REQUEST FOR QUALIFICATIONS for the Merchants Bridge West Approach Replacement

St. Louis City Missouri

Project Number:	FR-HSR-0077-11-01-00
RFQ Issued:	July 28, 2014
SOQs Due:	September 4, 2014

Terminal Railroad Association of St. Louis
415 South 18th Street, Suite 200
St. Louis, Missouri 63103

FORMS

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ADDENDA ISSUED

Addendum	Issued	Comments
1		

1 INTRODUCTION AND PROJECT OVERVIEW

The Terminal Railroad Association of St. Louis (TRRA) is soliciting Statements of Qualifications (SOQ) from entities (Submitters) interested in providing design-build services for the Merchants Bridge West Approach Replacement, located in the city of St. Louis, Missouri.

1.1 Project Description

Site Conditions:

The West Approach is located adjacent to Ferry Street in north St. Louis. The original west deck truss spans were replaced with a new structure in 2005. This new structure extends from the west end of the main truss spans to Pier W6. The remaining portion of the West Approach extends from Pier W6 as a double track structure to a Y, where the structure splits into two legs. One continues to the west and currently carries a single operating track. The other leg turns to the south and carries two tracks toward downtown St. Louis. This leg crosses Ferry Street.

Google earth image of the Merchants West Approach.

Looking west along Ferry St. at south side of Merchants Bridge West Approach.

Looking east along Ferry Street at south side of West Approach toward Pier W6 and main river spans.

Soil Conditions:

The West Approach is located on the floodplain of the Mississippi River. Limestone bedrock is located at a depth of 45 to 70 feet below the existing ground surface. The top layers of soil typically consist of fill material. Alluvial deposits below the fill include a variety of soil types such as sands, silts, fat and lean clays, and mixtures of those types.

Extensive geotechnical investigations and analyses have been done as part of the design of the replacement structure. These analyses indicate that the site has some settlement potential.

Utilities and Existing Facilities:

The St. Louis Metropolitan Sewer District has a large waste-water treatment facility (Bissell Point) north of the West Approach. An access road crosses below the structure to connect Ferry St. to a gate on the south fence of the Bissell Point facility.

Ferry Street is a public street that runs south of the West Approach and approximately parallel to it. Ferry Street currently has a 60' wide right-of-way and is unpaved in the vicinity of the structure.

A number of utilities cross the West Approach area. The major utility conflicts that are in the protection/relocation process are:

- A large natural gas main (16" diameter) runs along Ferry St. south of the existing structure. It passes below the south track leg where Ferry St. goes below the structure. The line crosses to the north side of the structure several spans west of Pier W6.
- A 78" reinforced concrete sewage pipe crosses below the structure near the abutment of the westbound main (north track).
- An 8'x10' brick arch and a 102" reinforced concrete pipe runs below and adjacent to the existing structure around Pier W6 and to its west. The brick arch sewer is reportedly abandoned and filled.

ROW and Permitting:

To compensate for filling the existing Ferry Street alignment near the east end of the project, TRRA is acquiring the adjacent property to the south. Several utilities will relocate into this location and the roadway will shift to the south.

The City of St. Louis has provided preliminary approval of the conceptual design for an infill and will be permitting the final roadway design. The design build contractor will be responsible for obtaining the final permit.

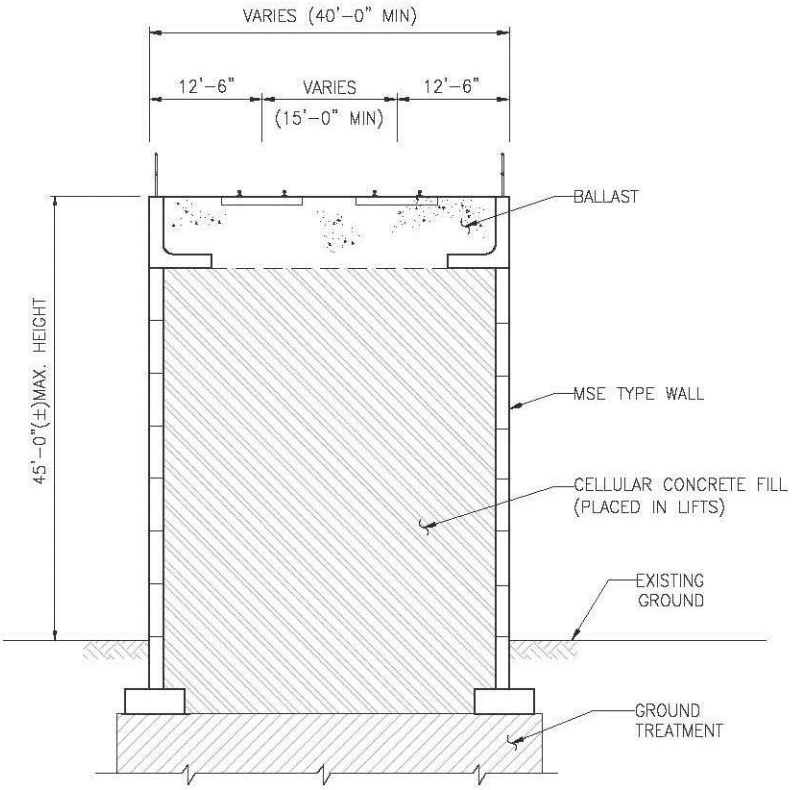
Proposed Replacement:

The proposed replacement of the West Approach consists of cellular concrete fill within MSE-type facing walls. This fill would extend from the west abutments (north and south) to existing Pier W6. It is anticipated that the cellular concrete fill will extend from the existing ground level to just below the bottom of the existing steel stringers. Ballast will be placed on top of the cellular concrete fill to support the new tracks. It is anticipated that ground treatment will be needed to reduce settlement during and after construction. The design-build contractor will be responsible for checking the final design for global stability.

The current plan is to protect the natural gas main and sewer pipes with micropile-supported concrete protective covers (utility bridges). The design of these utility

bridges is in progress and the completed designs (approved by the utilities) will be provided with the RFP. The design-build contractor will be responsible for constructing the utility bridges.

A conceptual typical section for the fill is shown below:



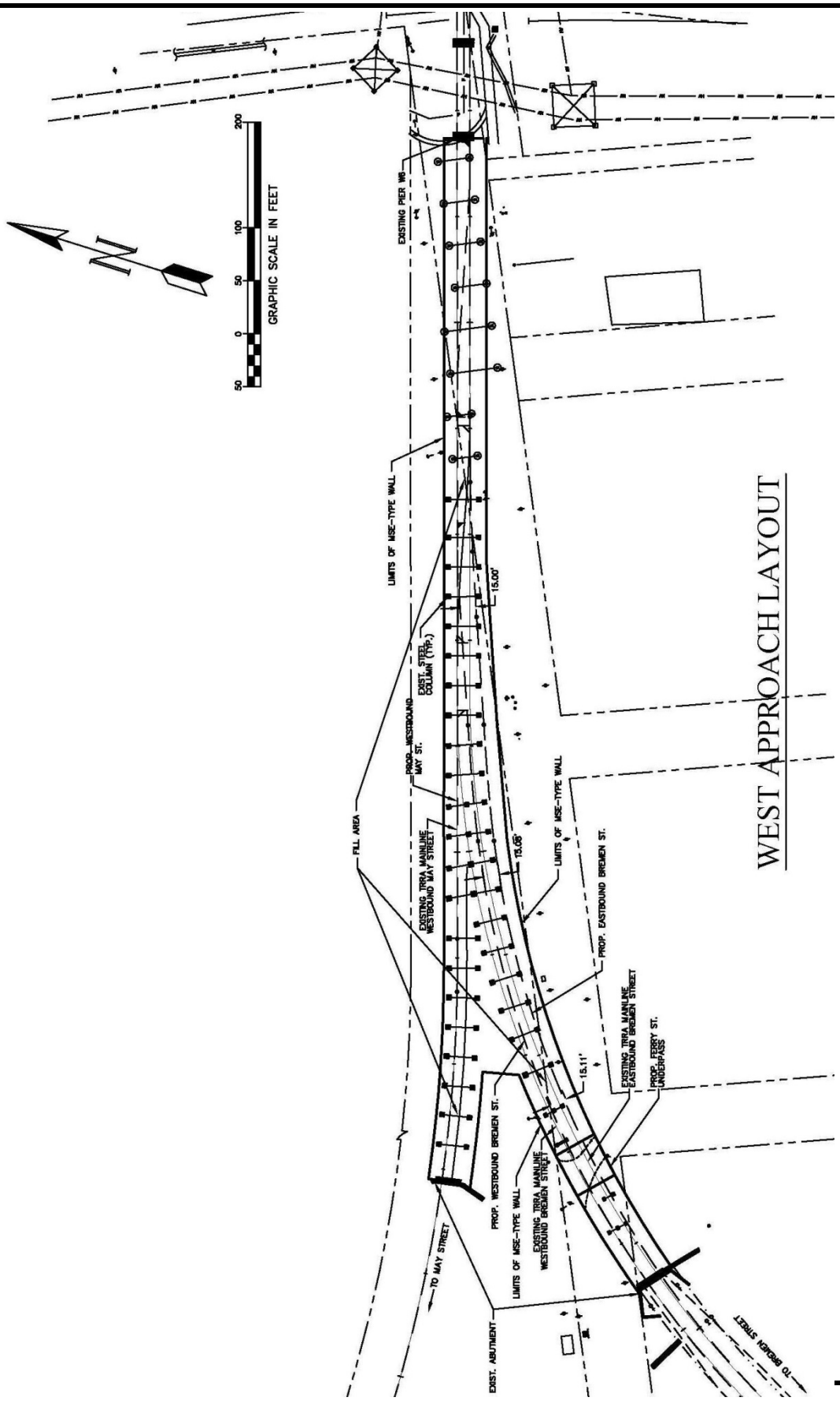
Cross-Section of Cellular Concrete Fill (note that the 15' minimum track center is to allow for future track widening)

Anticipated Construction Sequence:

The work would begin with the construction of the utility bridges, Ferry Street underpass and ground treatment (ground improvement). Following this, the concrete pads below the MSE-type wall facing would be placed.

The concrete wall panels would be set and the cellular fill material placed in lifts. The fill material can flow through the steel bridge towers and encase the existing structure. Note that the cellular concrete fill would not be placed around the existing steel superstructure girder spans as this would prevent their later removal.

Ballast would be stockpiled to the right and/or left of the existing superstructure during construction. During the change-out period, the superstructure spans would be lifted off the towers. The stockpiled fill would be pushed into the areas where the spans had set and would be compacted. Ballast and trackwork would be placed into the final position and the track returned to service.


WEST APPROACH LAYOUT
GRAPHIC SCALE IN FEET
200
100
50
0
50
N
EXISTING PIER W8
LIMITS OF MSE-TYPE WALL
15.00'
EXIST. STEEL COLUMN (TYP.)
PROP. WESTBOUND MAY ST.
FILL AREA
EXISTING TRRA MAINLINE WESTBOUND MAY STREET
15.08'
LIMITS OF MSE-TYPE WALL
PROP. EASTBOUND BREMEN ST.
EXISTING TRRA MAINLINE EASTBOUND BREMEN STREET
PROP. FERRY ST. UNDERPASS
15.11'
PROP. WESTBOUND BREMEN ST.
LIMITS OF MSE-TYPE WALL
EXISTING TRRA MAINLINE WESTBOUND BREMEN STREET
TO MAY STREET
EXIST. ABUTMENT
TO BROADWAY STREET

1.2 Project Goals

The following goals have been established for the project:

- Deliver the project within the program budget.
- Complete the project no later than June 30, 2016.
- Provide a stable and durable fill for supporting rail traffic over a 100 year life.
- Minimize the number, length, and impact of track outages during construction.
- Provide a quality product, following the American Railway Engineering and Maintenance-of-Way Association (AREMA) *Manual for Railway Engineering* and industry standards, resulting in a long-lasting transportation facility.
- Perform all work safely and in compliance with all local, state, federal and railroad requirements.

1.3 Estimated Cost and Maximum Time Allowed

The estimated design-build contract budget range is $20 to $40 million. The Project must be completed by June 30, 2016.

1.4 Procurement Process

TRRA will use a two-phase procurement process to select a design-build contractor to deliver the Merchants Bridge West Approach Replacement project. This Request for Qualifications (RFQ) is issued as part of the first phase to solicit information, in the form of SOQs, that TRRA will evaluate to determine which Submitters are the most highly qualified to successfully deliver the Project. TRRA will short list at least two (if any) but not more than four most highly qualified Submitters.

In the second phase, T R R A will issue a Request for Proposals (RFP) for the Project to the short listed Submitters. Only the short listed Submitters will be eligible to submit proposals for the Project. Each short listed Submitter that submits a proposal in response to the RFP is referred to herein as a Proposer. TRRA will award a design-build contract (if any) for the Project to the Proposer offering the best value, to be determined as described in the RFP. TRRA will provide a stipend to unsuccessful proposers at the RFP phase.

1.5 Work Provided by Owner

The following items have been performed by TRRA or its consultants and will not need to be designed/performed by the design-build team:

- Track plans for final alignment
- Utility relocation coordination and utility bridge design
- Right-of-way acquisition
- Design of signal platform additions on existing spans east of Pier W6
- Signal design, relocation, and construction

Plans showing these items, where applicable, will be provided to short-listed firms when the RFP is released.

1.6 Federal Funds

Federal funds in the amount of $13.5 million have been appropriated for this project. The remainder of the project cost will be provided by TRRA. Federal procurement requirements will apply to this project. These funds are administered by the Missouri Department of Transportation (MoDOT).

1.7 Additional Relevant Information

Exhibits A through E attached to this RFQ provide additional information on the project. These include:

Exhibit A: Existing Structure Plans
Exhibit B: Geotechnical Investigation Information
Exhibit C: TRRA Insurance Requirements
Exhibit D: TRRA Safety Instructions and Contractor Requirements
Exhibit E: TRRA Requirements for eRAILSAFE Training

It should be noted that all information provided prior to the release of the RFP is provided **FOR INFORMATION ONLY**. The requirements given in Exhibits C, D and E may be modified prior to issuance of the RFP.

2 RFQ PROCESS

2.1 Submitter Information

If an entity intends to submit a proposal as part of a team, the entire team is required to submit a single SOQ as a single Submitter. No stipends will be paid for submitting SOQs.

2.2 Communications

TRRA's Chief Engineer, Eric Fields, is TRRA's sole contact person for receiving all communication regarding the project. Each Submitter is solely responsible for providing a single contact person.

Inquiries and comments regarding the Project and the procurement must be sent to Mr. Fields as shown below. E-mail is the preferred method of communication for the Project.

Eric P. Fields, P.E.
Chief Engineer
Terminal Railroad Association of St. Louis
415 South 18th Street, Suite 200
St. Louis, Missouri 63103
efields@TerminalRailroad.com

During the Project procurement process, commencing with issuance of this RFQ and continuing until award of a contract for the Project (or cancellation of the procurement), no employee, member, or agent of any Submitter shall have ex parte communications regarding this procurement with any staff member of TRRA, their advisors, or any of their contractors or consultants involved with the procurement, except for communications expressly permitted by this RFQ (or subsequent to issuance of the RFP, except for communications expressly permitted by the RFP). Any Submitter engaging in such prohibited communications may be disqualified at the sole discretion of TRRA's Chief Engineer. However, communication is allowed with local entities and utilities.

Questions and requests for clarifications regarding this RFQ must be submitted via e-mail to TRRA's Chief Engineer by 4:00 pm, Central Time, on the date shown in Section 2.3.

2.3 Procurement Schedule

Deadlines for submitting RFQ questions and SOQs are shown below. This schedule is subject to revision by addenda to this RFQ and by the RFP.

Item	Date
Issue RFQ	July 28, 2014
Site Visit	July 31, 2014
Deadline for submitting RFQ questions	August 14, 2014
TRRA post responses to questions	August 19, 2014
Final RFQ Addendum issued	August 21, 2014
SOQs due	September 4, 2014
TRRA notifies short-listed Submitters	September 11, 2014
Issue RFP	September 16, 2014
Proposals due	November 14, 2014

2.4 Addenda

TRRA reserves the right to revise this RFQ at any time before the SOQ due date.

2.5 Ineligible Firms

TRRA has retained the consulting firms of Design Nine, Inc., Modjeski and Masters, Inc., and W.N. Marianos, Jr., P.E. (a sole proprietorship) to provide guidance in preparing and evaluating this RFQ and the RFP and advice on related contractual and technical matters. These firms are not eligible to submit a proposal or to act as a member of any Submitter's team. In addition, a firm is ineligible to submit a proposal, in either a prime or subconsultant role, if it assists in the development of the scope of work, the RFQ, or the RFP.

2.6 Confidentiality

Documents submitted pursuant to this RFQ will be subject to the Missouri Public Records Act, (§§ 610.010, et.seq., RSMo). Information clearly marked as confidential and proprietary will be kept confidential by TRRA, unless otherwise provided by law. TRRA will notify the Submitter if a request is made for such information, and the denial is challenged, so that the Submitter may take any action it deems necessary to defend the challenge. The Submitter, not TRRA, shall be the entity responsible for defending against the Missouri Public Records Act disclosures for any records claimed by the Submitter to be confidential and proprietary.

2.7 Organizational Conflicts of Interest

Pursuant to 23 CFR 636.116, consultants and subconsultants who assist TRRA in the preparation of an RFP document are not allowed to participate on a Submitter's team. Submitter must provide to TRRA information regarding all potential organizational conflicts of interest in its proposal, including all relevant facts concerning any past, present or currently planned interests which may present an organizational conflict of interest, as required by 23 CFR 636.116. TRRA's Chief Engineer will determine whether an organizational conflict of interest exists, and the actions necessary to avoid, neutralize, or mitigate such conflict.

TRRA may disqualify a Submitter if any of its Major Participants (as defined in Section 2.10) belong to more than one Submitter organization.

2.8 Equal Employment Opportunity

The Submitter will be required to follow Federal Equal Employment Opportunity (EEO) policies.

TRRA will affirmatively assure that on any project constructed pursuant to this advertisement, equal employment opportunity will be offered to all persons without regard to race, color, creed, religion, national origin, sex, marital status, status with regard to public assistance, membership or activity in a local commission, disability, sexual orientation, or age.

2.9 Disadvantaged Business Enterprises

It is the policy of MoDOT that Disadvantaged Business Enterprises (DBEs), as defined in 49 CFR Part 26, and other small businesses shall have the opportunity to compete fairly in contracts financed in whole or in part with public funds. Consistent with this policy, MoDOT will not allow any person or business to be excluded from participation in, denied the benefits of, or otherwise be discriminated against in connection with the award and performance of any federally assisted contract because of sex, race, religion, or national origin.

A DBE goal of 8% has been established for the project. MoDOT has implemented the Unified Certification Program and has formed the Missouri Regional Certification Committee (MRCC). DBE firms will need to be certified with MRCC. The MRCC DBE Directory can

be viewed at the following website:
http://www.modot.mo.gov/business/contractor_resources/External_Civil_Rights/DBE_program.htm.

2.10 Major Participant

The term Major Participant is defined as any of the following entities:

- All general partners or joint venture members of the Submitter; all individuals, persons, partnerships, limited liability partnerships, corporations, limited liability companies, business associations, or other legal entities, however organized, directly or indirectly holding a 15% or greater interest in the Submitter.
- The lead engineering/design firm(s).
- Each subcontractor that will perform work valued at 10% or more of the construction work.
- Each subconsultant that will perform 20% or more of the design work.

Major Participants identified in the SOQ may not be removed, replaced, or added without written approval of TRRA. Written request must document the proposed change and demonstrate that the change will be equal to or better than the Major Participant submitted in the SOQ.

The prime contractor in the team must be on the MoDOT Qualified Contractor List. All firms listed on the team must have all necessary licenses and authorizations to work in Missouri by the time proposals are submitted.

2.11 Key Personnel

Key Personnel identified in the SOQ may not be removed, replaced, or added without written approval of TRRA. Written request must document the proposed change and demonstrate that the change will be equal to or better than the Key Personnel submitted in the SOQ.

2.12 Site Visit

A site visit will be held at 9:00 a.m. Central Time on the date shown in the table in Section 2.3. All participants must use the proper Personal Protective Equipment (PPE) as described in Exhibit D. Participants should meet on Ferry Street at the south abutment of the west approach.

3 CONTENTS OF SOQ

3.1 Organization of SOQ

The SOQ shall be organized as follows:

- Cover Letter

- Title Page
- Table of Contents
- Part 1 – Submitter Experience
- Part 2 – Key Personnel and Organization
- Part 3 – DBE Plan
- Appendix A – Team Member Information
- Appendix B – Reference Projects
- Appendix C – Resumes
- Appendix D – Receipt of Addenda

3.2 Cover Letter

A one-page cover letter shall be included in the SOQ. The cover letter must contain the business name, business type (corporation, joint venture, partnership) and must identify one contact person. The address, phone, fax, and e-mail for the contact person must be included.

3.3 Part 1 – Submitter Experience

Demonstrate experience with projects similar to the Merchants Bridge West Approach Replacement project (or projects with key aspects similar to key aspects of the project). Identify the team member's ability to meet the goals of the West Approach Replacement project. At a minimum, demonstrate experience in each of the following areas:

- Use of innovative approaches to deliver a project within budget.
- Experience and approaches to delivering projects on schedule or ahead of schedule.
- Design and construction of major transportation projects.
- Design and construction of ground treatment with estimation of short and long-term surface settlement.
- Condition inspection and evaluation of existing railroad structures.
- Design of large embankments, including consideration of local and global fill stability.
- Experience performing major construction around active railroad lines, including successful completion of track change-outs within limited track outage periods.
- Meeting or exceeding project DBE goals.

A maximum of 12 reference projects can be described for each Submitter. Work on the reference projects must be within the past ten years.

Appendix B shall be incorporated into Part 1 by reference. TRRA reserves the right to contact references identified in Form 2 – Reference Project Summary.

3.4 Part 2 – Key Personnel and Organization

Each Submitter shall define Key Personnel and develop a corresponding organizational chart that demonstrates the Submitter's knowledge of the Project and approach to meeting

the project goals. Each Submitter shall describe the organization of the team and indicate how the qualifications of each Key Personnel increase the Submitter's ability to meet or exceed the Project goals.

Submitters should define the following three positions as Key Personnel:

- Project Manager – The Project Manager is responsible for all aspects of the Project, including, but not limited to, overall design, construction, quality management, and contract administration. The Project Manager should have at least ten years of recent experience managing the design and construction of major transportation projects. The Project Manager must be assigned to the Project full time and shall be required to be on site for the duration of the Project.

- Quality Manager – The Quality Manager's responsibilities include, but are not limited to, creation and execution of the Submitter's quality program, quality personnel, assurance activities independent of production, enforcement of quality procedures, and documentation of quality records including public information, environmental compliance and DBE/labor compliance. The Quality Manager shall report directly to the Submitter's executive management team. The Quality Manager should have at least five years of recent experience developing, implementing, and overseeing quality programs.

- Design Manager – The Design Manager is responsible for ensuring the project design is completed and all design requirements are met. The Design Manager must be assigned to the Project full time when design activities are being performed. The Design Manager should have at least ten years of recent experience managing the design of major transportation projects of a similar nature and must be a registered professional engineer in the State of Missouri.

Additional Key Personnel may be included in the RFP. Submitters may provide resumes for up to six additional personnel.

Appendix C shall be incorporated into Part 2 by reference.

3.5 Part 3 – DBE Plan

Describe your detailed plan to meet or exceed the DBE participation goals described in Section 2.9 for the Project.

3.6 Appendix A – Major Participant Information

Appendix A must include:

- Form 1 – Major Participant Information. One form is to be completed for each Major Participant.

- Letter(s) of Bonding Capacity – Provide a letter(s) from a surety or insurance company or companies stating that the Submitter is capable of obtaining a performance bond and payment bond covering the Project in the amount of up to $40 million. In the case of a joint venture, multiple letters may be provided for

members who will be jointly and severally liable for the work. Letters indicating "unlimited" bonding capability are not acceptable. The surety or insurance company or companies providing such letter(s) must be licensed as a surety or sureties and qualified to do business in the State of Missouri and must be listed in the current edition of US Department of Treasury, Fiscal Service – Circular 570, *Companies Holding Certificates of Authority as Acceptable Sureties of Federal Bonds and as Acceptable Reinsuring Companies.*

3.7 Appendix B – Reference Projects

Appendix B must include:

- Form 2 – Reference Project Summary. One summary is to be completed for each reference project described in Part 1. Each summary is limited to a maximum of three pages. A maximum of 12 reference projects can be described for each Submitter.

3.8 Appendix C – Resumes

Appendix C must include:

- Form 3 – Resume Summary
- Resumes – Resumes for the three identified Key Personnel are to be included. Additionally, resumes may be included for up to six additional personnel. Each resume is limited to two pages.

3.9 Appendix D – Receipt of Addenda

Appendix D must include:

- Form 4 – Receipt of Addenda

4 SUBMITTAL REQUIREMENTS

4.1 Page Limits

The maximum number of pages is shown in the following table:

Item	Maximum Number of Pages
Cover Page	1
Title Page	1
Table of Contents	1
Part 1 – Submitter Experience	10
Part 2 – Key Personnel and Organization	
Part 3 – DBE Plan	
Appendix A – Major Participant Information	as needed
Appendix B – Reference Projects	36
Appendix C – Resumes	21
Appendix D – Receipt of Addenda	1

Dividers between sections of the SOQ are not counted.

4.2 Format

The SOQ must be formatted for 8.5" x 11" paper. Charts and other graphical information may be formatted for 11" x 17" paper. Use of 11" x 17" format shall be limited to a maximum of two pages. Minimum font size is 11 points. However, 10-point text may be used within graphs or tables.

4.3 Due Date and Quantities

SOQs must be submitted by 4:00 pm, Central Time, on the date shown in Section 2.3. Five hard copies of the SOQ are to be delivered to the TRRA Chief Engineer as shown in Section 2.2. Submitters shall also e-mail one Adobe Acrobat format of the SOQ, in a single .pdf file, to efields@TerminalRailroad.com by the same due date and time.

5 EVALUATION PROCESS

5.1 SOQ Evaluation

TRRA will evaluate all responsive SOQs to determine the most highly qualified Submitters.

TRRA will use the criteria set forth in this RFQ using the following weightings:

Item	**Weight**
Part 1 – Submitter Experience	50%
Part 2 – Key Personnel and Organization	50%
Part 3 – DBE Plan	pass/fail

The ratings to be used during the evaluation process for Parts 1 and 2 are as follows:

Rating	Description
Exceptional +/-	The Submitter has demonstrated an approach that is considered to significantly exceed stated requirements/objectives and provides a consistently outstanding level of quality. There is very little or no risk that the Submitter would fail to meet the requirements of the RFP. There are essentially no weaknesses.
Good +/-	The Submitter has demonstrated an approach that is considered to exceed stated requirements/objectives and offers a generally better than acceptable quality. There is little risk that the Submitter would fail to meet the requirements of the RFP. Weaknesses, if any, are minor.
Acceptable +/-	The Submitter has demonstrated an approach that is considered to meet the stated requirements/objectives and has an acceptable level of quality. The Submitter demonstrates a reasonable probability of meeting the requirements of the RFP. Weaknesses are minor.
Unacceptable	The Submitter has demonstrated an approach that is considered to fail to meet the stated requirements/objectives and/or provides unacceptable quality and/or demonstrates no reasonable likelihood of meeting the requirements of the RFP and/or contains weaknesses that are so major and/or extensive that a major revision to the SOQ would be necessary.

5.2 Short Listed Submitters

TRRA will use the SOQ Evaluation Process to determine a ranked list of Submitters. TRRA will short-list at least two (if any) but not more than four most highly qualified Submitters.

TRRA will publish a list of short listed Submitters on the MoDOT website and will notify, via e-mail, all Submitters of the posting of this information.

5.3 Debriefing Meetings

After the short list is posted, Submitters may request an informal debriefing meeting with TRRA to discuss the RFQ and the short-listing process.

6 PROTEST PROCEDURES

6.1 RFQ Protests

A Submitter may protest the results of the above-described evaluation and qualification process by filing a written notice of protest by hand delivery or courier to the Chief Legal Officer of TRRA with a copy to the TRRA Chief Engineer. The protesting Submitter shall concurrently file a copy of its notice of protest with the other Submitters. The notice of protest shall specifically state the grounds of the protest.

Notice of protest of any decision to accept or disqualify an SOQ on responsiveness grounds must be filed within five calendar days after the earliest of notification of non-responsiveness or the public announcement of short listing. Notice of protest of the decision on short listing must be filed within five calendar days after the public announcement of short listing.

Within seven calendar days of the notice of protest, the protesting Submitter must file with the Chief Legal Officer of TRRA, with a copy to the TRRA Chief Engineer, a detailed statement of the grounds, facts and legal authorities, including all documents and evidentiary statements, in support of the protest. The protesting Submitter shall concurrently deliver a copy of the detailed statement to all other Submitters. Evidentiary statements, if any, shall be submitted under penalty of perjury. The protesting Submitter shall have the burden to prove that the decision of TRRA was arbitrary and capricious.

Failure to file a notice of protest or a detailed statement within the applicable period shall constitute an unconditional waiver of the right to protest the evaluation or qualification process and decisions thereunder, other than any protest based on facts not reasonably ascertainable as of such date.

Other Submitters may file by hand delivery or courier to the Chief Legal Officer of TRRA, with a copy to the TRRA Chief Engineer, a statement in support of or in opposition to the protest. Such statement must be filed within seven calendar days after the protesting Submitter files its detailed statement of protest. TRRA will promptly forward copies of any such statements to the protesting Submitter.

Unless otherwise required by law, no evidentiary hearing or oral argument shall be provided, except, in the sole and absolute discretion of the Chief Legal Officer of TRRA, a hearing or argument may be permitted if necessary for protection of the public interest or an expressed, legally recognized interest of a Submitter or MoDOT. The Chief Legal Officer of TRRA or his designee will issue a written decision regarding the protest within 30 calendar days after TRRA receives the detailed statement of protest or any allowed (discretionary) evidentiary hearing or oral argument. Such decision shall be final

and conclusive. The Chief Legal Officer of TRRA or his designee will deliver the written decision to the protesting Submitter and copies to the other Submitters.

If a notice of protest regarding responsiveness is filed prior to release of the draft RFP, TRRA may proceed with issuance of the draft RFP before the protest is withdrawn or decided, unless the Chief Legal Officer of TRRA or his designee determines, in his or her sole discretion, that it is in the public interest to postpone issuance of the draft RFP. Such a determination shall be in writing and shall state the facts on which it is based.

If the Chief Legal Officer of TRRA or his designee concludes that the Submitter filing the protest has established a basis for protest, the Chief Legal Officer of TRRA or his designee will determine what remedial steps, if any, are necessary or appropriate to address the issues raised in the protest. Such steps may include, without limitation, withdrawing or revising the decisions, issuing a new request for qualifications or taking other appropriate actions.

Form 1

Terminal Railroad Association of St. Louis
Merchants Bridge West Approach Replacement
Major Participant Information

Submitter (Team) Name:

Company Name:		**Year Established:**	
Company Address:		**Federal Tax ID:**	
Company Phone:		**Organization:**	☐ Corporation
Company Fax:			☐ Joint Venture
Contact Name:			☐ Partnership
Contact Phone:			☐ Other
Contact E-mail:		**State of Incorporation:** (if applicable)	

Under penalty of perjury, I certify that:

- I am the company's Official Representative;
- The company is either prequalified to perform work as a consultant or contractor for MoDOT or is able to obtain prequalification status prior to submitting a Proposal;
- To the best of my knowledge and belief, following reasonable inquiry, the information submitted in this SOQ is true and correct.

_____ _____

Signature Date

_____ _____

Typed Name Title

Form 2

Terminal Railroad Association of St. Louis
Merchants Bridge West Approach Replacement
Reference Project Summary

Submitter (Team) Name:

Reference Project Name: Project Location:

Contact Name:		**Type of Project:**	☐ Design-Build
Contact Address:			☐ Design
Contact Phone:			☐ Construction
Original Project Budget:		**Project Start Date:**	
Final Project Cost:		**Project End Date:**	
DBE % Goal:		**Actual DBE %:**	

Form 2

Description of Project:	

Form 2

MAJOR PARTICIPANTS INVOLVED IN REFERENCE PROJECT			
MAJOR PARTICIPANT	**ROLE**	**DESCRIPTION OF WORK PERFORMED**	**PERCENTAGE OF WORK**

PERSONNEL INVOLVED IN REFERENCE PROJECT List only individuals shown in Appendix C		
NAME (Last, First)	**ROLE**	**DESCRIPTION OF WORK PERFORMED**

Form 3

Terminal Railroad Association of St. Louis
Merchants Bridge West Approach Replacement
Resume Summary

Submitter (Team) Name:

Position	Name (Last, First)	Years of Experience	% Assigned to this Project		On Site (yes/no)
			During Design Phase	During Construction Phase	
Project Manager					
Quality Manager					
Design Manager					

Terminal Railroad Association of St. Louis
Merchants Bridge West Approach Replacement
Receipt of Addenda

Submitter (Team) Name:

Addendum Number:		**Dated:**	
Addendum Number:		**Dated:**	
Addendum Number:		**Dated:**	
Addendum Number:		**Dated:**	
Addendum Number:		**Dated:**	

The undersigned acknowledges receipt of the addenda to the RFQ as indicated above.

_____ _____

Signature Date

_____ _____

Typed Name Title

EXHIBIT A

EXISTING STRUCTURE DRAWINGS

(FOR INFORMATION ONLY)

South line of Ferry Str.

6'-6"

25°-51'

62'-0"

Present Timber Bulk-head

Centre line of Ferry Str.

N.

Tang. to 6° Curve V at Sta. 15+65.7

Centre line of West-bound Track

Centre line between Tracks. 6°-00' Curve.

Centre line of East-bound Track

32'-0"

Sta. 15+65.7

West pier of 126' Span over Ferry Str.

Present Timber Bulk-head

51'-0"

ST. LOUIS MERCHANTS BRIDGE TERMINAL RY. CO.

SECTION OF WEST APPROACH SHOWING PROPOSED LOCATION OF MASONRY ABUTMENT AT FERRY STR.

JANUARY 6. 1899.

SCALE 1/8" = 1'

SUPT. STRUCTURES.

Top of Stringer : Grade - 1.5%

5'-0"

3'-6"

3'-0"

4'-0"

3'-0"

18'-0"

Present Timber Bulk-head

Batter 1"=1'

37'-0"

Top of Natural Ground

Elev. -90.

4'-0"

Elev-88.

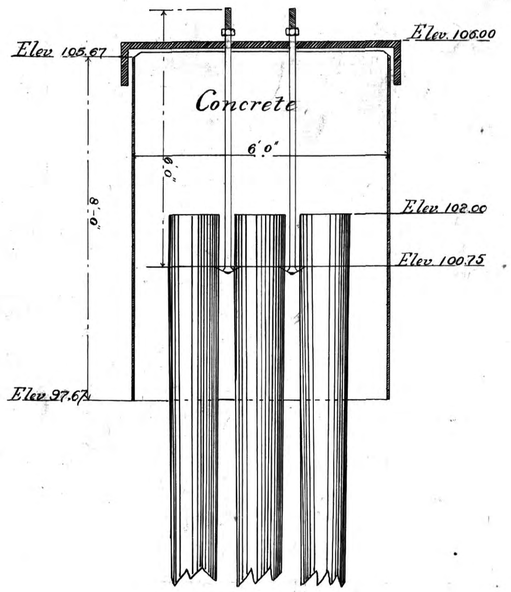
10'-11"

8'-1"

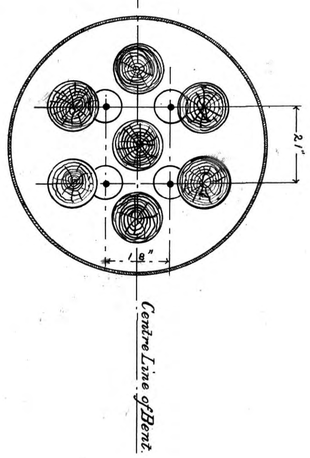
19'-0"

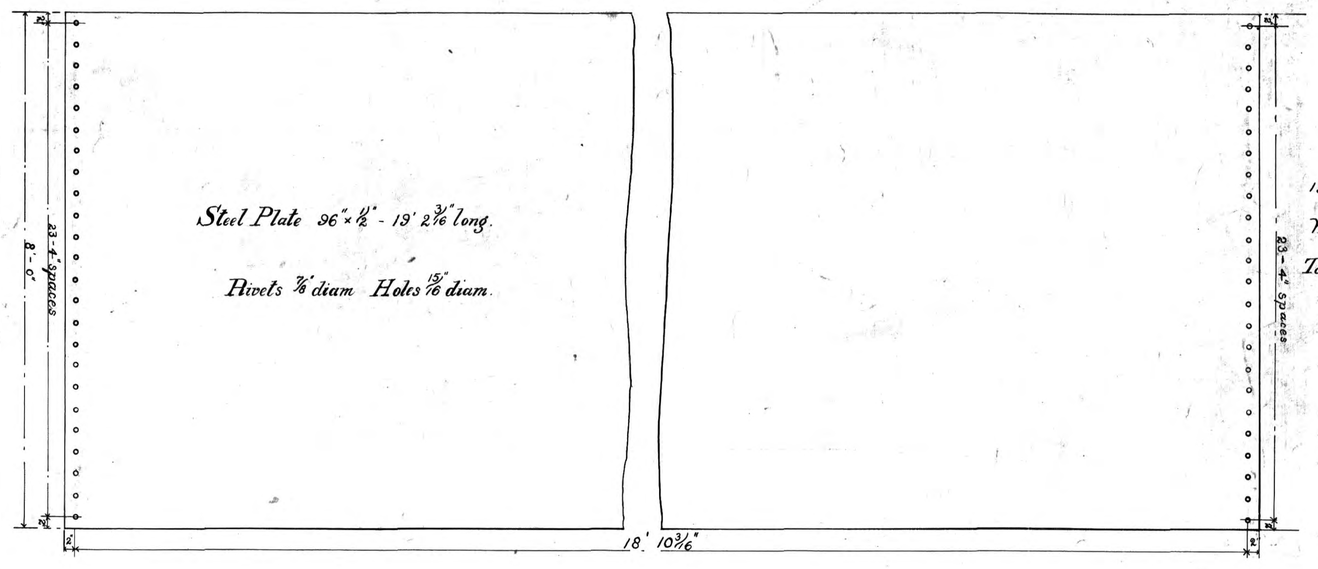
ST. LOUIS MERCHANTS BRIDGE

WEST APPROACH CYLINDER PIERS



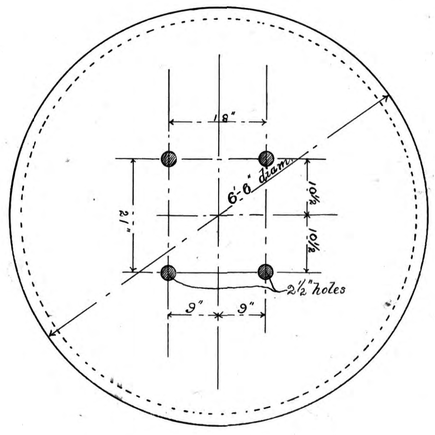
Scale ½" = 1 ft.



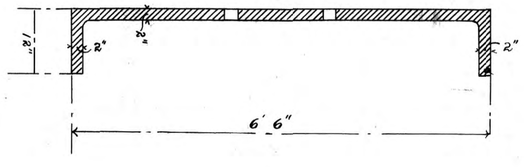


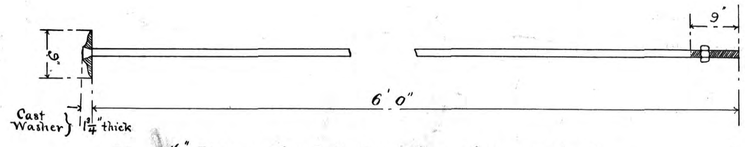
19 pieces like this required.
Weight of each = 3130 lbs.
Total weight of 19 shells = 59470 lbs.

Scale of details ¾" = 1 ft.



19 Cast iron caps like this required.
Weight of each = about 3735 lbs.
Total weight of 19 caps = about 70965 lbs.



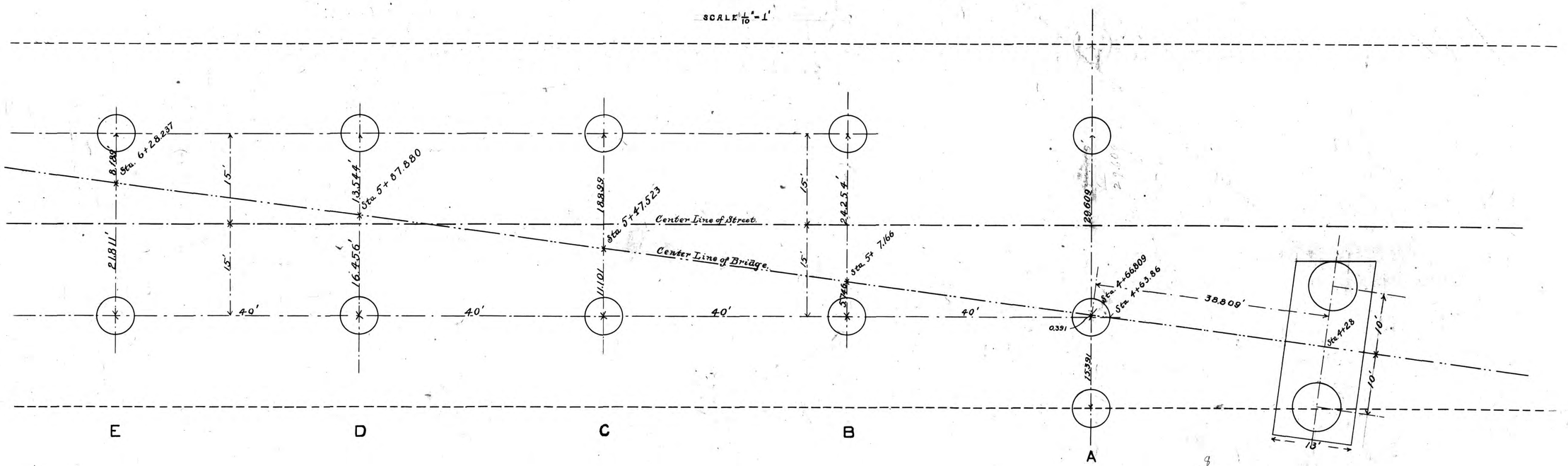


76 1½" diam. anchor bolts & cast washers required.

ST. LOUIS MERCHANTS' BRIDGE.

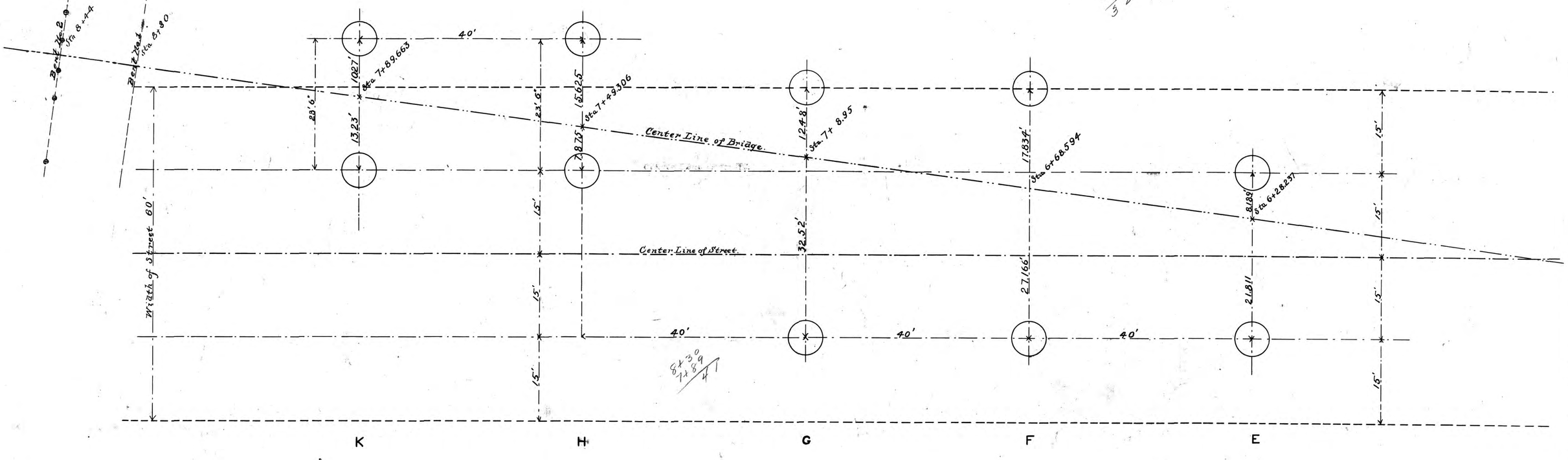
WEST APPROACH CYLINDER PIERS.

SCALE $\frac{1}{10}$"-1'

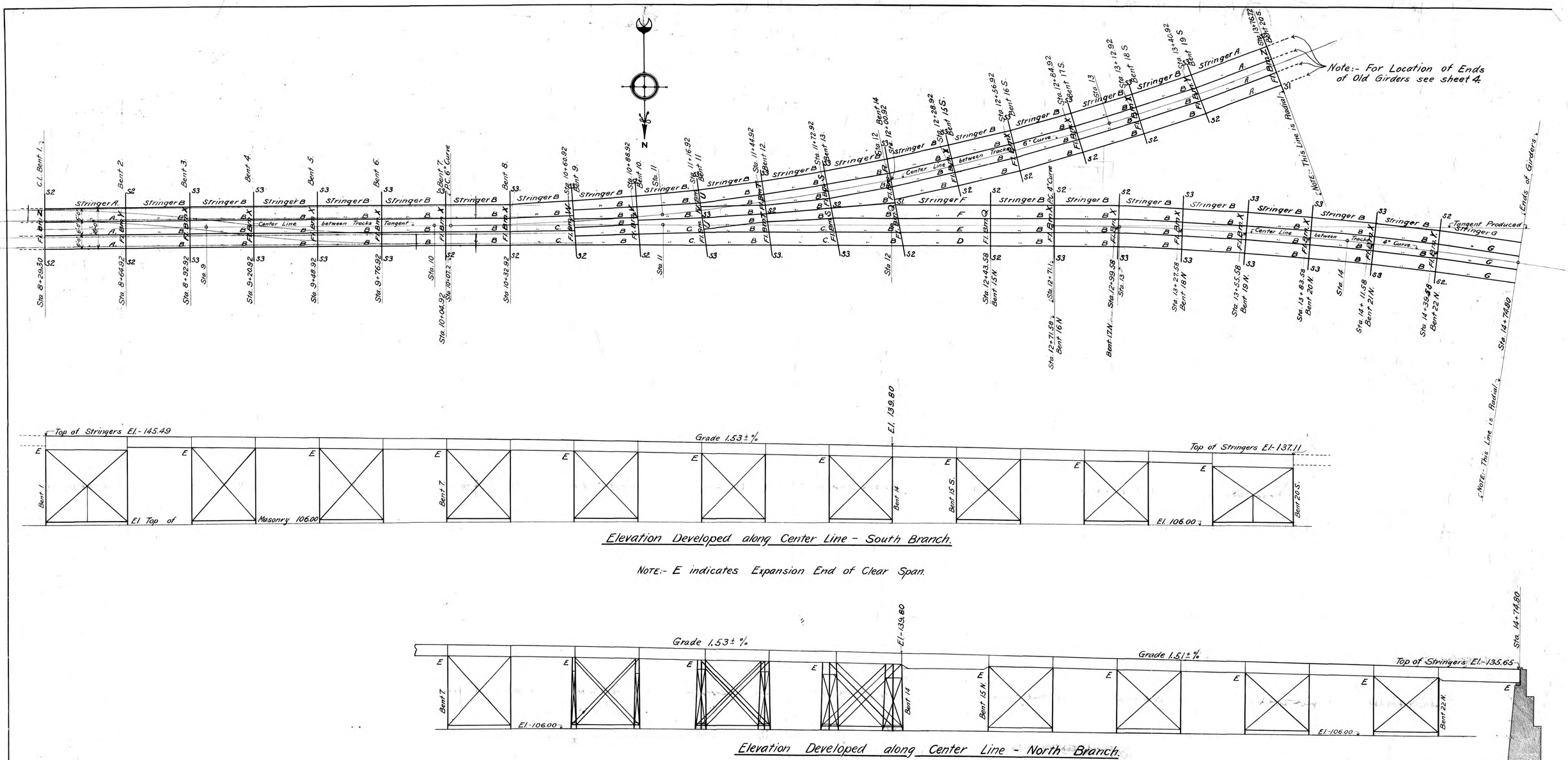


7+89.1
4+66.8
3 2 2 9

6.8
28
58.8



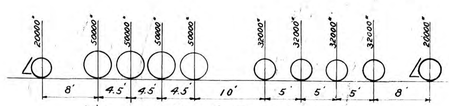
8+30
1+89
4 1



Elevation Developed along Center Line - South Branch.

NOTE:- E indicates Expansion End of Clear Span.

Elevation Developed along Center Line - North Branch.



Live Load St. Louis Terminal Engines.

3003

Approved:-
H. J. Fisher
First Asst. Engineer

Approved:-
Robt. Moore
Consulting Engineer

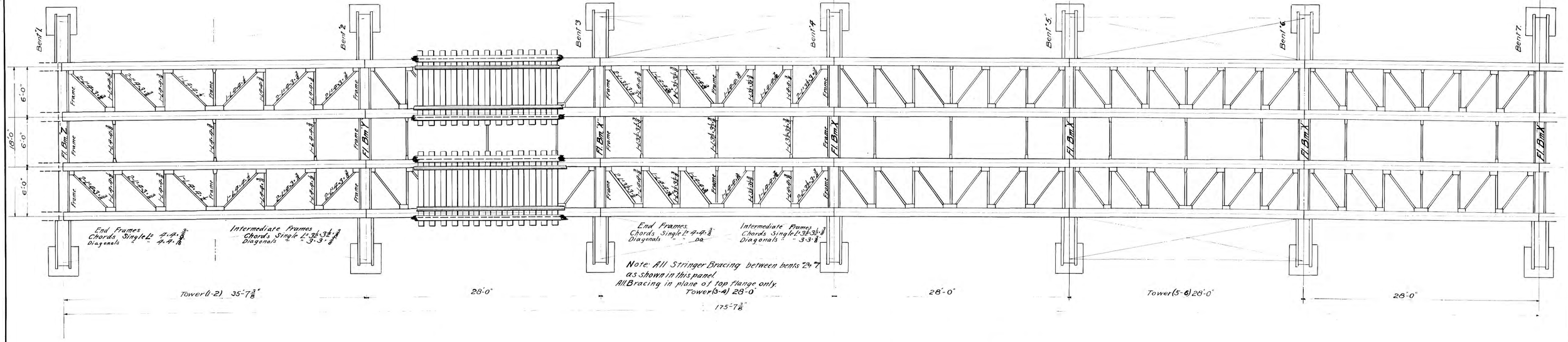
St. Louis, Mo. Mar. 20-1902.

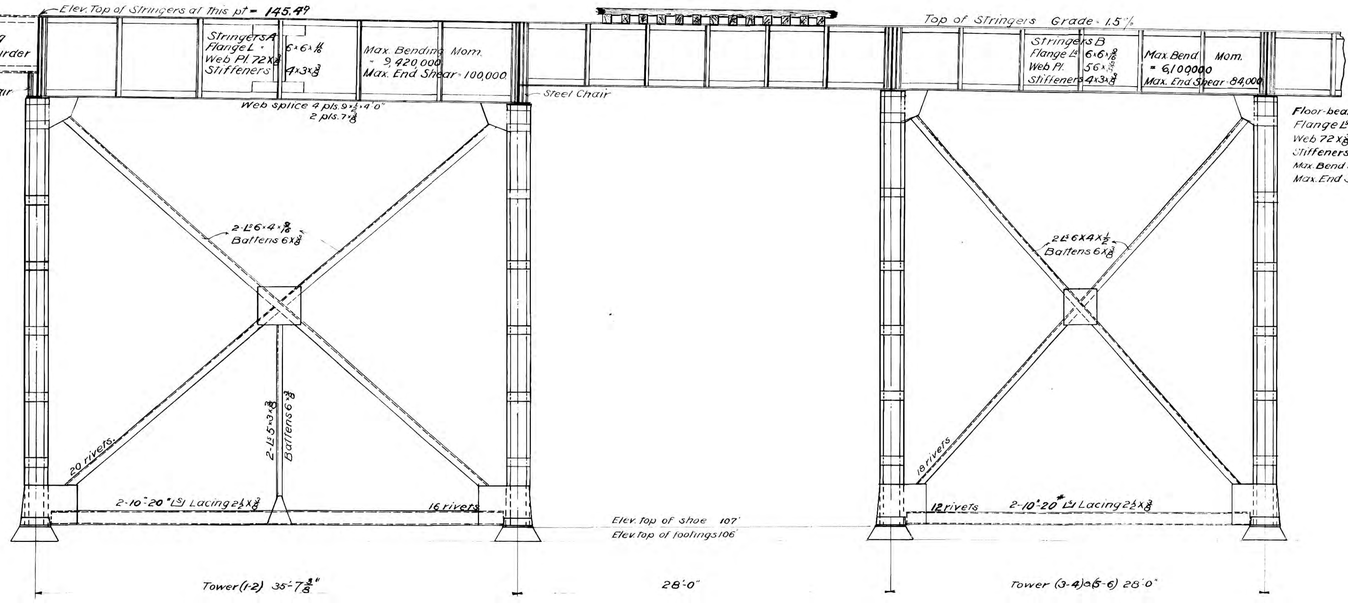
Notes:
All gussets ⅜" thick.
All Single Bracing Angles to be riveted by both legs.
All Dimensions to be verified before beginning work.
Material, Medium Steel except for rivets. All Holes reamed.
Rivets ⅞" diam. except in flanges of 12" I. under which are ¾" diam.
Open Holes 1⅛" diam. except where otherwise noted.
All rivet-holes to be punched using dies ⅛" smaller than rivet.
All sheared edges of plates to be planed ¼" deep.
All Stiffeners to be ground to fit tight at their ends, to Flange Angles.
Mark shipping weight on each piece.
All inaccessible surfaces to be painted with Red Lead and pure boiled linseed oil before assembling.
All work before leaving the shop shall be thoroughly cleaned from all loose scale and rust, and be given one good coating of pure raw linseed oil.
Otherwise Coopers Specifications for 1901.

Revised Aug. 1902

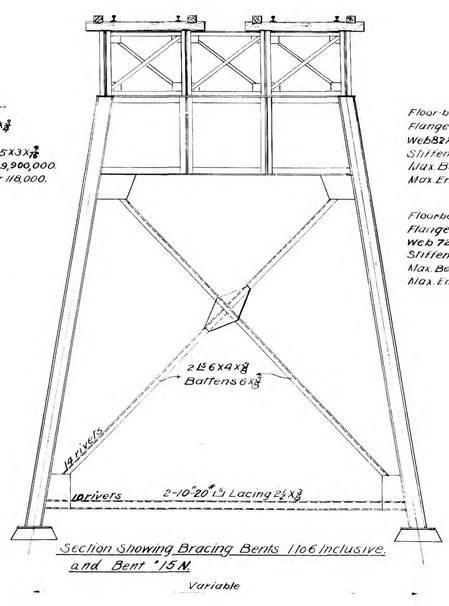
ST. LOUIS MERCHANTS TERMINAL R'Y. CO.
PLAN OF STEELWORK
WEST APPROACH TO MERCHANTS BRIDGE.
Scale 20 to 1".

Brenneke & Fay Designing Engineers.
St. Louis February, 1902.





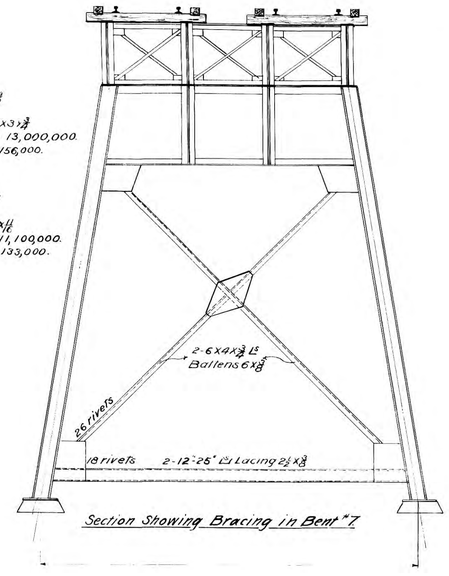
Floor-beams "X"
Flange L 6"x6"x⅞
Web 72"x⅜
Stiffeners 4 L 5"x3"x⅞
Max. Bend. Mom. 9,900,000.
Max. End Shear 118,000.



Section Showing Bracing Bents 1 to 6 Inclusive and Bent "15 N.
Variable

Floor-beams "Z"
Flange L 6"x6"x⅞
Web 52"x⅜
Stiffeners 4 L 5"x3"x⅜
Max. Bend. Mom. 13,000,000.
Max. End Shear 156,000.

Floorbeams "Y"
Flange L 6"x6"x⅞
Web 72"x⅜
Stiffeners 5"x3"x⅜
Max. Bend. Mom. 11,100,000.
Max. End Shear 133,000.



Section Showing Bracing in Bent "7

Approved:-
H. J. Pfeifer
First Ass't. Engineer

Approved:-
Robt. Moore
Consulting Engineer

St. Louis, Mo. March 20 - 1902.

Column Sections Bents 1 to 7. Make up of Columns				
Bent	Col.	I-Beam	Channels	Plates
1	N & S	1-15"-42#	2-15"-33#	2-12"x⅞"
2	"	"	2-15"-33#	2-12"x⅞"
3-6	"	"	2-15"-33#	2-12"x⅞"
7	N	"	2-15"-40#	2-12"x½"
7	S	"	2-15"-33#	2-12"x⅞"

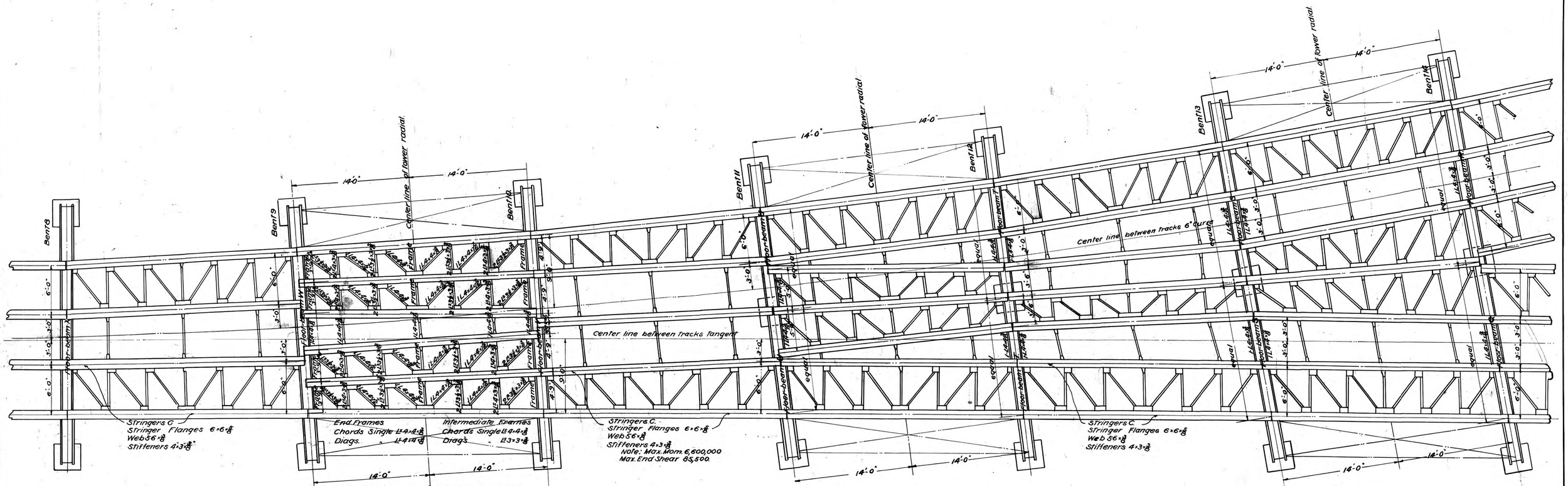
Revis. Aug. 1902

9009

ST. LOUIS MERCHANTS TERMINAL RY. CO.
PLAN OF STEELWORK
WEST APPROACH TO MERCHANTS BRIDGE.
From Bents 1 to 7 Inclusive
Scale ⅛" = 1'

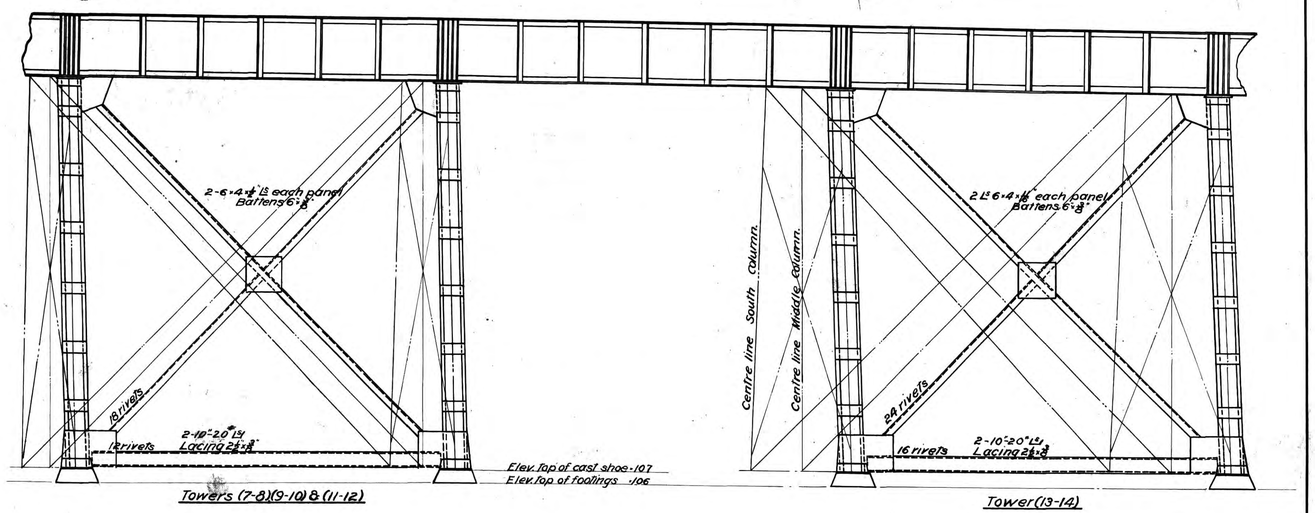
Brenneke & Fay Designing Engineers
St. Louis February 1902.

2



Note: All stringer bracing between Bents 8-14 as shown in this panel.
All bracing in plane of top flange only.

Note: All stringers on this sheet are Stringers B, see sheet 2, unless otherwise noted.



Towers (7-8)(9-10) & (11-12)

Tower (13-14)

Approved:-
H. J. Flad
First Ass't. Engineer

Approved:-
Robt. Moore.
Consulting Engineer

St. Louis, Mo. March 20-. 1902.

Note: See Sheet No. 7 for Columns Floorbeams and Bracing in Bents No. 8 to 14.

N 9008

ST. LOUIS MERCHANTS TERMINAL RY. CO.

PLAN OF STEEL WORK

WEST APPROACH TO MERCHANTS BRIDGE.

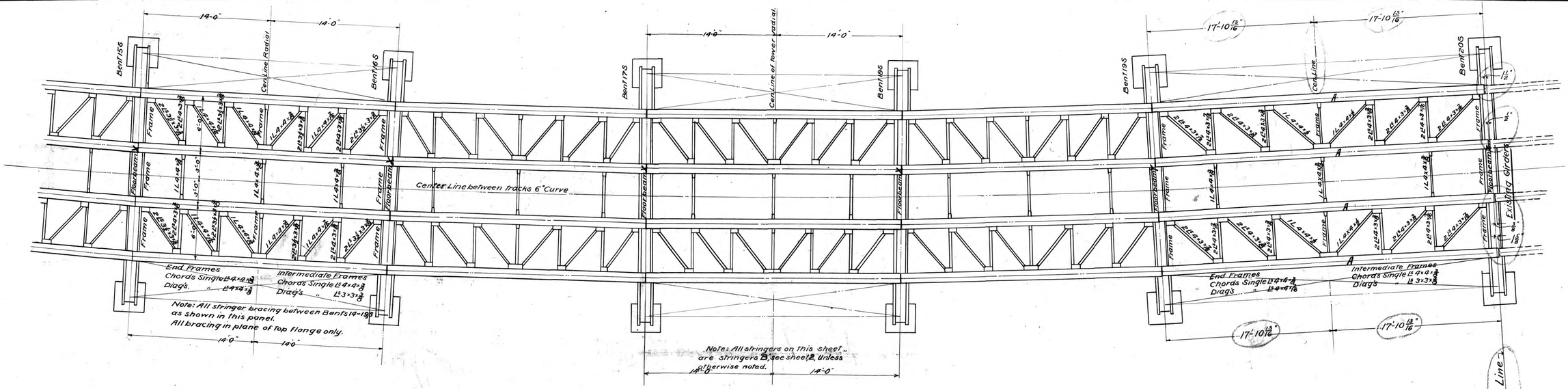
From Bents 8 to 14 Inclusive

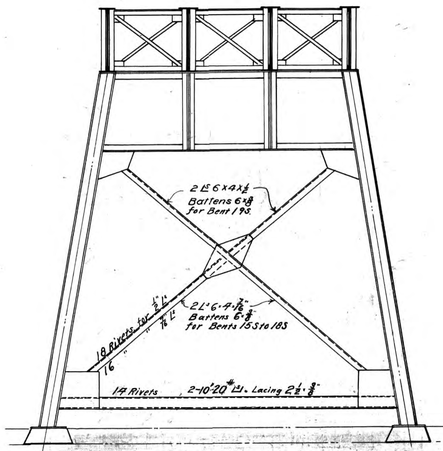
Scale ⅛" : 1'

Brenneke & Fay Designing Engineers.
Saint Louis February, 1902.

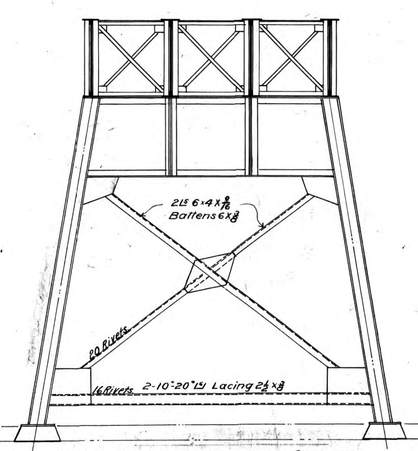
3 7

Revis. Aug. 1902

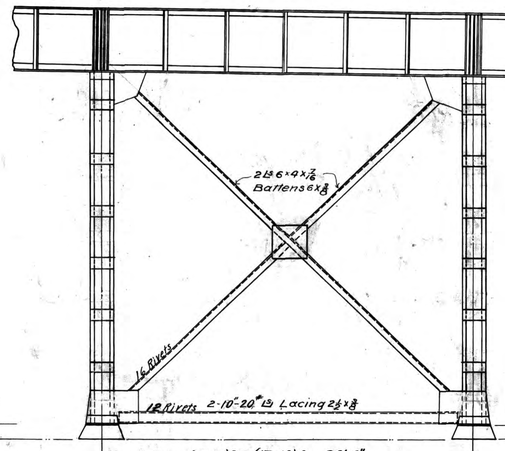




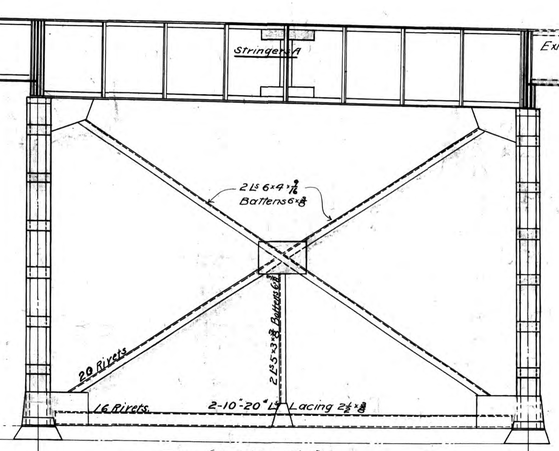
Section Showing Bracing in Bents "15S to "19S Inclusive



Section Showing Bracing in Bents "20S + 17N



Towers (15-16)S + (17-18)S 28'-0"



Tower (19-20)S 35'-5"

Approved:-
H. J. Pfeifer
First Ass't. Engineer.

Approved:-
Robt. Moore
Consulting Engineer

St. Louis, Mo. Nov. 20-1902.

Revis. Aug. 1902

Column Sections Bents 15S to 20S				
Make up of Columns				
Bent	Col.	I-Beam	Channels	Plates
15-18S	N	1-15"-42#	2-15"-33#	2-12"x 3/8"
15-18S	S	"	2-15"-40#	None
19S	N	"	2-15"-33#	2-12"x 7/16
19S	S	"	2-15"-33#	2-12"x 3/8
20S	N	"	2-15"-33#	2-12"x 7/16
20S	S	"	2-15"-33#	2-12"x 1/2

9008

ST. LOUIS MERCHANTS TERMINAL RY. CO.

PLAN OF STEELWORK

WEST APPROACH TO MERCHANTS BRIDGE.

From Bents 15S to 20S Inclusive

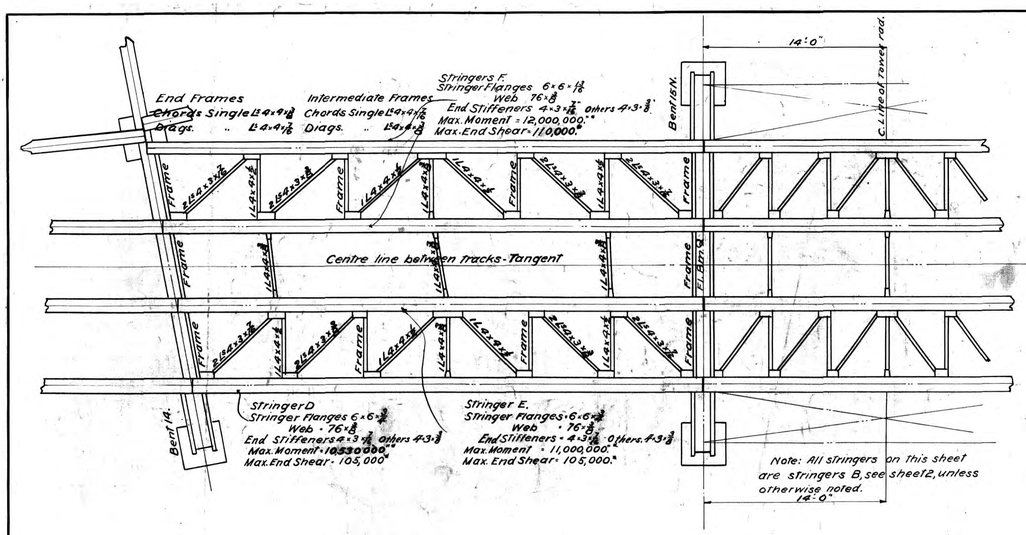
Scale 3/8"-1'

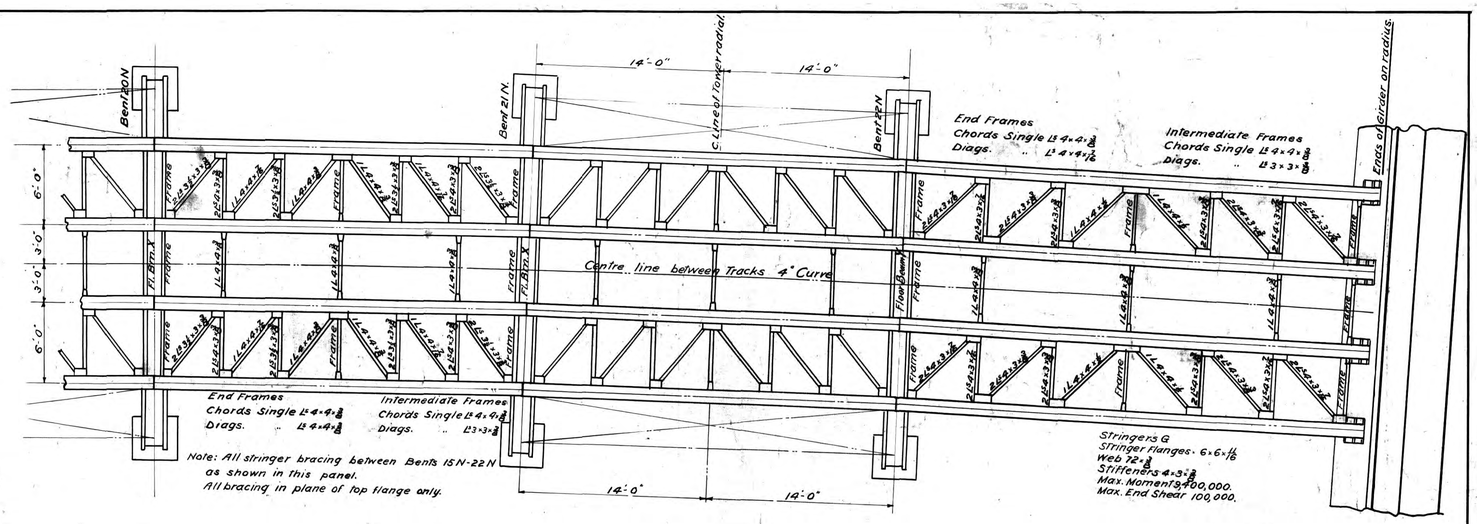
Brenneke & Fay Designing Engineers

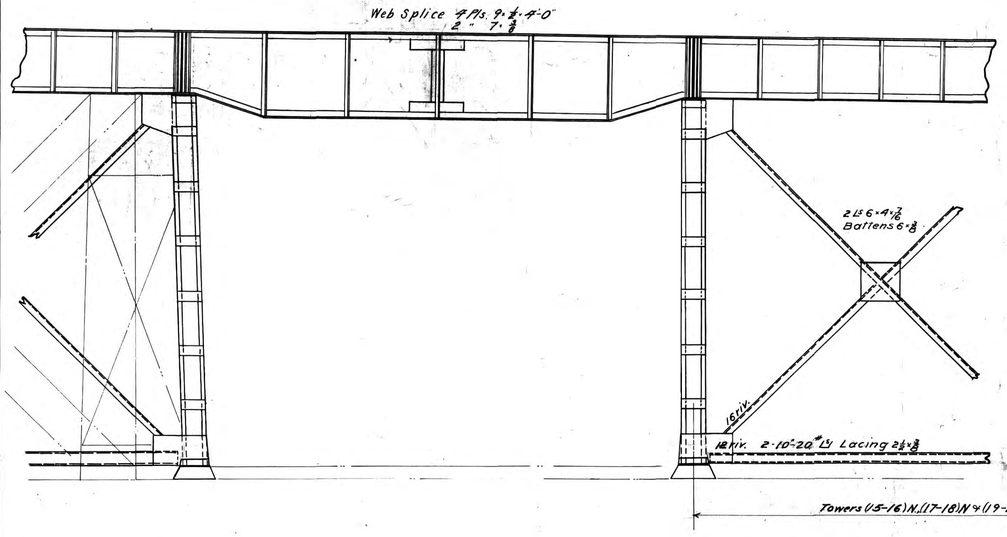
St. Louis February, 1902

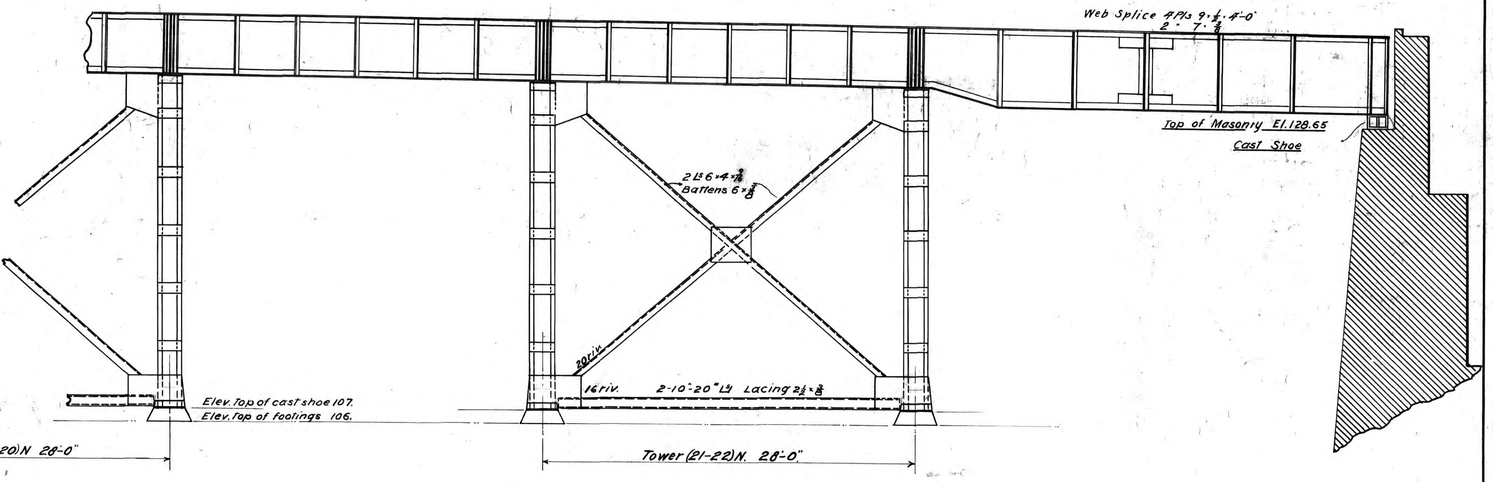
4

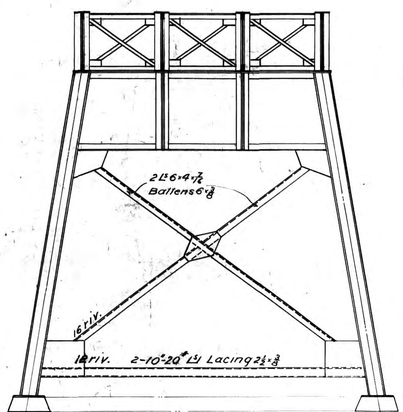
ECD



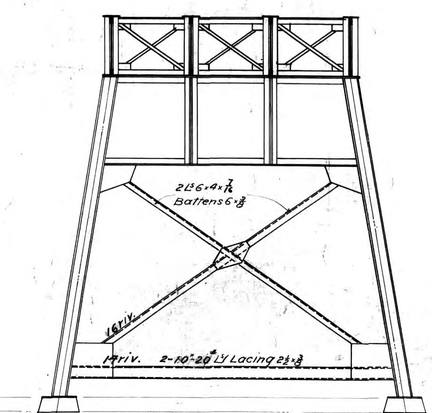








Section Showing Bents 18-21N



Section Showing Bent 22N.

Note: See Sheet "2 for Bent "15N.
" " "7 " " "16N.
" " "7 " " "17N.

Column Sections Bents 15N to 22N Make up of Colums.				
Bent	Col.	I-Beam	Channels	Plates.
15N	N & S	1-15"-42#	2-15"-33#	2-12"×⅜"
16N	N	"	2-15"-40#	None.
16N	S	"	2-15"-33#	2-12"-½"
17N	N	"	2-15"-40#	None.
17N	S	"	2-15"-33#	2-12"-⅜"
18-21N	N	"	2-15"-40#	None.
18-21N	S	"	2-15"-33#	2-12"-⅜"
22N	N	"	2-15"-33#	2-12"-⅜"
22N	S	"	2-15"-33#	2-12"-7/16"

Approved:-
H. J. Flynn
First Asst Engineer

Approved:-
Robt. Moore
Consulting Engineer

St. Louis, Mo. Jan 20-1902.

Revis. Aug. 1902

9008

ST. LOUIS MERCHANTS TERMINAL RY. CO.
PLAN OF STEELWORK
WEST APPROACH TO MERCHANTS BRIDGE.
From Bents 15N to 22N Inclusive.
Scale ⅛"-1'

Brenneke & Fay Designing Engineers.
St. Louis February, 1902.

5

Caps of Columns.
1 Cap Pl. 25-⅞" × 3'-0"
2 Bars 6" × ⅞"
1 L 6" × 4" × ⅞"
2 L's 3½" × 3½" × ⅞"
Note: Columns must be Faced top & Bottom before riveting on Cap & Sole Pls.

2-L's 6" × 4" × ⅞" Beveled Steel Sole Pls. on Stringers 13" × ⅞" on C.L. of Fl.Bm.

Fills

Fill as inside.

Battered 2" in 6"

Center Line of Column and Floor Beams

Clips 4" × 4" × ⅜"

Center Line of Tower

Base of Columns.
1 Sole Pl. 25" × ⅞" × 2'-1"
2 side " ⅜" Thick.
4 L's 6" × 6" × ⅜"

Faced

½" Joint

2'-0"

Elevation top of Footings = 106'

Half Elevation.

Plan of Column Base

Plan of Cast Iron Shoe.

Cast Iron Shoes.
Metal 1½" Holes 1⅛" for 1¼" Bolts.
Base of Shoe 41" Sq. for Shoe Sl. See Sheet #1. 2 Required.
" " " 39" " " " 52. " " " 24 "
" " " 35" " " " 53 " " " 34 "

Note: Anchor Bolts for Columns to be set 6' in Masonry.

End Connection L's on All Fl.Bms 6" × 4" × ½" except as in 14 - See sheet #. Ends of Fl.Bms. to be faced.

Fills

2-L's 4" × 4" × ⅜"

Note: All North & South Columns Battered 1 in 6

Clips 4" × 4" × ⅜"

Center Line of Bent 1

Half Cross Section

Tower

Expansion end of Clear-Span

Stringer.

Floor Beam.

Stringer.

6 Rivets for 28' Stringers.
8 " " 35'-5" " and over.

Pl. on Fl. Bm 13" × ⅜"
2-Bars 3" × ½"

Section A-A.
Showing Connection of Stringers to Columns and Floor Beams.

Section B-B
Showing Connection of Floor Beams to Columns.

6'-0" B to B

4-Pl's 12" × ⅜" for existing girders
4-Pl's 8" × ⅜" Stringers 'G'

Flanges" are Continuous

Beveled Steel Sole Pl. 13" × ⅜" on C.L. of Fl.Bm.
Pl. on Fl.Bm. 13" × ⅜" × 1'-1"

Elevation.

End View.

Steel Chairs
2 L's 6" × 6" × ⅜"
4 L's 4" × 3" × ⅜"
1-Pl. 18½" × ⅜" × 0'-10"
2-Bars 3" × ½" × 0'-10"
2-Fillers ⅜" Web
Sole Pl on Existing Girders 12" wide × ⅜" thick.
Sole Pls. on Stringers 12" wide × ⅜" thick.

Section C-C

Detail of End of Stringer 'A'
Showing Steel Chair and Connection of Stringer to Floor Beam.

1'-6"

Elevation top of Stringer - 125.65

6'-0" B to B

Beveled Steel Sole Pl. 13" × ⅜" at thinnest pt. × 1'-6"

Elevation Top of Bridge Seat - 120.65

½" Joint

Cast Iron Shoes
Metal 1½" Holes for ⅞" ø Bolts.
4 Shoes Required.

1'-6"

2'-0"

Plan of Cast Shoe.

Detail of End of Stringer 'G' on Abutment.

Approved:-
H. J. Pfeifer
First Ass't Engineer

Approved:-
Robt. Moore.
Consulting Engineer

St. Louis, Mo. Nov. 20-1902.

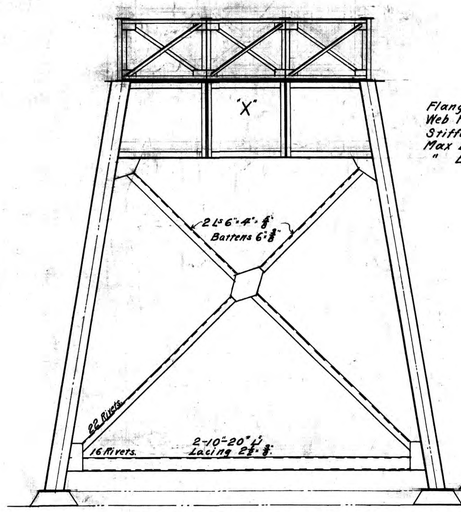
ST. LOUIS MERCHANTS TERMINAL RY. CO.
PLAN OF STEELWORK
WEST APPROACH TO MERCHANTS BRIDGE.
Showing Typical Details.
Scale ½" = 1'

Brenneke & Fay Designing Engineers.
St. Louis. February, 1902

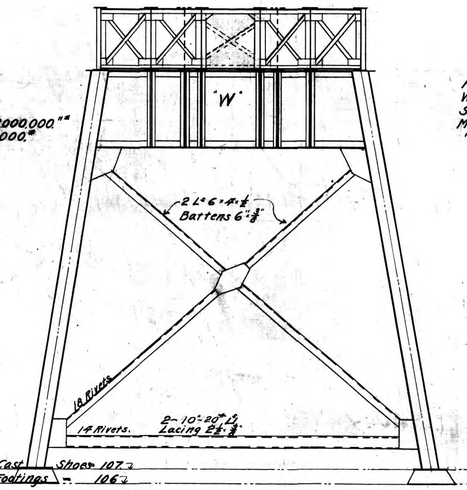
6

Revis. Aug. 1902

5008



Floor Beam "W"
Flange L⁵ 6·6·⅞
Web Pl. 72"·⅜"
Stiffeners 5·3·½
Max Bending Mom. = 12000,000."
" End Shear = 166000."

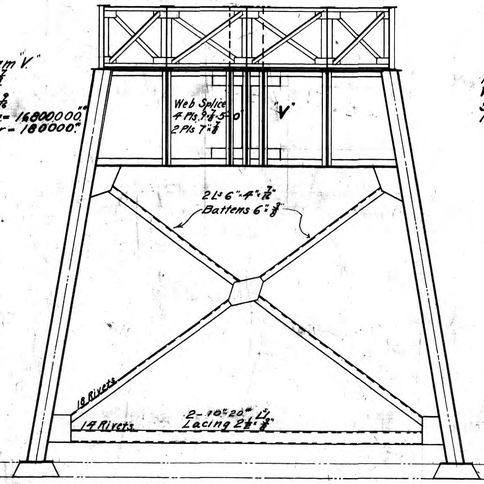


Elevation top of Cast Shoes = 107.2
" " " Footings = 106.2

Section Showing Bracing in Bents "8 to "16 N.

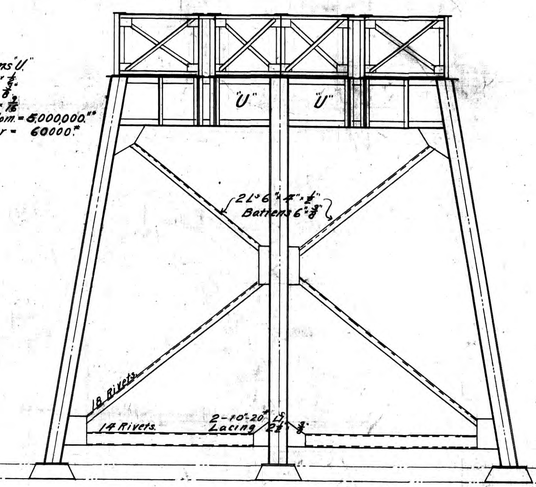
Section Showing Bracing in Bent "9

Floor Beam "V"
Flange L⁵ 6·6·⅞
Web Pl. 100"·⅜"
Stiffeners 5·3·½
Max. Bending Mom = 16800000"
" End Shear = 180000."



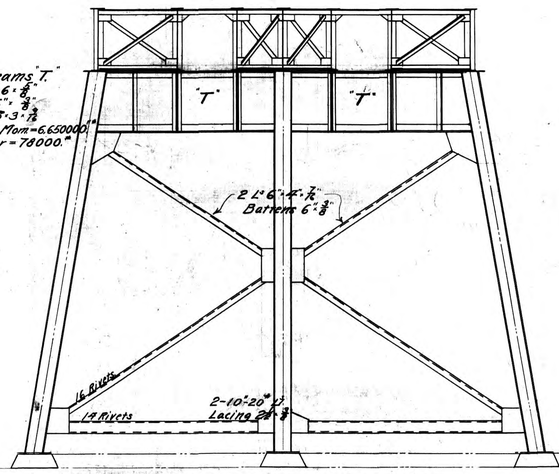
Section Showing Bracing in Bent "10

Floor Beams "U"
Flange L⁵ 6·6·⅞
Web Pl. 56"·⅜"
Stiffeners 5·3·½
Max. Bending Mom. = 5000,000."
" End Shear = 60000."

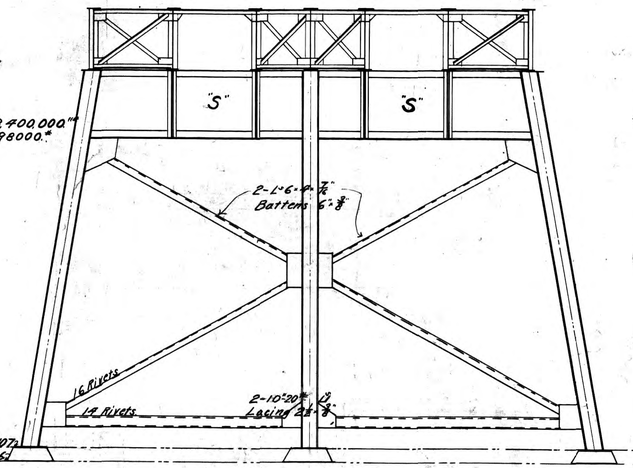


Section Showing Bracing in Bent "11

Floor Beams "T"
Flange L⁵ 6·6·⅞
Web Pl. 56"·⅜"
Stiffeners 5·3·½
Max. Bending Mom = 6650000."
" End Shear = 78000."



Floor Beams "S"
Flange L⁵ 6·6·⅞
Web Pl. 64"·⅜"
Stiffeners 5·3·½
Max. Bending Mom. = 8400,000."
" End Shear = 98000."

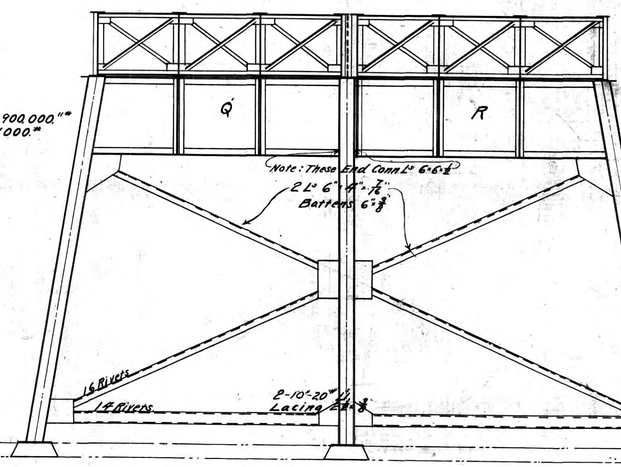


Elevation top of Cast Shoes = 107.2
" " " Footings = 106.2

Section Showing Bracing in Bent "12

Section Showing Bracing in Bent "13

Floor Beams "Q"
Flange L⁵ 6·6·⅞
Web Pl. 72"·⅜"
Stiffeners 5·3·½
Max Bending Mom. = 11,900,000."
" End Shear = 141000."



Floor Beam "R"
Flange L⁵ 6·6·⅞
Web Pl. 72"·⅜"
Stiffeners 5·3·½
Max Bending Mom = 10300000
" End Shear = 235000

Section Showing Bracing in Bent "14

Note All Sections taken Looking East

Column Sections Bents "8 to "14

Make up of Columns					Make up of Columns				
Bent	Col.	I-Beam	Channels	Plates	Bent	Col.	I-Beam	Channels	Plates
8	N	1-15"-42#	2-15"-33#	2-12"·½"	12	N	1-15"-42#	2-15"-40#	None.
8	S	DO	2-15"-33#	2-12"·⅜"	12	M	DO	2-15"-33#	2-12"·½"
9	N	"	2-15"-40#	2-12"·½"	12	S	"	2-15"-33#	None
9	S	"	2-15"-33#	2-12"·⅜"	13	N	"	2-15"-33#	2-12"·⅜"
10	N	"	2-15"-40#	2-12"·½"	13	M	"	2-15"-33#	2-12"·½"
10	S	"	2-15"-33#	2-12"·½"	13	S	"	2-15"-40#	None
11	N	"	2-15"-40#	None.	14	N	"	2-15"-33#	2-12"·⅜"
11	M	"	2-15"-33#	2-12"·⅜"	14	M	"	2-15"-40#	2-12"·½"
11	S	"	2-15"-33#	None.	14	S	"	2-15"-40#	None.

Approved:-
H. J. Pfeifer
First Asst. Engineer

Approved:-
Robt. Moore
Consulting Engineer

St. Louis, Mo. June 20-1902.

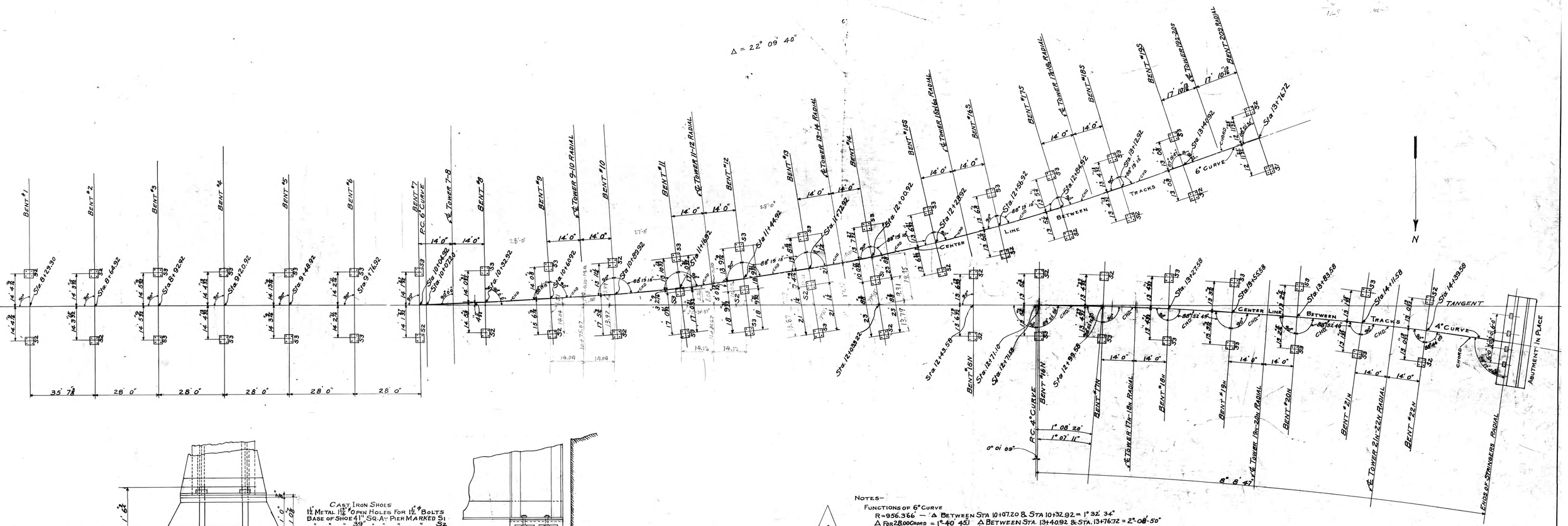
Revis. Aug. 1902

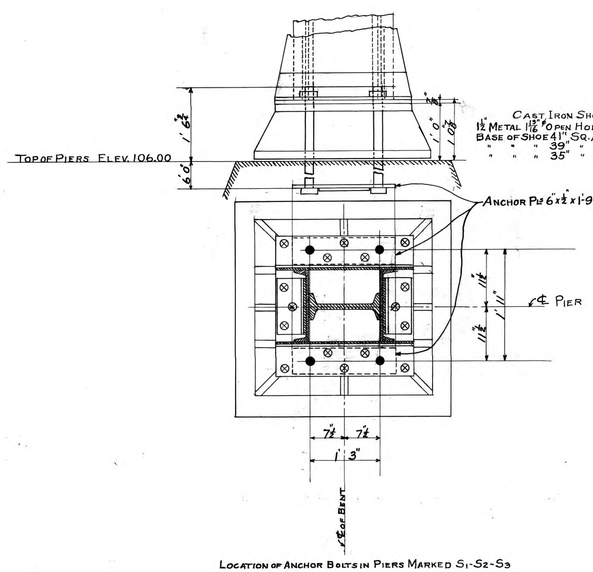
ST. LOUIS MERCHANTS TERMINAL RY. CO.
PLAN OF STEELWORK
WEST APPROACH TO MERCHANTS BRIDGE.
Elevs. Bents 8 to 14 Inclusive
Scale ½" = 1'

Brenneke & Fay Engineering Engineers.
St. Louis February 1902.

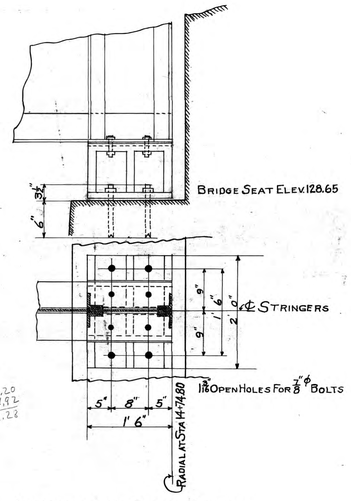
7

9008

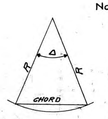




LOCATION OF ANCHOR BOLTS IN PIERS MARKED S1-S2-S3



LOCATION OF ANCHOR BOLTS AT ABUTMENT



NOTES-

FUNCTIONS OF 6° CURVE
R = 956.366' — Δ BETWEEN STA 10+07.20 & STA 10+32.92 = 1° 32' 34"
Δ FOR 28.00 CHORD = 1° 40' 45" Δ BETWEEN STA. 13+40.92 & STA. 13+76.72 = 2° 08' 50"
TOTAL CENTRAL ANGLE = 22° 09' 40"

FUNCTIONS OF 4° CURVE
R = 1432.6852 — Δ BETWEEN STA 12+71.10 & STA. 12+99.58 = 1° 08' 20"
Δ (FOR 28.00 CHORD) = 1° 07' 11" Δ BETWEEN STA 14+39.58 & 14+74.80 = 1° 24' 31"
TOTAL CENTRAL ANGLE = 8° 08' 47"

DISTANCES 28-0" ETC. BETWEEN TOWERS AND BENTS MEASURED ON CHORD
TOP OF MASONRY LEVEL ELEV = 106.00
ANCHOR BOLTS FURNISHED BY FORT PITT BRIDGE WORKS AND SET BY CUSTOMER ACCORDING TO THIS PLAN
OFFSET DUE TO BATTER CALCULATED FROM UNDER SIDE OF CAP PL. TO TOP SIDE OF BASE PL.
GRADE 1.53% THROUGHOUT.
ON STRAIGHT TRACK BENTS ARE PERPENDICULAR TO TANGENT
ON CURVES BENTS ARE PERPENDICULAR TO TOWER CHORDS
EXCEPT BENTS 3S & 4N WHICH ARE PERPENDICULAR TO TANGENT,
BENT #20S WHICH IS RADIAL AND BENT #19S WHICH IS PARALLEL TO BENT 20S

10+07.20
10+32.92
2.22

ST LOUIS MERCHANTS TERMINAL RY. CO.
MASONRY PLAN
WEST APPROACH TO MERCHANTS BRIDGE
Brenneke & Fay Engineers

FORT PITT BRIDGE WORKS
OF PITTSBURG PA
JULY 1 1902 H.C.D.

REVISED 9-8-02

C 721 #1.

Traced from blue print May 1933. [illegible]

Approved by

Z-1906

One Sole Plate 17SA.

" " " 17SB.
" " " 15SA (same as 17SA.)
" " " 13A.
" " " 13C (same as 17SB.)
" " " 13D (" " 17SA.)
" " " 13E.
" " " 11A.
" " " 11E (same as
" " " 9A (" "
" " " 9C.

For 17SA	1'-3"
" 17SB	10"
" 13A	1'-5"
" 13E	1'-1"
" 11A	1'-4"
" 9C	1'-0"

For 17SA, 17SB, 13A and 11A: 5/16"
For 13E and 9C: 3/8"

13"x 1" pl. x 1'-3" planed to 13" x 5/16" to 27/32" for 17SA.
13" x 15/16" x 10" " " 13" x 5/16" to 25/32" " 17SB.
13" x 15/16" x 1'-5" " " 13" x 5/16" to 7/8" " 13A.
13" x 15/16" x 1'-1" " " 13" x 5/16" to 23/32" " 13E.
13" x 15/16" x 1'-4" " " 13" x 5/16" to 29/32" " 11A.
13" x 15/16" x 1'-0" " " 13" x 5/16" to 25/32" " 9C.

Girder span east of Bent 15S and adjoining 126'-0" truss span over Ferry St.

NOTE TO ERECTOR:- All sole plates at expansion ends of stringers should be riveted securely to stringers. To this end, new sole plates are made longer, where necessary, than present ones.

In some cases, as for sole plate 17SB, (bent 17S) and 3B and 3C, (bent 3) it will be necessary to burn off a small amount of the horizontal legs of the bottom flange L of end cross frames to drive these rivets.

In some other cases, as for sole plate HGE (bent H) it will be necessary to burn off the end of the bottom flange, cover plate of the stringer to clear new sole plate.

14" x 7/16" to 5/8" to 14" x 1/2" to 5/8"
14" x 11/16" pl. x 1'-2 11/16" " " 14" x 5/8" to 11/16" " FGE.
14" x 1" pl. x 1'-2 7/16" " " 14" x 5/8" to 11/16" " CBF.
14" x 1" pl. x 1'-2 7/16" " " 14" x 5/8" to 11/16" " for HGF.
14" x 1" pl. x 1'-4" planed to 14" x 5/8" to 7/8"

15/16" x 2 1/2" slotted holes

For 5A	1'-0"
" 5B	11"
" 3B	9 1/16"
" 5A	1'-3"
" 5B	1'-2"
" 3B	1'-0"

13" x 1" pl. x 1'-3" planed to 13" x 5/16" to 27/32" for 5A.
13" x 1" " x 1'-2" " " 13" x 5/16" to 27/32" " 5B.
13" x 15/16" " x 1'-0" " " 13" x 5/8" to 13/16" " 3B.

One Sole Plate 5A.

" " " 5B.
" " " 3A (same as 5A.)
" " " 3B.
" " " 3C (same as 3B.)
" " " 3D (" " 5A.)

For 5A and 5B
" 3B

2-3" x 1/2" bars x 6 1/2" (about) Bolt for shipment
1-13" x 7/8" pl. x 1'-9"

One Bearing Plate FB13N.

One Sole Plate HKF
" " " FGF.
" " " DEF.
" " " CDF.
Alike.

One Sole Plate HGF.
" " " FGE
" " " DEE (same as FGE.)

One Sole Plate FEE.
" " " DCE (same as FEE.)

One Sole Plate CBF.

For HF only
For HF only
For HF only
For HF only
16" x 3/4" pl. x 1'-6"

3 Bearing Plates HF
1 " " FF.
2 " " DE.
3 " " DF.
2 " " CF.
Alike.

10. NOTE that plates HF only have corners clipped; remaining plates have square corners.

Field rivets.
(Do not ship from this list.)

No.	Size.	Head.	Grip.	Length.	Location.
20	7/8"	Butt'n.	1 3/16"	3 3/8"	Sole plates 17SA, 15SA, 13D, 13E, 11A, 9A, 5A, 5B, 3A and 3D to stringers.
8	"	"	1 5/16"	3"	" " 17SB, 13C, 3B and 3C to stringers.
18	"	"	1 9/16"	3 1/4"	" " 13A, 11E, 9C, HGF, FEE, DCE and CBF to stringers.
4	"	"	2"	3 7/16"	Bearing plate FB13N to cross girders.
7	"	"	1 9/16"	3 3/4"	" " " " " "
30	"	C'sk.	3"	5"	" " HF, FF, DE, DF and CF to cross girders.
4	"	Butt'n.	1 1/16"	2 3/4"	Sole plates FGE and DEE to stringers.

Required.

One each of following sole plates:- 17SA, 17SB, 15SA, 13A, 13C, 13D, 13E, 11A, 11E, 9A, 9C, 5A, 5B, 3A, 3B, 3C, 3D, HKF, FGF, DEF, CDF, HGF, FGE, DEE, CBF, FEE and DCE.
One bearing plate FB13N, 3 bearing plates HF, 2 bearing plates DE, 3 bearing plates DF, 2 bearing plates CF, 1 bearing plate FF.
4-48" x 3/4" plates x 3'-0" (plain.)
4-4" x 3 5/8" x 1/2" x 12'-0" (plain.)
4-3 1/2" x 3 5/8" x 11/16" x 9'-0" (" .)
20-4" x 3 5/8" x 1/2" x 10'-0" (plain.)
6-5" x 3 1/2" x 5/8" L x 3'-0" (" .)

Rivets as per following shipping list.

No.	Size.	Head.	Grip.	Length.
10	7/8"	Butt'n.	1 1/16"	2 3/4"
15	"	"	1 5/16"	3"
30	"	"	1 9/16"	3 1/4"
30	"	"	1 13/16"	3 1/4"

No.	Size.	Head.	Grip.	Length.
10	7/8"	Butt'n.	1 9/16"	3 3/4"
10	"	"	1 13/16"	3 3/4"
40	"	C'sk.	2"	3"

Bent 14, Bent 15N, Bent 16N, Bent 17N, Bent 18N, Bent 19N, Bent 20N, Bent 21N, Bent 22N, Bent 1S, Bent 2S, Bent 3S, Bent 4S, Bent 5S, Bent 6S, Bent 7S, Bent 8S, Bent 9S, Bent 10S, Bent 11S, Bent 12S, Bent 13S, Bent 14S

Bent 1, Bent 2, Bent 3, Bent 4, Bent 5, Bent 6, Bent 7, Bent 8, Bent 9, Bent 10, Bent 11, Bent 12, Bent 13, Bent 14

Bent B, Bent C, Bent D, Bent E, Bent F, Bent G, Bent H, Bent K, Bent 1

NOTE. Details for sole and bearing plates at this point given on sketch sheet dated Mar. 6, 1926 filed in "bridge portfolio."

All holes, except slotted holes, to be punched or drilled 11/16" in the shop and reamed to 15/16" in the field after assembling. Slotted holes to be made as dimensions given on above details in the shop. Material and workmanship to be in accordance with American Railway Engineering Association General Specification for Steel Railway Bridges dated 1920. Machined surfaces to have one coat of white lead and tallow. All other surfaces to have one coat of Mamolith Paint Co's Special Primer #326.

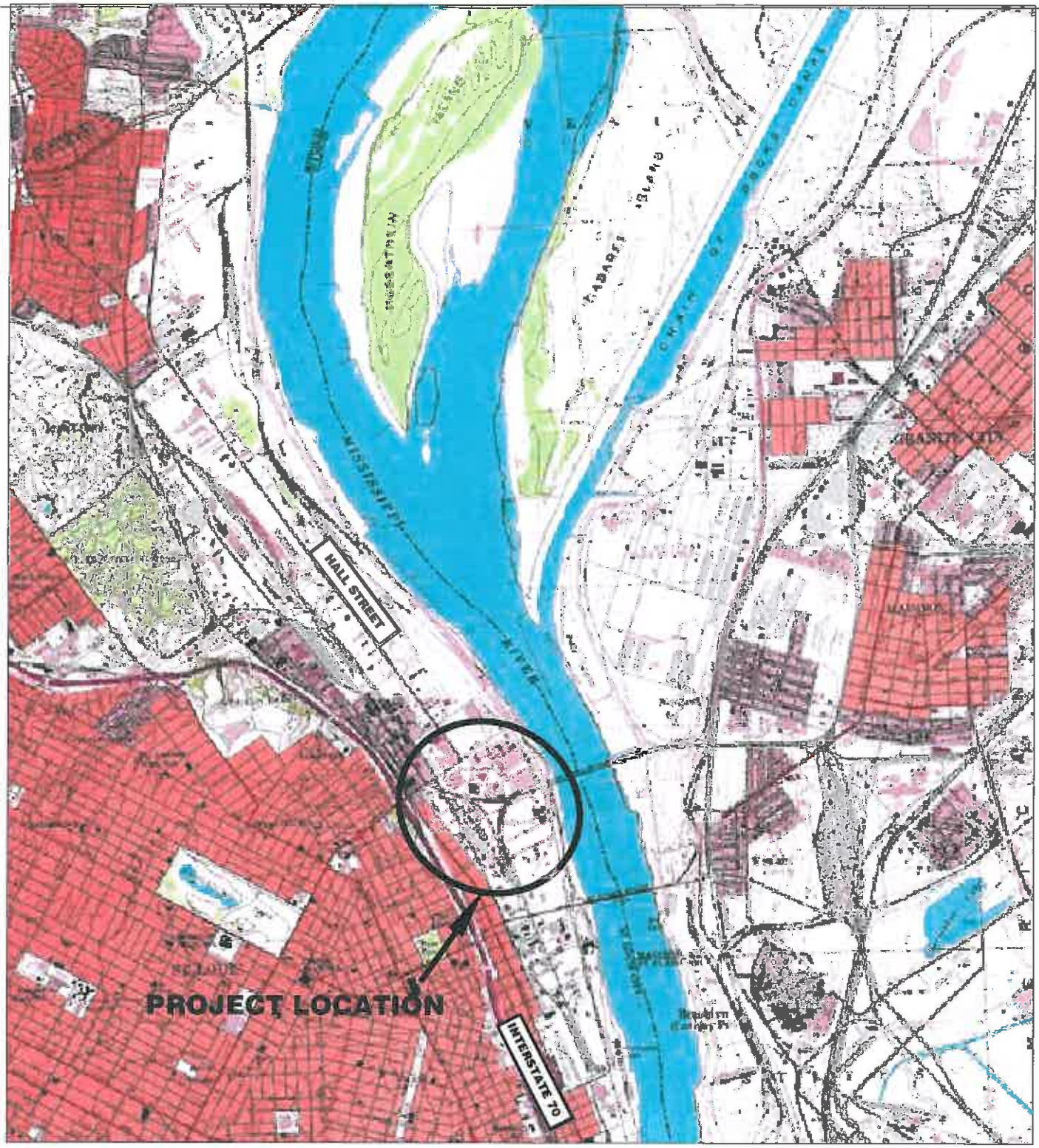
Merchants' Bridge.
West Approach.
Bearing plates, sole plates, etc., etc.
St. Louis, Mo. Feb. 26, 1926.

9061 - Z.

EXHIBIT B

GEOTECHNICAL INVESTIGATION INFORMATION

(FOR INFORMATION ONLY)



NOT TO SCALE

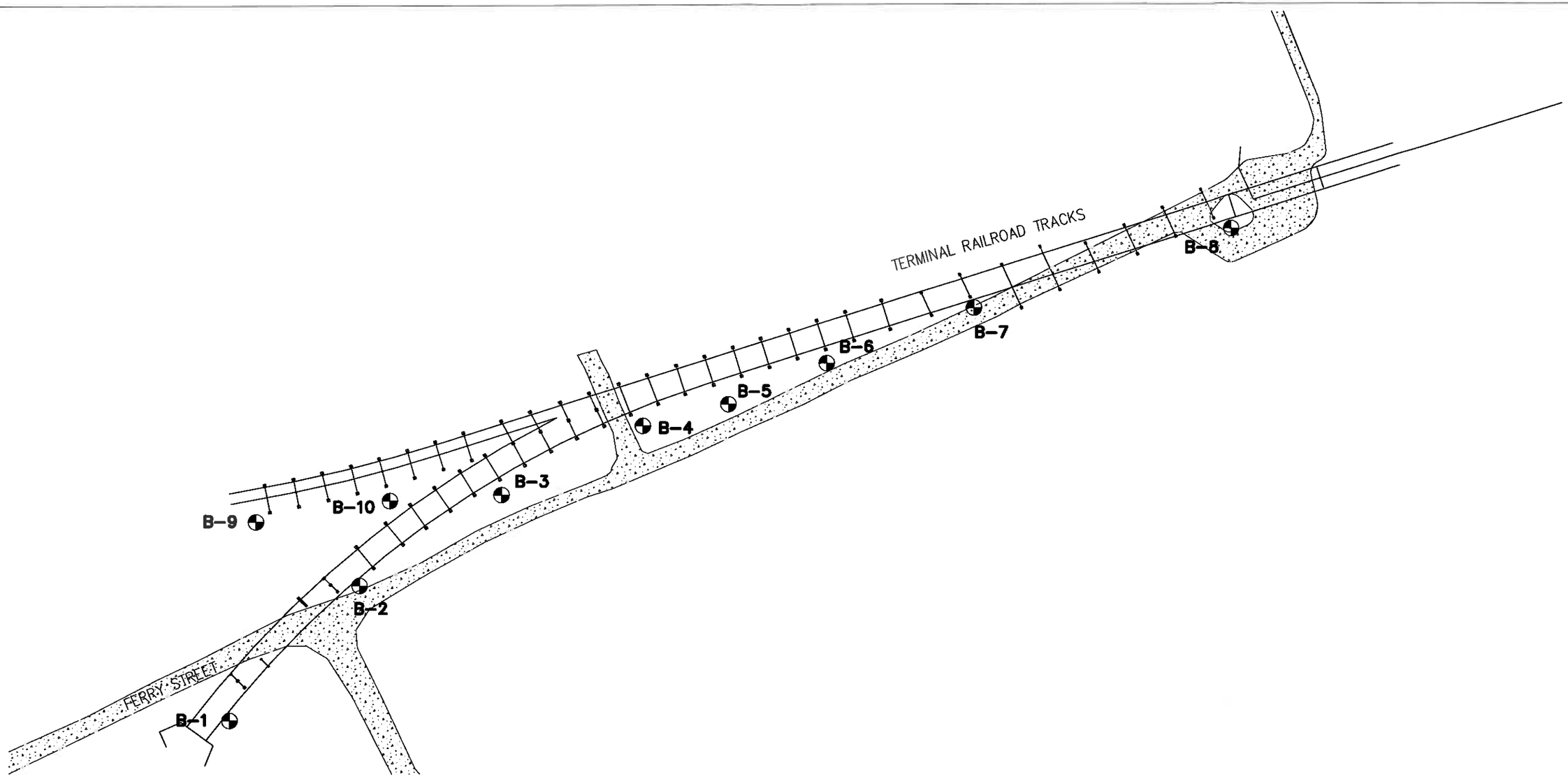
N

NOTE:
DRAWING PREPARED FROM AN IMAGE OBTAINED FROM TOPOQUEST.COM ON 10/4/2012

TSI
engineering, inc.
5850 ARSENAL STREET
ST. LOUIS, MISSOURI 63139

VICINITY MAP
REPLACEMENT OF MERCHANTS BRIDGE
WEST APPROACH
ST. LOUIS, MISSOURI

Drawn By: JAS	Checked By: TEO	
Project No. 20121080.01	Date: 10/4/12	Figure 1



LEGEND

B–1 APPROXIMATE BORING LOCATION AND NUMBER

NOTE: THIS PLAN WAS PREPARED FROM A DRAWING RECEIVED FROM EDSI ON 11–6–12.

N

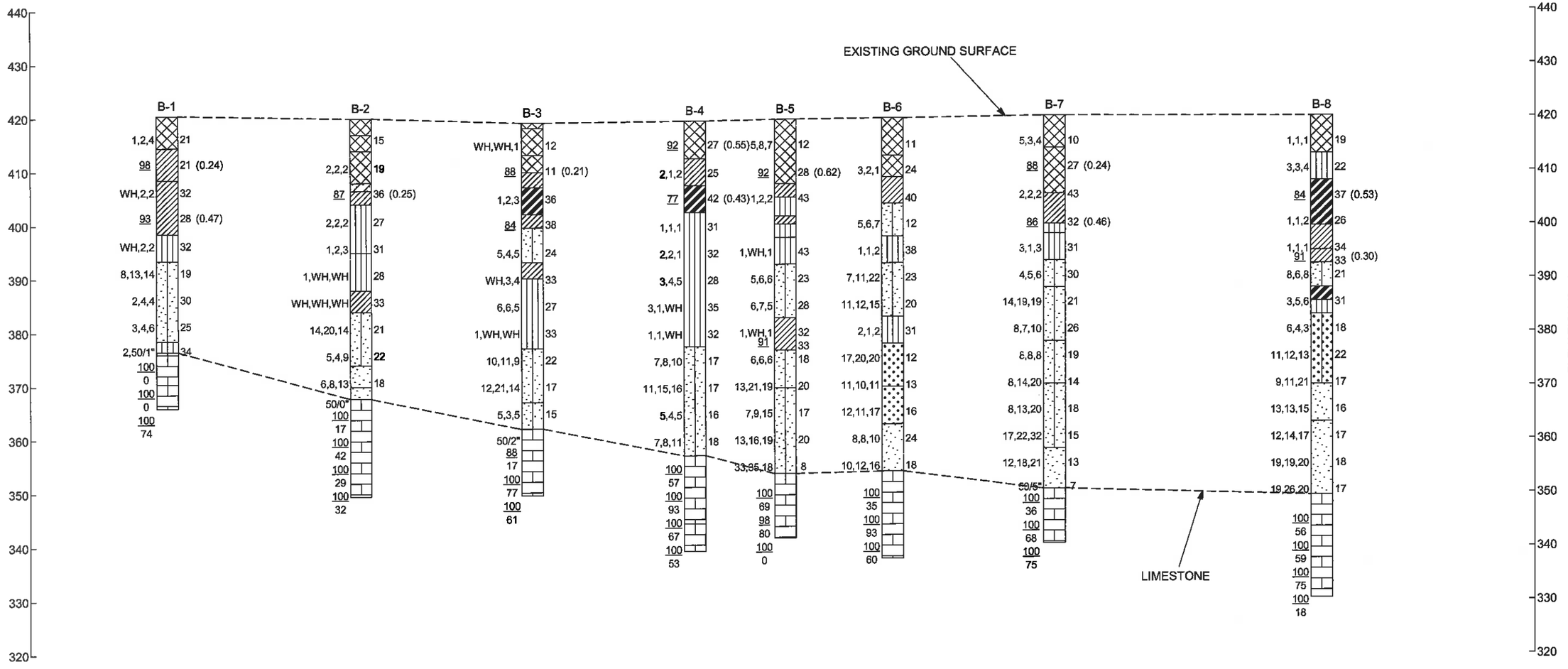
0 100 200 FT.

SCALE: 1" = 100'

TSI engineering, inc.
5850 ARSENAL ST.
ST. LOUIS, MISSOURI 63139

SITE AND BORING LOCATION PLAN
REPLACEMENT OF MERCHANTS BRIDGE
WEST APPROACH
ST. LOUIS, MO

Drawn By: JAS	Checked By: TEO	
Project No. 20121080.01	Date: 11/7/12	Figure 2



NOTES:
1. Horizontal scale is approximate.
2. The existing ground surface shown is a line extended between surveyed ground surface elevations at boring locations, and does not necessarily reflect the actual ground surface between borings.
3. The generalized stratigraphy shown is an interpretation of subsurface conditions based on field and laboratory test results on samples recovered at the indicated boring locations. The conditions between the borings could vary significantly from those shown.
4. Lines showing strata breaks are intended to show estimated correlations of strata from boring to boring, not an interpretation of conditions between borings.
5. See Subsurface Profile Legend, Figure 4, for explanation of boring log data.

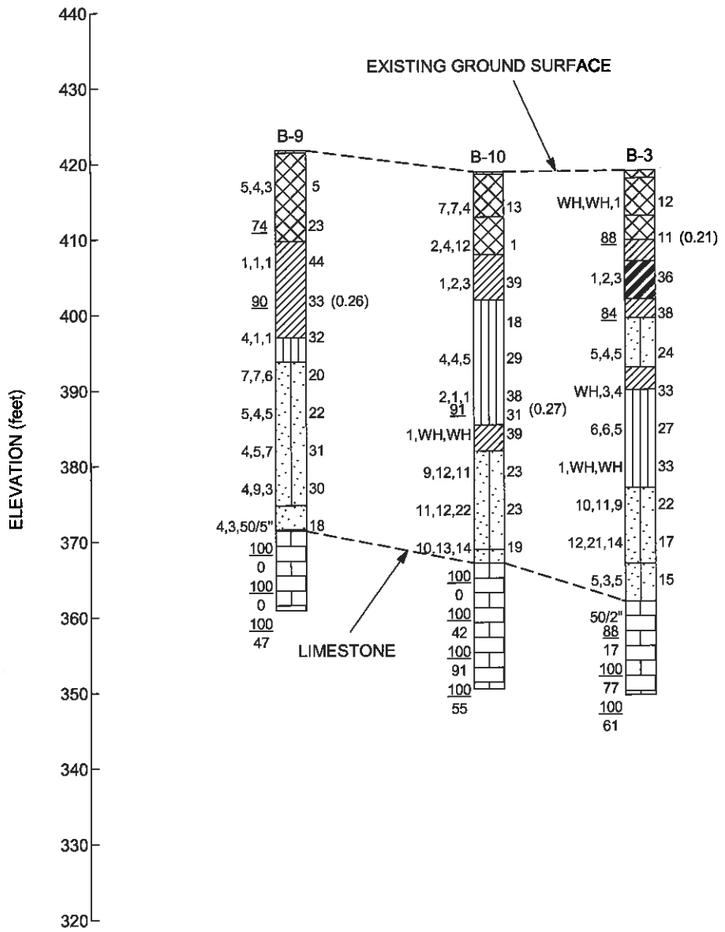
TSi engineering, inc.
5850 ARSENAL STREET
ST. LOUIS, MISSOURI 63139

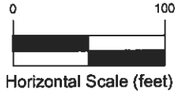
SUBSURFACE PROFILE

REPLACEMENT OF MERCHANTS BRIDGE
WEST APPROACH
ST. LOUIS, MO

Prepared By: JAS	Checked By: TEO	
Project No. 20121080.01	Date:11-8-12	Figure 3.1

TSI FENCE WITH LAB MERCHANTS BRIDGE LOGS.GPJ SOIL_B~1.GDT 11/8/12





NOTES:
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2. The existing ground surface shown is a line extended between surveyed ground surface elevations at boring locations, and does not necessarily reflect the actual ground surface between borings.
3. The generalized stratigraphy shown is an interpretation of subsurface conditions based on field and laboratory test results on samples recovered at the indicated boring locations. The conditions between the borings could vary significantly from those shown.
4. Lines showing strata breaks are intended to show estimated correlations of strata from boring to boring, not an interpretation of conditions between borings.
5. See Subsurface Profile Legend, Figure 4, for explanation of boring log data.

TSI engineering, inc.
5850 ARSENAL STREET
ST. LOUIS, MISSOURI 63139

SUBSURFACE PROFILE

REPLACEMENT OF MERCHANTS BRIDGE
WEST APPROACH
ST. LOUIS, MO

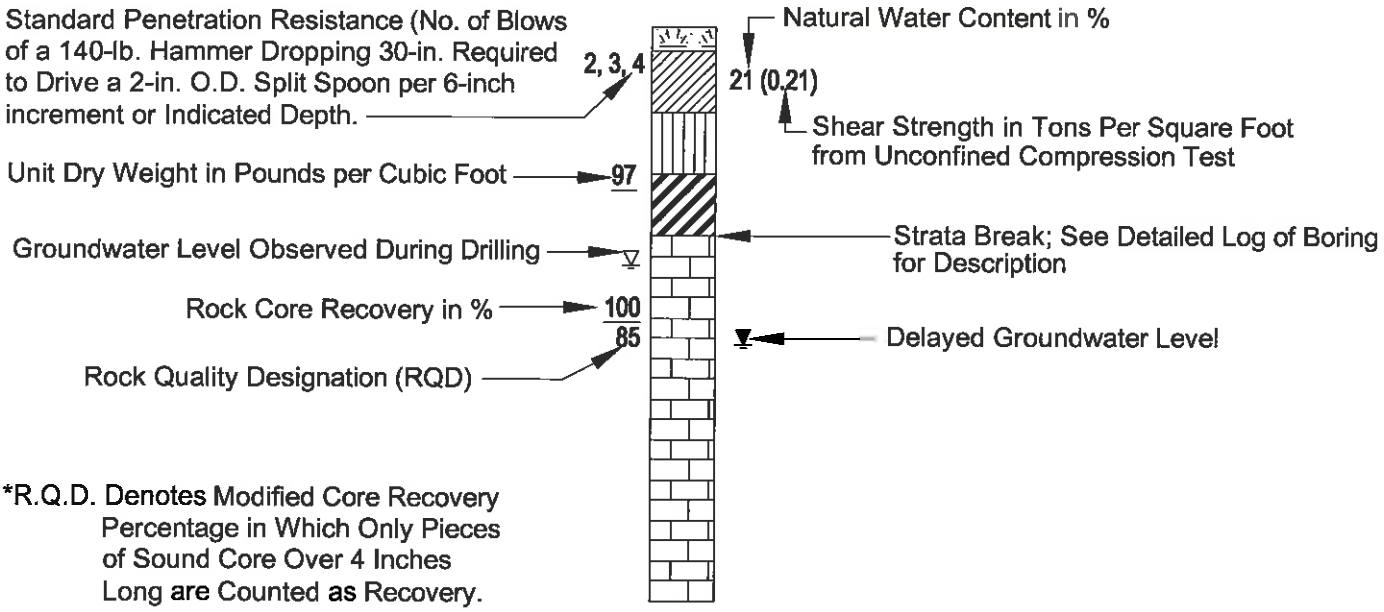
Prepared By: JAS	Checked By: TEO	
Project No. 20121080.01	Date:11-8-12	Figure 3.2

TSI FENCE WITH LAB MERCHANTS BRIDGE LOGS.GPJ SOIL_B-1.GDT 11/8/12

KEY TO GRAPHIC SYMBOLS

- Topsoil
- Asphaltic Concrete
- Flyash & Cinders
- Fill
- Lean Clay (CL)
- SILT (ML)
- Fat CLAY (CH)
- Poorly-graded SAND (SP)
- Silty SAND (SM)
- Clayey SAND (SC)
- Well-graded SAND (SW)
- Well-graded Silty SAND (SW-SM)
- Poorly-graded GRAVEL (GP)
- Poorly-graded SAND (SP-SM)
- Clayey GRAVEL (GC)
- Shaley CLAY
- Limey CLAYSTONE
- SANDSTONE
- SHALE
- LIMESTONE

KEY TO TEST DATA



*R.Q.D. Denotes Modified Core Recovery Percentage in Which Only Pieces of Sound Core Over 4 Inches Long are Counted as Recovery.

TSI engineering, Inc.
[illegible]

KEY TO SUBSURFACE PROFILES
REPLACEMENT OF MERCHANTS BRIDGE
WEST APPROACH
ST. LOUIS COUNTY, MISSOURI

Drawn By: JAS	Checked By: WJG	
Project No. 20121080.01	Date: 11/8/12	Figure 4

LOG OF BORING NO. B-1

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **420.5**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
5		SS-1		Brown and gray, lean CLAY (CL), trace brick, limestone pieces, sand (FILL)	33		1 2 4				21			
10		ST-2		Brown and gray, lean CLAY (CL)	67			0.50	0.24	98	21			
15		SS-3		Gray, lean CLAY (CL), trace wood pieces	100		WH 2 2	1.00			32	42	25	17
20		ST-4			100			2.00	0.47	93	28			
25		SS-5		Gray, SILT (ML)	100		WH 2 2	0.50			32			

Completion Depth: 54.50
Date Boring Started: 9/24/12
Date Boring Completed: 9/25/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

Continued Next Page

LOG OF BORING NO. B-1

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **420.5**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, SILT (ML)*(continued)*										
				Gray, silty fine SAND (SM)										
30		SS-6		(13% passing No. 200 sieve)	100		8 13 14				19			
35		SS-7			100		2 4 4				30			
40		SS-8			100		3 4 6				25			
				Gray, sandy SILT (ML)										
		SS-9			83		2 50/1"				34			
				Gray, weathered LIMESTONE										
45		RUN1		LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin bedded - fractured from 45.8 to 48.0 ft.	100	0								
		RUN2		- horizontal fracture at 49.2 ft. - 2.0" soft, gray clay seam at 48.7 ft.	100	0								
50														

Completion Depth: 54.50
Date Boring Started: 9/24/12
Date Boring Completed: 9/25/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

Continued Next Page

LOG OF BORING NO. B-1

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **420.5**

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		RUN3		LIMESTONE, cherty, gray, hard, slightly weathered, finely to medium crystalline, medium to thick bedded - healed vertical fracture from 50.0 to 50.5 ft. - moderately weathered from 51.2 to 51.3 ft. - vertical fracture from 53.8 to 54.5 ft.	100	74								
55				Boring terminated at 54.5 ft.										
60														
65														
70														
75														

Completion Depth: 54.50
Date Boring Started: 9/24/12
Date Boring Completed: 9/25/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

LOG OF BORING NO. B-10

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX

Surface El.: **418.9**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown, lean CLAY (CL), with grass and roots										
				Brown, SILT (ML), with crushed limestone, trace brick pieces (FILL)										
5		SS-1			17		7 7 4				13			
				Brown, fine to medium SAND (SP), trace clay (FILL)										
10		SS-2			44		2 4 12				1			
				Brown to gray, lean CLAY (CL)										
15		SS-3			100		1 2 3	1.50			39			
				Brown and gray, SILT (ML)										
20		ST-4			96			1.50			18	25	25	NP
25		SS-5			100		4 4	0.75			29			

Completion Depth: 68.40
Date Boring Started: 10/9/12
Date Boring Completed: 10/10/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-10

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **418.9**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown and gray, SILT (ML)*(continued)*			5							
30		SS-6		- gray below 29.0 ft.	100		2 1 1	<0.25			38			
		ST-7			46				0.27	91	31			
				Gray, lean CLAY (CL)										
35		SS-8			100		1 WH WH	<0.25			39			
				Gray, fine SAND (SP-SM), trace silt										
40		SS-9		(9% passing No. 200 sieve)	50		9 12 11				23			
45		SS-10		- fine to medium below 44.0 ft.	100		11 12 22				23			
50		SS-11			100		10 13				19			

Completion Depth: 68.40
Date Boring Started: 10/9/12
Date Boring Completed: 10/10/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-10

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **418.9**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, fine to coarse SAND (SP-SM)			14							
55		RUN1		LIMESTONE, gray, moderately hard to hard, moderately weathered, very finely crystalline, banded to thin bedded - highly fractured from 53.2 ft. to 53.3 ft. - 45 degree fractures at 53.0 and 53.7 ft. - thin to medium bedded, slightly to moderately weathered below 55.5 ft.	100	0								
		RUN2		- highly fractured from 54.2 ft. to 54.7 ft. - 1.0" soft gray, shale seam at 56.5 ft. - 45 degree fracture at 57.7 ft. - shaley from 58.8 ft. to 59.4 ft.	100	42								
60				- medium crystalline, slightly weathered below 59.4 ft. - with chert nodules from 59.4 ft. to 62.0 ft.										
		RUN3		- 1.0" soft brown clay seam at 61.1 ft. - 1.0" soft gray shale seam at 62.9 ft.	100	91								
65		RUN4			100	55								
				Boring terminated at 68.4 ft.										
70														
75														

Completion Depth: 68.40
Date Boring Started: 10/9/12
Date Boring Completed: 10/10/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

LOG OF BORING NO. B-2

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.9**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, lean CLAY (CL), with limestone pieces (FILL)										
5		ST-1		Gray, sandy lean CLAY (CL), with limestone pieces (FILL)	42						15			
				Brown and gray, lean CLAY (CL) (Possible FILL)										
10		SS-2			100		2 2 2	3.50			19			
				Gray, clayey fine SAND (SC)										
15		ST-3		Gray, lean CLAY (CL)	100			1.50	0.25	87	36			
				Gray, SILT (ML)										
20		SS-4			100		2 2 2	0.50			27	36	NP	36
25		SS-5		- brown and gray, more clayey below 24.0 ft.	100		1 2 3	0.50			31			

Completion Depth: 70.00
Date Boring Started: 9/26/12
Date Boring Completed: 9/26/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-2

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.9**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown and gray, SILT (ML)										
30		SS-6		- dark gray, trace sand below 28.5 ft.	50		1 WH WH				28			
				Gray, lean CLAY (CL), trace sand										
35		SS-7			100		WH WH WH	0.25			33	36	24	12
				Gray, silty fine SAND (SM)										
		SS-8		(15% passing No. 200 sieve)	100		14 20 14				21			
40														
		SS-9		(Grain Size Analysis) - fine to medium below 44.0 ft.	61		5 4 9				22			
45				Gray, fine to medium SAND (SP)										
		SS-10		- fine to coarse below 48.5 ft.	100		6 8 13				18			
50														

Completion Depth: 70.00
Date Boring Started: 9/26/12
Date Boring Completed: 9/26/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-2

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX

Surface El.: **419.9**

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, fine to coarse SAND (SP)										
		SS-11		LIMESTONE, gray moderately hard, slightly to moderately weathered, very finely crystalline, thin bedded			50/0"							
		RUN1		- highly fractured from 53.0 to 53.3 ft.	100	17								
55				- with clay partings from 53.7 to 54.4 ft.										
				- finely crystalline, thin to medium bedded below 55.0 ft.										
		RUN2			100	42								
60														
		RUN3			100	29								
				- with clay partings from 62.8 to 63.3 ft.										
65				- slightly weathered below 65.0 ft.										
		RUN4			100	32								
70				Boring terminated at 70.4 ft.										
75														

Completion Depth: 70.00
Date Boring Started: 9/26/12
Date Boring Completed: 9/26/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

LOG OF BORING NO. B-3

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.0**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown, silty SAND (SM), and LIMESTONE pieces (FILL)										
				Brown, silty SAND (SM), trace gravel, clay (FILL)										
5		SS-1			33		WH WH 1				12			
				Brown and black, sandy lean CLAY (CL), with brick fragments, trace gravel (FILL)										
		ST-2			71				0.21	88	11			
10				Brownish gray, lean CLAY (CL)										
				Grayish brown, fat CLAY (CH)										
15		SS-3			100		1 2 3				36			
				Gray, lean CLAY (CL), with fine sand										
		ST-4			100					84	38	34	21	13
20				Grayish brown, silty fine SAND (SM)										
		SS-5		(Grain Size Analysis)	100		5 4 5				24			
25														

Completion Depth: 69.40
Date Boring Started: 9/26/12
Date Boring Completed: 9/27/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-3

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.0**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Grayish brown, silty fine SAND (SM)*(continued)*										
				Gray, lean CLAY (CL)										
							WH							
30		SS-6		Gray, SILT (ML)	100		3 4				33			
		SS-7		- fine, sandy from 33.5 to 38.0 ft.	100		6 6 5				27			
35														
		SS-8			100		1 WH WH				33	30	29	1
40														
				Brown to gray, fine SAND (SP-SM)										
		SS-9		(Grain Size Analysis)	100		10 11 9				22			
45														
		SS-10			100		12 21 14				17			
50														

Completion Depth: 69.40
Date Boring Started: 9/26/12
Date Boring Completed: 9/27/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-3

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.0**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown to gray, fine SAND (SP-SM)*(continued)*										
				Gray, medium to coarse SAND (SP-SM), trace gravel										
55		SS-11			100		5 3 5				15			
		SS-12		LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin to medium bedded	0		50/2"							
60		RUN1			88	17								
				- 2.0" core loss due to clay seam at 60.6 ft. - 1.0" core loss due to clay seam at 61.2 ft. - massive bedded from 63.6 to 65.1 ft. - highly weathered from 62.6 to 62.8 ft. - with chert nodules from 61.4 to 63.4 ft.										
		RUN2			100	77								
65				- quartz nodule at 65.2 ft.										
		RUN3			100	61								
				- clay partings at 68.0, 68.1, 68.7 and 69.0 ft.										
70				Boring terminated at 69.4 ft.										
75														

Completion Depth:	69.40
Date Boring Started:	9/26/12
Date Boring Completed:	9/27/12
Engineer/Geologist:	JAS
Project No.:	20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

LOG OF BORING NO. B-4

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX

Surface El.: **419.2**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
5		ST-1		Brown, sandy lean CLAY (CL), with slag, brick pieces (FILL)	63				0.55	92	27			
10		SS-2		Grayish brown, lean CLAY (CL)	44		2 1 2	2.50			25			
15		ST-3		Brown, fat CLAY (CH)	75			1.50	0.43	77	42	65	27	38
20		SS-4		Grayish brown, SILT (ML)	100		1 1 1	<0.25			31			
25		SS-5			100		2 2				32	30	29	1

Completion Depth: 80.10
Date Boring Started: 9/27/12
Date Boring Completed: 9/28/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-4

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.2**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Grayish brown, SILT (ML)*(continued)*			1							
30		SS-6		- fine sandy below 29.0 ft. (67% passing No. 200 sieve)	100		3 4 5				28			
35		SS-7			100		3 1 WH				35			
40		SS-8			100		1 1 WH				32			
				Gray, fine to coarse SAND (SP-SM)										
45		SS-9		(Grain Size Analysis)	100		7 8 10				17			
50		SS-10			100		11 15				17			

Completion Depth: 80.10
Date Boring Started: 9/27/12
Date Boring Completed: 9/28/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-4

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.2**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, fine to coarse SAND (SP-SM)*(continued)*			16							
55		SS-11		- more coarse below 54.0 ft.	33		5 4 5				16			
60		SS-12		- fine to medium below 59.0 ft.	100		7 8 11				18			
65		RUN1		LIMESTONE, gray, moderately hard to hard, moderately weathered, finely crystalline, thin to medium bedded - cherty from 63.5 to 64.9 ft. - 1/8" soft, gray clay seam at 64.9 ft. - slightly weathered below 64.9 ft. - very finely crystalline, medium to thick bedded below 66.0 ft. - with chert nodules from 66.7 to 67.5 ft.	100	57								
		RUN2			100	93								
70				- thin to medium bedded below 71.0 ft.										
		RUN3			100	67								
75														

Completion Depth: 80.10
Date Boring Started: 9/27/12
Date Boring Completed: 9/28/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-4

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.2**

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
80		RUN4		LIMESTONE, gray, moderately hard to hard, slightly weathered, very finely crystalline, thin to medium bedded - thin to medium bedded below 76.0 ft. - clay partings at 79.2 and 79.5 ft.	100	53								
				Boring terminated at 79.8 ft.										
85														
90														
95														
100														

Completion Depth: 80.10
Date Boring Started: 9/27/12
Date Boring Completed: 9/28/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

LOG OF BORING NO. B-5

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.5**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
5		SS-1		Brown to black, lean CLAY (CL), with rubber pieces, trace brick and glass pieces, sand (FILL)	100		5 8 7	1.50			12			
10		ST-2			63			1.00	0.62	92	28			
				Brown, lean CLAY (CL)			1							
15		SS-3		Brownish gray, SILT (ML)	100		2 2	1.25			43			
				Gray, lean CLAY (CL), trace fine sand										
20		ST-4		Brown, SILT (ML), with fine sand (Grain Size Analysis)	83									
				Gray, SILT (ML)										
25		SS-5			100		1 WH	0.50			43	41	27	14

Completion Depth: 78.00
Date Boring Started: 9/28/12
Date Boring Completed: 9/29/12
Engineer/Geologist: JAS/JAO
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-5

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.5**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, SILT (ML)*(continued)*			1							
30		SS-6		Brown, silty fine SAND (SM)	83		5 6 6				23			
35		SS-7		(Grain Size Analysis)	78		6 7 5				28			
40		SS-8		Gray, lean CLAY (CL), trace sand	100		1 WH 1	0.50			32			
		ST-9			54			0.50		91	33			
45		SS-10		Gray, fine to coarse SAND (SP-SM) (Grain Size Analysis)	50		6 6 6				18			
50		SS-11		- trace gravel below 49.0 ft.	67		13 21				20			

Completion Depth: 78.00
Date Boring Started: 9/28/12
Date Boring Completed: 9/29/12
Engineer/Geologist: JAS/JAO
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-5

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.5**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, fine to medium SAND (SP), trace gravel			19							
55		SS-12			78		7 9 15				17			
60		SS-13			67		13 16 19				20			
65		SS-14		- medium to coarse, with gravel below 64.0 ft.	72		33 35 18				8			
				LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin to medium bedded										
70		RUN1		- chert nodule at 69.4 ft. - 1.0" soft, gray clay seam at 70.9 ft. - thin to thick bedded below 71.6 ft. - healed vertical fracture from 71.2 to 71.6 ft.	100	69								
		RUN2			98	80								
75														

Completion Depth: 78.00
Date Boring Started: 9/28/12
Date Boring Completed: 9/29/12
Engineer/Geologist: JAS/JAO
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-5

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.5**

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		RUN3		LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin to medium bedded *(continued)*	100	0								
				Boring terminated at 78.0 ft.										
80														
85														
90														
95														
100														

Completion Depth: 78.00
Date Boring Started: 9/28/12
Date Boring Completed: 9/29/12
Engineer/Geologist: JAS/JAO
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

LOG OF BORING NO. B-6

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.7**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
5		ST-1		Brown, silty SAND (SM), trace brick and limestone pieces, fabric (FILL)	46			>4.50			11			
10		SS-2		Brown and gray, lean CLAY (CL), trace brick and slag pieces (FILL)	56		3 2 1	1.00			24			
15		ST-3		Grayish brown, lean CLAY (CL)	100			1.50			40			
20		SS-4		Grayish brown, silty fine SAND (SM) (48% passing No. 200 sieve)	100		5 6 7				12			
25		SS-5		Gray, SILT (ML)	100		1 1	<0.25			38	30	28	2

Completion Depth: 82.00
Date Boring Started: 10/1/12
Date Boring Completed: 10/6/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-6

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.7**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, SILT (ML)*(continued)*			2							
				Brown, silty fine SAND (SM)										
30		SS-6		(Grain Size Analysis)	100		7 11 22				23			
				- brownish gray below 32.0 ft.										
35		SS-7			100		11 12 15				20			
				Gray, fine sandy SILT (ML)										
40		SS-8			100		2 1 2	<0.25			31			
				Gray, fine to medium SAND (SW), trace silt, with gravel										
45		SS-9			100		17 20 20				12			
50		SS-10		(Grain Size Analysis) - fine to coarse below 49.0 ft.	56		11 10				13			

Completion Depth:	82.00
Date Boring Started:	10/1/12
Date Boring Completed:	10/6/12
Engineer/Geologist:	JAS
Project No.:	20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

LOG OF BORING NO. B-6

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.7**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, fine to coarse SAND (SW), trace silt, gravel			11							
55		SS-11			100		12 11 17				16			
				Gray, fine SAND (SP), trace silt										
60		SS-12			100		8 8 10				24			
65		SS-13		- fine to coarse below 64.0 ft.	44		10 12 16				18			
				LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin to medium bedded - highly fractured due to coring from 67.5 to 68.4 ft. - 1.0" soft, gray clay seam at 69.5 ft. - vertical fracture from 69.8 to 70.0 ft. - healed 45 degree fracture at 70.7 ft. - 45 degree fractures at 70.1 and 70.5 ft. - vertical fracture from 71.6 to 72.0 ft. - slightly weathered, medium to massive bedded below 72.0 ft. - 45 degree fracture at 73.0 ft.										
70		RUN1			100	35								
75		RUN2			100	93								

Completion Depth: 82.00
Date Boring Started: 10/1/12
Date Boring Completed: 10/6/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

LOG OF BORING NO. B-6

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **419.7**

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
80		RUN3		LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin to medium bedded *(continued)*	100	60								
				Boring terminated at 82.0 ft.										
85														
90														
95														
100														

Completion Depth: 82.00
Date Boring Started: 10/1/12
Date Boring Completed: 10/6/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

LOG OF BORING NO. B-7

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **420.1**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown to black, silty SAND (SM), with clay, concrete, and metal pieces (FILL)										
5		SS-1			33		5 3 4				10			
				Brown and gray, SILT (ML), with sand, limestone, brick pieces, trace clay (FILL)										
10		ST-2		(75% passing No. 200 sieve)	100			1.25	0.24	88	27			
							2	0.50						
15		SS-3		Gray, lean CLAY (CL)	100		2 2	1.00			43			
20		ST-4			67				0.46	86	32			
				Brown and gray, sandy SILT (ML), trace clay seams										
				Brown and gray, SILT (ML)										
25		SS-5		(99% passing No. 200 sieve)	100		3 1	<0.25			31			

Completion Depth: 79.80
Date Boring Started: 10/6/12
Date Boring Completed: 10/8/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-7

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **420.1**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown and gray, SILT (ML)*(continued)*			3							
				Gray, silty fine SAND (SM)										
30		SS-6			100		4 5 6				30			
				Gray-brown, fine SAND (SP-SM), trace silt										
35		SS-7		(7% passing No. 200 sieve)	100		14 19 19				21			
40		SS-8			67		8 7 10				26			
				Gray, fine to coarse SAND (SP-SM), trace silt										
45		SS-9		(Grain Size Analysis)	100		8 8 8				19			
50		SS-10		- trace limestone pieces from 49.0 to 50.5 ft.	100		8 14				14			

Completion Depth: 79.80
Date Boring Started: 10/6/12
Date Boring Completed: 10/8/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-7

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **420.1**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Gray, fine to coarse, SAND (SP-SM), trace silt, with limestone pieces			20							
55		SS-11		- fine to medium below 54.0 ft.	100		8 13 20				18			
60		SS-12			100		17 22 32				15			
				Gray, fine to coarse SAND (SP), with gravel										
65		SS-13		(Grain Size Analysis)	100		12 18 21				13			
		SS-14		- with gravel and limestone pieces below 69.0 ft.	100		50/5"				7			
70		RUN1		LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin to thick bedded	100	36								
		RUN2		- healed, vertical fracture from 72.0 to 72.8 ft. - 45 degree fracture at 72.9 ft. - healed, 45 degree fracture at 73.3 ft.	100	68								
75														

Completion Depth:	79.80
Date Boring Started:	10/6/12
Date Boring Completed:	10/8/12
Engineer/Geologist:	JAS
Project No.:	20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

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LOG OF BORING NO. B-7

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX

Surface El.: **420.1**

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		RUN3		LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin to thick bedded *(continued)* - horizontal fracture at 75.3 ft. - moderately weathered from 76.5 ft. to 77.5 ft. - massive bedded below 77.5 ft.	100	75								
80				Boring terminated at 79.8 ft.										
85														
90														
95														
100														

Completion Depth: 79.80
Date Boring Started: 10/6/12
Date Boring Completed: 10/8/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Mud rotary drilling began at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

LOG OF BORING NO. B-8

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **Approx. 420**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown, lean CLAY (CL), trace sand, limestone and coal pieces (FILL)										
5		SS-1			50		1 1 1	1.00			19			
				Brown, fine sandy SILT (ML)										
10		SS-2			100		3 3 4				22			
				Gray, fat CLAY (CH), trace sand										
15		ST-3		- fine sand seam at 15.0 ft.	83			1.75	0.53	84	37	52	23	29
				- gray and brown below 19.0 ft.										
20		SS-4			100		1 1 2	1.00			26			
				Gray, lean CLAY (CL)										
25		SS-5		- brown and gray below 24.0 ft.	100		1 1	1.25			34			

Completion Depth: 89.70
Date Boring Started: 10/8/12
Date Boring Completed: 10/9/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.
Boring moved east of staked location; ground surface elevation estimated.

The stratification lines represent approximate strata boundaries. In situations, the transition may be gradual.

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LOG OF BORING NO. B-8

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **Approx. 420**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		ST-6		Brown and gray, lean CLAY (CL) - trace fine sand below 26.0 ft.	83		1	1.00	0.30	91	33	30	22	8
30		SS-7		Gray, silty fine SAND (SM)	100		8 6 8				21			
				Gray, fat CLAY (CH)			3	0.25						
35		SS-8		Gray, fine sandy SILT (ML)	100		5 6				31			
40		SS-9		Brown, fine to coarse SAND (SW-SM), trace gravel (Grain Size Analysis)	100		6 4 3				18			
45		SS-10		- gray, fine to medium below 44.0 ft.	100		11 12 13				22			
50		SS-11			100		9 11				17			

Completion Depth: 89.70
Date Boring Started: 10/8/12
Date Boring Completed: 10/9/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.
Boring moved east of staked location; ground surface elevation estimated.

The stratification lines represent approximate strata boundaries. In situations, the transition may be gradual.

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LOG OF BORING NO. B-8

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **Approx. 420**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown, fine to medium SAND (SP), trace gravel			21							
				- trace gravel, limestone pieces below 52.0 ft.										
55		SS-12			100		13 13 15				16			
				Brown, fine to coarse SAND (SP), trace gravel										
				(Grain Size Analysis)										
60		SS-13			100		12 14 17				17			
65		SS-14			100		19 19 20				18			
70		SS-15			100		19 26 20				17			
				Weathered gray LIMESTONE										
75														

Completion Depth: 89.70
Date Boring Started: 10/8/12
Date Boring Completed: 10/9/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.
Boring moved east of staked location; ground surface elevation estimated.

The stratification lines represent approximate strata boundaries. In situations, the transition may be gradual.

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LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

LOG OF BORING NO. B-8

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **Approx. 420**

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		RUN1		LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely crystalline, thin to medium bedded *(continued)* - slightly weathered below 75.8 ft. - 1/8" soft gray clay seam at 76.5 ft.	100	56								
		RUN2		- 1/8" shaley, limestone seam at 77.8 ft. - shaley from 79.2 ft. to 80.2 ft. - healed, vertical fracture, from 80.2 ft. to 80.8 ft. - healed, vertical fracture from 80.8 ft. to 82.4 ft. - thick bedded from 80.6 to 83.5 ft.	100	59								
80		RUN3		- horizontal fractures at 84.7 ft. and 84.9 ft. - banded to thin bedded below 85.8 ft.	100	75								
85		RUN4		- 1.0" black chert seam at 89.3 ft.	100	18								
90				Boring terminated at 89.7 ft.										
95														
100														

Completion Depth: 89.70
Date Boring Started: 10/8/12
Date Boring Completed: 10/9/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.
Boring moved east of staked location; ground surface elevation estimated.

The stratification lines represent approximate strata boundaries. In situations, the transition may be gradual.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

LOG OF BORING NO. B-9

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **421.8**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown, lean CLAY (CL), with grass and roots										
				Brown, SILT (ML), with sand, limestone and glass pieces (FILL)										
5		SS-1			33		5 4 3				5			
10		ST-2		- trace brick pieces below 9.0 ft.	58					74	23			
				Grayish brown, lean CLAY (CL)										
15		SS-3			100		1 1 1	2.00			44			
20		ST-4		- gray, trace fine sand and fine sand lenses from 19.0 to 21.0 ft. - gray below 22.0 ft.	96			1.50	0.26	90	33	37	20	17
25		SS-5			100		4 1	<0.25			32			

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

Completion Depth: 60.90
Date Boring Started: 10/10/12
Date Boring Completed: 10/11/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

Continued Next Page

LOG OF BORING NO. B-9

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **421.8**
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Brown and gray, SILT (ML)*(continued)*			1	<0.25						
				Brown, silty fine SAND (SM)										
30		SS-6		(43% passing No. 200 sieve)	61		7 7 6				20			
35		SS-7		- gray below 34.0 ft.	100		5 4 5				22			
40		SS-8			100		4 5 7				31			
45		SS-9			100		4 9 3				30			
				Gray, fine to coarse SAND (SP)										
50		SS-10			76		4 3				18			

Completion Depth: 60.90
Date Boring Started: 10/10/12
Date Boring Completed: 10/11/12
Engineer/Geologist: JAS
Project No.: 20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

Continued Next Page

LOG OF BORING NO. B-9

Project Description: **Replacement of Merchants Bridge W. Approach**
St. Louis, MO

Geotechnical Engineering
5850 Arsenal Street
St. Louis, Missouri 63139
(314) 644-3134 (314) 644-3135 FAX
TSI engineering, inc.

Surface El.: **421.8**

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
							50/5"							
				Gray, lean CLAY (CL)										
				LIMESTONE, gray, moderately hard to hard, slightly to moderately weathered, very finely to finely crystalline, thin bedded										
		RUN1			100	0								
				- vertical fracture from 53.3 to 53.5 ft.										
				- vertical fracture from 54.2 to 54.8 ft.										
55				- highly fractured from 54.8 to 54.9 ft.										
		RUN2		- 45 degree fracture at 56.0 ft.	100	0								
				- vertical fracture from 56.3 to 57.7 ft.										
				- thin to medium bedded below 56.9 ft.										
				- soft gray, shale seam from 58.0 to 58.2 ft.										
		RUN3		- with chert from 58.2 to 60.3 ft.	100	47								
60				- vertical fracture from 58.2 to 58.3 ft.										
				- 45 degree fracture at 59.1 ft.										
				- healed vertical fracture from 59.4 to 59.7 ft.										
				Boring terminated at 60.9 ft.										
65														
70														
75														

Completion Depth:	60.90
Date Boring Started:	10/10/12
Date Boring Completed:	10/11/12
Engineer/Geologist:	JAS
Project No.:	20121080.01

Remarks: Boring drilled with CME 75 using HSA and auto SPT.
Groundwater not encountered during drilling.
Began mud rotary drilling at 20.0 ft.
Boring grouted upon completion.

LOG WITH LAB MERCHANTS BRIDGE LOGS.GPJ 5/2/13

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

GENERAL NOTES

The number of borings is based on: topographic and geologic factors; the magnitude of structure loading; the size, shape, and value of the structure; consequences of failure; and other factors. The type and sequence of sampling are selected to reduce the possibility of undiscovered anomalies and maintain drilling efficiency. Attempts are made to detect and/or identify occurrences during drilling and sampling such as the presence of water, boulders, gas, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation in resistance to driving split-spoon samplers, unusual odors, etc. However, lack of notation regarding these occurrences does not preclude their presence.

Although attempts are made to obtain stabilized groundwater levels, the levels shown on the Logs of Boring may not have stabilized, particularly in more impermeable cohesive soils. Consequently, the indicated groundwater levels may not represent present or future levels. Groundwater levels may vary significantly over time due to the effects of precipitation, infiltration, or other factors not evident at the time indicated.

Unless otherwise noted, soil classifications indicated on the Logs of Boring are based on visual observations and are not the result of classification tests. Although visual classifications are performed by experienced technicians or engineers, classifications so made may not be conclusive.

Generally, variations in texture less than one foot in thickness are described as layers within a stratum, while thicker zones are logged as individual strata. However, minor anomalies and changes of questionable lateral extent may appear only in the verbal description. The lines indicating changes in strata on the Logs of Borings are approximate boundaries only, as the actual material change may be between samples or may be a gradual transition.

Samples chosen for laboratory testing are selected in such a manner as to measure selected physical characteristics of each material encountered. However, as samples are recovered only intermittently and not all samples undergo a complete series of tests, the results of such tests may not conclusively represent the characteristics of all subsurface materials present.

NOTATION USED ON BORING LOGS

APPROXIMATE PROPORTIONS

TRACE	<15%
WITH	15-30%
MODIFIER	>30%

Clay or clayey may be used as major material or modifier, regardless of relative proportions, if the clay content is sufficient to dominate the soil properties.

PARTICLE SIZE

BOULDERS		>12 Inches
COBBLES		12 Inches – 3 Inches
GRAVEL		
	Coarse	3 Inches – ¾ Inch
	Fine	¾ Inch – No. 4 Sieve (4.750 mm)
SAND		
	Coarse	No. 4 – No. 10 Sieve (2.000 mm)
	Medium	No. 10 – No. 40 Sieve (0.420 mm)
	Fine	No. 40 – No. 200 Sieve (0.074 mm)
SILT		No. 200 Sieve - 0.002 mm
CLAY		< 0.002 mm

PENETRATION – BLOWS

Number of impacts of a 140-pound hammer falling a distance of 30 inches to cause a standard split-barrel sampler, 1 3/8 inches I.D., to penetrate a distance of 6 inches. The number of impacts for the first 6 inches of penetration is known as the seating drive. The sum of the impacts for the last 12 inches of penetration is the Standard Penetration Test Resistance or "N" value, blows per foot. For example, if blows = 6-8-9, "N" = 8+9 or 17.

OTHER NOTATIONS

Recovery % – length of recovered soil divided by length of sample attempted.

50/2"	Impacts of hammer to cause sampler to penetrate the indicated number of inches
WR	Sampler penetrated under the static loading of the weight of the drill rods
WH	Sampler penetrated under the static loading the weight of the hammer and drill rods
HSA	Hollow stem auger drilling method
FA	Flight auger drilling method
RW	Rotary wash drilling methods with drilling mud
AH	Automatic hammer used for Standard Penetration Test sample
SH	Safety hammer with rope and cathead used for Standard Penetration Test sample

GRAPHIC SYMBOLS


Depth at which groundwater was encountered during drilling


Depth at which groundwater was measured after drilling


Standard Penetration Test Sample, ASTM D1586


3-inch diameter Shelby Tube Sample, ASTM D1587

Sample grabbed from auger

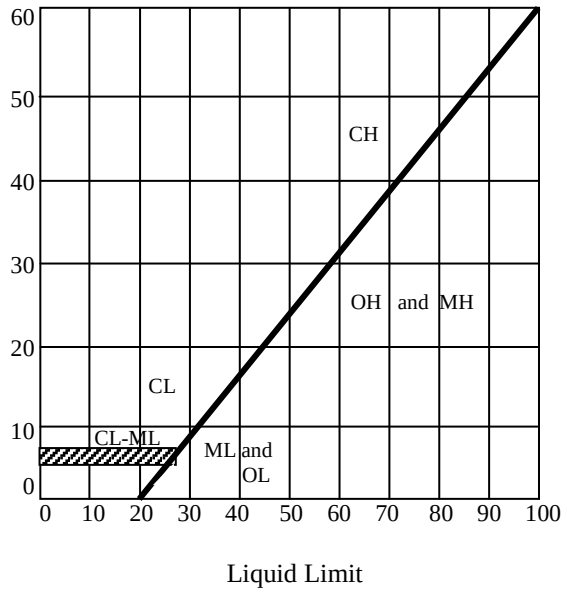

NX Size rock core sample

UNIFIED SOIL CLASSIFICATION SYSTEM, (ASTM D-2487)

Major Divisions			*Group Symbols*		*Typical Names*	*Laboratory Classification Criteria*	
Coarse-grained soils (More than half of materials is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = D_{60}$ greater than 4; $C_c = (D_{30})^2$ between 1 and 3 D_{10} $D_{10} \times D_{60}$	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a]	d	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.1. less than 4	Above "A" line with P.1. between 4 and 7 are *borderline* cases requiring use of dual symbols
				u			
			GC		Clayey gravels, gravel-sand-clay mixtures	Atterberg limits below "A" line with P.1. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = D_{60}$ greater than 6; $C_c = (D_{30})^2$ between 1 and 3 D_{10} $D_{10} \times D_{60}$	
			SP		Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a]	d	Silty sands, sand-mix mixtures	Atterberg limits about "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
				u			
			SC		Clayey sands, sand-clay mixtures	Atterberg limits about "A" line with P.I. greater than 7	
Fine-grained soils (More than half of materials is smaller than No. 200 sieve size)	Silts and clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL		Organic silts and organic silty clays of low plasticity		
	Silts and clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH		Inorganic clays of medium to high plasticity, organic silts		
			OH		Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		Pt		Peat and other highly organic soils		

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-Grained soils are classified as follows:
Less than 5 per cent — GW, GP, SW, SP
More than 12 per cent — GM, GC, SM, SC
5 to 12 per cent — Borderline cases requiring dual symbols[b]

Plasticity Chart



[a]Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when
L.L. is 26 or less and the P.1. is 6 or less; the suffix u used when L.L. is greater than 28.

[b]Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

ROCK CORE DESCRIPTIONS AND CRITERIA

Hardness

Very Soft	- Easily indented with the thumb
Soft	- Able to be scratched with a fingernail
Moderately Hard	- Easily scratched with a knife; cannot be scratched with the fingernail
Hard	- Difficult to scratch with a knife
Very Hard	- Cannot be scratched with a knife

Crystallinity (Soluble Rock Only)

Aphanitic	- Crystals cannot be distinguished with the naked eye
Very Finely Crystalline	- Crystals are barely discernable with the naked eye
Finely Crystalline	- Crystals are easily discernable with the naked eye
Medium Crystalline	- Crystals are medium size; up to 1/8” in diameter
Coarsely Crystalline	- Crystals are 1/8” to 1/4” in diameter
Very Coarsely Crystalline	- Crystals are larger than 1/4” in diameter

Grain Size

Very Fine Grained	- Less than or equal to 0.0029” (#200 Sieve)
Fine Grained	- 0.0029” to 0.0165” (#200 to #40 Sieve)
Medium Grained	- 0.0165” to 0.07087” (#40 to #10 Sieve)
Coarse Grained	- Greater than 0.0787” (#10 Sieve)

Mass Bedding

Parting	- Less than 0.02 foot
Band	- 0.02 to 0.2 foot
Thin Bed	- 0.2 to 0.5 foot
Medium Bed	- 0.5 to 1.0 foot
Thick Bed	- 1.0 to 2.0 feet
Massive	- Greater than 2.0 feet

Weathering

Fresh	- No visible signs of decomposition or discoloration
Slightly Weathered	- Slight discoloration inward from open fractures
Moderately Weathered	- Discoloration throughout, slight loss of strength, texture intact
Highly Weathered	- Specimen can be broken by hand, texture indistinct, fabric intact
Completely Weathered	- Specimen easily crumbled, minerals decomposed to soil

Voids

Dense	- Usually not discernable with the naked eye
Pitted	- Discernable to ¼”
Vuggy	- ¼” to diameter of the core
Cavity	- Larger than 6” in diameter

TSi
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St. Louis, MO 63139
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www.tsi-engineering.com

December 30, 2013

Mr. David W. Petermeier, PE, SE
Modjeski & Masters, Inc.
#4 Sunset Hills Professional Center
Edwardsville, Illinois 62025

Re: Additional Shelby Tube Borings
Replacement of Merchant's Bridge West Approach
St. Louis, Missouri
TSi Project No.: 20121080.01

Dear Mr. Petermeier:

This letter report documents the drilling of four additional borings and associated laboratory testing performed for the replacement of the Merchant's Bridge west approach for the Terminal Railroad Association of St. Louis (TRRA), in St. Louis, Missouri. TSi Engineering, Inc. (TSi) had previously drilled ten borings at the site as part of the geotechnical study for design of the replacement of the west approach of the bridge. Those borings are documented in the TSi geotechnical study report for Modjeski & Masters, Inc. (M&M), submitted November 12, 2012. The locations of the additional borings, the depths of the samples recovered, and the laboratory tests performed on those samples were selected by Mr. Thomas Imholte, PE of M&M.

On November 1, 2013, TSi drilled four additional borings adjacent to existing Borings B-1, B-4, B-8 and B-10. The borings were designated as B-1A, B-4A, -8A and -10A. The additional borings were offset approximately 5 feet from the original boring locations, with the exception of Boring B-8A, which was offset approximately 10 feet away from the original boring location. For reference, the previously completed boring locations are shown on the attached Site and Boring Location Plan. The borings were drilled to depths ranging from 21.0 to 33.0 feet below ground surface. The borings were drilled using a CME 55 track-mounted drill rig. Shelby tube samples were obtained from the borings in accordance with ASTM D 1587. The samples were preserved by sealing the entire sample in the tube and then transported to the TSi laboratory.

Lab testing on the Shelby tube samples consisted of natural moisture content (ASTM D 2216), unit weight, grain size analysis (ASTM D 422), Atterberg Limits (ASTM D 4318), and one-dimensional consolidation tests (ASTM D 2435).

PROFESSIONAL SERVICE SINCE 1989

Initial laboratory tests performed on the soil samples yielded the values listed in the following table:

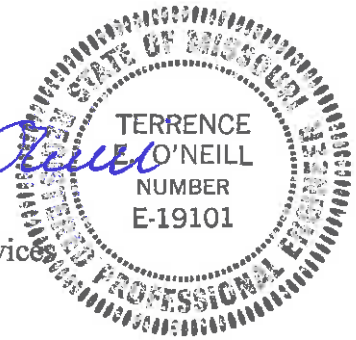
TABLE 1.
LABORATORY TEST RESULTS OF SHELBY TUBE SAMPLES

Boring No.	Sample Number	Sample Depth (ft)	Soil Classification (USCS)	Moisture Content (%)	Dry Density (lbs/ft^3)
B-1A	ST-1-4	14.5-15.0	Lean CLAY (CL)	31.1	91.8
B-1A	ST-2-2	23.5-24.0	SILT (ML)	31.8	92.5
B-4A	ST-1-3	15.0-15.5	Fat CLAY (CH)	39.3	79.3
B-4A	ST-2-2	19.5-20.0	SILT (ML)	30.5	94.1
B-8A	ST-1-2	16.5-17.0	Fat CLAY (CH)	30.9	90.6
B-8A	ST-4-3	24.0-24.5	Lean CLAY (CL)	33.5	91.3
B-10A	ST-1-2	13.5-14.0	Fat CLAY (CH)	40.4	78.6
B-10A	ST-2-2	31.5-32.0	SILT (ML)	29.9	93.5

Based on these initial test results, grain size analyses, Atterberg Limits, and one-dimensional consolidation tests were requested for samples B-1A, ST-1-4 and ST-2-2; B-4A, ST-1-3; B-8A, ST-4-3; and B-10-A, ST-2-2. The laboratory test reports for the Atterberg Limits, grain size analyses, and consolidation tests are attached to this letter. These test results were previously forwarded to M&M as the tests were completed.

TSi appreciates the opportunity to assist Modjeski & Masters, Inc. with this project. Please call us if you have any questions or if we may be of further service to you.

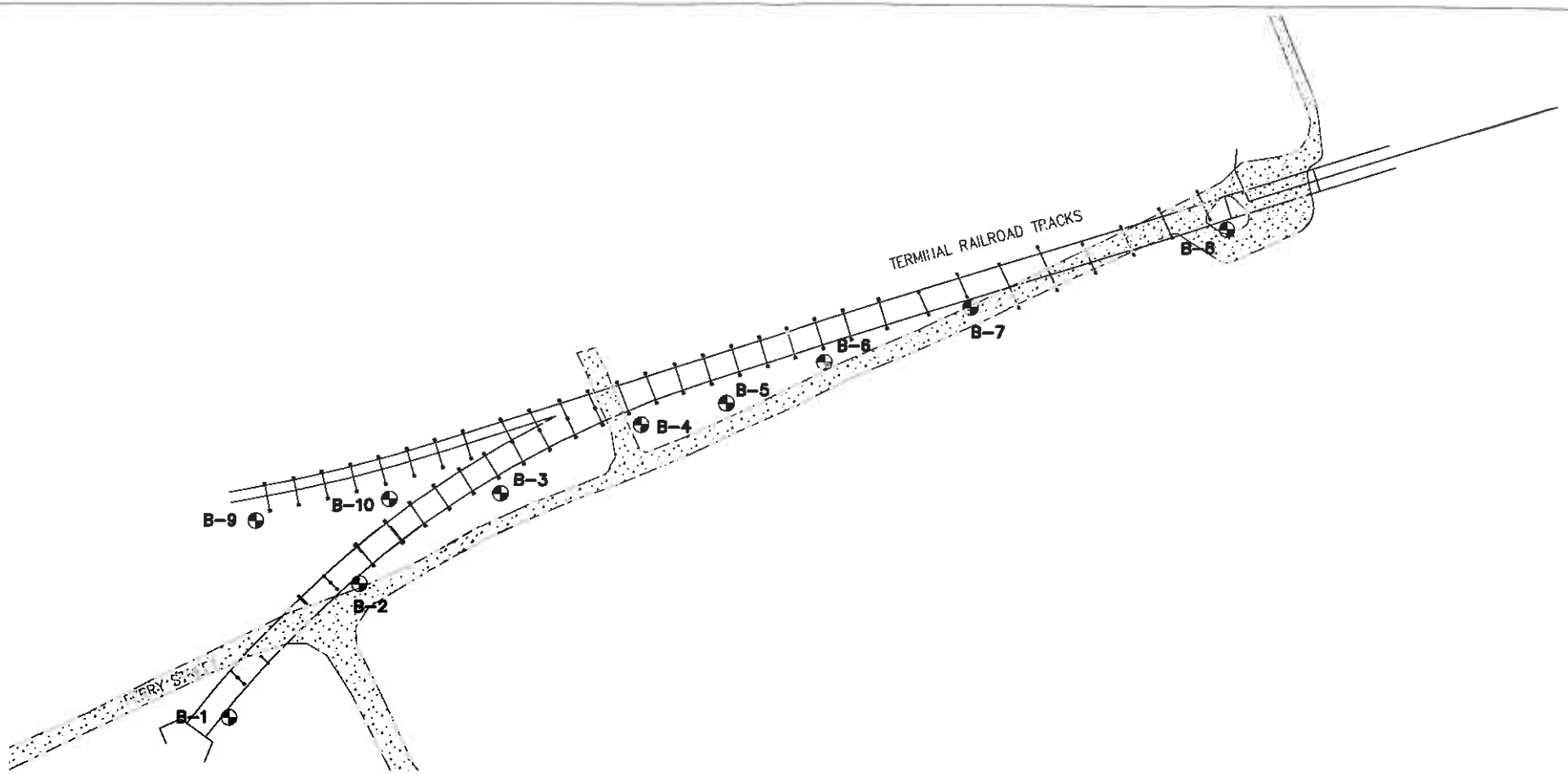
Respectfully submitted,
TSI ENGINEERING, INC.



Terrence E. O'Neill, PE
Manager, Geotechnical Services

Denise B. Hervey, PE
Principal

Attachments: Site and Boring Location Plan
Atterberg Limits Results
Grain Size Analyses Results
One-Dimensional Consolidation Test Results



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LEGEND

B-1 APPROXIMATE BORING LOCATION AND NUMBER

NOTE: THIS PLAN WAS PREPARED FROM A DRAWING RECEIVED FROM EDSI ON 11-6-12.

0 100 200 FT.

SCALE: 1" = 100'

TSi
5890 ALGONAL ST.
ST. LOUIS, MISSOURI 63139

SITE AND BORING LOCATION PLAN
REPLACEMENT OF MERCHANTS BRIDGE
WEST APPROACH
ST. LOUIS, MO

Drawn By: JAS	Checked By: TEO	
Project No. 20121080.01	Date: 11/7/12	Figure 2

TSi Engineering, Inc.

Merchants Bridge West Approach Replacement

Atterberg Limits Results (ASTM D-4318)

Boring	Sample No.	Depth (ft.)	Liquid Limit	Plastic Limit	Plasticity Index	USCS Class
B-1A	ST-1-4	14.5 – 15.0	42	21	21	CL
B-1A	ST-2-2	23.5 – 24.0	31	25	6	ML
B-4A	ST-1-3	15.0 – 15.5	75	32	43	CH
B-8A	ST-4-3	24.0 – 24.5	31	28	3	ML
B-10A	ST-2-2	31.5 – 32.0	-	-	Non-Plastic	ML

Geo 11/20/13

TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-1A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-1-4	**Calculated by:**	CAV 11-25-13
Sample Depth:	14.0-14.5	**Checked by:**	TRD 11/26/13
Visual Description:	Gray-brown, lean CLAY (CL)		

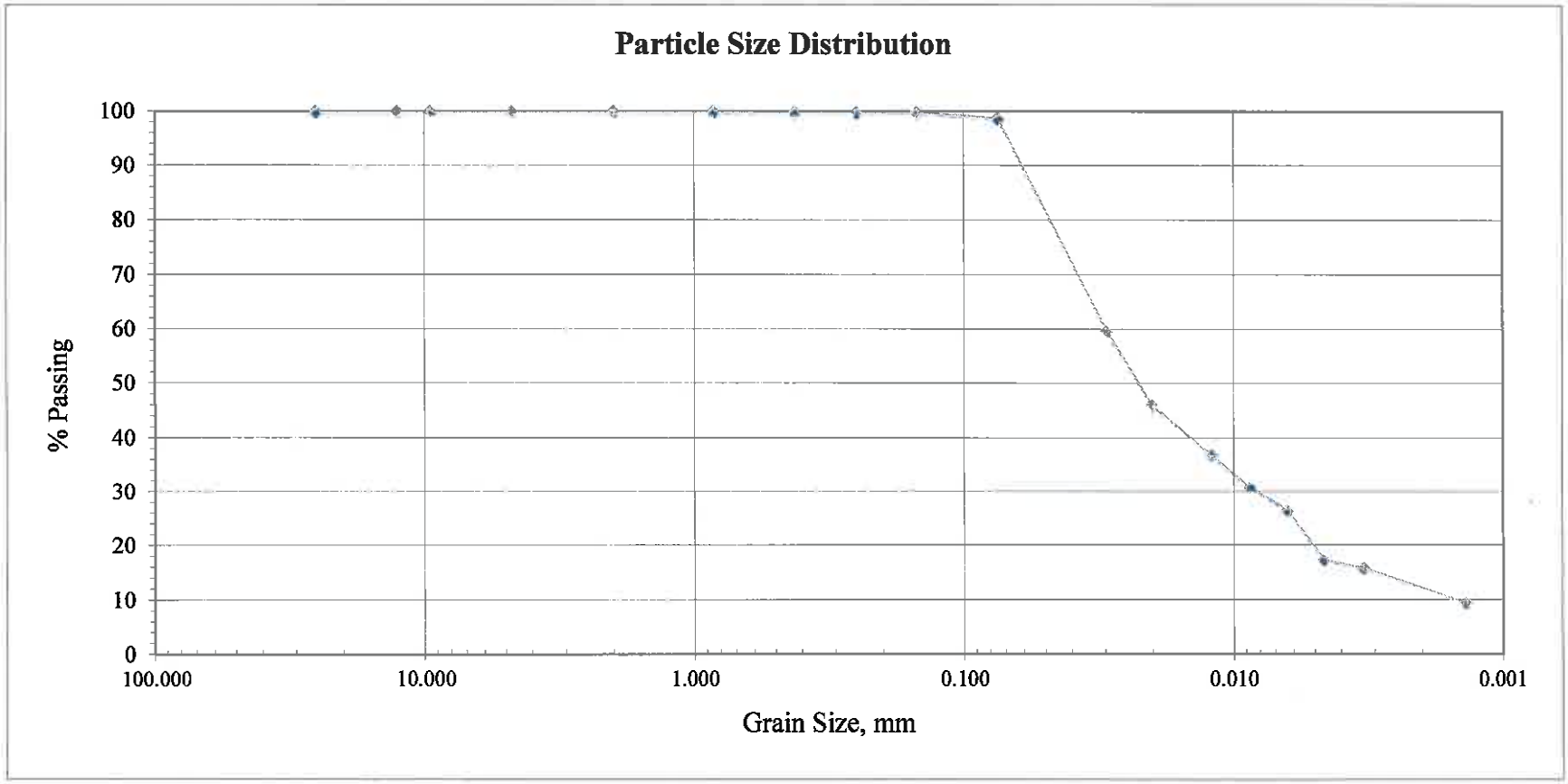
Sieve	Particle Size, mm	Percent Finer
1"	25.40	100
1/2"	12.70	100
3/8"	9.53	100
No.4	4.75	100
No.10	2.00	100
No.20	0.85	100
No.40	0.425	100
No.60	0.250	100
No.100	0.150	100
No.200	0.075	99
Hydrometer Analysis	0.0296	60
	0.0201	46
	0.0121	37
	0.0088	31
	0.0063	26
	0.0046	17
	0.0033	16
	0.0014	9
	0.0000	0

Particle Size Description
Unified Soil Classification System

Particle	Size Range, mm	Percent of Specimen
Gravel	4.75 to 76.4	0
Coarse Sand	2.00 to 4.75	0
Medium Sand	0.43 to 2.00	0
Fine Sand	0.075 to 0.43	1
Silt	0.005 to 0.075	80
Clay	<0.005	19

TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-1A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-1-4	**Calculated by:**	CAV 11-25-13
Sample Depth:	14.0-14.5	**Checked by:**	11/26/13
Visual Description:	Gray-brown, lean CLAY (CL)		



TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-1A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-2-2	**Calculated by:**	CAV 11-25-13
Sample Depth:	23.5-24.0	**Checked by:**	JRC 11/26/13
Visual Description:	Brown, SILT (ML)		

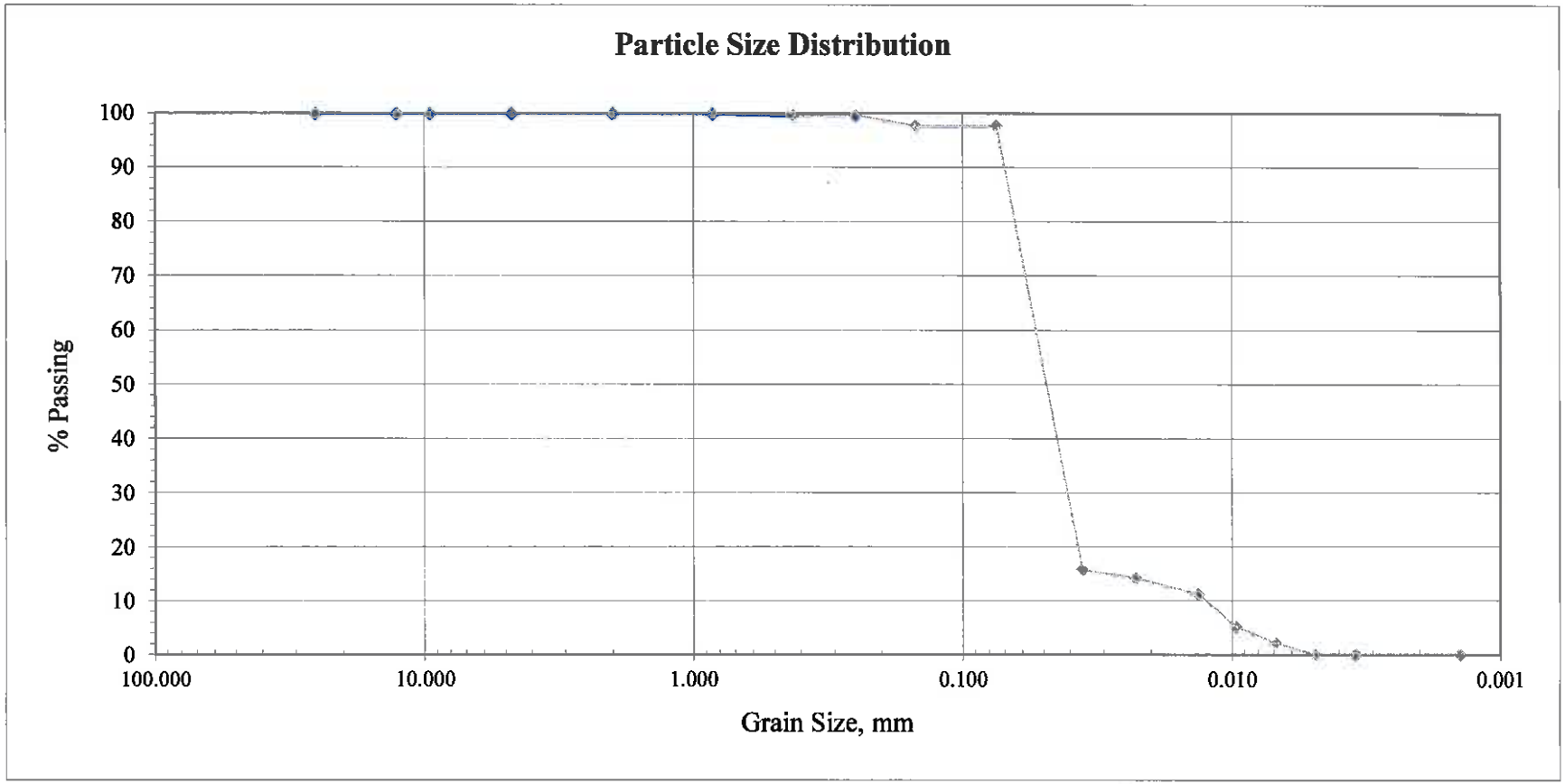
Sieve	Particle Size, mm	Percent Finer
1"	25.40	100
1/2"	12.70	100
3/8"	9.53	100
No.4	4.75	100
No.10	2.00	100
No.20	0.85	100
No.40	0.425	100
No.60	0.250	100
No.100	0.150	98
No.200	0.075	98
Hydrometer Analysis	0.0361	16
	0.0229	14
	0.0134	11
	0.0097	5
	0.0069	2
	0.0049	0
	0.0035	0
	0.0014	0
	0.0000	0

Particle Size Description
Unified Soil Classification System

Particle	Size Range, mm	Percent of Specimen
Gravel	4.75 to 76.4	0
Coarse Sand	2.00 to 4.75	0
Medium Sand	0.43 to 2.00	0
Fine Sand	0.075 to 0.43	2
Silt	0.005 to 0.075	98
Clay	<0.005	0

TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-1A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-2-2	**Calculated by:**	CAV 11-25-13
Sample Depth:	23.5-24.0	**Checked by:**	JMO 11/26/13
Visual Description:	Brown, SILT (ML)		



TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-4A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-1-3	**Calculated by:**	CAV 11-25-13
Sample Depth:	15.0-15.5	**Checked by:**	JMO 11/26/13
Visual Description:	Brown-gray, fat CLAY (CH)		

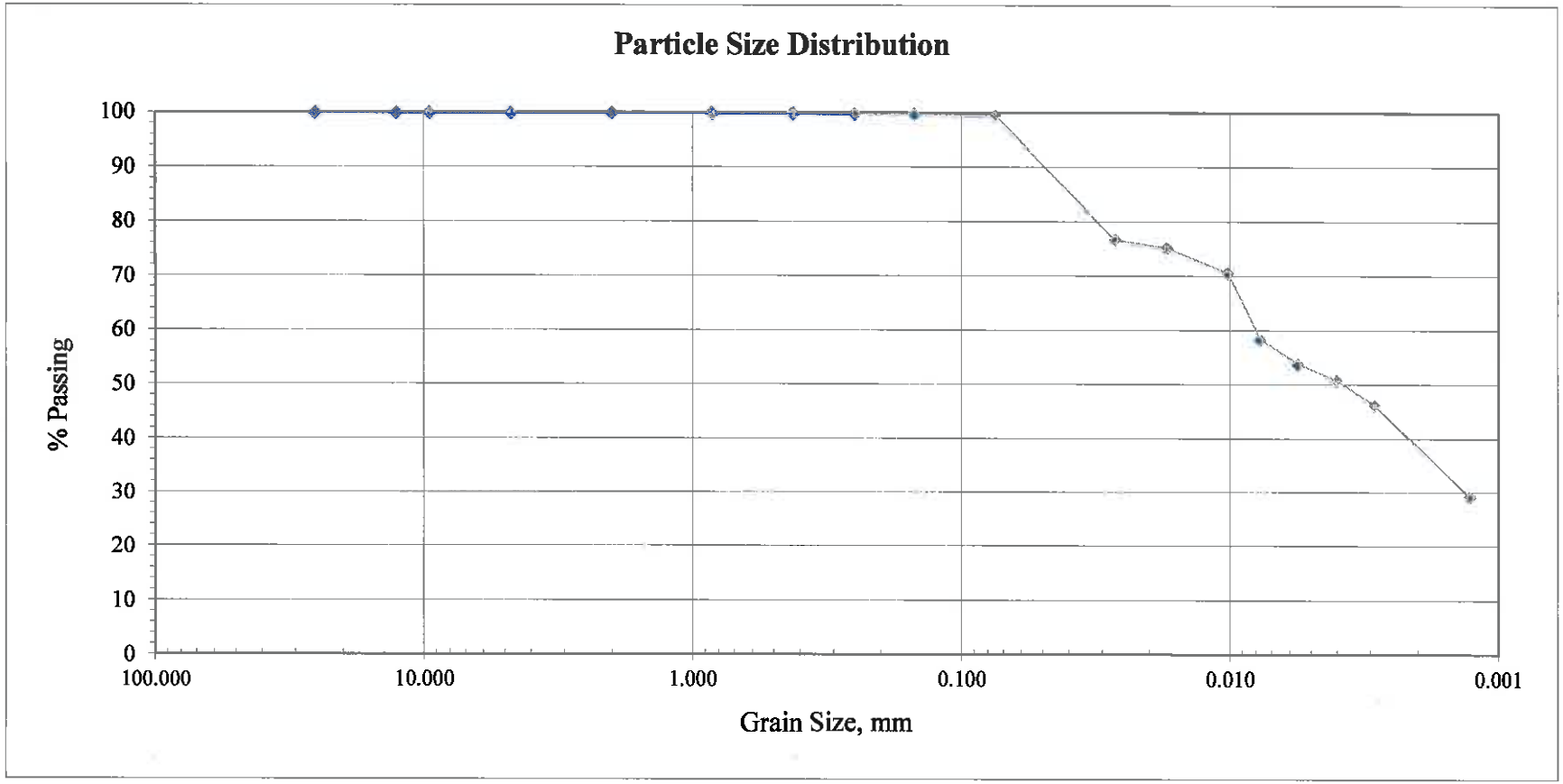
Sieve	Particle Size, mm	Percent Finer
1"	25.40	100
1/2"	12.70	100
3/8"	9.53	100
No.4	4.75	100
No.10	2.00	100
No.20	0.85	100
No.40	0.425	100
No.60	0.250	100
No.100	0.150	100
No.200	0.075	100
Hydrometer Analysis	0.0268	77
	0.0172	75
	0.0102	71
	0.0077	58
	0.0056	54
	0.0040	51
	0.0029	46
	0.0013	29
	0.0000	0

Particle Size Description
Unified Soil Classification System

Particle	Size Range, mm	Percent of Specimen
Gravel	4.75 to 76.4	0
Coarse Sand	2.00 to 4.75	0
Medium Sand	0.43 to 2.00	0
Fine Sand	0.075 to 0.43	0
Silt	0.005 to 0.075	47
Clay	<0.005	53

TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-4A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-1-3	**Calculated by:**	CAV 11-25-13
Sample Depth:	15.0-15.5	**Checked by:**	JEO 11/26/13
Visual Description:	Brown-gray, fat CLAY (CH)		



TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-8A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-4-3	**Calculated by:**	CAV 11-25-13
Sample Depth:	24.0-24.5	**Checked by:**	JEO 11/26/13
Visual Description:	Gray, SILT (ML)		

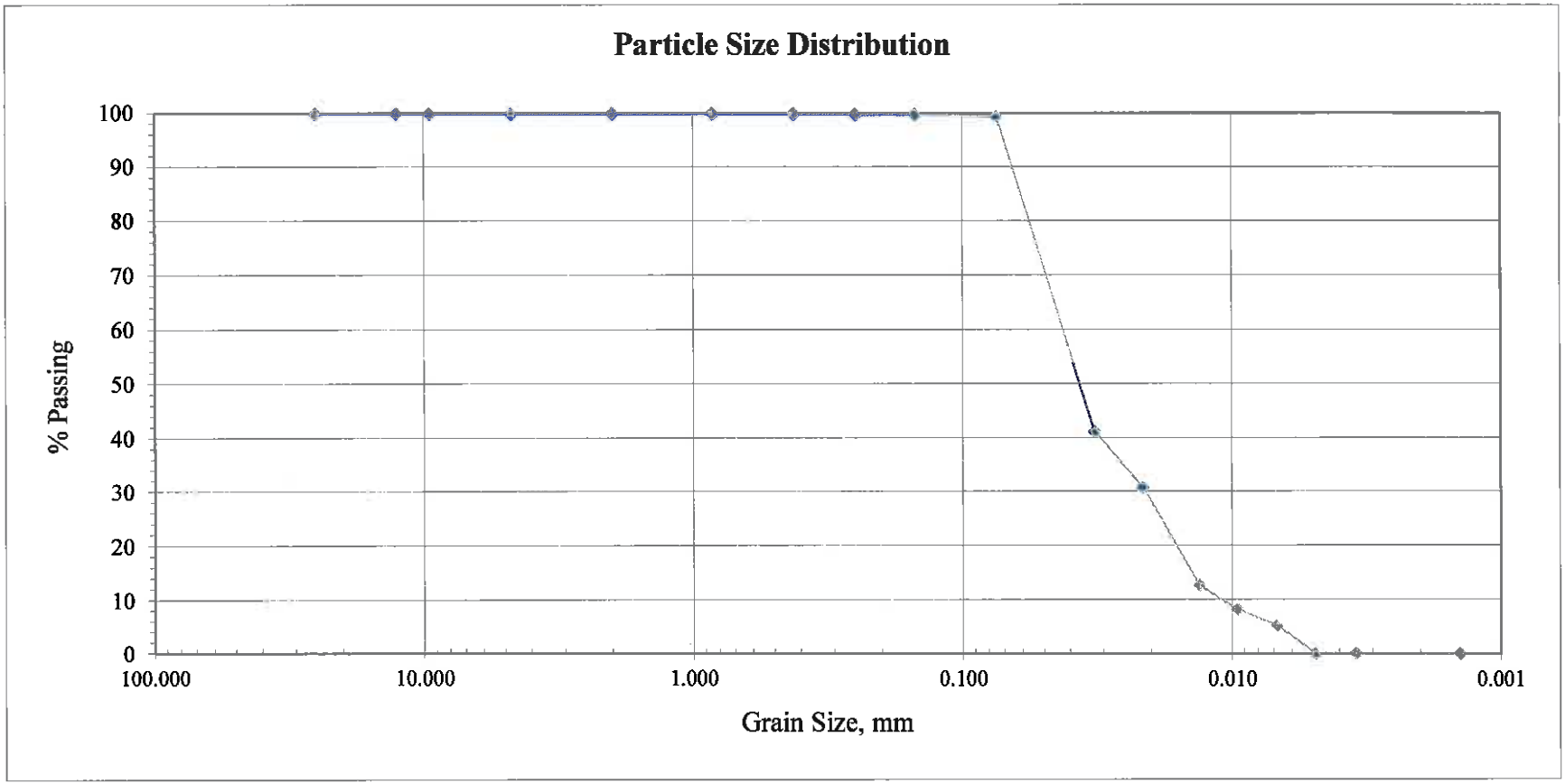
Sieve	Particle Size, mm	Percent Finer
1"	25.40	100
1/2"	12.70	100
3/8"	9.53	100
No.4	4.75	100
No.10	2.00	100
No.20	0.85	100
No.40	0.425	100
No.60	0.250	100
No.100	0.150	100
No.200	0.075	100
Hydrometer Analysis	0.0325	41
	0.0215	31
	0.0133	13
	0.0096	8
	0.0068	5
	0.0049	0
	0.0035	0
	0.0014	0
	0.0000	0

Particle Size Description
Unified Soil Classification System

Particle	Size Range, mm	Percent of Specimen
Gravel	4.75 to 76.4	0
Coarse Sand	2.00 to 4.75	0
Medium Sand	0.43 to 2.00	0
Fine Sand	0.075 to 0.43	0
Silt	0.005 to 0.075	99
Clay	<0.005	0

TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-8A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-4-3	**Calculated by:**	CAV 11-25-13
Sample Depth:	24.0-24.5	**Checked by:**	JCW 11/26/13
Visual Description:	Gray, SILT (ML)		



TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-10A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-2-2	**Calculated by:**	CAV 11-25-13
Sample Depth:	31.5-32.0	**Checked by:**	JMO 11/26/13
Visual Description:	Brown, SILT (ML), with fine sand		

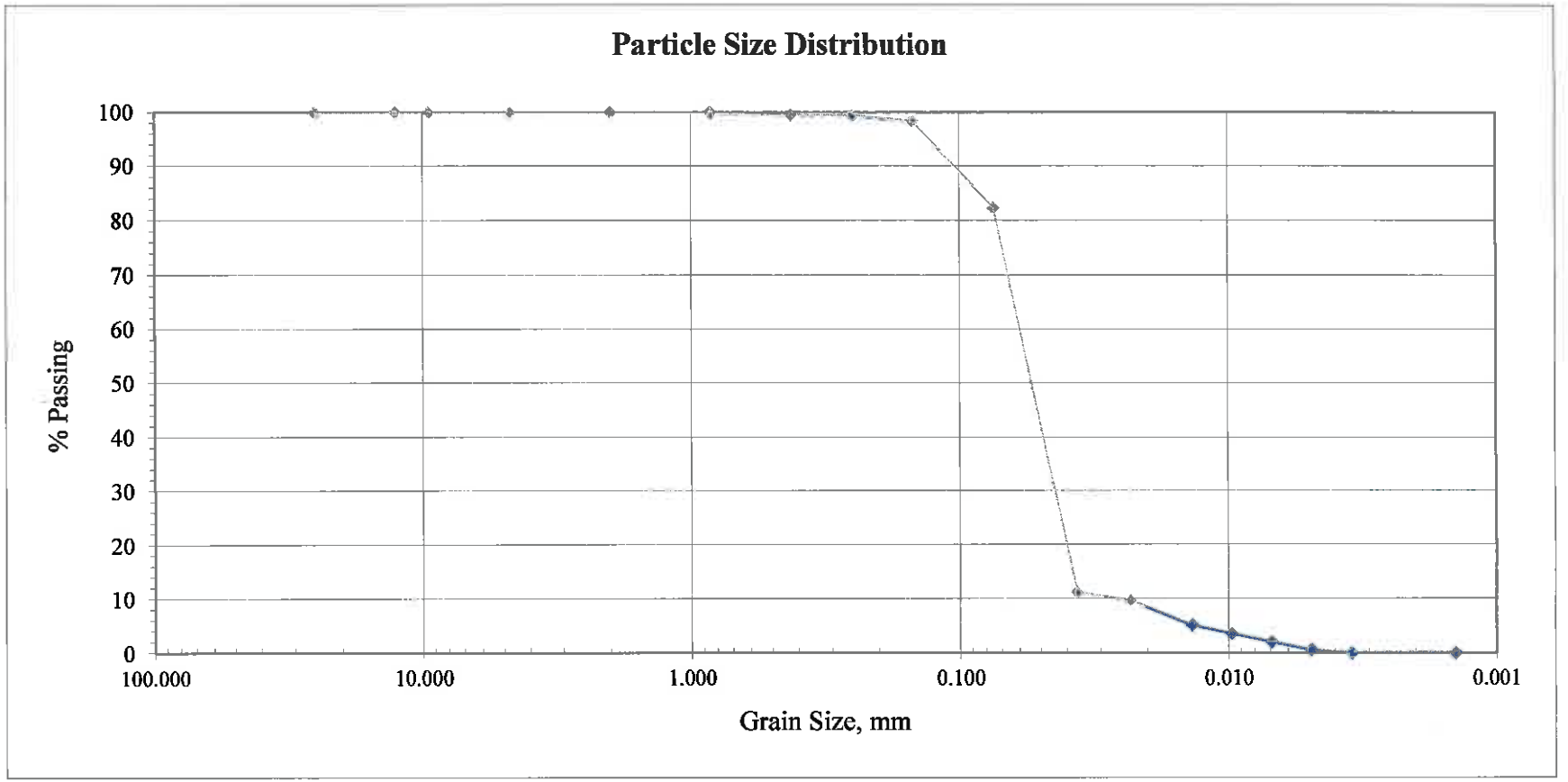
Sieve	Particle Size, mm	Percent Finer
1"	25.40	100
1/2"	12.70	100
3/8"	9.53	100
No.4	4.75	100
No.10	2.00	100
No.20	0.85	100
No.40	0.425	100
No.60	0.250	99
No.100	0.150	98
No.200	0.075	82
Hydrometer Analysis	0.0367	11
	0.0233	10
	0.0137	5
	0.0097	4
	0.0069	2
	0.0049	1
	0.0035	0
	0.0014	0
	0.0000	0

Particle Size Description
Unified Soil Classification System

Particle	Size Range, mm	Percent of Specimen
Gravel	4.75 to 76.4	0
Coarse Sand	2.00 to 4.75	0
Medium Sand	0.43 to 2.00	0
Fine Sand	0.075 to 0.43	17
Silt	0.005 to 0.075	82
Clay	<0.005	1

TSi Engineering, Inc.
HYDROMETER ANALYSIS (ASTM D422)

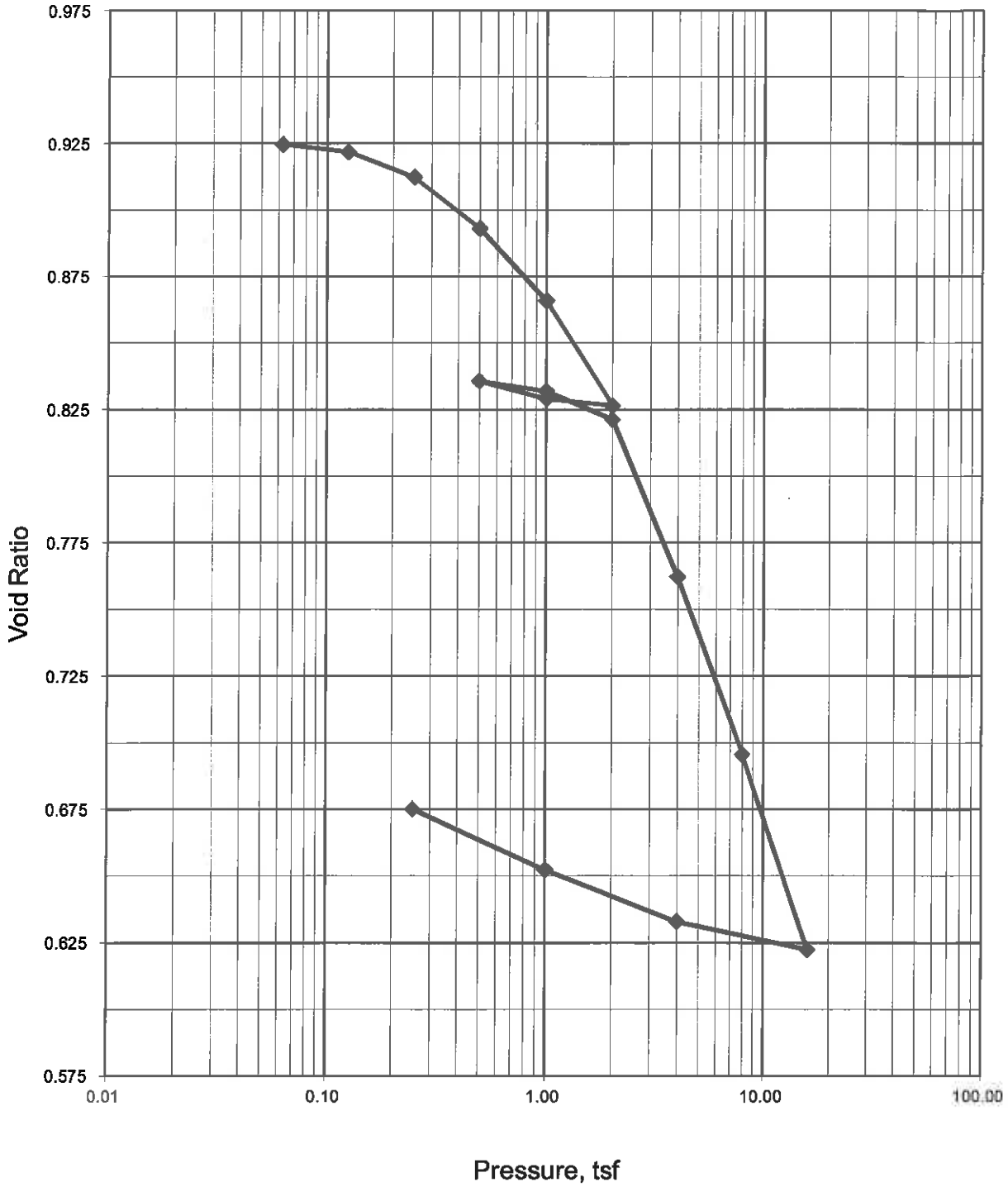
Project Name:	Replacement of Merchant's Bridge	**Project Number:**	20131080.02
Boring Number:	B-10A	**Tested by:**	CAV 11-22-13
Sample Number:	ST-2-2	**Calculated by:**	CAV 11-25-13
Sample Depth:	31.5-32.0	**Checked by:**	JMO 11/26/13
Visual Description:	Brown, SILT (ML), with fine sand		



CONSOLIDATION TEST

Merchants Bridge

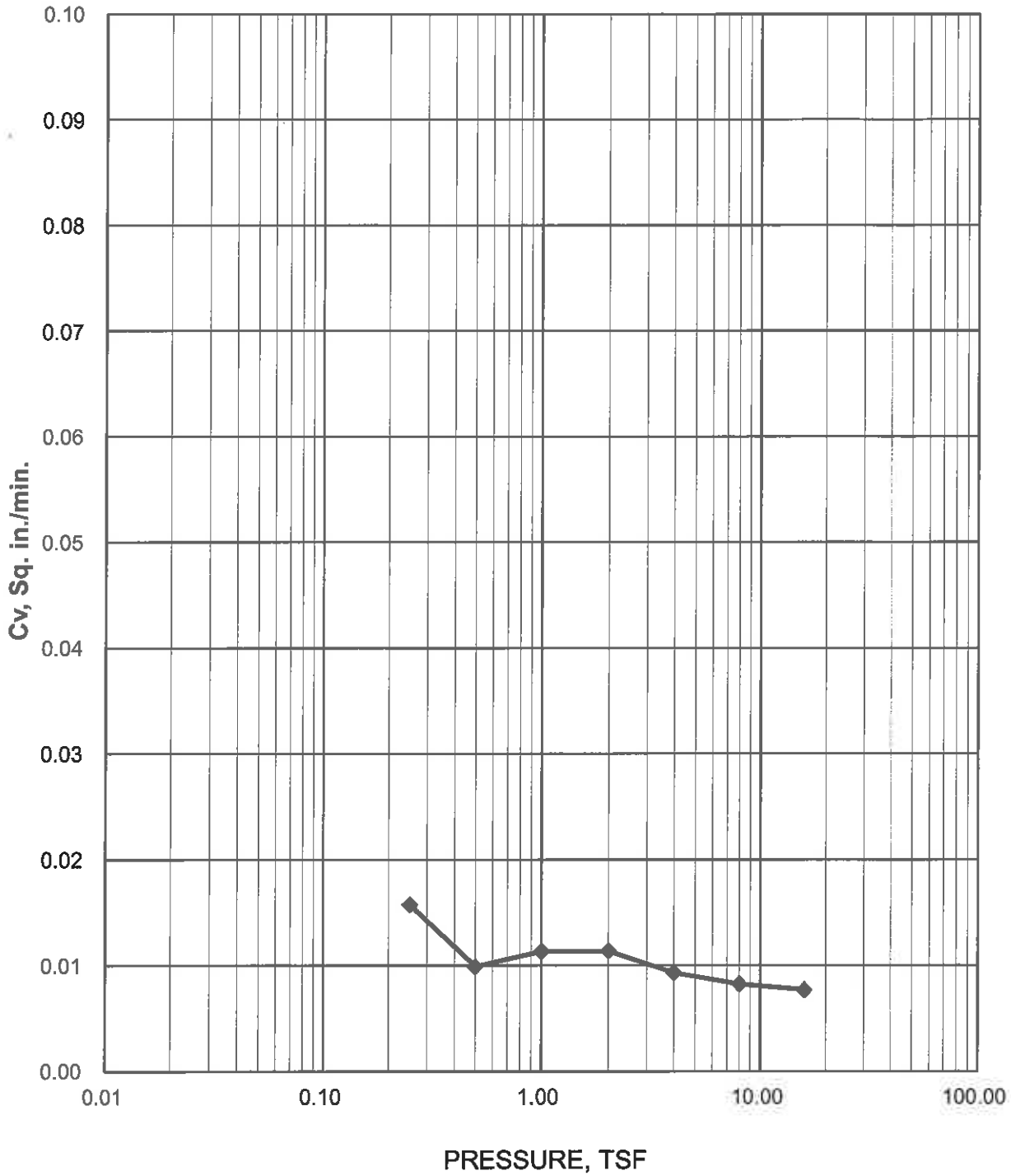
Boring B-1A, Sample ST-1 at 14.5 - 15.0 Feet
Dry Unit Wt. = 88.8 pcf; Moisture Content = 32.6%
Material: Olive-Brown Silty CLAY - CL



CONSOLIDATION TEST

Merchants Bridge

Boring B-1A, Sample ST-1 at 14.5 - 15.0 Feet
Dry Unit Wt. = 88.8 pcf; Moisture Content = 32.6%
Material: Olive-Brown Silty CLAY - CL



CONSOLIDATION
TEST DATA
(Log Time Method)

Merchants Bridge

JOB NUMBER:	J022177.01.6003	INITIAL MOISTURE:		FINAL MOISTURE:		INITIAL DATA:	
BORING NUMBER:	B-1A	WET WT SPLE + RING	188.97	WET WT SPLE + RING	182.09	SAMPLE HT.:	0.741
SAMPLE NUMBER:	ST-1-4	DRY WT SPLE + RING	161.28	DRY WT SPLE + RING	161.28	SAMPLE DIA.:	2.501
DEPTH (Feet):	14.5 - 15.0	WT OF RING	76.40	WT OF RING	76.40	VOLUME:	59.654
		DRY WT OF SAMPLE	84.88	DRY WT OF SAMPLE	84.88	SPECIFIC GRAV. (Ass.):	2.74
WET UNIT WT =	117.8	WT OF WATER	27.69	WT OF WATER	20.81	HT. OF SOLIDS:	0.385
DRY UNIT WT =	88.8	MOISTURE CONTENT	32.6	MOISTURE CONTENT	24.5	VOID RATIO:	0.926

PRESSURE (tsf)	D100 *0.0001"	MACHINE DEFLECTION *0.0001"	CORR. FACTOR	CORR. D100 *0.0001"	CONSOLIDATION (Percent)	VOID RATIO CHANGE	VOID RATIO	D 50 UNCORR	H 50 CORR	t 50	Cv (SQ IN/MIN)
0.000	0.0	0.0	0.0	0.0	0.00	0.0000	0.926				
0.063	7.0	3.0	0.0	4.0	0.05	0.0010	0.925				
0.125	25.0	10.0	0.0	15.0	0.20	0.0039	0.922				
0.250	70.5	19.0	0.0	51.5	0.70	0.0134	0.912	52.8	0.7376	1.70	0.0158
0.500	156.5	31.0	0.0	125.5	1.69	0.0326	0.893	125.3	0.7316	2.66	0.0099
1.000	277.0	47.0	0.0	230.0	3.10	0.0598	0.866	235.0	0.7222	2.27	0.0113
2.000	446.0	64.0	0.0	382.0	5.16	0.0993	0.826	382.0	0.7092	2.18	0.0114
1.000	462.0	59.0	31.0	372.0	5.02	0.0967	0.829				
0.500	429.0	52.0	31.0	346.0	4.67	0.0899	0.836				
1.000	448.0	56.0	31.0	361.0	4.87	0.0938	0.832				
2.000	500.0	67.0	31.0	402.0	5.43	0.1045	0.821				
4.000	714.0	85.0	0.0	629.0	8.49	0.1635	0.762	620.5	0.6875	2.50	0.0093
8.000	996.0	110.0	0.0	886.0	11.96	0.2302	0.695	885.0	0.6635	2.63	0.0082
16.000	1298.0	131.0	0.0	1167.0	15.75	0.3033	0.622	1168.0	0.6373	2.60	0.0077
4.000	1273.0	108.0	38.0	1127.0	15.21	0.2929	0.633				
1.000	1172.0	82.0	38.0	1052.0	14.20	0.2734	0.652				
0.250	1064.0	62.0	38.0	964.0	13.01	0.2505	0.675				

Va = Volume of air
Vw = Volume of water
Vv = Volume of voids
Vs - Volume of dry soil
V = Total volume
Ma = Mass of air (=0)
Mw = Mass of water
Md = Mass of dry soil
M = Total mass
Hs = Height of Solids

		Volume		Mass
	Volume	Va	AIR	Ma=0
	of			
	Voids	Vw	WATER	Mw
		Vs	SOIL	Md
		V	Total	M

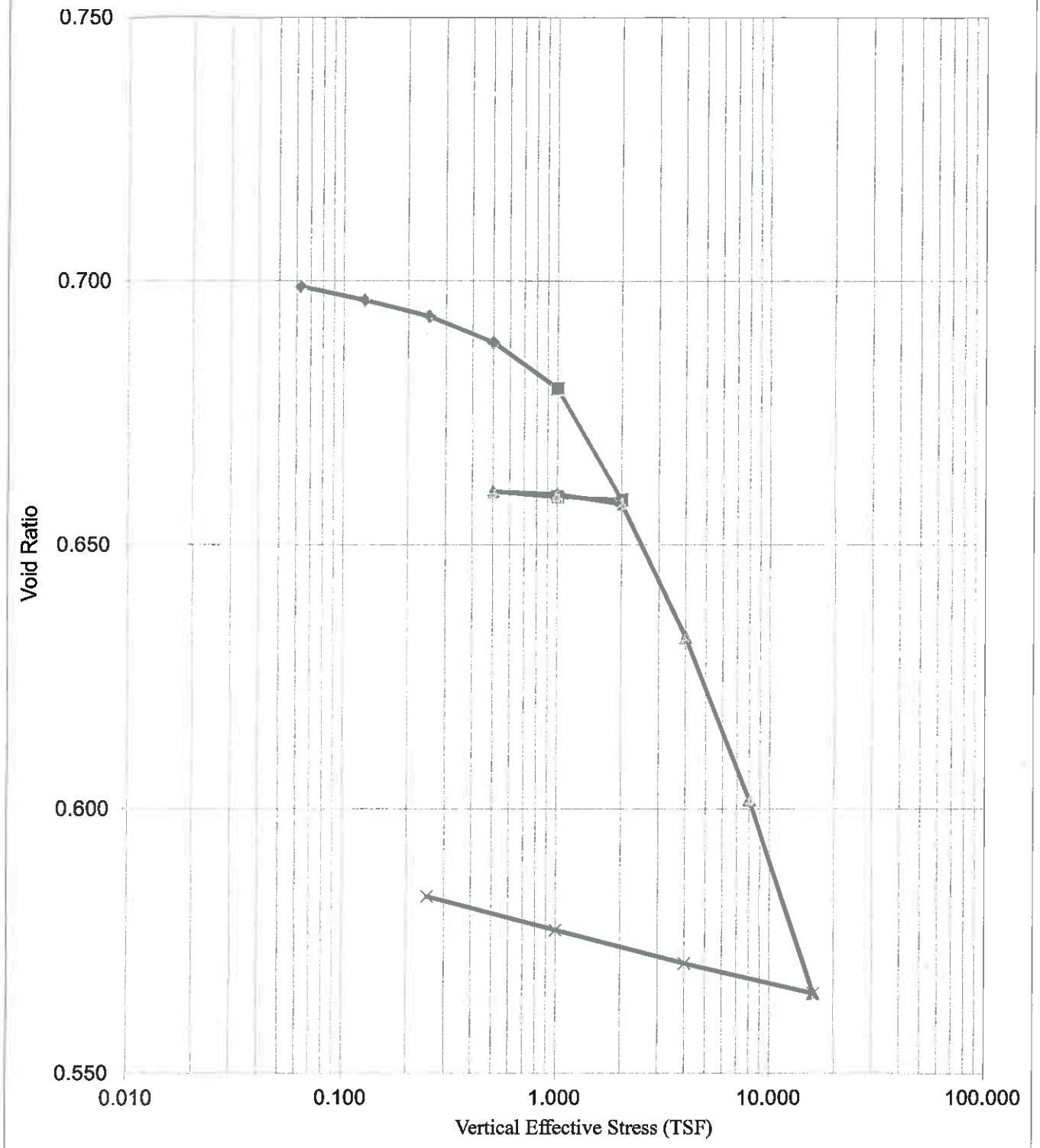
		Volume (cc)		Mass (gms)
Tsi Project No.:	20121080.01			
Boring No.:	B-1A			
Sample No.:	ST-1-4	0.99	AIR	0.00
Depth (Feet):	14.5 - 15.0	28.68		
		27.69	WATER	27.69
		30.98	SOIL	84.88
INITIAL SAMPLE DATA (Prior to Consolidation)		59.65	Total	112.57

Height	0.741	(in)	
Diameter	2.501	(in)	
Weight	112.57	(g)	**Height of Solids (Hs) = Vs/A =** **0.405 (cm)**
Area	76.53	(sq cm)	
Volume	59.65	(cc)	**Specific Gravity - (Assumed) =** **2.74 (g/cc)**
Bulk Density, Wet	1.887	(g/cc)	
Bulk Density, Dry	**1.423**	**(g/cc)**	**Degree of Saturation (S) = Vw/Vv =** **0.966 (cc/cc)**
Wet + Tare	230.32	(gms)	
Dry + Tare	202.63	(gms)	**Water Filled Porosity (n) = Vw/V =** **0.464 (cc/cc)**
Tare	117.75	(gms)	
Water Content - ASTM D 2216	**32.6**	**(%)**	**Air Filled Porosity (n) = Va/V =** **0.017 (cc/cc)**
Gravimetric Water Content	**0.326**	**(g/g)**	
Volumetric Water Content	**0.464**	**(cc/cc)**	**Void Ratio (e) = Vv/Vs =** **0.926**

		Volume (cc)		Mass (gms)
Tsi Project No.:	20121080.01			
Boring No.:	B-1A			
Sample No.:	ST-1-4	0.10	AIR	0.00
Depth (Feet):	14.5 - 15.0	20.91		
		20.81	WATER	20.81
		30.98	SOIL	84.88
FINAL SAMPLE DATA (After Consolidation)		51.89	Total	105.69

Height	0.645	(in)	
Diameter	2.501	(in)	
Weight	105.7	(g)	**Height of Solids (Hs) = Vs/A =** **0.139 (cm)**
Area	31.69	(sq cm)	
Volume	51.89	(cc)	**Specific Gravity - (Assumed) =** **2.74 (g/cc)**
Bulk Density, Wet	2.037	(g/cc)	
Bulk Density, Dry - ASTM D 2937	**1.636**	**(g/cc)**	**Degree of Saturation (S) = Vw/Vv =** **0.995 (cc/cc)**
Wet + Tare	223.44	(gms)	
Dry + Tare	202.63	(gms)	**Water Filled Porosity (n) = Vw/V =** **0.401 (cc/cc)**
Tare	117.75	(gms)	
Water Content - ASTM D 2216	**24.5**	**(%)**	**Air Filled Porosity (n) = Va/V =** **0.002 (cc/cc)**
Gravimetric Water Content	**0.245**	**(g/g)**	
Volumetric Water Content	**0.401**	**(cc/cc)**	**Void Ratio (e) = Vv/Vs =** **0.675**

Consolidation Test Summary



Boring No. B-1A Sample ST-2-2 Depth 23.5-24.0

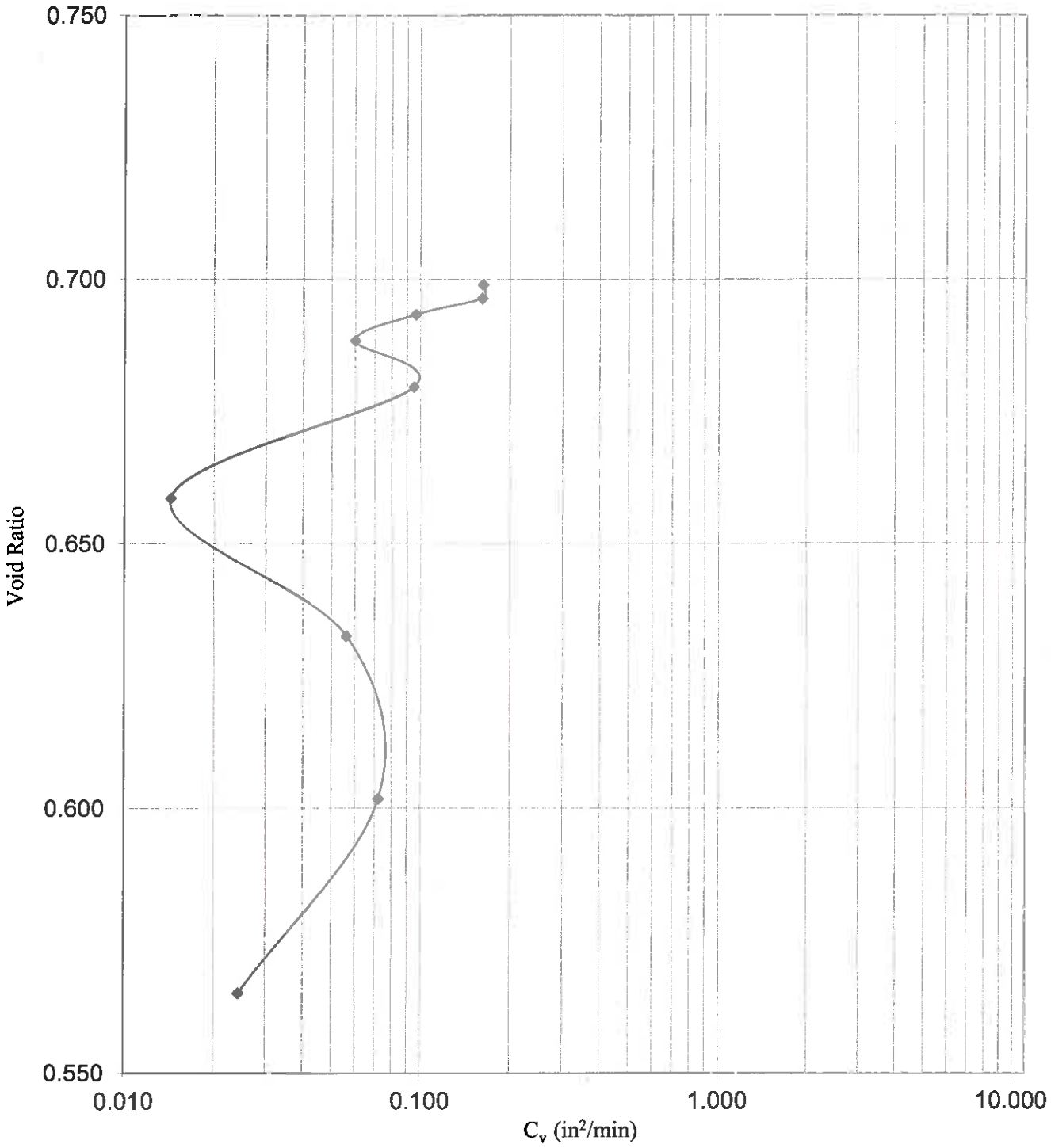
Soil Description : Brown, SILT (ML)

Initial Moisture Content (%): 18.3 Specific Gravity: 2.7 (assumed)

Initial Dry Density(pcf): 98.5

Replacement of Merchants Bridge West Approach
TSi No. 20121080.01

Void Ratio vs. C_v



Boring No. B-1A Sample: ST-2-2 Depth: 23.5-24.0

Replacement of Merchants Bridge West Approach
TSi No. 20121080.01

CONSOLIDATION TEST DATA
(Square Root of Time Method)

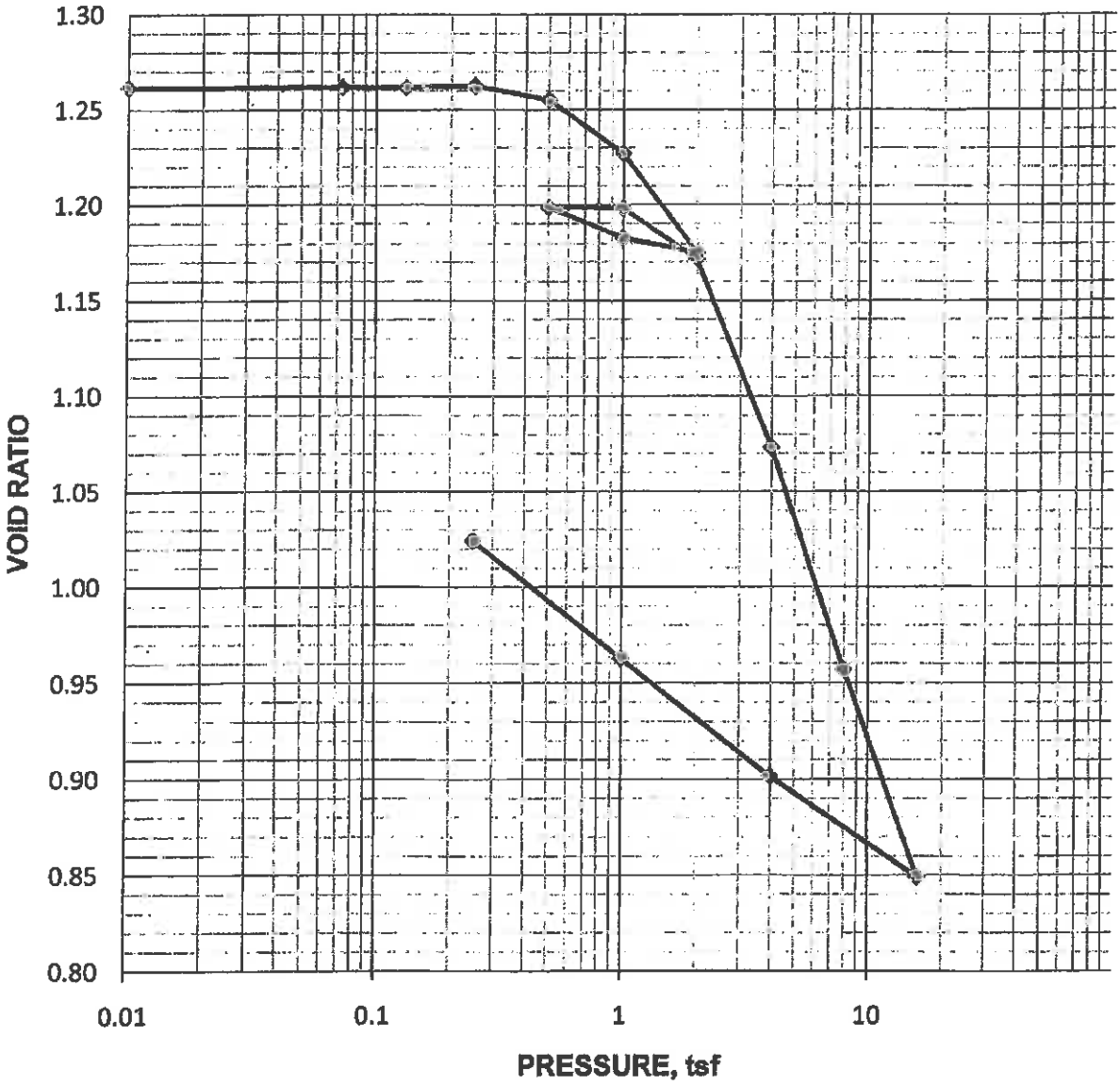
Calculated By: JAS Date: 12/4/13
Checked By: JCL Date: 12/4/13

Project Name:	Replacement of Merchants Bridge West Approach						
Project Number:	20121080.01	**Initial Moisture**		**Final Moisture**		**Initial Data**	
Boring Number:	B-1A	Wet Wt Sample+Ring (g):	295.43	Wet Wt Sample+Ring (g):	301.75	Sample Height (in):	1.000
Sample Number:	ST-2-2	Dry Wt Sample+Ring (g):	272.25	Dry Wt Sample+Ring (g):	272.25	Sample Diameter (in):	2.498
Depth (ft):	23.5-24.0	Wt of Ring (g):	145.55	Wt of Ring (g):	145.55	Volume (in^3):	4.901
		Dry Wt of Sample (g):	126.7	Dry Wt of Sample (g):	126.7	Specific Gravity:	2.7
Wet Unit Weight (pcf):	116.50	Wt of Water (g):	23.18	Wt of Water (g):	29.5	Height of Solids (in):	0.584
Dry Unit Weight (pcf):	98.49	Moisture Content (%):	18.3	Moisture Content (%):	23.3	Initial Void Ratio:	0.711

Load (tsf)	D_{100} (0.0001")	Machine Deflection (0.0001")	Correction Factor	Corrected D_{100} (0.0001")	Consolidation (%)	Void Ratio Change	Void Ratio	D_{50} Uncorrected (0.0001")	H_{50} Corrected	t_{50} (min)	Cv (in^2/min)
0.010	0.0	0.0	0.0	0.0	0.00	0.0000	0.711				
0.063	94.0	21.0	0.0	73.0	0.73	0.0125	0.699	84.5	0.9937	0.30	0.1621
0.125	114.0	26.0	0.0	88.0	0.88	0.0151	0.696	112.0	0.9914	0.30	0.1614
0.250	137.0	31.0	0.0	106.0	1.06	0.0181	0.693	133.0	0.9898	0.50	0.0965
0.500	176.0	41.0	0.0	135.0	1.35	0.0231	0.688	171.0	0.9870	0.80	0.0600
1.000	241.0	55.0	0.0	186.0	1.86	0.0318	0.680	234.0	0.9821	0.50	0.0950
2.000	382.0	73.0	0.0	309.0	3.09	0.0529	0.659	367.0	0.6821	1.60	0.0143
1.000	395.0	72.0	17.0	306.0	3.06	0.0524	0.659				
0.500	383.0	66.0	17.0	300.0	3.00	0.0513	0.660				
1.000	390.0	70.0	17.0	303.0	3.03	0.0519	0.660				
2.000	409.0	78.0	17.0	314.0	3.14	0.0537	0.658				
4.000	555.0	94.0	0.0	461.0	4.61	0.0789	0.633	540.9	0.9553	0.80	0.0562
8.000	756.0	115.0	0.0	641.0	6.41	0.1097	0.602	738.0	0.9377	0.60	0.0722
16.000	990.0	135.0	0.0	855.0	8.55	0.1463	0.565	968.0	0.9167	1.70	0.0243
4.000	988.0	118.0	48.0	822.0	8.22	0.1407	0.571				
1.000	931.0	98.0	48.0	785.0	7.85	0.1343	0.577				
0.250	881.0	85.0	48.0	748.0	7.48	0.1280	0.583				

P:\37xxx\37400\37423\Lab\41-1-37423-001 4-A ST-1-3 D2435 12/2/2013

CONSOLIDATION TEST



Load, tsf	Coefficient of Consolidation, mm^2/second	Load, tsf	Coefficient of Consolidation, mm^2/second
0.073	5.4E+00	1.0	NA
0.132	7.1E-01	2.0	NA
0.25	3.4E+00	4.0	2.0E-02
0.5	1.3E+00	8.0	1.0E-02
1.0	1.1E-01	16.0	5.4E-03
2.0	3.5E-02	4.0	NA
1.0	NA	1.0	NA
0.5	NA	0.25	NA

Replacement of Merchants Bridge West Approach

St. Louis, Missouri

VOID RATIO PLOT

Boring: 4-A

Sample: ST-1-3

Gray-Brown, fat CLAY (CH).

November 2013 41-1-37423-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG.

CONSOLIDATION TEST

Project	Replacement of Merchants Bridge West Approach			Client		TSI Engineering, Inc.	
Location	St. Louis, Missouri			Tested By / Date		CMB	11/14/13
Job Number	41-1-37423-001			Calculated By / Date		CMB	12/02/13
Boring:	4-A			Checked By / Date		CMB	12/02/13
Sample:	ST-1-3			File		41-1-37423-001 4-A ST-1-3 D2435	
Depth (ft)	15.0-15.5			Procedure		ASTM D2435	
Initial Data			*Final Data*			*Trimmings #1*	
Sample Height	1.006	inches	Sample Height	0.896	inches	Tare No.	1
Ring Diameter	2.501	inches	Sample Diameter	2.501	inches	Tare Weight	2.55
Wet Weight + Ring	282.60	grams	Wet Weight + Ring	359.72	grams	Wet Weight	60.30
Weight of Ring	144.11	grams	Dry Weight + Ring	323.39	grams	Dry Weight	43.07
Specific Gravity	2.69		Tare Weight	82.92	grams	M.C. %	42.5%
Sample Volume	80.99	cm^3	Sample Volume	72.14	cm^3	*Trimmings #2*	
Height of Solids	0.445	inches	Height of Solids	0.445	inches	Tare No.	2
Void Ratio	1.26		Void Ratio	1.01		Tare Weight	2.54
Saturation	93.3	percent	% Saturation	100.0	percent	Wet Weight	49.01
Weight of Water	42.13	grams	Weight of Water	36.33	grams	Dry Weight	35.04
Moisture Content	43.7	percent	Moisture Content	37.7	percent	M.C. %	43.0%
Wet Unit Weight	106.8	pcf	Wet Unit Weight	114.8	pcf		
Dry Unit Weight	74.3	pcf	Dry Unit Weight	83.4	pcf	Ring Number	410
Method Used	(A) or B		Measured Ending Sample Height	0.905	inches		
Trimming Method	Cutting Shoe	Turntable	None (Ring Lined Sampler)		Inundation @	1.0	tsf

Notes: The specific gravity is computed assuming saturation at the end of the test.

Load 1		Load 2		Load 3		Load 4	
Air Press.	0.7	Air Press.	0.9	Air Press.	1.3	Air Press.	2.1
Load, tsf	0.073	Load, tsf	0.132	Load, tsf	0.25	Load, tsf	0.5
Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4
0.1	1	0.1	3	0.1	22	0.1	57
0.25	0	0.25	5	0.25	24	0.25	62
0.5	-4	0.5	7	0.5	24	0.5	65
1	-12	1	12	1	24	1	68
2		2	16	2	25	2	72
4		4	18	4	26	4	73
8		8	19	8	27	8	77
15		15	16	15		15	79
30		30		30		30	80
60		60		60		60	81
120		120		120		120	
240		240		240		240	
480		480		480		480	
1440		1440		1440		1440	

Load 5		Load 6		Load 7		Load 8	
Air Press.	3.7	Air Press.	6.8	Air Press.	3.7	Air Press.	2.1
Load, tsf	1.0	Load, tsf	2.0	Load, tsf	1.0	Load, tsf	0.5
Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4
0.1	144	0.1	312	0.1	493	0.1	442
0.25	152	0.25	323	0.25	491	0.25	438
0.5	159	0.5	332	0.5	489	0.5	435
1	164	1	341	1	487	1	432
2	171	2	352	2	485	2	428
4	178	4	363	4	483	4	423
8	187	8	375	8	480	8	416
15	194	15	389	15	477	15	396
30	204	30	406	30	472	30	383
60	212	70	431	60	468	60	375
120	220	120	448	120	464	120	369
240	226	240	465	240	461	240	359
1172	238	490	479	480		1147	345
1440		4297	508	1440		1440	

Shannon & Wilson, Inc.
2043 Westport Center Dr.
St. Louis, Mo. 63146

CONSOLIDATION TEST

Project	Replacement of Merchants Bridge West Approach			Client		TSi Engineering, Inc.	
Location	St. Louis, Missouri			Tested By / Date		CMB	11/14/13
Job Number	41-1-37423-001			Calculated By / Date		CMB	12/02/13
Boring:	4-A			Checked By / Date		CMB	12/02/13
Sample:	ST-1-3			File		41-1-37423-001 4-A ST-1-3 D2435	
Depth (ft)	15.0-15.5			Procedure		ASTM D2435	
Initial Data			*Final Data*			*Trimmings #1*	
Sample Height	1.006	inches	Sample Height	0.896	inches	Tare No.	1
Ring Diameter	2.501	inches	Sample Diameter	2.501	inches	Tare Weight	2.55
Wet Weight + Ring	282.60	grams	Wet Weight + Ring	359.72	grams	Wet Weight	60.30
Weight of Ring	144.11	grams	Dry Weight + Ring	323.39	grams	Dry Weight	43.07
Specific Gravity	2.69		Tare Weight	82.92	grams	M.C. %	42.5%
Sample Volume	80.99	cm^3	Sample Volume	72.14	cm^3	*Trimmings #2*	
Height of Solids	0.445	inches	Height of Solids	0.445	inches	Tare No.	2
Void Ratio	1.26		Void Ratio	1.01		Tare Weight	2.54
Saturation	93.3	percent	% Saturation	100.0	percent	Wet Weight	49.01
Weight of Water	42.13	grams	Weight of Water	36.33	grams	Dry Weight	35.04
Moisture Content	43.7	percent	Moisture Content	37.7	percent	M.C. %	43.0%
Wet Unit Weight	106.8	pcf	Wet Unit Weight	114.8	pcf		
Dry Unit Weight	74.3	pcf	Dry Unit Weight	83.4	pcf	Ring Number	410
Method Used	(A) or B	Measured Ending Sample Height		0.905	inches		
Trimming Method	Cutting Shoe	Turntable	None (Ring Lined Sampler)		Inundation @	1.0	tsf

Load 9		Load 10		Load 11		Load 12	
Air Press.	3.7	Air Press.	6.8	Air Press.	13.1	Air Press.	25.7
Load, tsf	1.0	Load, tsf	2.0	Load, tsf	4.0	Load, tsf	8.0
Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4
0.1	363	0.1	439	0.1	629	0.1	1044
0.25	366	0.25	445	0.25	640	0.25	1054
0.5	368	0.5	450	0.5	649	0.5	1062
1	372	1	457	1	662	1	1072
2	375	2	464	2	678	2	1088
4	378	4	473	4	696	5	1120
8	382	8	483	8	723	8	1143
15	385	15	492	15	753	15	1175
30	390	30	502	30	795	30	1229
60	393	60	512	60	844	60	1303
120	397	120	520	120	890	120	1376
315	400	203	527	240	930	240	1448
480		1135	542	480	957	480	1496
1440		1440		1410	983	1440	1542

Load 13		Load 14		Load 15		Load 16	
Air Press.	50.7	Air Press.	13.1	Air Press.	3.7	Air Press.	1.3
Load, tsf	16.0	Load, tsf	4.0	Load, tsf	1.0	Load, tsf	0.25
Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4
0.1	1582	0.1	1971	0.1	1725	0.1	1424
0.25	1586	0.25	1967	0.25	1721	0.25	1420
0.5	1590	0.5	1963	0.5	1720	0.5	1419
1	1596	1	1959	1	1717	1	1416
2	1605	2	1952	2	1712	2	1411
4	1618	4	1943	4	1705	4	1404
8	1635	8	1929	8	1696	8	1395
15	1660	15	1912	15	1685	18	1384
30	1704	30	1890	30	1665	30	1364
60	1764	60	1858	60	1638	60	1337
120	1843	120	1820	120	1596	120	1295
240	1924	240	1783	240	1544	240	1248
501	1990	464	1760	480	1487	480	1186
1473	2034	2807	1740	1440	1428	1440	1099

CONSOLIDATION TEST

Project	Replacement of Merchants Bridge West Approach			Client		TSi Engineering, Inc.	
Location	St. Louis, Missouri			Tested By / Date		CMB	11/14/13
Job Number	41-1-37423-001			Calculated By / Date		CMB	12/02/13
Boring:	4-A			Checked By / Date		CMB	12/02/13
Sample:	ST-1-3			File		41-1-37423-001 4-A ST-1-3 D2435	
Depth (ft)	15.0-15.5			Procedure		ASTM D2435	
Initial Data			*Final Data*			*Trimmings #1*	
Sample Height	1.006	inches	Sample Height	0.896	inches	Tare No.	1
Ring Diameter	2.501	inches	Sample Diameter	2.501	inches	Tare Weight	2.55
Wet Weight + Ring	282.60	grams	Wet Weight + Ring	359.72	grams	Wet Weight	60.30
Weight of Ring	144.11	grams	Dry Weight + Ring	323.39	grams	Dry Weight	43.07
Specific Gravity	2.69		Tare Weight	82.92	grams	M.C. %	42.5%
Sample Volume	80.99	cm^3	Sample Volume	72.14	cm^3	*Trimmings #2*	
Height of Solids	0.445	inches	Height of Solids	0.445	inches	Tare No.	2
Void Ratio	1.26		Void Ratio	1.01		Tare Weight	2.54
Saturation	93.3	percent	% Saturation	100.0	percent	Wet Weight	49.01
Weight of Water	42.13	grams	Weight of Water	36.33	grams	Dry Weight	35.04
Moisture Content	43.7	percent	Moisture Content	37.7	percent	M.C. %	43.0%
Wet Unit Weight	106.8	pcf	Wet Unit Weight	114.8	pcf		
Dry Unit Weight	74.3	pcf	Dry Unit Weight	83.4	pcf	Ring Number	410
Method Used	(A) or B		Measured Ending Sample Height	0.905	inches		
Trimming Method	Cutting Shoe	Turntable	None (Ring Lined Sampler)		Inundation @	1.0	tsf

CALIBRATION OF CONSOLIDATION DEFORMATION

Procedure SWCP-15 (Reference ASTM D2435 AASHTO T216)

Equipment Calibrated:	Consolidation Deformation	Date Calibrated:	11/27/13
Reason for Calibration:	Test Completion	Next Calibration Due:	Next Test
Equipment Used:	Consolidation Appartus	Calibrated By:	CMB
	Steel Calibration Disk	Checked By:	CMB

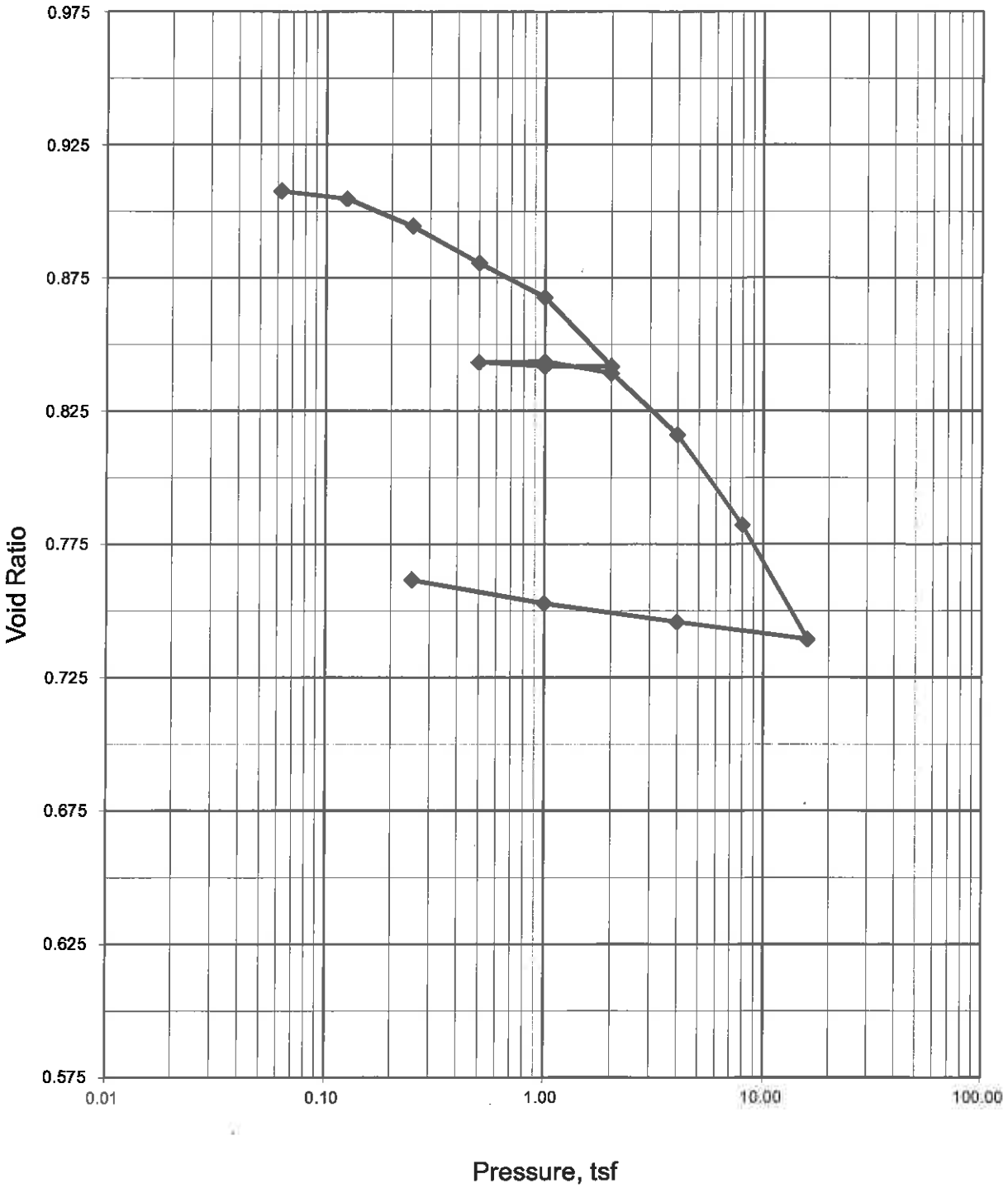
Machine Number: 410

Load tsf	Machine Def x 10^{-4}	Correction Factor x 10^{-4}	U-100 x 10^{-4}	Corr. U-100 x 10^{-4}	Compression, Percent	C_v	Void Ratio
0.01	0	0	0	0	0.00%	0	1.262
0.073	2	0	1.0	-1	0.00%	5.4E+00	1.262
0.132	18	0	17.0	-1	0.00%	7.1E-01	1.262
0.25	28	0	24.0	-4	0.00%	3.4E+00	1.262
0.5	43	0	72.0	29	0.29%	1.3E+00	1.255
1.0	67	0	221.0	154	1.54%	1.1E-01	1.227
2.0	85	0	470.0	385	3.85%	3.5E-02	1.175
1.0	78	38	467.0	351	3.51%	NA	1.183
0.5	68	38	386.0	280	2.80%	NA	1.199
1.0	75	38	395.0	282	2.82%	NA	1.198
2.0	85	38	523.0	400	4.00%	NA	1.172
4.0	103	0	941.0	838	8.38%	2.0E-02	1.073
8.0	124	0	1479.0	1355	13.55%	1.0E-02	0.957
16.0	143	0	1978.0	1835	18.35%	5.4E-03	0.849
4.0	128	56	1786.0	1602	16.02%	NA	0.901
1.0	101	56	1486.0	1329	13.29%	NA	0.963
0.25	73	56	1185.0	1056	10.56%	NA	1.024

CONSOLIDATION TEST

Merchants Bridge

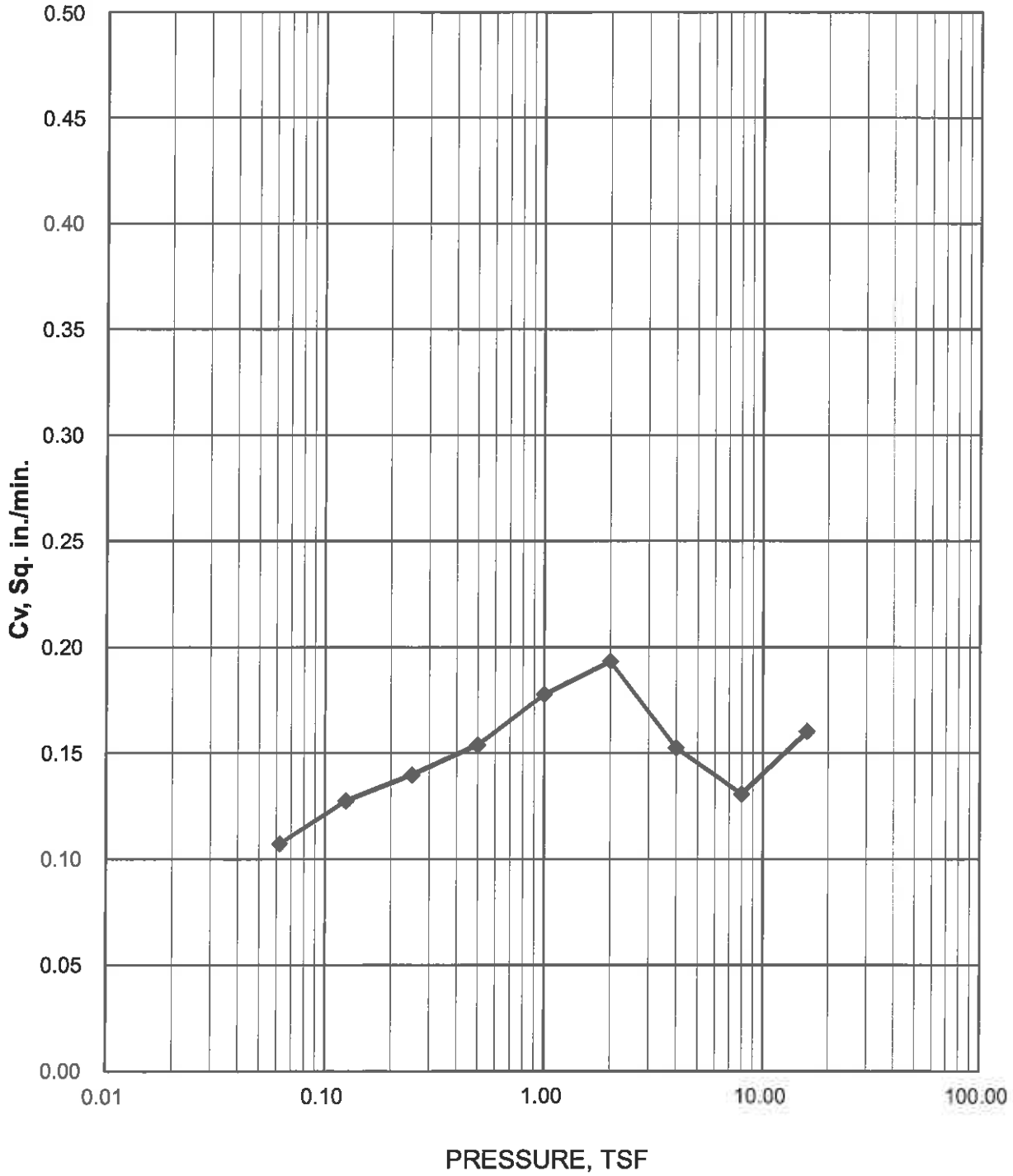
Boring B-8A, Sample ST-4 at 24.0 - 24.5 Feet
Dry Unit Wt. = 90.0 pcf; Moisture Content = 33.0%
Material: Dark Gray Silty CLAY - CL



CONSOLIDATION TEST

Merchants Bridge

Boring B-8A, Sample ST-4 at 24.0 - 24.5 Feet
Dry Unit Wt. = 90.0 pcf; Moisture Content = 33.0%
Material: Dark Gray Silty CLAY - CL



CONSOLIDATION
TEST DATA
(Square Root of Time Method)

Merchants Bridge

JOB NUMBER:	J022177.01.6003	INITIAL MOISTURE:		FINAL MOISTURE:		INITIAL DATA:	
BORING NUMBER:	B-8A	WET WT SPLE + RING	190.24	WET WT SPLE + RING	184.97	SAMPLE HT.:	0.738
SAMPLE NUMBER:	ST-4-3	DRY WT SPLE + RING	162.01	DRY WT SPLE + RING	162.01	SAMPLE DIA.:	2.501
DEPTH (Feet):	24.0 - 24.5	WT OF RING	76.40	WT OF RING	76.40	VOLUME:	59.412
		DRY WT OF SAMPLE	85.61	DRY WT OF SAMPLE	85.61	SPECIFIC GRAV. (Ass.)	2.75
WET UNIT WT =	119.6	WT OF WATER	28.23	WT OF WATER	22.96	HT. OF SOLIDS:	0.387
DRY UNIT WT =	90.0	MOISTURE CONTENT	33.0	MOISTURE CONTENT	26.8	VOID RATIO:	0.908

PRESSURE (tsf)	D100 *0.0001"	MACHINE DEFLECTION *0.0001"	CORR. FACTOR	CORR. D100 *0.0001"	CONSOLIDATION (Percent)	VOID RATIO CHANGE	VOID RATIO	D 50 UNCORR	H 50 CORR	t 50	Cv (SQ IN/MIN)
0.000	0.0	0.0	0.0	0.0	0.00	0.0000	0.908				
0.063	7.5	4.0	0.0	3.5	0.05	0.0009	0.908	5.0	0.7379	0.25	0.1073
0.125	23.9	9.0	0.0	14.9	0.20	0.0039	0.9046	17.2	0.7372	0.21	0.1274
0.250	71.6	17.0	0.0	54.6	0.74	0.0141	0.8943	56.3	0.7341	0.19	0.1397
0.500	137.3	29.0	0.0	108.3	1.47	0.0280	0.8805	120.7	0.7288	0.17	0.1539
1.000	197.2	39.0	0.0	158.2	2.14	0.0409	0.8675	186.5	0.7233	0.15	0.1777
2.000	313.1	55.0	0.0	258.1	3.50	0.0667	0.8417	292.6	0.7142	0.13	0.1933
1.000	332.0	53.0	20.9	258.1	3.50	0.0667	0.842				
0.500	319.0	46.0	20.9	252.1	3.42	0.0652	0.843				
1.000	319.0	47.0	20.9	251.1	3.40	0.0649	0.844				
2.000	344.0	55.0	20.9	268.1	3.63	0.0693	0.839				
4.000	428.4	71.0	0.0	357.4	4.84	0.0924	0.816	416.2	0.7035	0.16	0.1523
8.000	577.4	89.0	0.0	488.4	6.62	0.1263	0.782	560.2	0.6909	0.18	0.1306
16.000	764.1	110.0	0.0	654.1	8.86	0.1691	0.739	741.1	0.6749	0.14	0.1602
4.000	780.0	87.0	63.9	629.1	8.52	0.1627	0.746				
1.000	737.0	71.0	63.9	602.1	8.16	0.1557	0.753				
0.250	687.0	55.0	63.9	568.1	7.70	0.1469	0.762				

Va = Volume of air
Vw = Volume of water
Vv = Volume of voids
Vs - Volume of dry soil
V = Total volume
Ma = Mass of air (=0)
Mw = Mass of water
Md = Mass of dry soil
M = Total mass
Hs = Height of Solids

		Volume		Mass
	Volume	Va	AIR	Ma=0
	of	Vw	WATER	Mw
	Voids	Vs	SOIL	Md
		V	Total	M

		Volume (cc)		Mass (gms)
Tsi Project No.:	20121080.01			
Boring No.:	B-8A			
Sample No.:	ST-4-3	0.00	AIR	0.00
Depth (Feet):	24.0 - 24.5	28.23		
		28.23	WATER	28.23
		31.13	SOIL	85.61
INITIAL SAMPLE DATA (Prior to Consolidation)		59.36	Total	113.84

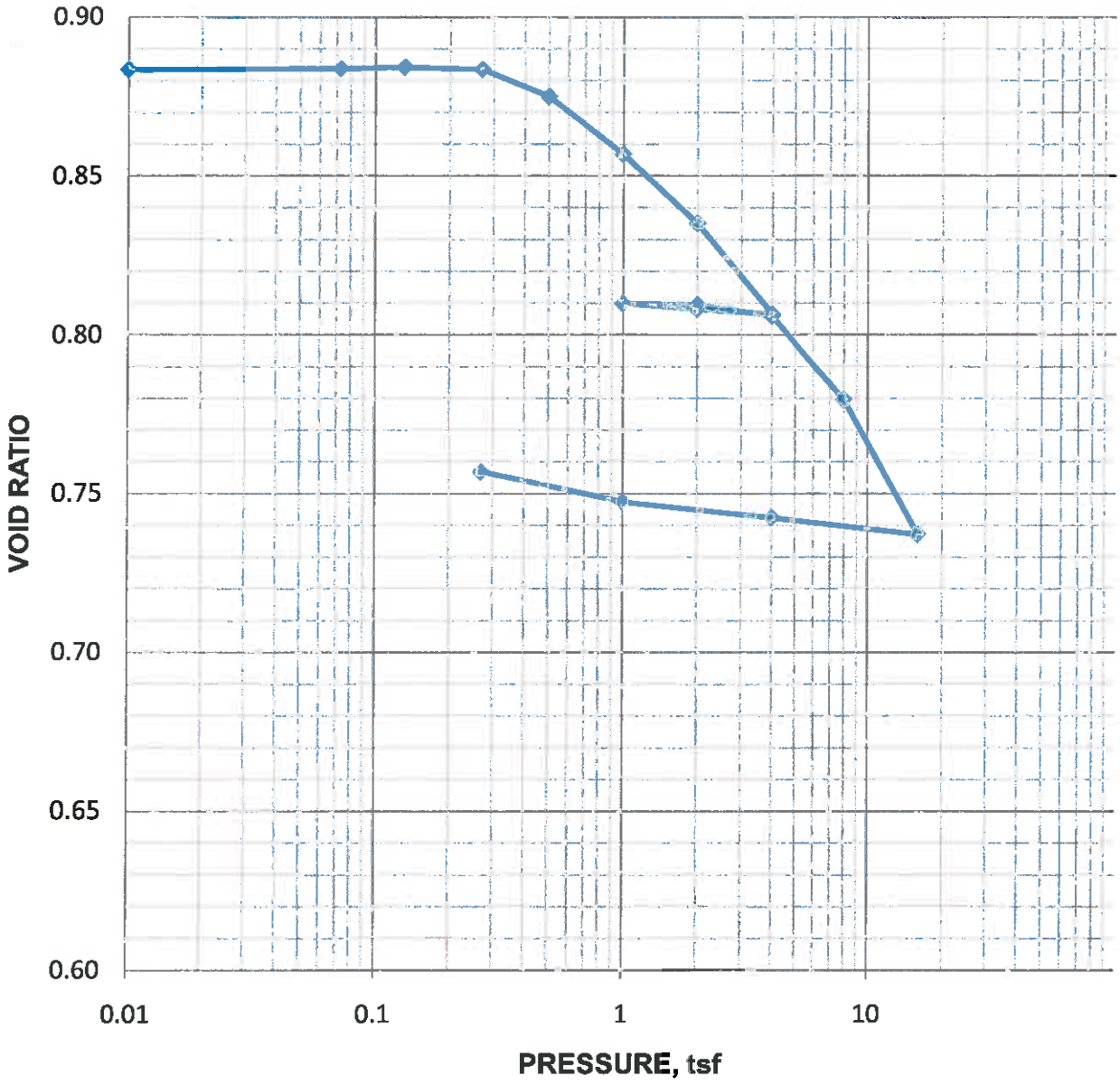
Height	0.738	(in)	
Diameter	2.500	(in)	
Weight	113.84	(g)	**Height of Solids (Hs) = Vs/A =** **0.407 (cm)**
Area	76.53	(sq cm)	
Volume	59.36	(cc)	**Specific Gravity - (Assumed) =** **2.75 (g/cc)**
Bulk Density, Wet	1.918	(g/cc)	
Bulk Density, Dry	**1.442**	**(g/cc)**	**Degree of Saturation (S) = Vw/Vv =** **1.000 (cc/cc)**
Wet + Tare	242.63	(gms)	
Dry + Tare	214.40	(gms)	**Water Filled Porosity (n) = Vw/V =** **0.476 (cc/cc)**
Tare	128.79	(gms)	
Water Content - ASTM D 2216	**33.0**	**(%)**	**Air Filled Porosity (n) = Va/V =** **0.000 (cc/cc)**
Gravimetric Water Content	**0.330**	**(g/g)**	
Volumetric Water Content	**0.476**	**(cc/cc)**	**Void Ratio (e) = Vv/Vs =** **0.907**

		Volume (cc)		Mass (gms)
Tsi Project No.:	20121080.01			
Boring No.:	B-8A			
Sample No.:	ST-4-3	0.00	AIR	0.00
Depth (Feet):	24.0 - 24.5	22.97		
		22.97	WATER	22.97
		31.13	SOIL	85.60
FINAL SAMPLE DATA (After Consolidation)		54.10	Total	108.57

Height	0.673	(in)	
Diameter	2.500	(in)	
Weight	108.6	(g)	**Height of Solids (Hs) = Vs/A =** **0.131 (cm)**
Area	31.67	(sq cm)	
Volume	54.10	(cc)	**Specific Gravity - (Assumed) =** **2.75 (g/cc)**
Bulk Density, Wet	2.007	(g/cc)	
Bulk Density, Dry - ASTM D 2937	**1.582**	**(g/cc)**	**Degree of Saturation (S) = Vw/Vv =** **1.000 (cc/cc)**
Wet + Tare	237.37	(gms)	
Dry + Tare	214.40	(gms)	22.97
Tare	128.79	(gms)	**85.61** **Water Filled Porosity (n) = Vw/V =** **0.425 (cc/cc)**
Water Content - ASTM D 2216	**26.8**	**(%)**	**Air Filled Porosity (n) = Va/V =** **0.000 (cc/cc)**
Gravimetric Water Content	**0.268**	**(g/g)**	
Volumetric Water Content	**0.425**	**(cc/cc)**	**Void Ratio (e) = Vv/Vs =** **0.738**

P:\37xxx\37400\37423\Lab\41-1-37423-001 10-A ST-2-2 D2435 11/22/2013

CONSOLIDATION TEST



Load, tsf	Coefficient of Consolidation, mm^2/second	Load, tsf	Coefficient of Consolidation, mm^2/second
0.073	3.1E+00	1.0	NA
0.132	9.7E-01	2.0	NA
0.27	1.4E+00	4.0	NA
0.5	2.2E+00	8.0	3.4E+00
1.0	2.2E+00	16.0	7.4E-01
2.0	3.0E+00	4.0	NA
4.0	1.9E+00	1.0	NA
2.0	NA	0.27	NA

Replacement of Merchants Bridge West Approach

St. Louis, Missouri

VOID RATIO PLOT

Boring: 10-A

Sample: ST-2-2

Brown, SILT (ML).

November 2013 41-1-37423-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG.

CONSOLIDATION TEST

Project	Replacement of Merchants Bridge West Approach			Client		TSi Engineering, Inc.	
Location	St. Louis, Missouri			Tested By / Date		CMB	11/14/13
Job Number	41-1-37423-001			Calculated By / Date		CMB	11/20/13
Boring	10-A			Checked By / Date		CMB	11/20/13
Sample	ST-2-2			File		41-1-37423-001 10-A ST-2-2 D2435	
Depth (ft)	31.5-32.0			Procedure		ASTM D2435	
Initial Data			*Final Data*			*Trimmings #1*	
Sample Height	0.957	inches	Sample Height	0.877	inches	Tare No.	5
Ring Diameter	2.504	inches	Sample Diameter	2.504	inches	Tare Weight	2.53
Wet Weight + Ring	296.06	grams	Wet Weight + Ring	369.08	grams	Wet Weight	73.89
Weight of Ring	146.32	grams	Dry Weight + Ring	339.30	grams	Dry Weight	55.73
Specific Gravity	2.67		Tare Weight	83.62	grams	M.C. %	34.1%
Sample Volume	77.23	cm^3	Sample Volume	70.78	cm^3	*Trimmings #2*	
Height of Solids	0.508	inches	Height of Solids	0.508	inches	Tare No.	6
Void Ratio	0.88		Void Ratio	0.73		Tare Weight	2.53
Saturation	111.5	percent	% Saturation	100.0	percent	Wet Weight	67.48
Weight of Water	40.38	grams	Weight of Water	29.78	grams	Dry Weight	51.29
Moisture Content	36.9	percent	Moisture Content	27.2	percent	M.C. %	33.2%
Wet Unit Weight	121.1	pcf	Wet Unit Weight	122.7	pcf		
Dry Unit Weight	88.4	pcf	Dry Unit Weight	96.5	pcf	Ring Number	440
Method Used	(A) or B		Measured Ending Sample Height	0.870	inches		
Trimming Method	Cutting Shoe	Turntable	None (Ring Lined Sampler)		Inundation @	1.0	tsf

Notes: The specific gravity is computed assuming saturation at the end of the test.

Load 1		Load 2		Load 3		Load 4	
Air Press.	0.7	Air Press.	0.9	Air Press.	1.3	Air Press.	2.0
Load, tsf	0.073	Load, tsf	0.132	Load, tsf	0.27	Load, tsf	0.5
Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4
0.1	2	0.1	13	0.1	33	0.1	83
0.25	3	0.25	14	0.25	35	0.25	96
0.5	3	0.5	15	0.5	36	0.5	101
1	4	1	16	1	37	1	105
2	4	2	18	2	38	2	109
4	5	4	19	4	38	4	112
8	7	8	20	8	39	8	115
15	8	15	21	15	40	15	118
30	8	30	21	30		30	121
60		60		60		60	124
120		120		120		120	
240		240		240		240	
480		480		480		480	
1440		1440		1440		1440	

Load 5		Load 6		Load 7		Load 8	
Air Press.	3.9	Air Press.	6.8	Air Press.	13.1	Air Press.	6.8
Load, tsf	1.0	Load, tsf	2.0	Load, tsf	4.0	Load, tsf	2.0
Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4
0.1	196	0.1	341	0.1	504	0.1	536
0.25	208	0.25	352	0.25	514	0.25	535
0.5	214	0.5	356	0.5	521	0.5	535
1	219	1	364	1	523	1	534
2	224	2	368	2	533	2	534
4	228	4	373	4	537	4	534
8	232	8	378	8	541	8	533
15	235	15	382	15	546	15	533
30	239	30	386	30	552	30	533
60		60	391	60		60	533
120		120	395	120		120	
240		1040	409	240		240	
480		480		480		480	
1440		1440		1440		1440	

CONSOLIDATION TEST

Project	Replacement of Merchants Bridge West Approach			Client		TSi Engineering, Inc.	
Location	St. Louis, Missouri			Tested By / Date		CMB	11/14/13
Job Number	41-1-37423-001			Calculated By / Date		CMB	11/20/13
Boring	10-A			Checked By / Date		CMB	11/20/13
Sample	ST-2-2			File		41-1-37423-001 10-A ST-2-2 D2435	
Depth (ft)	31.5-32.0			Procedure		ASTM D2435	
Initial Data			*Final Data*			*Trimmings #1*	
Sample Height	0.957	inches	Sample Height	0.877	inches	Tare No.	5
Ring Diameter	2.504	inches	Sample Diameter	2.504	inches	Tare Weight	2.53
Wet Weight + Ring	296.06	grams	Wet Weight + Ring	369.08	grams	Wet Weight	73.89
Weight of Ring	146.32	grams	Dry Weight + Ring	339.30	grams	Dry Weight	55.73
Specific Gravity	2.67		Tare Weight	83.62	grams	M.C. %	34.1%
Sample Volume	77.23	cm^3	Sample Volume	70.78	cm^3	*Trimmings #2*	
Height of Solids	0.508	inches	Height of Solids	0.508	inches	Tare No.	6
Void Ratio	0.88		Void Ratio	0.73		Tare Weight	2.53
Saturation	111.5	percent	% Saturation	100.0	percent	Wet Weight	67.48
Weight of Water	40.38	grams	Weight of Water	29.78	grams	Dry Weight	51.29
Moisture Content	36.9	percent	Moisture Content	27.2	percent	M.C. %	33.2%
Wet Unit Weight	121.1	pcf	Wet Unit Weight	122.7	pcf		
Dry Unit Weight	88.4	pcf	Dry Unit Weight	96.5	pcf	Ring Number	440
Method Used	(A) or B		Measured Ending Sample Height	0.870	inches		
Trimming Method	Cutting Shoe	Turntable	None (Ring Lined Sampler)		Inundation @	1.0	tsf

Notes: The specific gravity is computed assuming saturation at the end of the test.

Load 9		Load 10		Load 11		Load 12	
Air Press.	3.6	Air Press.	6.8	Air Press.	13.1	Air Press.	25.7
Load, tsf	1.0	Load, tsf	2.0	Load, tsf	4.0	Load, tsf	8.0
Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4
0.1	515	0.1	524	0.1	554	0.1	674
0.25	514	0.25	524	0.25	556	0.25	682
0.5	514	0.5	524	0.5	557	0.5	688
1	514	1	525	1	558	1	694
2	513	2	525	2	560	2	700
4	513	4	525	4	561	4	706
8	512	8	525	8	562	8	712
15	512	15	526	15	564	15	717
30	511	30		30	566	30	722
60	511	60		60	568	60	728
120	511	120		120	570	120	734
240		240		205	573	240	739
480		480		3992	589	480	
1440		1440		1440		1440	

Load 13		Load 14		Load 15		Load 16	
Air Press.	50.7	Air Press.	13.1	Air Press.	3.6	Air Press.	1.3
Load, tsf	16.0	Load, tsf	4.0	Load, tsf	1.0	Load, tsf	0.27
Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4	Time, min.	Def x10-4
0.1	874	0.1	928	0.1	878	0.1	822
0.25	883	0.25	927	0.25	876	0.25	814
0.5	891	0.5	927	0.5	874	0.5	809
1	899	1	926	1	873	1	805
2	907	2	926	2	871	2	801
4	914	4	925	4	870	4	797
8	922	8	925	8	869	8	794
15	928	15	925	15	868	15	791
30	935	30	924	30	867	30	789
60	941	60		60		60	786
120	948	120		120		120	
240	955	240		240		240	
1146	971	480		480		480	
1440		1440		1440		1440	

CONSOLIDATION TEST

Project	Replacement of Merchants Bridge West Approach			Client		TSI Engineering, Inc.	
Location	St. Louis, Missouri			Tested By / Date		CMB	11/14/13
Job Number	41-1-37423-001			Calculated By / Date		CMB	11/20/13
Boring	10-A			Checked By / Date		CMB	11/20/13
Sample	ST-2-2			File		41-1-37423-001 10-A ST-2-2 D2435	
Depth (ft)	31.5-32.0			Procedure		ASTM D2435	
Initial Data			*Final Data*			*Trimmings #1*	
Sample Height	0.957	inches	Sample Height	0.877	inches	Tare No.	5
Ring Diameter	2.504	inches	Sample Diameter	2.504	inches	Tare Weight	2.53
Wet Weight + Ring	296.06	grams	Wet Weight + Ring	369.08	grams	Wet Weight	73.89
Weight of Ring	146.32	grams	Dry Weight + Ring	339.30	grams	Dry Weight	55.73
Specific Gravity	2.67		Tare Weight	83.62	grams	M.C. %	34.1%
Sample Volume	77.23	cm^3	Sample Volume	70.78	cm^3	*Trimmings #2*	
Height of Solids	0.508	inches	Height of Solids	0.508	inches	Tare No.	6
Void Ratio	0.88		Void Ratio	0.73		Tare Weight	2.53
Saturation	111.5	percent	% Saturation	100.0	percent	Wet Weight	67.48
Weight of Water	40.38	grams	Weight of Water	29.78	grams	Dry Weight	51.29
Moisture Content	36.9	percent	Moisture Content	27.2	percent	M.C. %	33.2%
Wet Unit Weight	121.1	pcf	Wet Unit Weight	122.7	pcf		
Dry Unit Weight	88.4	pcf	Dry Unit Weight	96.5	pcf	Ring Number	440
Method Used	(A) or B	Measured Ending Sample Height		0.870	inches		
Trimming Method	Cutting Shoe	Turntable	None (Ring Lined Sampler)		Inundation @	1.0	tsf
Notes: The specific gravity is computed assuming saturation at the end of the test.							

CALIBRATION OF CONSOLIDATION DEFORMATION

Procedure SWCP-15 (Reference ASTM D2435 AASHTO T216)

Equipment Calibrated:	Consolidation Deformation	Date Calibrated:	11/19/13
Reason for Calibration:	Test Completion	Next Calibration Due:	Next Test
Equipment Used:	Consolidation Appartus	Calibrated By:	CMB
	Steel Calibration Disk	Checked By:	CMB

Machine Number: 440

Load tsf	Machine Def x 10^{-4}	Correction Factor x 10^{-4}	U-100 x 10^{-4}	Corr. U-100 x 10^{-4}	Compression, Percent	C_v	Void Ratio
0.01	0	0	0	0	0.00%	0	0.884
0.073	4	0	3.0	-1	0.00%	3.1E+00	0.884
0.132	21	0	18.0	-3	0.00%	9.7E-01	0.884
0.27	37	0	38.0	1	0.01%	1.4E+00	0.883
0.5	57	0	101.0	44	0.44%	2.2E+00	0.875
1.0	79	0	215.0	136	1.36%	2.2E+00	0.857
2.0	105	0	352.0	247	2.47%	3.0E+00	0.835
4.0	129	0	521.0	392	3.92%	1.9E+00	0.806
2.0	120	31	535.0	384	3.84%	NA	0.808
1.0	108	31	514.0	375	3.75%	NA	0.810
2.0	116	31	524.0	377	3.77%	NA	0.809
4.0	130	31	556.0	395	3.95%	NA	0.806
8.0	153	0	682.0	529	5.29%	3.4E+00	0.779
16.0	173	0	917.0	744	7.44%	7.4E-01	0.737
4.0	155	54	927.0	718	7.18%	NA	0.742
1.0	128	54	874.0	692	6.92%	NA	0.747
0.27	101	54	799.0	644	6.44%	NA	0.757

EXHIBIT C

Insurance Requirements

Contractor and its independent associates, consultants, and subcontractors must, at their respective sole cost and expense, procure and continuously maintain during the Term of the Agreement the following insurance coverages:

1. **Automobile Liability Insurance**.

   a. Coverage. Automobile Liability insurance must contain the following coverage and limits:

      i. Primary Bodily Injury: $1,000,000 per occurrence applying to each annual period; and

      ii. Primary Property Damage: $1,000,000 per occurrence applying to each annual period; or

      iii. Combined single limits for Primary Bodily and Primary Property Damage: $2,000,000 per occurrence applying to each annual period.

      iv. Applies to any and all motor vehicles owned, non-owned, used, or hired must be covered, and mobile equipment must be covered to the extent it may be excluded from general liability insurance.

      v. All policies shall provide contractual liability (including, but not limited to, its Contractor's indemnification obligations under this Agreement) by endorsement ISO Form CA 00 25 or equivalent.

      vi. In the event that Contractor or any subcontractor will be transporting and/or disposing of any hazardous material or waste off the jobsite, a MCS-90 Endorsement shall be added to this policy.

2. **Commercial General Liability Insurance**.

   a. Coverage. Commercial General Liability Insurance must contain broad form contractual liability covering the indemnification provision contained in this Agreement and broad form property damage coverage with a combined single limit of a minimum of $5,000,000 each occurrence and an aggregate limit of at least $10,000,000 applying to each annual period. If the aforementioned required minimum limits can only be met when applying an umbrella/excess liability policy, the umbrella/excess liability policy must follow the

Exhibit C—Continued.

form of the underlying policy and be extended to "drop down" to become primary in the event the primary limits are reduced or the aggregate limits are exhausted. Coverage must be purchased on a post 1997 ISO occurrence form or equivalent and include coverage for, but not limited to the following:

i. Bodily Injury (including death) and Property Damage;

ii. Personal Injury and Advertising Injury;

iii. Fire legal liability; and

iv. Products and completed operations.

v. Terrorism coverage shall also be included and evidenced on the certificate of insurance.

b. Other Coverage Requirements. The Commercial General Liability Insurance policy must also contain the following provisions, which must be indicated on the certificate of insurance:

i. It is agreed that any workers' compensation exclusion does not apply to TRRA's payments related to the Federal Employers Liability Act or a Railroad Wage Continuation Program or similar programs and any payments made are deemed not to be either payments made or obligations assumed under any workers' compensation, disability benefits, or unemployment compensation law or similar law.

ii. The definition of insured contract must not include any exclusion exception or other limitation for any Services being done within 50 feet of TRRA's railroad tracks (Form CG 24 17).

iii. Any exclusions related to the explosion, collapse and underground hazards must be removed.

No other endorsements limiting coverage as respects obligations under the Agreement may be included on the policy.

3. **Worker's Compensation Insurance**. Workers Compensation insurance must include coverage for:

a. Contractor's statutory liability under the worker's compensation laws of the state(s) in which the Services are to be performed. If optional under State law, the insurance must cover all employees.

b. Employers' Liability (Part B) with limits of at least $1,000,000 each accident, $1,000,000 by disease policy limit, $1,000,000 by disease each employee.

4. **Employer's Liability Insurance**.

a. Employers' Liability with limits of at least $1,000,000 each accident, $1,000,000 by disease policy limit, $1,000,000 by disease each employee.

5. **Professional Liability Insurance**.

a. $2,000,000 per occurrence applying to each annual period.

6. **Railroad Protective Liability Insurance**.

a. Railroad Protective Liability Insurance shall be maintained naming only Terminal Railroad Association of St. Louis as the insured and providing a minimum limit for bodily injury, liability and property damage of $5,000,000 per occurrence and $10,000,000 annual aggregate, which policy form shall be AAR-AASHTO with broad form coverage for "Physical Damage to Property" (ISO Form GL 0030) or as revised ISO-RIMA (Form CG 0035) and shall include coverage for pollution arising out of fuels and lubricants brought to the job site (ISO Form CG 28 31 or equivalent); provided, however, that said Railroad Protective Liability Insurance shall only be required in the event that, in connection with any work by Contractor or its independent professional associates, consultants, and subcontractors in an area where any person or equipment will be within 50 feet of any railroad track, or will be near enough to any railroad track that any equipment extension (such as, but not limited to, a crane boom) will reach to within 50 feet of any railroad track.

b. The original policy must be provided to TRRA prior to the Contractor or any of its independent professional associates, consultants, and subcontractors perform any Services under the Agreement.

7. **"All Risk" Property Insurance**.

a. Standard "all-risk" property insurance, insuring Contactor's property of every kind and description and of persons claiming by or through Contractor against those risks normally encompassed in an "all-risk" policy, including, but not limited to, (i) loss or damage by fire; (ii) loss

or damage from such other risks or hazards now or hereafter embraced by an "Extended Coverage Endorsement;" (iii) loss for flood if the area/property upon which Contractor is working is a designated flood or flood insurance area; and (iv) such other risks as a reasonably prudent owner of similar property in the locality where the work area is located would normally insure against. Such insurance shall provide for the payment of full replacement cost in the event of a total destruction of Contractor's property.

8. **Contractor's Pollution Liability Insurance**.

a. Coverage for liability arising out of any sudden and/or non-sudden pollution or impairment of the environment, including clean-up costs and defense, that arise from the operations of Contractor with TRRA. Coverage under this policy shall have limits of liability of not less than $2,000,000 each occurrence.

9. **Other Requirements**.

a. TRRA must be a named insured on all policies (except Workers' Compensation) required above. The certificate of insurance must list TRRA as an insured for each such policy.

b. No Punitive Damage Exclusions. All policies (applying to coverage listed above) must not contain an exclusion for punitive damages and certificates of insurance must reflect that no such exclusion exists.

c. Waivers of Recovery and Subrogation. Contractor agrees to waive its right of recovery against TRRA for all claims and suits against TRRA. In addition, its insurers, through the terms of the policy or policy endorsement, must waive their right of subrogation against TRRA for all claims and suits. The certificate of insurance must reflect the waiver of subrogation. Contractor further waives its right of recovery, and its insurers must also waive their right of subrogation against TRRA for loss of its owned or leased property or property under Contractor's care, custody or control.

d. Primary and Non-Contributing. Contractor's insurance policies through policy endorsement must include wording which states that the policy is primary and non-contributing with respect to any insurance carried by TRRA. The certificate of insurance must reflect that the above wording is included in evidenced policies.

Exhibit C—Continued.

e. Separation of Insureds. All policy(ies) required above (excluding Workers Compensation) must include a separation of insureds provision. Separation of insureds must be indicated on the certificate of insurance.

f. Self Insurance. Contractor is not allowed to self insure without the prior written consent of TRRA. If granted by TRRA, any deductible, self-insured retention or other financial responsibility for claims must be covered directly by Contractor in lieu of insurance. Any and all TRRA liabilities that would otherwise, in accordance with the provisions of the Agreement, be covered by Contractor's insurance will be covered as if Contractor elected not to include a deductible, self-insured retention or other financial responsibility for claims.

g. Certificates of Insurance; Copies of Policies. Prior to commencing the Services with respect to any Project, Contractor must furnish to TRRA acceptable certificate(s) of insurance including an original signature of the authorized representative evidencing the required coverage, endorsements, and amendments and referencing the contract audit/folder number if available. The policy(ies) must contain a provision that obligates the insurance company(ies) issuing such policy(ies) to notify TRRA in writing at least 30 days prior to any cancellation, non-renewal, substitution or material alteration. This provision must be indicated on the certificate of insurance. Upon request from TRRA, a certified duplicate original of any required policy must be furnished. Copies of policies may be required as a pre-condition of beginning to provide Services with respect to any Project. Contractor should send the certificate(s) and/or policies to the following address:

Asim S. Raza
Chief Legal Officer, Director of Real Estate & Marketing
Terminal Railroad Association of St. Louis
415 South 18th Street, Suite 200
St. Louis, MO 63103
Ph: 314-241-4729
Fax: 314-621-3673
E-mail: araza@terminalrailroad.com

h. Approved Insurance Providers. Any insurance policy must be written by a reputable insurance company acceptable to TRRA or with a current Best's Guide Rating of A- and Class VII or better,

Exhibit C—Continued.

and authorized to do business in the state(s) in which the service is to be provide.

i. Broker's Review. Contractor represents that the Agreement has been thoroughly reviewed by Contractor's insurance agent(s)/broker(s), who have been instructed by Contractor to procure the insurance coverage required by the Agreement.

j. Modification of Required Coverages. Attorney's fees and necessary litigation expenses must be in addition to all policy limits for the insurance coverages referenced above. Not more frequently than once a year, TRRA may reasonably modify the required insurance coverage to reflect then-current risk management practices in the railroad industry and underwriting practices in the insurance industry. In such event, such modifications will be set forth in a written notice delivered to Contractor and Contractor shall modify its insurance coverage in compliance with such modifications within thirty (30) days of the receipt of such notice.

k. Independent Associates, Consultants, & Subcontractors. If any portion of the Services are to be subcontracted by Contractor, Contractor must require that the independent associate(s), consultant(s), and/or subcontractor(s) provide and maintain the insurance coverages set forth herein, naming TRRA as an additional insured, and requiring that the independent associate(s), consultant(s), and/or subcontractor(s) release, defend and indemnify TRRA to the same extent and under the same terms and conditions as Contractor is required to release, defend and indemnify TRRA herein.

l. Remedies. Failure to provide evidence as required by this Exhibit will entitle, but not require, TRRA to terminate the Agreement immediately. Acceptance of a certificate that does not comply with this Exhibit will not operate as a waiver of Contractor's obligations hereunder.

m. No Limits. The fact that insurance (including, without limitation, self-insurance) is obtained by Contractor will not be deemed to release or diminish the liability of Contractor including, without limitation, liability under the indemnity provisions of the Agreement. Damages recoverable by TRRA will not be limited by the amount of the required insurance coverage.

Exhibit C—Continued.

n. Definition of TRRA. For purpose of this Exhibit, TRRA includes its owner railroads.

o. Definition of Occurrence. For purpose of this Exhibit, "Occurrence," as used herein, means any event or related exposure to conditions which result in bodily injury, death, or property damage.

[End of Exhibit C.]

EXHIBIT D

Safety Instructions & Contractor Requirements

1. SAFETY ORIENTATION

1.1 **Contractor Orientation and Training.** Contractor, its employees, and its independent professional associates, consultants, and all Subcontractors, Sub-subcontractors and other persons and entities performing any Work or services under this Agreement or Task Order (collectively and individually, "**Authorized Personnel**"), shall first complete the TRRA-specific e-RAILSAFE course as specifically outlined in **Exhibit E** to this Agreement.

2. CONTRACTOR ROADWAY WORKER ON TRACK SAFETY PROGRAM AND SAFETY ACTION PLAN

2.1 **Development of Safety Program.** Contractor and each of the Authorized Personnel that will perform Work within 25 feet of the centerline of a railroad track must develop and implement a Roadway Worker Protection/On Track Safety Program (a "**RW Safety Program**") for the Work with TRRA in order to develop an on track safety strategy as described in the guidelines listed in the on track safety portion of the Contractor Safety Orientation. This RW Safety Program must provide training for the Contractor and the Authorized Personnel. Contractor shall reinforce this training at the job site through job safety briefings. During the performance of the Work, Contractor must audit the performance of the Work to ensure RW Safety Program compliance. Contractor must designate one on-site supervisor to serve as the contact person for TRRA and who will be responsible to maintain a copy of the RW Safety Program, safety audits, and Material Safety Datasheets ("**MSDS**"), at the site of the Work. All Work performed by Contractor or the Authorized Personnel within 25 feet of any track must be in compliance with Federal Railroad Administration ("**FRA**") Roadway Worker Protection Regulations.

3. CONTRACTOR GENERAL SAFETY REQUIREMENTS

3.1 **General.** The Contractor and each of the Authorized Personnel shall keep the job site free from safety and health hazards and ensure that their respective employees are competent and adequately trained in all safety and health aspects of the job. All work shall be conducted in such a manner as will assure the safety of TRRA, its employees, and its railroad operations. TRRA's authorized representative shall have the right, but not the duty, to require certain procedures to be used or to supervise the work on TRRA's property. **If any Work is to be done in the confines of TRRA's Madison Yard, in Venice, Illinois, the Contractor is required to contact the Director of Safety and Operating Practices, at 618-660-9551, prior to accessing the property, so a mandatory safety film can be shown to Contractor and all Authorized Personnel and their respective employees, and such must be complied with by the same.**

Exhibit D—Continued.

3.2 **Moving Trains.** Work in the proximity of TRRA's railroad track(s) is potentially hazardous where movement of trains and equipment can occur at any time and in any direction. When any Work is in progress in the vicinity of railroad tracks, Contractor and the Authorized Personnel should always be alert for approaching trains or engines, and should expect the movement of trains, engines or cars on any track at any time. Upon the approach of a train or engine, Contractor and the Authorized Personnel shall stop all Work and station themselves not closer than twenty-five feet (25'0") from the centerline of the track on which the train is operating. Because the performance of the Work on and around railroad tracks can be hazardous, safety precautions and TRRA's instructions must be followed at all times.

3.3 **Protective Equipment/Clothing.**

3.3.1 All personnel protective equipment ("**PPE**") used on TRRA property must meet applicable OSHA and American National Standards Institute ("**ANSI**") specifications. Such specifications require that Contractor and the Authorized Personnel performing the Work in and around train operations shall wear suitable clothing and other personal protective equipment as may be required by TRRA. A list of current TRRA PPE may be obtained from TRRA, however, a partial list of the requirements include: (i) safety glasses/eye protection with permanently affixed side shields (no yellow lenses) that meets ANSI Z87.1 or latest revision; (ii) hard hats/protective head gear that meets ANSI Z89.1 or latest revision (it is suggested that all hard hats be affixed with Contractor's company logo or name); (iii) safety shoes with hardened toes, above-the ankle lace-up and a defined heel; and (iv) high visibility retro-reflective work wear. Hearing protection, fall protection, gloves, and respirators must be worn as required by State and Federal regulations.

3.3.2 Contractor and the Authorized Personnel shall have proper first aid supplies available on the job site so that prompt first aid services can be provided to any person that may be injured on the job site.

3.3.3 Contractor and the Authorized Personnel shall be suitably dressed to perform their respective duties safely and in a manner that will not interfere with the vision, hearing or free use of their hands or feet. Only waist length shirts with sleeves and trousers that cover the entire leg are to be worn. If flare-legged trousers are worn, the trouser bottoms must be tied to prevent catching.

3.4 **Report Injuries.** TRRA is required to report certain injuries as a part of compliance with FRA reporting requirements. Any personal injury sustained by Contractor or the Authorized Personnel while on TRRA's property must be reported immediately (by phone mail if unable to contact in person) to the TRRA's designated representative. The Individual Incident Report form is to be completed and emailed to to the TRRA's designated representative no later than the close of shift on the date of the injury.

Exhibit D—Continued.

3.5 **Safety Briefings.** Before commencing any of Work, a thorough job safety briefing must be conducted with all Authorized Personnel involved with the Work. Such job safety briefing shall be repeated when the Authorized Personnel or Task Order involved with the Work changes. If any Work performed by Authorized Personnel is within 25 feet of the centerline of any railroad track (measured at right angles thereto), the job safety briefing must include TRRA's flagger, as applicable, and include the procedures Contractor shall use to protect the Authorized Personnel when moving any equipment adjacent to or across any railroad track(s).

3.6 **Safety Strategy.** Contractor and the Authorized Personnel shall not perform Work within 25 feet of the centerline of any track (measured at right angles thereto) without an on-track safety strategy approved by TRRA. When authority is provided, each of the Authorized Personnel must know: (i) the identity of the TRRA flagger and how to contact the TRRA flagger, (ii) limits of the authority, (iii) the method of communication to stop and resume Work, and (iv) location of the designated place of safety. Persons or equipment entering flag/Work limits that were not previously job briefed must notify the flagger immediately and be given a job briefing when Work are within 25 feet of the centerline of track (measured at right angles thereto).

3.7 **Activities After Hours.** When Contractor or the Authorized Personnel are to perform Work on the Property after normal business hours or on weekends, an authorized representative of TRRA must be notified prior to conducting such activities. A minimum of two (2) employees must be present at all times such Work is conducted.

3.8 **Drugs, Alcohol, Weapons.** For safety reasons, while conducting any Work, no person shall (i) have in their possession any pocket knives, firearms or other deadly weapons, and (ii) be under the influence of drugs or alcohol or be in possession of drugs or alcohol. Any Authorized Personnel under suspicion of being under the influence of drugs or alcohol, or in the possession of same, shall be immediately removed from TRRA property by Contractor or TRRA, and if removed by TRRA, such Authorized Personnel shall be subsequently released to the custody of a representative of Contractor. Future access to TRRA property will be denied to any Authorized Personnel found to have violated this Section.

3.9 **Report Damage.** Contractor and any Authorized Personnel must immediately report to TRRA any damage to TRRA property, or any hazard noticed on passing trains. In the event any vehicle or machine comes in contact with any track, signal equipment, or structure (bridge) and such contact could result in a train derailment, Contractor and any Authorized Personnel shall report such contact immediately to a TRRA representative in charge of the project and to TRRA's Chief Engineer at **(618) 451-8428**. Local emergency numbers are to be obtained from TRRA prior to the start of any Work and Contractor shall post such emergency numbers at the job site.

3.10 **Storage.** Neither Contractor nor any authorized personnel shall pile or store any materials, machinery, or equipment, closer than **25 FEET** to the center line of

the nearest TRRA track (measured at right angles thereto). Materials, machinery or equipment must not be stored or left within **250 FEET** of any highway/rail at-grade crossings (measured at right angles thereto), where storage of the same will obstruct the view of a train approaching the crossing. Prior to beginning of the Work, Contractor must establish a storage area with concurrence of TRRA's designated representative. .

3.11 **Unattended Equipment.** Machines or vehicles must not be left unattended with the engine running. Parked machines or equipment must be in gear with brakes set and if equipped with blade, pan or bucket, they must be lowered to the ground. All machinery and equipment left unattended on TRRA's property must be left inoperable and secured against movement. TRRA is not responsible for theft or any damage of machinery and equipment left on its property.

3.12 **Drainage.** Neither Contractor nor any Authorized Personnel shall create and leave any conditions on TRRA property where the Work that has been/that is being performed would interfere with water drainage. Any Work performed near and over water or which may impact a waterway must meet all Federal, State and Local regulations.

3.13 **Power Lines.** All power line wires must be considered dangerous and of high voltage unless informed to the contrary by proper authority. For all power lines the minimum clearance between the lines and any part of the equipment or load must be: (i) 200 KV or below – 27 feet; (ii) 200 to 350 KV – 28 feet; (iii) 350 to 500 KV – 30 feet; (iv) 500 to 750 KV – 35 feet; and (v) 750 to 1000 KV – 45 feet. If capacity of the line is not known, a minimum clearance of 45 feet must be maintained. A person must be designated to observe clearance of the equipment and give a timely warning for all operations where it is difficult for an operator to maintain the desired clearance by visual means.

3.14 **Heavy Equipment/Machinery/Vehicles.** All heavy equipment, machinery, and vehicles provided or leased by the Contractor and Authorized Personnel shall be equipped with audible back-up warning devices. If, in the opinion of TRRA, any of the Contractor's or Authorized Personnel's equipment, machinery, or vehicles are unsafe for use on the Railroad's right-of-way, Contractor or the Authorized Personnel, at the request of TRRA, shall remove such equipment, machinery, or vehicles, from the TRRA right-of-way.

4. GENERAL

4.1 **No Interference**. Contractor must plan, schedule and conduct all Work so as not to interfere with the movement of any trains on TRRA property.

4.2 **Cooperation of TRRA**. Subject to the movement of TRRA's trains, TRRA will cooperate with Contractor such that the Work may be handled and performed in an efficient manner.

4.3 **Cease Activities**. TRRA shall have the absolute right to cause the Work to cease if, in the opinion of TRRA, Contractor's activities create a hazard to TRRA's

property, or any of TRRA's employees and/or operations. Contractor shall have no claim whatsoever for any type of damages or for extra or additional compensation in the event the Work is delayed by TRRA.

4.4 **FalseWork or Excavations**. Contractor shall furnish TRRA with five (5) sets of drawings showing details of construction affecting TRRA's property and tracks, if the Work involves (i) any false work above any tracks or (ii) any excavations (A) located within twenty-five (25) feet of the centerline of the nearest track (measured at right angles thereto) or (B) intersecting a slope from the plane of the top of rail on a 1 ½ horizontal to 1 vertical slope beginning at eleven (11) feet from centerline of the nearest track, both measured perpendicular to the centerline of the track. Drawings must include the proposed method of installation and removal of false work, shoring or cribbing, not included in the contract plans and two (2) sets of structural calculations of any false work, shoring or cribbing. All calculations must take into consideration railway surcharge loading and must be designed to meet American Railway Engineering and Maintenance-of Way Association (previously known as American Railway Engineering Association) Coopers E-80 live loading standard. All drawings and calculations must be stamped by a registered professional engineer licensed to practice in the state the project is located. Contractor shall not begin Work until notified by TRRA that the plans for false work have been approved. Contractor shall be required to use lifting devices such as, cranes and/or winches to place or to remove any false work over TRRA's tracks. In no case will Contractor be relieved of responsibility for results obtained by the implementation of said approved plans.

4.5 **Flagger Services**.

4.5.1 **Prior Notice**. Contractor must give the designated representative of TRRA a minimum of seven (7) calendar days advance written notice when flagging services will be required so that TRRA's designated representative may make appropriate arrangements (i.e., bulletin the flagger's position). If flagging services are scheduled in advance by Contractor and it is subsequently determined by the parties hereto that such services are no longer necessary, Contractor must give TRRA five (5) business days advance written notice so that appropriate arrangements can be made to abolish the position, pursuant to union requirements.

4.5.2 **When Required**. Unless determined otherwise by TRRA's designated representative, a TRRA flagger and protective services and devices will be required and furnished when (i) Contractor's Work are located over, under and/or within twenty-five (25) feet measured horizontally from centerline of the nearest track, and (ii) cranes or similar equipment positioned beyond 25-feet from the track centerline could foul the track in the event of tip-over or other-catastrophic occurrence, resulting from (but not limited to) the following conditions:

(a) When in the opinion of TRRA's designated representative it is necessary to safeguard TRRA's property, employees, trains, engines and facilities.

(b) When any excavation is performed below the bottom of railroad tie elevation, if, in the opinion of TRRA's designated representative, track or other TRRA facilities may be subject to movement or settlement.

(c) When Work in any way interferes with the safe operation of trains at timetable speeds.

(d) When any hazard is presented to TRRA's tracks, communications, signals, electrical, or other facilities either due to persons, material, equipment or blasting in the vicinity.

4.5.3 **Heavy Equipment/Objects**. Special permission must be obtained from TRRA before moving heavy or cumbersome objects or equipment which might result in making the track impassable.

4.5.4 **Flagging Work**. All flagging services will be performed by qualified TRRA flaggers. A flagging crew generally consists of one (1) employee. However, additional personnel may be required to protect TRRA property and TRRA operations, if deemed necessary by TRRA's designated representative.

(a) Each time a flagger is called, the minimum period for billing will be the eight (8) hour basic day.

(b) The cost of flagger services provided by TRRA, when deemed necessary by the Railroad Representative, will be borne by Contractor. The estimated cost for one (1) flagger is [$700] for an eight (8) hour basic day with time and one-half or double time for overtime, rest days and holidays. The estimated cost for each flagger includes vacation allowance, paid holidays, TRRA and unemployment insurance, public liability and property damage insurance, health and welfare benefits, transportation, meals, lodging and supervision. Negotiations by appropriate Federal authorities may increase actual or estimated flagging rates. The flagging rate in effect at the time services are performed will be used to calculate the actual costs of flagging pursuant to this Section.

4.6 **Excavation**.

4.6.1 **Underground Structures**. In the event the Work involves excavation, prior to performing any such excavation, Contractor must determine whether any underground structures, equipment or facilities (including without limitation, utility lines, pipe lines, electric wires or cables, fiber optic cable systems) (any of which may be referred to as an "Underground Structure") are present where such Work may be performed. Contractor must determine whether excavation could cause damage to any Underground Structure. Damage to an Underground Structure may result in delays to TRRA traffic and disruption of service to other users. Delays and disruptions to service may cause business interruptions involving loss of revenue and profits. Before commencing excavation, Contractor must contact TRRA's Signal Supervisor or Signal Maintainer to obtain approval prior to any excavation, and to ascertain to the extent possible, the location of any buried railroad signal cables near the proposed work. All

underground and overhead wires will be considered HIGH VOLTAGE and dangerous until verified with the company having ownership of the line. It is Contractor's responsibility to notify any other companies that have underground utilities in the area where Work will be performed and arrange for the location of all underground utilities before performing any excavation activity.

4.6.2 **Location of Underground Structures**. If there is any doubt about the location of an Underground Structure of any kind, no Work shall be performed until the exact location of such Underground Structure has been determined. There will be no exceptions to these instructions. Contractor must cease all Work and notify TRRA's designated representative immediately before continuing excavation in the area if obstructions (including Underground Structures) are encountered which do not appear on drawings. If the obstruction is a utility and the owner of the utility can be identified, then Contractor must also notify the owner immediately.

4.6.3 **OSHA Standards**. All excavations must be conducted in compliance with applicable OSHA regulations and, regardless of depth, must be properly shored where there is any danger to tracks, structures or personnel.

4.6.4 **Excavations Secured**. Any excavations, holes or trenches on the Property must be covered, guarded and/or protected at all times including when Work thereon is not being performed. When leaving TRRA property at night and over weekends, Contractor shall secure the Work site and leave it in a condition that will ensure that TRRA employees and other personnel who may be working or passing through TRRA's property are protected from all hazards. All excavations must be back filled as soon as possible and to such specifications as may be required by TRRA.

Exhibit D—Continued.

4.7 **Protective Measures**

4.7.1 **Protection of Facilities**. Contractor must take protective measures as are necessary to keep TRRA's facilities, including track ballast, free of sand, debris, and other foreign object and materials resulting from Contractor's operations. Any damage to TRRA's facilities resulting from Contractor's Work shall be repaired or replaced by TRRA and Contractor agrees to promptly reimburse TRRA for all costs of such repairs or replacement.

4.7.2 **Blasting**. Contractor must notify TRRA's project representative or Chief Engineer at (618) 451-8428 and provide blasting plans to TRRA for review not less than seven (7) calendar days prior to conducting any blasting operations adjacent to or on the Property.

4.7.3 **Temporary Clearances**. Contractor must abide by the following temporary clearances during construction and the performance of all Work:

(a) 15' 0" Horizontally from center line of nearest track (measured at right angles thereto);

(b) 23' 0" Vertically above top of the highest rail.

If lesser clearances than the above are required for any part of a Project, the Contractor shall secure written authorization from TRRA's authorized representative or Chief Engineer for such lesser clearances in advance of the start of that portion of the work.

4.7.4 **Permanent Clearances**. Upon completion of construction, the following clearances shall be maintained:

(a) 25' 0" Horizontally from centerline of nearest track; and

(b) 23'-3 ½" Vertically above top of rail.

4.7.5 **Clearance Infringement**. If any infringement of State or Federal statutory clearances due to the Work is anticipated, details of such infringement must be submitted to TRRA and, if Contractor is working on behalf of a political subdivision of the State, to such political subdivision. No Work involving such infringement may be undertaken until (i) approved in writing by TRRA, and (ii) the applicable political subdivision has obtained any necessary authorization from the State or Federal Regulatory Authority for the infringement. No extra compensation will be allowed in the event the Work is delayed pending TRRA approval and/or the State or Federal Regulatory Authority's approval.

4.7.6 **Tell-Tale**. In the case of impaired vertical clearance above top of rail, TRRA may install "tell-tale" or other protective devices TRRA deems **.**

necessary for protection of TRRA operations. The cost of tell-tale or protective devices shall be borne by Contractor.

4.7.7 **Additional Details**. The details of Work affecting TRRA Property and tracks not included in the contract plans must be submitted to TRRA for approval before Work may be undertaken.

4.7.8 **Temporary Crossing**. Other than at public road crossings, Contractor shall not move any equipment, machinery, or materials across the Property or tracks until permission has been obtained from TRRA. Contractor must obtain a "Temporary Private Crossing Right of Entry" from TRRA prior to moving such equipment, machinery, or materials across TRRA's tracks. The temporary crossing must be gated and locked at all times when not required for use by Contractor. The temporary crossing for use of the Contractor will be at the sole expense of Contractor.

4.7.9 **Hazardous Materials**. Contractor shall not allow TRRA's property to become a treatment, storage or transfer facility for hazardous materials or substances as those terms are defined in the Resource Conservation and Recovery Act or any state analogue. The discharge, release or spill on TRRA's property of any hazardous substances, oil, petroleum, constituents, pollutants, contaminants, or any hazardous waste is prohibited.

4.8 **Reporting Requirements**.

4.8.1 **Environmental Laws**. If, while performing any Work under this Agreement, Contractor or any of the Authorized Personnel (i) discover any hazardous waste, hazardous substance, petroleum or other deleterious material, including but not limited to any non-containerized commodity or material, (A) on or adjacent to TRRA property, or (B) in or near any surface water, swamp, wetlands or waterways, or (ii) cause any discharge, release or spills of such materials in excess of a reportable quantity, then Contractor shall immediately:

(a) notify TRRA's authorized representative or Chief Engineer at (618) 451-8428, of such discovery or release;

(b) take safeguards necessary to protect its Authorized Personnel and/or third parties; and

(c) exercise due care with respect to the discovery or release, including the taking of any appropriate measure to minimize the impact of such release.

4.9 **Train Delay**.

4.9.1 **Contractor Liable for Delays**. Contractor is responsible for and hereby indemnifies and holds harmless TRRA (including its owner railroads and its tenants) for, from and against all damages arising from any unscheduled delay to a freight or passenger train which affects TRRA's ability to fully utilize its equipment and to meet customer service and contract obligations which are caused by Contractor, or the Authorized Personnel, subcontractors or subservice providers performing Work under this Agreement. Contractor will be billed, as further provided below, for all of the economic losses arising from such delay, including without limitation (i) loss of use of equipment, (ii) contractual loss of incentive pay and bonuses and (iii) contractual penalties resulting from train delays.

(a) For loss of use of equipment, Contractor will be billed the current freight train hour rate per train as determined from TRRA's records. Any disruption to train traffic may cause delays to multiple trains at the same time for the same period.

(b) Additionally, the parties acknowledge that passenger, U.S. mail trains and certain other grain, intermodal, coal and freight trains operate under incentive/penalty contracts between TRRA and its customer(s). Under these arrangements, if TRRA does not meet its contract service commitments, TRRA may suffer loss of performance or incentive pay and/or be subject to penalty payments. Contractor is responsible for any train performance and incentive penalties or other contractual economic losses actually incurred by TRRA which are attributable to a train delay caused by Contractor, the Authorized Personnel or its subcontractors.

(c) The contractual relationship between TRRA and its customers is proprietary and confidential. In the event of a train delay covered by this Agreement, TRRA will share information relevant to any train delay to the extent consistent with TRRA confidentiality obligations. Damages for train delay for certain trains may be as high as $50,000.00 per incident.

4.10 **Work Windows**.

If absolutely required for the Work, Contractor may request Work Windows from TRRA and TRRA may, in its sole discretion, grant Contractor and the Authorized Personnel permission for such work windows provided that Contractor provide TRRA's designated representative seven (7) days advance notice of the times and dates for proposed work windows. TRRA and Contractor will establish mutually agreeable work windows for the Work. TRRA has the right, at any time, to revise or change the work windows due to train operations or service obligations. TRRA will not be responsible for any additional costs or expenses resulting from a change in work windows. Additional costs or expenses resulting from a change in work windows shall be accounted for in Contractor's expenses for the Work.

4.11 **Removal.**

Contractor shall be required upon the completion of any Project to remove from within the limits of TRRA's Property all machinery, equipment, surplus materials, false work, rubbish or temporary buildings, and to leave the property in a condition satisfactory to the Chief Engineer of TRRA or his authorized representative.

[End of Exhibit D.]

EXHIBIT E

e-RAILSAFE Training

Contractor, its employees, and its independent associates, consultants, subcontractors or other related persons or entities involved in any Task Order, or engaged on behalf of Contractor pertaining to any Task Order controlled by this Agreement shall, before entering upon the property of TRRA for the performance of any work shall confer with TRRA relative to requirements for railroad clearances, operation and general safety regulations, and shall go through Railroad Safety Training at http://www.e-railsafe.com/. TRRA reserves the right to bar any of Contractor's employees, and its independent associates, consultants, subcontractors, or other related persons or entities from TRRA's property at any time for any reason.

Prior to contacting e-RAILSAFE, in order to access TRRA Property, Contractor, and independent associates, consultants, subcontractors, or other related persons or entities shall call Dan Morton (or any other person designated by TRRA) at (314) 539-4763 or email at dmorton@terminalrailroad.com to get a "Vendor Number". When they have their vendor number, they can then get into e-RAILSAFE. Mr. Morton will determine if the Contractor, its employees, its independent associates, consultants, subcontractors, or other persons or entities involved in any Task Order controlled by this Agreement need only the TRRA based Safety Training and e-RAILSAFE, or if they will have to endure, in addition thereto, background checks, depending upon the work that they will be engaged to complete. Minimum information required is Company Name, Address, Telephone Number, Contact Person for State Projects, the DOT Contract No. and AAR/DOT Number must be included.

The Contractor, its employees, its independent associates, consultants, subcontractors or other related persons or entities shall have in their possession at all times the credentials and I.D. cards obtained from TRRA (including e-RAILSAFE) prior to entering onto any TRRA property or performing any Work. It shall be the responsibility of Contractor to ensure that its employees, and its independent associates, consultants, subcontractors and other related persons or entities understand and adhere to the safety requirements outlined in such orientation and contained in this Agreement. Notwithstanding the foregoing, it is agreed and understood that Contractor shall have ultimate responsibility for supervision, safe work method and practices of its agents, independent associates, consultants, subcontractors, servants, and employees and compliance with FRA regulations (including, but not limited to, FRA Roadway Worker Protection – 49CFR, Part 214, Subpart C) and Occupational Safety and Health Administration regulations, as well as other appropriate local, State, and Federal regulations. Contractor shall be responsible for the cost of such orientation. Contractor must renew such orientation for its employees, and its independent associates, consultants, subcontractors or other related persons or entities annually, in the event the term of this Agreement or Task Order exceeds one year.

[End of Exhibit E.]