peck et al (1971)

☒ INPUT**Please see drawing on first page for variables definitions**

Vertical pressure at Crown due to Traffic	=	$P_{\text{surcharge}} := 0.39 \cdot \text{psi}$	$P_{\text{surcharge}} = 2.689 \cdot \text{kPa}$
Crown Radius	=	$R_t := 80.5 \cdot \text{in}$	$R_t = 2044.7 \cdot \text{mm}$
Height of springline above invert	=	$B_{\text{inv}} := 19.5 \cdot \text{in}$	$B_{\text{inv}} = 495.3 \cdot \text{mm}$
Soil/Rock Height above crown	=	$H_c := 10 \cdot \text{ft}$	$H_c = 3048 \cdot \text{mm}$
Water depth below ground surface	=	$d_w := 16.75 \cdot \text{ft}$	(This is thickness of stone above new liner)
Soil Poisson's ratio	=	$\nu_m := 0.4$	$d_w = 5105.4 \cdot \text{mm}$
Liner Poisson's ratio	=	$\nu_{\text{Liner}} := 0.18$	
Coefficient of earth pressure at rest	=	$K_o := 0.66 \left(\frac{\nu_m}{(1 - \nu_m)} \right)$	
Average unit weight of soil/rock	=	$\gamma_m := 130 \cdot \text{pcf}$	$\gamma_m = 20.421 \cdot \frac{\text{kN}}{\text{m}^3}$
Unit Weight of Water	=	$\gamma_w := 62.4 \cdot \text{pcf}$	
Soil/rock Modulus for med dense to dense sand	=	$E_m := 3 \cdot \text{ksi}$	$E_m = 20.684 \cdot \text{MPa}$
Modulus of Horizontal Reaction (E')	=	$(E_{\text{prime}}) := 1000 \cdot \text{psi}$	$E_{\text{prime}} = 6.895 \cdot \text{MPa}$
Liner Modulus (long Term)	=	$E_{\text{Liner}} := 3000 \cdot \text{ksi}$	$E_{\text{Liner}} = 20684.272 \cdot \text{MPa}$
Compressive strength	=	$f_c := 3000 \cdot \text{psi}$	$f_c = 20.684 \cdot \text{MPa}$
Allowable Diametric Strain	=	$\epsilon_{\text{diametric}} := 1\%$	
Flexure Strength of Liner (long term)	=	$f_{\text{flexure}} := 800 \cdot \text{psi}$	$f_{\text{flexure}} = 5.516 \cdot \text{MPa}$
Load Factor for Thrust-Moment Interaction Diagram=		$L_d\text{factor} := 1.4$	
Strength Reduction Factor for Interaction Diagram =		$\Phi_f := 0.6$	
Factor of safety against buckling	=	$F_s := 2$	
Crown Liner Thickness	=	$t := 2 \cdot \text{in}$	$t = 50.8 \cdot \text{mm}$
Thickness for Invert	=	$t_{\text{inv}} := 5\text{in}$	$t_{\text{inv}} = 127 \cdot \text{mm}$



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG

Thickness for vertical wall

=

$t_{vw} := 2.5 \text{ in}$

$t_{vw} = 63.5 \cdot \text{mm}$

Show Radial and Tangential Stresses Considering:

- ☒ Both Horizontal and Vertical In-Situ Stresses
- ☐ Vertical In-Situ Stress Only Ignoring In-Situ Horizontal Stress
- ☐ Horizontal In-Situ Stress Only Ignoring Vertical In-Situ Stress

Choose Soil/liner Slippage Condition

- ☐ No Slip Condition - Stiff Soil
- ☒ Full Slip Condition - Soft Soil

INPUTDesign Calculations:

Height of soil above springline =

$H_m := H_c + R_t = 16.708 \text{ ft}$

$H_m = 5092.7 \cdot \text{mm}$

Modulus of Rupture

=

$MR := 7.5 \cdot \sqrt{(f_c \cdot 1 \text{ psi})} = 410.792 \text{ psi}$

$MR = 2.832 \cdot \text{MPa}$

Average Tunnel radius

=

$a := R_t + \frac{t}{2} = 81.5 \cdot \text{in}$

$a = 2070.1 \cdot \text{mm}$

Constrained Modulus =

$$M_{\text{cons}} := \frac{E_m \cdot (1 - \nu_m)}{(1 + \nu_m) \cdot (1 - 2 \cdot \nu_m)} = 6428.571 \text{ psi}$$

$M_{\text{cons}} = 44.323 \cdot \text{MPa}$

Flexibility Ratio

=

$$F := \frac{1}{4} \cdot \frac{(1 - 2 \cdot \nu_m)}{(1 - \nu_m)} \cdot (1 - \nu_{\text{Liner}}^2) \cdot \frac{M_{\text{cons}}}{\frac{E_{\text{Liner}}}{F_s}} \cdot \frac{(2 \cdot a)^3}{t^3} = 187.073$$

Compressibility ratio =

$$C := \frac{1}{2} \cdot \frac{(1 - \nu_{\text{Liner}}^2)}{(1 - \nu_m)} \cdot \frac{M_{\text{cons}}}{E_{\text{Liner}}} \cdot \frac{(2 \cdot a)}{t} = 0.141$$

$$a1 := \frac{(1 - 2 \cdot \nu_m) \cdot (C - 1)}{[(1 - 2 \cdot \nu_m) \cdot C + 1]}$$

No Slip Condition Parameter:

$$a2 := \frac{(1 - 2 \cdot \nu_m) \cdot (1 - C) \cdot F - 0.5 \cdot (1 - 2 \cdot \nu_m)^2 \cdot C + 2}{F \cdot [(3 - 2 \cdot \nu_m) + (1 - 2 \cdot \nu_m) \cdot C] + (2.5 - 8 \cdot \nu_m + 6 \cdot \nu_m^2) \cdot C + 6 - 8 \cdot \nu_m}$$



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG

$$a3 := \frac{[[1 + (1 - 2 \cdot \nu_m)] \cdot F - 0.5 \cdot (1 - 2 \cdot \nu_m) \cdot C - 2]}{[(3 - 2 \cdot \nu_m) + (1 - 2 \cdot \nu_m) \cdot C] \cdot F + [(2.5 - 8 \cdot \nu_m + 6 \cdot \nu_m^2) \cdot C + 6 - 8 \cdot \nu_m]}$$

Full Slip Condition Parameter:

$$a2 := \frac{(2 \cdot F + 1 - 2 \cdot \nu_m)}{(2 \cdot F + 5 - 6 \cdot \nu_m)}$$

$$a3 := \frac{(2 \cdot F - 1)}{(2 \cdot F + 5 - 6 \cdot \nu_m)}$$



For the selected full slip condition

$$a1 = -0.167$$

$$a2 = 0.994$$

$$a3 = 0.99$$

$$b1 := 1 - a1 = 1.167$$

$$b2 := 1 + 3 \cdot a2 - 4 \cdot a3 = 0.019$$

$$\gamma_{eff} := (\gamma_m - \gamma_w)$$

$$\theta1 := 90 \cdot \text{deg}$$

(This is angle measured from the X-axis counter wise)

Arched Crown AnalysisA. Thrust Calculation Per Foot Wide Strip in Long Direction:

1. Thrust calculations due to soil/rock medium

$$\text{Thrust}_m := \frac{a}{2} \cdot 1 \cdot \text{ft} \cdot \left[\gamma_m \cdot (H_m - d_w) + P_{\text{surchage}} \right] + \gamma_{eff} \cdot d_w \cdot \left[(1 + K_o) \cdot b1 - \frac{1}{3} \cdot (1 - K_o) \cdot b2 \cdot \cos(2 \cdot \theta1) \right]$$

$$\text{Thrust}_m = 7.792 \cdot \text{kip}$$

$$\text{Thrust}_m = 34.661 \cdot \text{kN}$$

2. Thrust due to water column

$$\text{Thrust}_{water} := \gamma_w \cdot d_w \cdot a \cdot 1 \cdot \text{ft} = 7.099 \cdot \text{kip}$$

$$\text{Thrust}_{water} = 31.576 \cdot \text{kN}$$

3. Total Thrust per foot

$$\text{Total Thrust} = T_{total} := \text{Thrust}_m + \text{Thrust}_{water} = 14.891 \cdot \text{kip}$$

$$T_{total} = 66.238 \cdot \text{kN}$$

B. Moment Calculation Per Foot Wide Strip in Long Direction:

1. Moment due to weight above water table

$$\text{Moment}_m := \frac{1}{6} \cdot (1 - K_o) \cdot b2 \cdot \left[\gamma_m \cdot (H_m - d_w) + P_{\text{surchage}} \right] \cdot a^2 \cdot \cos(2 \cdot \theta1) \cdot 1 \cdot \text{ft} = -0.003 \text{ ft} \cdot \text{kip}$$

$$\text{Moment}_m = -0.003 \cdot \text{kN} \cdot \text{m}$$



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG**2. Moment due to weight under water table**

$$\text{Moment_eff} := \frac{1}{6} \cdot (1 - K_o) \cdot b_2 \cdot \gamma_{\text{eff}} \cdot d_w \cdot a^2 \cdot \cos(2 \cdot \theta_1) \cdot 1 \cdot \text{ft} = -0.057 \text{ ft} \cdot \text{kip}$$

$$\text{Moment_eff} = -0.252 \text{ ft} \cdot \text{kip}$$

3. Total Moment per foot

$$\text{Total Moment} = \quad \text{M_total} := \text{Moment_m} + \text{Moment_eff} = -0.059 \cdot \text{kip} \cdot \text{ft}$$

$$\text{M_total} = -0.08 \cdot \text{kN} \cdot \text{m}$$

C. Deflection Calculation (Effective Stress Approach):**1. Deflection due to soil/rock weight above water table**

$$\text{Deflection_1} := \frac{\gamma_m \cdot (H_m - d_w) \cdot a}{2M_{\text{cons}}} \cdot \left[(1 - \nu_m) \cdot (1 + K_o) \cdot b_1 \cdot C + \frac{2}{3} \cdot \frac{(1 - \nu_m)}{(1 - 2 \cdot \nu_m)} \cdot (1 - K_o) \cdot b_2 \cdot F \cdot \cos(2 \cdot \theta_1) \right]$$

$$\text{Deflection_1} = 0.001 \cdot \text{in}$$

$$\text{Deflection_1} = 0.014 \cdot \text{mm}$$

2. Deflection due to soil/rock weight below water table

$$\text{Deflection_2} := 0.5 \cdot \frac{(\gamma_{\text{eff}}) \cdot d_w \cdot a}{M_{\text{cons}}} \cdot \left[(1 - \nu_m) \cdot (1 + K_o) \cdot b_1 \cdot C + \frac{2}{3} \cdot \frac{(1 - \nu_m)}{(1 - 2 \cdot \nu_m)} \cdot (1 - K_o) \cdot b_2 \cdot F \cdot \cos(2 \cdot \theta_1) \right]$$

$$\text{Deflection_2} = -0.113 \cdot \text{in}$$

$$\text{Deflection_2} = -2.871 \cdot \text{mm}$$

3. Deflection due to water pressure

$$\text{Deflection_3} := 0.5 \cdot \frac{(\gamma_w) \cdot d_w \cdot a}{M_{\text{cons}}} \cdot [(1 - \nu_m) \cdot (2) \cdot b_1 \cdot C] = 0.009 \cdot \text{in}$$

$$\text{Deflection_3} = 0.23 \cdot \text{mm}$$

Total Deflection =

$$\Delta_t := \text{Deflection_1} + \text{Deflection_2} + \text{Deflection_3} = -0.103 \cdot \text{in}$$

$$\Delta_t = -2.626 \cdot \text{mm}$$

C. Deflection Calculation (Total Stress Approach):

$$\text{Deflection} := 0.5 \cdot \frac{\gamma_m \cdot H_m \cdot a}{M_{\text{cons}}} \cdot \left[(1 - \nu_m) \cdot (1 + K_o) \cdot b_1 \cdot C + \frac{2}{3} \cdot \frac{(1 - \nu_m)}{(1 - 2 \cdot \nu_m)} \cdot (1 - K_o) \cdot b_2 \cdot F \cdot \cos(2 \cdot \theta_1) \right]$$

$$\text{Deflection} = -0.217 \cdot \text{in}$$

$$\text{Deflection} = -5.507 \cdot \text{mm}$$

Diametric Strain % =

$$D_{\text{strain}} := \frac{\Delta_t}{a} = -0.127 \cdot \%$$

allowable Diametric Strain % =

$$\epsilon_{\text{diametric}} = 1 \cdot \%$$



The calculated diametric strain is less than allowable diametric strain - OK



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG**Determine Moment Capacity of the Section and Check Buckling**

Total induced thrust =

$$T_{total} = 14.891 \cdot \text{kip}$$

$$T_u := Ld_{factor} \cdot T_{total} = 20.847 \cdot \text{kip}$$

Total Induced Moment =

$$M_{total} = -0.059 \cdot \text{kip} \cdot \text{ft}$$

$$M_u := Ld_{factor} \cdot M_{total} = -0.083 \cdot \text{kip} \cdot \text{ft}$$

Check Stresses at Crown

Second Moment of inertia =

$$I_{sec} := \frac{12 \text{in} \cdot t^3}{12} = 8 \cdot \text{in}^4$$

$$I_{sec} = 333 \cdot \text{cm}^4$$

$$A_{sec} := 12 \text{in} \cdot t = 24 \cdot \text{in}^2$$

Maximum flexural Stress =

$$\sigma_{max} := - \left| \frac{T_{total}}{A_{sec}} \right| + \left| \frac{M_{total} \cdot 0.5 \cdot t}{1 \cdot I_{sec}} \right| = -531.8 \text{ psi}$$

$$\sigma_{max} = -3.67 \cdot \text{MPa}$$

(Positive indicates tension)

Minimum flexural Stress =

$$\sigma_{min} := - \left| \frac{T_{total}}{A_{sec}} \right| - \left| \frac{M_{total} \cdot 0.5 \cdot t}{1 \cdot I_{sec}} \right| = -709.1 \text{ psi}$$

$$\sigma_{min} = -4.89 \cdot \text{MPa}$$

Allowable tensile flexural stress =

$$f_{allowable} := f_{flexure} \div F_s = 400 \text{ psi}$$

$$f_{allowable} = 2.758 \cdot \text{MPa}$$



The calculated maximum tensile flexural stress is less than allowable flexural strength - OK

The calculated minimum stress is less than 0.65*0.6*f_c - OK**For ultimate forces we have:**

Maximum flexural Stress =

$$\sigma_{max_u} := - \left| \frac{T_u}{A_{sec}} \right| + \left| \frac{M_u \cdot 0.5 \cdot t}{1 \cdot I_{sec}} \right| = -744.5 \text{ psi}$$

$$\sigma_{max_u} = -5.13 \cdot \text{MPa}$$

(Positive indicates tension)

Minimum flexural Stress =

$$\sigma_{min_u} := - \left| \frac{T_u}{A_{sec}} \right| - \left| \frac{M_u \cdot 0.5 \cdot t}{1 \cdot I_{sec}} \right| = -992.7 \text{ psi}$$

$$\sigma_{min_u} = -6.84 \cdot \text{MPa}$$

Ultimate tensile flexural stress =

$$(f_{ult} := 0.9 \cdot f_{flexure} = 720 \text{ psi})$$



The calculated ultimate maximum tensile flexural stress is less than ultimate strength - OK



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interaction

Calcs By : MG
Chk By : MG

The calculated ultimate minimum stress is less than $0.65 \cdot 0.6 \cdot f_c$ - OK

Check Buckling for Crown

Max radius=

$$R_t = 80.5 \cdot \text{in}$$

$$R_t = 2044.7 \cdot \text{mm}$$

Calculate critical buckling pressure

Second moment of inertia per inch

$$I_{\text{sec}_b} := \frac{t^3}{12}$$

$$I_{\text{sec}} = 0.667 \text{ ft} \cdot \text{in}^3$$

Water Buoyancy factor =

$$R_w := 1 - 0.33 \cdot \frac{d_w}{H_m} = 0.669$$



Coefficient of elastic support =

$$B := \frac{1}{\left(1 + 4e^{-.065 \cdot H_m \cdot \text{in}^{-1}}\right)} = 1$$

Ovality reduction factor =

$$C_{\text{factor}} := \left[\frac{(1 - \epsilon_{\text{diametric}})^3}{(1 + \epsilon_{\text{diametric}})^2} \right] = 0.914$$

Inner Diameter =

$$D_L := 2 \cdot R_t = 13.417 \text{ ft}$$

$$D_L = 4089.4 \cdot \text{mm}$$

Critical buckling stress =

$$P_{\text{critical}} := \frac{1}{F_s} \left(32 \cdot R_w \cdot B \cdot E_m \cdot E_{\text{Liner}} \cdot \frac{I_{\text{sec}_b}}{D_L^3} \right)^{0.5} = 87.784 \text{ psi}$$

$$P_{\text{critical}} = 0.605 \cdot \text{MPa}$$

Back calculate induced pressure

Induced axial stress =

$$P_{\text{induced}_u} := \frac{T_u}{R_t \cdot 1 \text{ ft}} = 21.581 \cdot \text{psi}$$

$$P_{\text{induced}_u} = 0.149 \cdot \text{MPa}$$

$$P_{\text{critical}} = 87.784 \text{ psi}$$

$$P_{\text{critical}} = 0.605 \cdot \text{MPa}$$



The calculated axial stress is less than critical buckling stress - OK



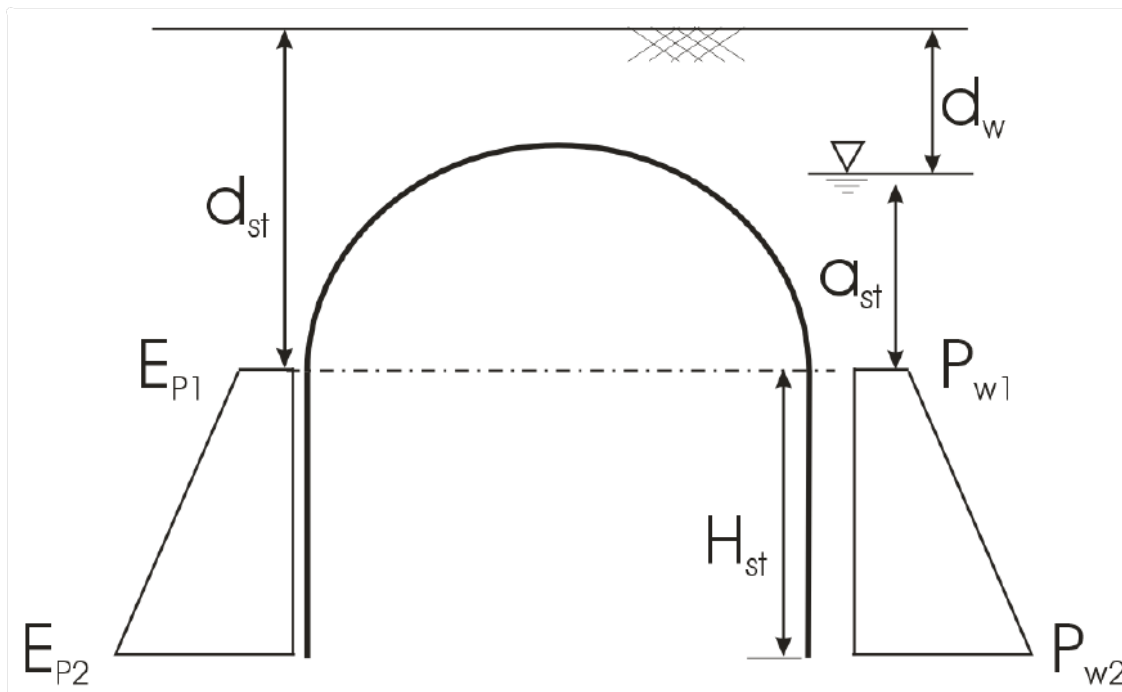
GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interaction

Calcs By : MG
Chk By : MG

Stresses on Vertical Wall

The schematic below shows the water pressure (on right) and the earth Pressure (on left)

Let: $H_{st} := B_{inv}$ $H_{st} = 19.5 \cdot \text{in}$ $d_{st} := H_m$ $d_{st} = 16.708 \text{ ft}$ $d_w = 16.75 \text{ ft}$


Pore water pressure distribution

Distance to the top of the pore water pressure diagram measured from springline=

$$a_{st} := d_{st} - d_w = -0.042 \text{ ft} \text{ (Negative value indicates that "a" shown in the drawing above is below springline)}$$

$$\text{Pore water pressure at top of wall} = P_{w1} := a_{st} \cdot \gamma_w \text{ (if negative value reset the value to 0.0)}$$

$$\text{Pore water pressure at bottom of wall} = P_{w2} := (a_{st} + H_{st}) \cdot \gamma_w$$



$$(P_{w1}) = 0 \cdot \text{psf}$$

$$(P_{w1}) = 0 \cdot \frac{\text{kN}}{\text{m}^2}$$

$$P_{w2} = 98.8 \cdot \text{psf}$$

$$P_{w2} = 4.731 \cdot \frac{\text{kN}}{\text{m}^2}$$



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interaction

Calcs By : MG
Chk By : MG

Horizontal Soil Pressure Distribution acting on Vertical Walls

Earth Pressure Ordinate at top of wall = $E_{p1} := (\gamma_m \cdot d_{st} - P_{w1}) \cdot K_o = 1433.6 \cdot \text{psf}$

$$E_{p1} = 68.64 \cdot \frac{\text{kN}}{\text{m}^2}$$

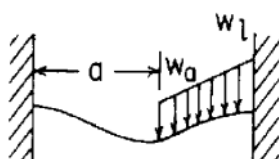
Earth Pressure Ordinate at bottom of wall $E_{p2} := [\gamma_m \cdot (d_{st} + H_{st}) - P_{w2}] \cdot K_o = 1507.8 \cdot \text{psf}$

$$E_{p2} = 72.193 \cdot \frac{\text{kN}}{\text{m}^2}$$

Moment due to nonuniform water pressure distribution on vertical walls

Using Roark's equations

2d. Left end fixed, right end fixed



$$R_A = \frac{w_a}{2l^3} (l - a)^3 (l + a) + \frac{w_l - w_a}{20l^3} (l - a)^3 (3l + 2a)$$

$$M_A = \frac{-w_a}{12l^2} (l - a)^3 (l + 3a) - \frac{w_l - w_a}{60l^2} (l - a)^3 (2l + 3a)$$

$$\theta_A = 0 \quad y_A = 0$$

$$R_B = \frac{w_a + w_l}{2} (l - a) - R_A$$

$$M_B = R_A l + M_A - \frac{w_a}{2} (l - a)^2 - \frac{w_l - w_a}{6} (l - a)^2$$

$$\theta_B = 0 \quad y_B = 0$$

In the drawing above we have:

$$W_a := P_{w1} \cdot 1\text{ft} = 0 \cdot \frac{1}{\text{ft}} \cdot \text{lbf}$$

$$W_l := P_{w2} \cdot 1\text{ft} = 98.8 \cdot \frac{1}{\text{ft}} \cdot \text{lbf}$$

Vertical wall span=

$$L := H_{st}$$

$$L = 1.625 \text{ ft}$$

$$L = 495.3 \cdot \text{mm}$$



a = Distance to first pressure ordinate below springline=

$$a = 0.042 \text{ ft}$$

Horizontal reaction due to water pressure load at top of vertical wall

$$(R_{Aw})$$

$$R_{Aw} := \frac{W_a}{2 \cdot L^3} (L - a)^3 (L + a) + \frac{W_l - W_a}{20 \cdot L^3} (L - a)^3 (3L + 2a) = 0.023 \cdot \text{kip}$$

$$R_{Aw} = 0.101 \cdot \text{kN}$$



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG

Horizontal reaction due to water pressure load at bottom of vertical wall

 (R_{BW})

$$R_{BW} := \frac{(W_a + W_l)}{2} \cdot (H_{st} - a) - R_{AW} = 0.056 \cdot \text{kip}$$

$$R_{BW} = 0.247 \cdot \text{kN}$$

Moment due to water pressure distribution on vertical Walls

Moment at top of vertical wall =

 (M_{AW})

$$M_{AW} := \left[\frac{-W_a}{12 \cdot L^2} (L - a)^3 (L + 3a) - \frac{W_l - W_a}{60 \cdot L^2} (L - a)^3 (2L + 3a) \right] = -0.008 \text{ ft} \cdot \text{kip}$$

$$M_{AW} = -0.011 \cdot \text{kN} \cdot \text{m}$$

Moment at bottom of wall =

 (M_{BW})

$$M_{BW} := R_{AW} \cdot L + M_{AW} - 0.5W_a \cdot (L - a)^2 - \left(\frac{W_l - W_a}{6} \right) (L - a)^2 = -0.013 \text{ ft} \cdot \text{kip}$$

$$M_{BW} = -0.017 \cdot \text{kN} \cdot \text{m}$$

Maximum moment causing tension on inner face of the wall (most critical)

$$M_{w_innFac} := 0.0215 \cdot W_l \cdot L^2 = 0.006 \cdot \text{kip} \cdot \text{ft}$$

$$M_{w_innFac} = 0.008 \cdot \text{kN} \cdot \text{m}$$

Moment due to nonuniform earth pressure on vertical walls

$$W_{as} := E_{p1} \cdot 1\text{ft} = 1433.575 \frac{1}{\text{ft}} \cdot \text{lbf}$$

$$W_{ls} := E_{p2} \cdot 1\text{ft} = 1507.792 \frac{1}{\text{ft}} \cdot \text{lbf}$$

Horizontal reaction due to soil pressure load at top of vertical wall

 (R_{As})

$$R_{As} := \frac{W_{as}}{2 \cdot L^3} (L - a)^3 (L + a) + \frac{W_{ls} - W_{as}}{20 \cdot L^3} (L - a)^3 (3L + 2a) = 1.122 \cdot \text{kip}$$

$$R_{As} = 4.991 \cdot \text{kN}$$

Horizontal reaction due to soil pressure load at bottom of vertical wall

 (R_{Bs})

$$R_{Bs} := \frac{(W_{as} + W_{ls})}{2} \cdot (H_{st} - a) - R_{As} = 1.206 \cdot \text{kip}$$

$$R_{Bs} = 5.367 \cdot \text{kN}$$

Moment at top of vertical wall due to soil loading

$$M_{As} := \left[\frac{-W_{as}}{12 \cdot L^2} (L - a)^3 (L + 3a) - \frac{W_{ls} - W_{as}}{60 \cdot L^2} (L - a)^3 (2L + 3a) \right] = -0.321 \text{ ft} \cdot \text{kip}$$

$$M_{As} = -0.435 \cdot \text{kN} \cdot \text{m}$$



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG**Moment at bottom of wall due to soil loading**

$$M_{Bs} := R_{As} \cdot L + M_{As} - 0.5W_{as} \cdot (L - a)^2 - \left(\frac{W_{Is} - W_{as}}{6} \right) (L - a)^2 = -0.624 \text{ ft} \cdot \text{kip}$$

$$M_{Bs} = -0.846 \text{ kN} \cdot \text{m}$$

Maximum moment causing tension on inner face of the wall (most critical)

$$M_{s_innFac} := 0.0215 \cdot W_{Is} \cdot L^2 = 0.086 \text{ kip} \cdot \text{ft}$$

total Moment action on inner face of vertical wall =

$$M_{vw_total} := M_{s_innFac} + M_{w_innFac} = 0.091 \text{ kip} \cdot \text{ft}$$

Axial Force acting on vertical wall =

$$T_{total} = 14.891 \text{ kip}$$

Total moment at top of wall =

$$M_{vwTop} := M_{As} + M_{Aw} = -0.329 \text{ kip} \cdot \text{ft}$$

Total moment at bottom of wall =

$$M_{vwBtm} := M_{Bs} + M_{Bw} = -0.637 \text{ kip} \cdot \text{ft}$$

Maximum moment =

$$M_{vw_max} := \max(|M_{vwTop}|, |M_{vwBtm}|) = 0.637 \text{ kip} \cdot \text{ft}$$

Second Moment of inertia

$$I_{sec_vw} := \frac{12 \text{ in} \cdot t_{vw}^3}{12} = 15.625 \text{ in}^4$$

Cross Section Area of vertical wall =

$$A_{sec_vw} := 12 \text{ in} \cdot t_{vw} = 30 \text{ in}^2$$

Maximum flexural Stress =

$$\sigma_{max.vw} := - \left| \frac{T_{total}}{A_{sec_vw}} \right| + \left| \frac{M_{vw_max} \cdot 0.5 \cdot t_{vw}}{I_{sec_vw}} \right| = 115.2 \text{ psi}$$

$$\sigma_{max.vw} = 0.794 \text{ MPa}$$

(Positive indicates tension)

Minimum flexural Stress =

$$\sigma_{min.vw} := - \left| \frac{T_{total}}{A_{sec_vw}} \right| - \left| \frac{M_{vw_max} \cdot 0.5 \cdot t_{vw}}{1 \cdot I_{sec_vw}} \right| = -1107.9 \text{ psi}$$

$$\sigma_{min.vw} = -7.639 \text{ MPa}$$

Allowable tensile flexural stress =

$$f_{allowable} := f_{flexure} \div F_s = 400 \text{ psi}$$



The calculated maximum tensile flexural stress is less than allowable flexural strength - OK

The calculated minimum stress is less than 0.65*0.6*f_c - OK

GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interaction

Calcs By : MG
Chk By : MG

For ultimate forces we have:

Ultimate moment on vertical wall =

$$M_{u,vw} := Ld_{factor} \cdot M_{vw_max} = 0.892 \cdot \text{kip} \cdot \text{ft}$$

Maximum flexural Stress =

$$\sigma_{max_u_vw} := - \frac{T_u}{A_{sec_vw}} + \frac{M_{u,vw} \cdot 0.5 \cdot t_{vw}}{1 \cdot I_{sec_vw}} = 161.3 \text{ psi}$$

(Positive indicates tension)

Minimum flexural Stress =

$$\sigma_{min_u_vw} := - \frac{T_u}{A_{sec_vw}} - \frac{M_{u,vw} \cdot 0.5 \cdot t_{vw}}{1 \cdot I_{sec_vw}} = -1551.1 \text{ psi}$$

Ultimate tensile flexural stress =

$$(f_{ult} := 0.9 \cdot f_{flexure} = 720 \text{ psi})$$



The calculated ultimate maximum tensile flexural stress is less than ultimate strength - OK



The calculated ultimate maximum stress is larger than allowable flexural stress - NG - revise



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG**Check Stresses at Invert****Solution assuming invert slab as fixed beam**

Axial Force Acting on the Invert Slab = $R_{inv} := R_{BW} + R_{Bs} = 1.262 \cdot \text{kip}$

Induced pressure in the invert = $P_{ind_inv} := P_{W2} = 0.686 \text{ psi}$

Maximum moment = $M_{inv_max} := \frac{12 \text{ in } P_{ind_inv} \cdot (2 \cdot R_t)^2}{12} = 1.482 \cdot \text{kip} \cdot \text{ft}$

Second Moment of inertia = $I_{sec_inv} := \frac{12 \text{ in} \cdot t_{inv}^3}{12} = 125 \cdot \text{in}^4$

Cross Section Area of Invert slab = $A_{sec_inv} := 12 \text{ in} \cdot t_{inv} = 60 \cdot \text{in}^2$

Maximum flexural Stress = $\sigma_{max_inv} := -\frac{R_{inv}}{A_{sec_inv}} + \frac{M_{inv_max} \cdot 0.5 \cdot t_{inv}}{I_{sec_inv}} = 334.7 \text{ psi}$
(Positive indicates tension)

Minimum flexural Stress = $\sigma_{min_inv} := -\frac{R_{inv}}{A_{sec_inv}} - \frac{M_{inv_max} \cdot 0.5 \cdot t_{inv}}{1 \cdot I_{sec_inv}} = -376.7 \text{ psi}$

Allowable tensile flexural stress = $f_{allowable} := f_{flexure} \div F_s = 400 \text{ psi}$



The calculated maximum tensile flexural stress is less than allowable flexural strength - OK



The calculated minimum stress is less than $0.65 \cdot 0.6 \cdot f_c$ - OK

For ultimate forces we have:

Ultimate invert axial force = $R_{inv_u} := L_d \text{ factor} \cdot R_{inv} = 1.767 \cdot \text{kip}$

Ultimate invert flexural force = $M_{inv_u} := L_d \text{ factor} \cdot M_{inv_max} = 2.075 \text{ ft} \cdot \text{kip}$

Maximum flexural Stress = $\sigma_{max_u_inv} := -\frac{R_{inv_u}}{A_{sec_inv}} + \frac{M_{inv_u} \cdot 0.5 \cdot t_{inv}}{1 \cdot I_{sec_inv}} = 468.5 \text{ psi}$ $\sigma_{max_u_inv} = 3.23 \cdot \text{MPa}$



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interaction

Calcs By : MG
Chk By : MG

Minimum flexural Stress =

$$\sigma_{\min_u_inv} := - \frac{R_{inv_u}}{A_{sec_inv}} - \frac{M_{inv_u} \cdot t_{inv}}{1 \cdot I_{sec_inv}} = -1025.4 \text{ psi}$$

$$\sigma_{\min_u_inv} = -7.07 \cdot \text{MPa}$$

(Positive indicates tension)

Ultimate tensile flexural stress =

$$(f_{ult} := 0.9 \cdot f_{flexure} = 720 \text{ psi})$$



The calculated ultimate maximum tensile flexural stress is less than ultimate strength - OK



The calculated ultimate minimum stress is less than 0.65*0.6*f_c - OK



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG**Analysis Summary****Crown Response**Crown Liner Thickness = $t = 2 \text{ in}$ Thickness for Invert = $t_{\text{inv}} = 5 \text{ in}$ Thickness for vertical wall = $t_{\text{vw}} = 2.5 \text{ in}$ Diametric Strain % = $D_{\text{strain}} = -0.127 \cdot \%$ allowable Strain % = $\epsilon_{\text{diametric}} = 1 \cdot \%$ 

The calculated diametric strain is less than allowable diametric strain - OK

Total induced thrust (Nominal) = $T_{\text{total}} = 14.891 \cdot \text{kip}$ Total induced thrust (Ultimate) = $T_{\text{u}} = 20.847 \cdot \text{kip}$ Total Induced Moment (Nominal) = $M_{\text{total}} = -0.059 \cdot \text{kip} \cdot \text{ft}$ Total Induced Moment (Ultimate) = $M_{\text{u}} = -0.083 \cdot \text{kip} \cdot \text{ft}$ **Check Stresses at Crown**Maximum flexural Stress = $\sigma_{\text{max}} = -531.806 \text{ psi}$ (Positive indicates tension)Minimum flexural Stress = $\sigma_{\text{min}} = -709.097 \text{ psi}$ allowable tensile flexural stress = $f_{\text{allowable}} := f_{\text{flexure}} \div F_s = 400 \text{ psi}$ 

The calculated maximum tensile flexural stress is less than allowable flexural strength - OK

The calculated minimum stress is less than $0.65 \cdot 0.6 \cdot f_c$ - OK**For ultimate forces we have:**Maximum flexural Stress = $\sigma_{\text{max}_u} = -744.528 \text{ psi}$ (Positive indicates tension)Minimum flexural Stress = $\sigma_{\text{min}_u} = -992.736 \text{ psi}$ Ultimate tensile flexural stress = $(f_{\text{ult}} := 0.9 \cdot f_{\text{flexure}} = 720 \text{ psi})$ 

GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interactionCalcs By : MG
Chk By : MG

The calculated ultimate maximum tensile flexural stress is less than ultimate strength - OK

Vertical Wall Response

Maximum moment = $M_{vw_max} = 0.637 \cdot \text{kip} \cdot \text{ft}$

Maximum flexural Stress = $\sigma_{max.vw} = 115.227 \text{ psi}$ (Positive indicates tension)

Minimum flexural Stress = $\sigma_{min.vw} = -1107.949 \text{ psi}$



The calculated maximum tensile flexural stress is less than allowable flexural strength - OK



The calculated minimum stress is less than $0.65 \cdot 0.6 \cdot f_c$ - OK

For ultimate forces we have:

Ultimate moment on vertical wall = $M_{u.vw} = 0.892 \cdot \text{kip} \cdot \text{ft}$

Ultimate axial on vertical wall = $T_u = 20.847 \cdot \text{kip}$

Maximum flexural Stress = $\sigma_{max_u_vw} = 161.317 \text{ psi}$

Minimum flexural Stress = $\sigma_{min_u_vw} = -1551.128 \text{ psi}$



The calculated ultimate maximum tensile flexural stress is less than ultimate strength - OK



The calculated ultimate maximum stress is larger than allowable flexural stress - NG - revise

Invert Response

Axial Force Acting on the Invert Slab = $R_{inv} = 1.262 \cdot \text{kip}$

Maximum moment = $M_{inv_max} = 1.482 \cdot \text{kip} \cdot \text{ft}$

Maximum flexural Stress = $\sigma_{max_inv} = 334.66 \text{ psi}$ (Positive indicates tension)

Minimum flexural Stress = $\sigma_{min_inv} = -376.728 \text{ psi}$



GeoKrete Thickness Design

Closed Form Elastic Solution
Considering Soil Structure interaction

Calcs By : MG
Chk By : MG



The calculated maximum tensile flexural stress is less than allowable flexural strength - OK



The calculated minimum stress is less than $0.65 \cdot 0.6 \cdot f_c$ - OK

For ultimate forces we have:

Ultimate invert axial force = $R_{inv_u} = 1.767 \cdot \text{kip}$

Ultimate invert flexural force = $M_{inv_u} = 2.075 \cdot \text{kip} \cdot \text{ft}$

Maximum flexural Stress = $\sigma_{max_u_inv} = 468.524 \text{ psi}$

Minimum flexural Stress = $\sigma_{min_u_inv} = -1025.39 \text{ psi}$



The calculated ultimate maximum tensile flexural stress is less than ultimate strength - OK



The calculated ultimate minimum stress is less than $0.65 \cdot 0.6 \cdot f_c$ - OK





| Proposed Alternative | Design of Improvements



Proposed Additive Alternative Design of Improvements



As we have proposed what we feel represents the most proactive, economical, cost-effective design solution as our base bid, we do not feel it warranted to present a completely separate alternative design approach. We do however see potential improvements that we felt should be offered as additive alternatives in the case that the Village would be interested in further improving the project beyond the headwall rebuild mentioned for consideration in the RFP. These additional services include the following:

GPR INVESTIGATION AND TARGETED CURTAIN GROUTING

One important aspect that was not covered in the available data is assessing the potential of voids existence behind the existing culvert, especially considering the culvert continuously conveys flow from an active creek. Such an investigation would be conducted with Ground Penetrating Radar (GPR) focused on the surrounding soils. The resulting data would then be used to determine the extent of any potentially necessary targeted curtain grouting to address areas of concern.

A key aspect of conduit rehabilitation involves stabilization of weakened or compromised soil and filling potential voids surrounding the culvert using chemical grout. Erosion voids may develop around buried infrastructure for various reasons including water infiltration through leaking joints and defects, carrying small amounts of soil into the culvert and overtime resulting in washouts, dissolution of Karst limestone, and dynamic loading caused by construction related activities. Not addressing such voids can result in a continuous redistribution of loading and affect the degree of confinement of the soils surrounding the conduit leading to stress reversal and concentration at certain locations along the perimeter. For example, a void under the invert leads to decrease in the lateral confinement and the moments can reverse their sign and instead of having the inner side of the liner under tension, the outer side becomes under tension resulting in premature failure. Soil stabilization through grouting seeks to shore up these weak spots returning the surrounding soils to equilibrium prior to further failure.

INSTALLATION OF NEW HEADWALL WITH STEPS

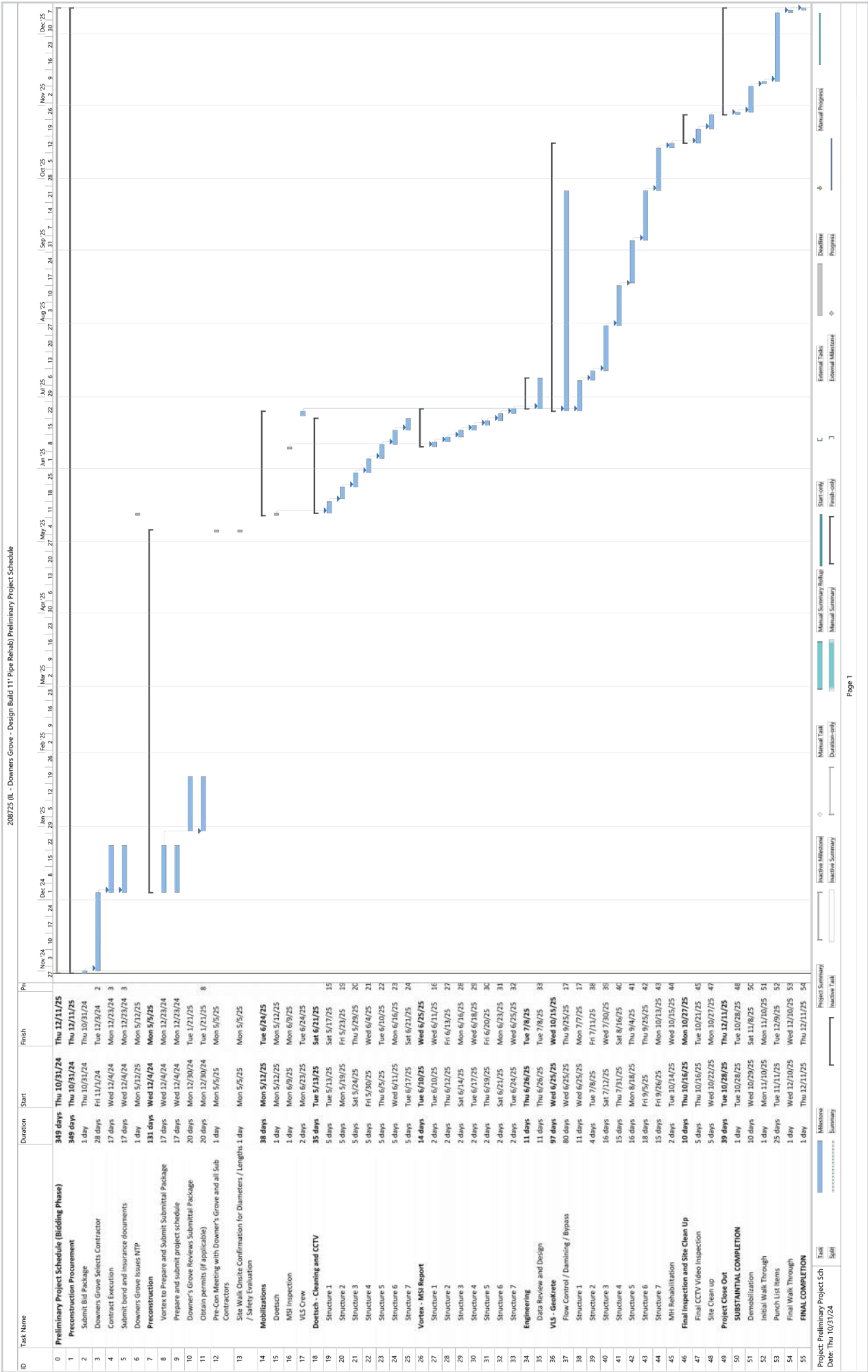
The Village of Downers Grove has discussed interest in reconfiguring or reconstructing the upstream headwall to incorporate stairs to make access easier. The design team will support this effort if the Village decides to move forward by first completing survey of the surrounding area to tie into existing topography. The team will then either design the complete reconstruction of the headwall or modification to the existing headwall to incorporate stairs if possible.



| Proposed Project Schedule



Proposed Project Schedule





Letter of Capability of Acquiring Performance Bond



Aaron P. Clark
Telephone No.: 713-458-5407
Fax No.: 713-430-5407
E-Mail: aclark@lockton.com

November 30, 2021

RE: Vortex Lining Systems, LLC
Statement Affirming Bonding Capability

Att: Village of Downers Grove
5101 Walnut Ave.
Downers Grove, IL 60515
Repair of the 11' Diameter Pipe through the DBD (SW-090-021)

To Whom It May Concern:

Since 2016, Vortex Lining Systems, LLC has been bonded with multiple surety partners maintaining an A.M. Best Rating of "A" with a financial rating of A (Excellent). The sureties who support Vortex Lining Systems, LLC provide in excess of \$110 million in aggregate bonding capacity with single job support in excess of \$10 million. We understand this project to be in the range of \$8.5 million. Current available aggregate capacity is in excess of \$40,000,000. At the request of Vortex Lining Systems, LLC, we would provide performance and payment bonds, subject to review and acceptance of the contract term, bond forms, evidence of adequate financing (if so deemed necessary) and all other usual and customary underwriting criteria employed by any surety.

You understand, of course, that any arrangement for final bonds is a matter between our surety partners and Vortex Lining Systems, LLC, and that our surety partners assume no liability to you or to third parties, if, for any reason, we do not execute a final bond or bonds on this project. Our experience with Vortex Lining Systems, LLC and their management team has been nothing but excellent and we highly recommend them for consideration on the referenced project.

Should you require further information regarding this company, please feel free to contact me at (713) 458-5407.

Sincerely,

A handwritten signature in blue ink, appearing to read "A. Clark", written over a horizontal line.

Aaron P. Clark
Assistant Vice President, Lockton Companies
Attorney-In-Fact, Harco National Insurance Company
Attorney-In-Fact, United States Fire Insurance Company
Attorney-In-Fact, Atlantic Specialty Insurance Company

Lockton Companies
3657 Briarpark Dr., Suite 700 / Houston, TX 77042
713-458-5200
www.lockton.com

POWER OF ATTORNEY
HARCO NATIONAL INSURANCE COMPANY
INTERNATIONAL FIDELITY INSURANCE COMPANY

Bond # N/A

Member companies of IAT Insurance Group, Headquartered: 702 Oberlin Road, Raleigh, North Carolina 27605

KNOW ALL MEN BY THESE PRESENTS: That HARCO NATIONAL INSURANCE COMPANY, a corporation organized and existing under the laws of the State of Illinois, and INTERNATIONAL FIDELITY INSURANCE COMPANY, a corporation organized and existing under the laws of the State of New Jersey, and having their principal offices located respectively in the cities of Rolling Meadows, Illinois and Newark, New Jersey, do hereby constitute and appoint

TIMOTHY F. KELLY, AARON P. CLARK, FLORENCE MCCLELLAN, KRISTIN DARLING, R.F. BOBO

Houston, TX

their true and lawful attorney(s)-in-fact to execute, seal and deliver for and on its behalf as surety, any and all bonds and undertakings, contracts of indemnity and other writings obligatory in the nature thereof, which are or may be allowed, required or permitted by law, statute, rule, regulation, contract or otherwise, and the execution of such instrument(s) in pursuance of these presents, shall be as binding upon the said HARCO NATIONAL INSURANCE COMPANY and INTERNATIONAL FIDELITY INSURANCE COMPANY, as fully and amply, to all intents and purposes, as if the same had been duly executed and acknowledged by their regularly elected officers at their principal offices.

This Power of Attorney is executed, and may be revoked, pursuant to and by authority of the By-Laws of HARCO NATIONAL INSURANCE COMPANY and INTERNATIONAL FIDELITY INSURANCE COMPANY and is granted under and by authority of the following resolution adopted by the Board of Directors of INTERNATIONAL FIDELITY INSURANCE COMPANY at a meeting duly held on the 13th day of December, 2018 and by the Board of Directors of HARCO NATIONAL INSURANCE COMPANY at a meeting held on the 13th day of December, 2018.

"RESOLVED, that (1) the Chief Executive Officer, President, Executive Vice President, Senior Vice President, Vice President, or Secretary of the Corporation shall have the power to appoint, and to revoke the appointments of, Attorneys-in-Fact or agents with power and authority as defined or limited in their respective powers of attorney, and to execute on behalf of the Corporation and affix the Corporation's seal thereto, bonds, undertakings, recognizances, contracts of indemnity and other written obligations in the nature thereof or related thereto; and (2) any such Officers of the Corporation may appoint and revoke the appointments of joint-control custodians, agents for acceptance of process, and Attorneys-in-fact with authority to execute waivers and consents on behalf of the Corporation; and (3) the signature of any such Officer of the Corporation and the Corporation's seal may be affixed by facsimile to any power of attorney or certification given for the execution of any bond, undertaking, recognizance, contract of indemnity or other written obligation in the nature thereof or related thereto, such signature and seals when so used whether heretofore or hereafter, being hereby adopted by the Corporation as the original signature of such officer and the original seal of the Corporation, to be valid and binding upon the Corporation with the same force and effect as though manually affixed."

IN WITNESS WHEREOF, HARCO NATIONAL INSURANCE COMPANY and INTERNATIONAL FIDELITY INSURANCE COMPANY have each executed and attested these presents on this 31st day of December, 2018



STATE OF NEW JERSEY
County of Essex



Executive Vice President, Harco National Insurance Company
and International Fidelity Insurance Company

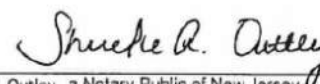
STATE OF ILLINOIS
County of Cook



On this 31st day of December, 2018, before me came the individual who executed the preceding instrument, to me personally known, and, being by me duly sworn, said he is the therein described and authorized officer of HARCO NATIONAL INSURANCE COMPANY and INTERNATIONAL FIDELITY INSURANCE COMPANY; that the seals affixed to said instrument are the Corporate Seals of said Companies; that the said Corporate Seals and his signature were duly affixed by order of the Boards of Directors of said Companies.



IN TESTIMONY WHEREOF, I have hereunto set my hand affixed my Official Seal, at the City of Newark, New Jersey the day and year first above written.



Shirelle A. Outley a Notary Public of New Jersey
My Commission Expires April 4, 2023

CERTIFICATION

I, the undersigned officer of HARCO NATIONAL INSURANCE COMPANY and INTERNATIONAL FIDELITY INSURANCE COMPANY do hereby certify that I have compared the foregoing copy of the Power of Attorney and affidavit, and the copy of the Sections of the By-Laws of said Companies as set forth in said Power of Attorney, with the originals on file in the home office of said companies, and that the same are correct transcripts thereof, and of the whole of the said originals, and that the said Power of Attorney has not been revoked and is now in full force and effect.

IN TESTIMONY WHEREOF, I have hereunto set my hand on this day, November 30, 2021

A00717



Irene Martins, Assistant Secretary

**POWER OF ATTORNEY
UNITED STATES FIRE INSURANCE COMPANY
PRINCIPAL OFFICE - MORRISTOWN, NEW JERSEY**

KNOW ALL MEN BY THESE PRESENTS: That United States Fire Insurance Company, a corporation duly organized and existing under the laws of the state of Delaware, has made, constituted and appointed, and does hereby make, constitute and appoint: **Tim Kelly; Robert Bobo; Florence McClellan; Aaron P. Clark; Autumn Stockton; and Kristin Darling** each, its true and lawful Attorney(s)-In-Fact, with full power and authority hereby conferred in its name, place and stead, to execute, acknowledge and deliver: Any and all bonds and undertakings of surety and other documents that the ordinary course of surety business may require, and to bind United States Fire Insurance Company thereby as fully and to the same extent as if such bonds or undertakings had been duly executed and acknowledged by the regularly elected officers of United States Fire Insurance Company at its principal office, in amounts or penalties not exceeding: **One Hundred Twenty Five Million Eight Hundred Thousand Dollars (\$125,800,000)**

This Power of Attorney limits the act of those named therein to the bonds and undertakings specifically named therein, and they have no authority to bind United States Fire Insurance Company except in the manner and to the extent therein stated.

This Power of Attorney revokes all previous Powers of Attorney issued on behalf of the Attorneys-In-Fact named above and expires on January 1, 2023.

This Power of Attorney is granted pursuant to Article IV of the By-Laws of United States Fire Insurance Company as now in full force and effect, and consistent with Article III thereof, which Articles provide, in pertinent part:

Article IV, Execution of Instruments - Except as the Board of Directors may authorize by resolution, the Chairman of the Board, President, any Vice-President, any Assistant Vice President, the Secretary, or any Assistant Secretary shall have power on behalf of the Corporation:

- (a) to execute, affix the corporate seal manually or by facsimile to, acknowledge, verify and deliver any contracts, obligations, instruments and documents whatsoever in connection with its business including, without limiting the foregoing, any bonds, guarantees, undertakings, recognizances, powers of attorney or revocations of any powers of attorney, stipulations, policies of insurance, deeds, leases, mortgages, releases, satisfactions and agency agreements;
- (b) to appoint, in writing, one or more persons for any or all of the purposes mentioned in the preceding paragraph (a), including affixing the seal of the Corporation.

Article III, Officers, Section 3.11, Facsimile Signatures. The signature of any officer authorized by the Corporation to sign any bonds, guarantees, undertakings, recognizances, stipulations, powers of attorney or revocations of any powers of attorney and policies of insurance issued by the Corporation may be printed, facsimile, lithographed or otherwise produced. In addition, if and as authorized by the Board of Directors, dividend warrants or checks, or other numerous instruments similar to one another in form, may be signed by the facsimile signature or signatures, lithographed or otherwise produced, of such officer or officers of the Corporation as from time to time may be authorized to sign such instruments on behalf of the Corporation. The Corporation may continue to use for the purposes herein stated the facsimile signature of any person or persons who shall have been such officer or officers of the Corporation, notwithstanding the fact that he may have ceased to be such at the time when such instruments shall be issued.

IN WITNESS WHEREOF, United States Fire Insurance Company has caused these presents to be signed and attested by its appropriate officer and its corporate seal hereunto affixed this 11th day of March, 2021.



UNITED STATES FIRE INSURANCE COMPANY

Anthony R. Slimowicz

Anthony R. Slimowicz, Executive Vice President

State of New Jersey }
County of Morris }

On this 11th day of March 2021, before me, a Notary public of the State of New Jersey, came the above named officer of United States Fire Insurance Company, to me personally known to be the individual and officer described herein, and acknowledged that he executed the foregoing instrument and affixed the seal of United States Fire Insurance Company thereto by the authority of his office.

SONIA SCALA
NOTARY PUBLIC OF NEW JERSEY
MY COMMISSION EXPIRES 3/25/2024
No. 2163686

Sonia Scala
Sonia Scala, (Notary Public)

I, the undersigned officer of United States Fire Insurance Company, a Delaware corporation, do hereby certify that the original Power of Attorney of which the foregoing is a full, true and correct copy is still in force and effect and has not been revoked.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the corporate seal of United States Fire Insurance Company on the 30th day of November 20 21



UNITED STATES FIRE INSURANCE COMPANY

Daniel Sussman

Daniel Sussman, Senior Vice President

*For verification of the authenticity of the Power of Attorney, please contact Pat Taber at 860-956-3424 or email: SuretyInquiries@amynntagroup.com



Power of Attorney

KNOW ALL MEN BY THESE PRESENTS, that ATLANTIC SPECIALTY INSURANCE COMPANY, a New York corporation with its principal office in Plymouth, Minnesota, does hereby constitute and appoint: **Robert F. Bobo, Florence McClellan, Kristin Darling, Autumn Stockton, Aaron P. Clark, Rachel Richardson, Nick Patetta**, each individually if there be more than one named, its true and lawful Attorney-in-Fact, to make, execute, seal and deliver, for and on its behalf as surety, any and all bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof; provided that no bond or undertaking executed under this authority shall exceed in amount the sum of: **unlimited** and the execution of such bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof in pursuance of these presents, shall be as binding upon said Company as if they had been fully signed by an authorized officer of the Company and sealed with the Company seal. This Power of Attorney is made and executed by authority of the following resolutions adopted by the Board of Directors of ATLANTIC SPECIALTY INSURANCE COMPANY on the twenty-fifth day of September, 2012:

Resolved: That the President, any Senior Vice President or Vice-President (each an "Authorized Officer") may execute for and in behalf of the Company any and all bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof, and affix the seal of the Company thereto; and that the Authorized Officer may appoint and authorize an Attorney-in-Fact to execute on behalf of the Company any and all such instruments and to affix the Company seal thereto; and that the Authorized Officer may at any time remove any such Attorney-in-Fact and revoke all power and authority given to any such Attorney-in-Fact.

Resolved: That the Attorney-in-Fact may be given full power and authority to execute for and in the name and on behalf of the Company any and all bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof, and any such instrument executed by any such Attorney-in-Fact shall be as binding upon the Company as if signed and sealed by an Authorized Officer and, further, the Attorney-in-Fact is hereby authorized to verify any affidavit required to be attached to bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof.

This power of attorney is signed and sealed by facsimile under the authority of the following Resolution adopted by the Board of Directors of ATLANTIC SPECIALTY INSURANCE COMPANY on the twenty-fifth day of September, 2012:

Resolved: That the signature of an Authorized Officer, the signature of the Secretary or the Assistant Secretary, and the Company seal may be affixed by facsimile to any power of attorney or to any certificate relating thereto appointing an Attorney-in-Fact for purposes only of executing and sealing any bond, undertaking, recognizance or other written obligation in the nature thereof, and any such signature and seal where so used, being hereby adopted by the Company as the original signature of such officer and the original seal of the Company, to be valid and binding upon the Company with the same force and effect as though manually affixed.

IN WITNESS WHEREOF, ATLANTIC SPECIALTY INSURANCE COMPANY has caused these presents to be signed by an Authorized Officer and the seal of the Company to be affixed this twenty-seventh day of April, 2020.

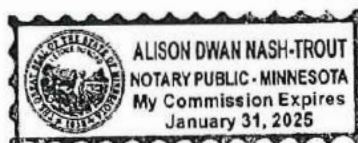
STATE OF MINNESOTA
HENNEPIN COUNTY



By


Paul J. Brehm, Senior Vice President

On this twenty-seventh day of April, 2020, before me personally came Paul J. Brehm, Senior Vice President of ATLANTIC SPECIALTY INSURANCE COMPANY, to me personally known to be the individual and officer described in and who executed the preceding instrument, and he acknowledged the execution of the same, and being by me duly sworn, that he is the said officer of the Company aforesaid, and that the seal affixed to the preceding instrument is the seal of said Company and that the said seal and the signature as such officer was duly affixed and subscribed to the said instrument by the authority and at the direction of the Company.



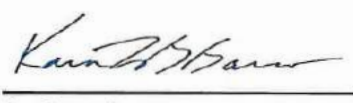

Notary Public

I, the undersigned, Secretary of ATLANTIC SPECIALTY INSURANCE COMPANY, a New York Corporation, do hereby certify that the foregoing power of attorney is in full force and has not been revoked, and the resolutions set forth above are now in force.

Signed and sealed. Dated 30 day of November, 2021.

This Power of Attorney expires
January 31, 2025




Kara Barrow, Secretary

Please direct bond verifications to surety@intactinsurance.com



WWW.VORTEXCOMPANIES.COM
SALES@VORTEXCOMPANIES.COM

1-855-WHYDIG1
 18150 IMPERIAL VALLEY DR.
 HOUSTON, TX 77060

