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STATE OF MISSOURI THADDEUS KOSMICKI NUMBER PE-2008000074 PROFESSIONAL ENGINEER THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY	**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION** 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65101 Phone (888) 275-6636
	HDR Engineering *10450 Holmes Road, Suite 600* *Kansas City, MO 64131* Certificate of Authority: 000856 Consultant Phone:816-360-2700
	If a seal is present on this sheet, JSP's has been electronically sealed and dated.
	JOB NO. J1P3384 Atchison County, MO Date Prepared: 7/30/2020
Only the following items of the Job Special Provisions (Bridge) are authenticated by this seal: ALL	

ADDITIONAL INFORMATION

Geosyntec Consultants Bathymetric Survey (March 2020)

A. CONSTRUCTION REQUIREMENTS

1.0 Description. This provision contains general construction requirements for this project.

2.0 Construction Requirements. Plans for the existing structure and the March 2020 Bathymetric Survey files are included in the contract in the bridge electronic deliverables zip file for informational purposes only.

2.1 In order to assure the least traffic interference, the work shall be scheduled so that no lane closures are required to complete the work.

2.2 Provisions shall be made to prevent any debris and material from falling into the river. If determined necessary by the engineer, any debris and material that falls below the bridge outside the previously specified limits shall be removed as approved by the engineer at the contractor's expense.

2.4 Any damage sustained to the remaining structure as a result of the contractor's operations shall be repaired or the material replaced as approved by the engineer at the contractor's expense.

2.5 Provisions shall be made to prevent damage to any existing utilities. Any damage sustained to the utilities as a result of the contractor's operations shall be the responsibility of the contractor. All costs of repair and disruption of service shall be as determined by the utility owners and as approved by the engineer.

3.0 Navigation Requirements.

3.1 All work shall be performed so that the free flow of navigation is not unreasonably interfered with, the navigable depths are not impaired and navigation lighting is visible at all times. Any floating equipment or vessels working in the channel shall display lights and signals as required by the current “Inland Navigation Rules”. If scaffolding or nets are suspended below low steel in the navigation span, the U.S. Coast Guard district office shall be advised so that the temporary reductions in clearance for river traffic can be checked for reasonableness and appropriate notices can be published. Positive precautions shall be taken to prevent the accidental dropping of spark producing, flame producing, lighted or damaging objects onto barges or vessels passing beneath the bridge. All flame cutting, welding or other similar spark producing operations shall be ceased over the channel when vessels are passing beneath the bridge.

3.2 The contractor shall be responsible for submitting a work plan to the engineer for review. When the engineer is in concurrence with the work plan, the engineer will forward the material to the U.S. Coast Guard district office for approval. The U.S. Coast Guard will require at least 30 days to review the work plan prior to any work beginning. The work plan shall be submitted to the District Commander, Western Rivers Operation, Eighth Coast Guard District, Bridge Branch.

4.0 Method of Measurement. No measurement will be made.

5.0 Basis of Payment. Payment for the above described work will be considered completely covered by the contract unit price for other items included in the contract.

B. RIGHT-OF-WAY AND ACCESS

1.0 Description. The Contractor shall become acquainted with the right-of-way limits and available work and storage space at the site. Any additional working areas and storage spaces required by the contractor shall be provided and paid for by the Contractor. All bidders are required to visit the site in order to become acquainted with the terrain throughout the project site and the nature of the river and surrounding topography. By submission of a bid, the Contractor acknowledges review of the site and acceptance of the existing site conditions.

1.1 The Contractor shall comply with the requirements of federal, state, and local agencies having jurisdiction and with all permit requirements during construction. The Contractor shall coordinate the construction of temporary haul roads, access points, berms, boat docks, material storage areas, and other incidental or temporary construction with such agencies prior to beginning construction of temporary works.

2.0 Construction Requirements.

2.1 Street Closure. Route 136 and all streets in Brownville, NE shall remain open to traffic at all times.

2.2 Structures, Levees and Railroad Protection. The contractor shall conduct all operations in a manner that the existing structures, levees and facilities of the railroad are protected from damage. Existing structures adjacent or below the bridge shall not be removed unless removal of such structures is indicated. Any damage sustained to the city streets, buildings, levees, facilities of the railroad or other features as a result of the contractor's operations, shall be repaired or the material replaced as determined by the engineer at the contractor's expense. The contact for the levee districts are as follows:

Missouri River Levee Unit L-550-561
Atchison County Levee District No. 1
Ryan Ottmann, President
Rockport, MO 64482
660-744-6867

2.3 Temporary Bulkheads. Dredging and temporary bulkheads used to access the construction site shall only be permitted on the eastern side of the Missouri River.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. Payment for the above described work will be considered completely covered by the contract unit price of other items.

C. NAVIGATIONAL CONSIDERATIONS AND WORK WITHIN RIVER

1.0 Description. All work in navigable waters shall be so conducted that free navigation of the waterway will not be unreasonably impaired. The primary navigation channel is between Piers 2 and 3. The Contractor's plan for temporary construction and falsework shall provide for maintenance of navigation through the primary navigation channel.

2.0 Construction Requirements.

2.1 All construction operations in and over the Missouri River shall conform to the requirements and directions of the District Commander, USCG; the United States Army Corps of Engineers; the State of Missouri; and/or other federal, state, or local authority having cognizance of any aspect pertaining to the location and that the free navigation of the waterway is not unreasonably interfered with and the present navigable depths are not impaired. The construction of falsework, pilings or other obstructions, if required for the work, shall be submitted to the USCG Commander for approval. The channel through the structure shall be promptly cleared of all obstructions placed herein or caused by the construction of the bridge to the satisfaction of the USCG District Commander, when in his judgment the construction work has reached a point where such action should be taken.

2.2 Should the Contractor, during the progress of work, lose, throw overboard, sink or misplace any material, machinery, plant or appliance which in the opinion of the engineer may be dangerous or obstructive to navigation, the Contractor shall immediately recover and remove. The Contractor shall give immediate notice with the description and location of such obstruction to the engineer and US Coast Guard. When required, the contractor shall mark, by one or more lighted buoys, obstructions until removed to the satisfaction of the District Commander, Western Rivers Operation, Eighth Coast Guard District, Bridge Branch. Such buoys shall be horizontally striped orange and white with the top stripe orange. The buoys shall be aligned cross-river at intervals of about 25 feet or as close as practicable to the obstruction in the river. Each buoy shall be lighted at night with a quick flashing white light (60 flashes per minute). If obstruction is extending above water, orange flags by day and quick flashing white lights by night may be displayed on the obstruction in lieu of any buoy.

2.3 The Contractor shall be totally responsible for maintenance and protection of any partially completed work in the river from navigation and floating debris.

2.4 Plans for temporary structures within the waterway area, construction schemes, and other applications or documents customarily requiring approval by the above mentioned authorities to perform specific work shall initially be submitted to the engineer. Such plans, narratives, or applications will be reviewed by the engineer, and when in concurrence therewith, the engineer will forward the material to the appropriate agency or agencies for approval. The Contractor shall furnish sufficient copies of all necessary materials for submittal as may be established by procedure. Submittals shall be made sufficiently in advance of the work involved as to permit orderly processing.

2.5 Permits returned by governing authorities in response to the above described submittals will be issued to the Missouri Highways and Transportation Commission, with all stipulations therein becoming the obligation of the contractor in carrying out the work. Routine approvals, with or without conditions attached, will be returned to the contractor via the engineer.

2.6 Temporary navigation lights shall be provided along with other navigational signals or facilities that may be required by Governmental authorities on any temporary construction or vessels and on any partially or wholly finished permanent construction. All of these facilities shall be provided and maintained, as hereinafter specified, in accordance with the requirements of the USCG. The Contractor will be required, therefore to notify the District Commander, Western Rivers Operation, Eighth Coast Guard District, Bridge Branch, prior to commencement of work within the waterway and shall submit such information and documents as are customarily required by the USCG. Temporary lights, signals, or facilities, where specifically required or otherwise so ordered, shall

be provided and maintained throughout the life of the contract or until the obstruction for which the lights furnished is removed.

2.7 The USACE Omaha District shall be notified at least ten (10) days before work/usage is started to allow post-permission over sight performed by USACE Omaha District. USACE Contact Information:

Jonas Grundman
Omaha District Section 408 Coordinator
CENWO-ODT-N
USACE, Omaha District
1616 Capitol Avenue
Omaha, NE 68102
Office Phone: (402) 995-2195
Email: Jonas.Grundman@usace.army.mil

2.8 The USACE Omaha District shall be notified within thirty (30) days after completion of the work/usage to allow for a final inspection performed by USACE Omaha District.

2.9 A copy of the "as-built" drawings shall be submitted to the USACE Omaha District within 180 days of completion of work showing the new work as it relates to identifiable features of the project.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. All costs incurred by the Contractor in complying with the above requirements shall be considered completely covered by the cost of other items. No direct payment will be made.

D. NAVIGATIONAL DISRUPTION OR CLOSURE TO RIVER TRAFFIC

1.0 Description. This provision contains navigation disruption or closure requirements for this project due to floating equipment.

2.0 Construction Requirements.

2.1 Floating equipment shall not be moored in the main channel span, between Piers 2 and 3, except when actually engaged in construction activities. Floating equipment shall be removed upon request for passage of river traffic.

2.2 Requests to temporarily block the river and stop river traffic or otherwise impede navigation shall be submitted, in writing, for approval to the District Commander, Western Rivers Operation, Eighth Coast Guard District, Bridge Branch, at least 15 days in advance. Any revision of work schedule may require a 15 day delay for issuance of revised notices. Notification shall be updated by telephone if necessary to assure that navigation interests are aware of impending events that may affect the movement of river traffic.

2.3 Any schedule of river closures is subject to review and approval of the US Coast Guard Bridge Branch. Circumstances will influence a decision to close or block the river. The US Coast Guard may disapprove any river closures on case by case situation, depending upon conditions. The

Contractor shall submit, via the Engineer, a proposal for closures, falsework, etc. before the US Coast Guard will provide a definitive answer.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. Payment for the above described work will be considered completely covered by the contract unit price of other items.

E. WATER TRANSPORTATION FOR THE ENGINEER

1.0 Description. The Contractor shall furnish to the engineer a boat and safety equipment at the site, along with adequate docking facilities. The boat shall be for the exclusive use of the engineer. The boat shall be operated by the Contractor for transportation purposes at the request of the Engineer.

2.0 Water Transportation Requirements.

2.1 The boat shall not be less than 18 feet in length with at least a 72 inch beam, equipped with two outboard motors, one motor of at least 70 horsepower and the second motor of at least 9.9 horsepower. The boat shall be capable of accommodating at least six adult passengers, including the operator. The Engineer shall at all times retain the right to travel on or be present on any of the Contractor's floating plants or equipment.

2.2 The boat shall be in good condition and meet the approval of the engineer. The boat and safety equipment shall at all times meet all applicable boating regulations of the US Coast Guard.

2.3 The boat shall be equipped with two fuel tanks, complete remote control, a spotlight and an adequate whistle or horn. The motor shall be equipped with electric and hand starters, an alternator or generator and slip clutch propeller protection. The requirements are in addition to all US Coast Guard or State requirements.

2.4 The Contractor shall provide service, gas, oil and maintain the boat during the life of the contract unless otherwise directed by the engineer. The contractor shall monitor the operationof the boat and provide assistance as needed.

2.5 The Contractor shall provide one safe and serviceable docking facility for one boat unless otherwise directed by the engineer. The docking facilities shall be located within the right-of-way. The docking facilities shall be maintained in serviceable condition for the duration of the contract. At the termination of the contract, the dock shall be immediately removed and remain the property of the contractor.

2.6 The Contractor shall provide adequate liability insurance with a minimum coverage of $500,000 and shall save the Commission and the Commission's representatives harmless from any and all damage to or caused by the boat or the boat operation.

2.7 The Contractor shall be permitted to make changes from any of the above requirements, providing the engineer approves the changes in writing.

2.8 Upon completion of the project and when released by the engineer, the boat and all related items shall become the property of the Contractor.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. Payment for the above described work will be considered completely covered by the contract lump sum price for "Water Transportation for Engineer".

F. WATER QUALITY PROTECTION

1.0 Description. Special measures shall be taken to prevent fuels, oils, greases, bitumens, chemicals, acids, waste washings, debris from concrete bridge deck removal, drilling slurry, herbicides, insecticides, lime, wet concrete, cement, silt or organic or other deleterious materials from entering surface or subsurface waters. It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, County, and Municipal laws concerning pollution of surface or subsurface waters, including pollutant discharge permit regulations. All work under this contract shall be performed in such a manner that conditions objectionable to the Engineer or any enforcement agency will not be created in surface or subsurface water through or adjacent to the project area.

2.0 Construction Requirements. Water used in aggregate processing, concrete curing, concrete cleanup, and other waste waters shall not be allowed to reenter the river directly if an excessive or prolonged increase in the turbidity of the river will result therefrom.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. The cost of work in connection with protecting the quality of surface and subsurface waters and with control of turbidity and erosion will be included in the cost of other items included in the contract.

G. ENVIRONMENTAL CONSIDERATIONS

1.0 Description. The Contractor shall conduct work in the waterway so as to minimize increases in suspended solids and turbidity that may degrade water quality and damage aquatic life outside the immediate area of operations.

2.0 Construction Requirements.

2.1 General Requirements.

2.1.1 The Contractor shall establish and carry out a program for immediate removal of debris during construction in order to prevent the accumulation of unsightly, deleterious and potentially polluted materials in the waterway.

2.1.2 The Contractor shall not permit any fuel or oil storage containers, permanent or mobile, located near any waterway to be placed in such a manner to cause the spread of petroleum products in case of leakage. A contingency plan shall be formulated to be effective in event of accidental spill of petroleum products.

2.1.3 The Contractor shall be required to store all materials, equipment and petroleum products, when not in use, above anticipated high water levels. The Contractor shall not permit debris or any waste material to be stored in any area where debris or waste material could be washed into the waterway as a result of natural runoff or flooding.

2.1.4 Construction activities shall be in accordance with the existing rules and regulations of governmental agencies having jurisdiction over streams and water supplies in the area. To prevent contamination of streams and other water resources adjacent to the project area, the contractor shall not cause:

(a) Violation of applicable water quality standards of the Missouri Department of Natural Resources.

(b) Water pollution defined and prohibited by the Missouri Environmental Protection Act.

(c) Interference with water use practices near public recreation areas, private land owner access points and water supply intakes.

2.1.5 Federally endangered pallid sturgeon migrate up and down the Missouri River through the project area throughout spawning season. The sturgeon chub and flathead chub are inhabitants of the Missouri River and considered state protective and/or endangered species. For protection of pallid sturgeon, sturgeon chub and flathead chub, temporary access bulkheads shall not be placed in or removed from the Missouri River between April 1 and June 30. The Contractor shall perform the following aimed at reducing impacts to the aquatic environment:

(a) The Contractor shall not place any material below ordinary high water between April 1 and June 30. Temporary bulkheads may be constructed outside of these dates and <u>left in place</u> during the restriction period.

(b) The Contractor shall not remove temporary access bulkheads between April 1 and June 30.

2.1.6 Existing spur dikes projecting from the easterly river bank both north and south of the bridge shall not be disturbed. Existing spur dike projecting from the westerly river bank immediately north of the bridge, and revetment along the westerly river bank, shall not be disturbed.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. The cost of work required to comply with this special provision will be considered completely covered by the cost of other items included in the contract. No direct payment will be made.

H. <u>RESTORING RIVER CONDITIONS</u>

1.0 Description. This is a Section 10 waterway. This project may require the use of temporary fill for construction access. The USACE requires that the river be restored to pre-construction conditions after project completion with the exception of the permanent fill being placed under this contract.

1.1 In addition to following MoDOT Standard Specification 806.100, the contractor shall conduct pre-construction and post-construction topographic mapping in order to ensure that the river bottom is restored to pre-construction conditions, with the exception of the permanent fill being place under this contract, after temporary fill removal.

2.0 Basis of Payment. No direct pay shall be provided for any labor, equipment, time, or materials necessary to complete this work.

I. BASIS OF DESIGN RIVER STAGE AT SITE

1.0 Description. For information only, the 2% water elevation at the bridge location is estimated at 895.40 at the site. This represents the river stage which is expected to be exceeded two percent (2%) of the time as determined from hydrographic data. Actual river stage may be higher or lower at any time during construction, and the water level may exceed the stipulated elevation for any given period of time.

2.0 Construction Requirements. The Contractor shall become acquainted with the nature of the river and shall consider all factors which may affect the character of the work and construction procedures. For this purpose, the Contractor shall acquire and review hydrographs of the upstream and downstream river gauges along the Missouri River.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. Payment for the above described work will be considered completely covered by the contract unit price of other items.

J. HYDROGRAPHIC SURVEY

1.0 Description. This item shall consist of providing hydrographic surveys to ensure that the project is constructed according to the plans and as documentation for the quantities and verification of the proposed riprap placement.

2.0 Construction Requirements. The Contractor shall provide hydrographic surveys covering the scour mitigation area at Pier 3 prior to construction and at the completion of construction. The scour mitigation area shall be defined as 10 feet beyond the limits of the rip rap placement in all directions as shown on the plans.

2.1 The Contractor is responsible for ensuring the project is constructed to the plan limits and elevations and that the fill and filter materials are placed to the plan limits and elevations. The survey shall indicate the river bottom at the completion of the underwater excavation and placement of granular fill material. The survey shall also indicate the top of filter placement prior to riprap placement and top of riprap after completion of construction.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. Payment for the above described work will be considered completely covered by the contract lump sum price of “Hydrographic Survey.”

K. SUBSURFACE CONDITIONS

1.0 Description. The subsurface riverbed condition was obtained from an existing hydrographic survey completed by Geosyntec Consultants, March 26, 2020.

2.0 Construction Requirements. The Contractor is requested to view the site for all proposed construction, and to examine the existing bridge plans. The Contractor shall interpret the probable subsurface conditions and the probable difficulties in excavating the riverbed to the line and grade depicted on the plans. The Contractor's bid shall be based on his/her own assessment of these conditions. It is possible that various snags, logs, boulders, and entirely foreign and artificial debris may be encountered during excavation. The prices bid for all work shall cover all risk or uncertainties encountered in subsurface conditions and the removal or dealings with obstructions.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. Payment for the above described work will be considered completely covered by the contract unit price of other items.

L. UNDERWATER EXCAVATION

1.0 Description. This item shall consist of excavation and disposal of river bed material as necessary to prepare the river bed for sand filled filter bags and riprap installation. This work shall be performed in accordance with the cross sections shown on the plans.

2.0 Construction Requirements. Excavated materials may be used to fill locations where fill is required beyond the limits indicated on the plans to require a three foot filter material, provided that this process does not create a suspended sediment condition in violation of a permit requirement or other special provision item.

3.0 Method of Measurement. Measurement will be made based on a comparison of the bottom surface of the excavation (plan surface) to the hydrographic survey prior to construction (See item K).

4.0 Basis of Payment. All labor, equipment, material costs, and time required to complete the described work shall be completely covered by item numbers:

Item No.	Item Description	Units
704-99.07	Underwater Excavation	CY

M. SAND FILLED FILTER BAG FILL MATERIAL

1.0 Description. This item shall consist of furnishing and placing three foot thick sand filled filter bag fill material to the lines and grades indicated on the plans.

1.1 Areas requiring fill beyond the limits of the required three foot sand filled filter bags may be either filled with sand filled filter bags or other fill material such as granular backfill or sand/silt from the river bottom. Based on the March 2020 survey the additional fill required beyond the limits of the required three foot sand filled filter bags is estimated to be 190 cubic yards, however the actual amount could vary due to changes in the river bottom at the time of material placement.

1.0 Material Requirements – Sand Filled Filter Bag. Either woven or non-woven, needle punched fabrics may be used for sand filled bag. If a non-woven fabric is used, it must have a mass density greater than 12 oz/yd2 (400 g/m2). Under no circumstances will spun-bond or slit-film fabrics be allowed. Table 1 provides the recommended characteristics for geotextile filters for the sand filled bags. Class 1 geotextile shall be used for the sand filled bags.

Table 1. Recommended requirements for geotextile properties.

Test Designation	Property	Allowable value (1)		Comments
		Elongation < 50%(2)	Elongation > 50%(2)	
ASTM D 4632	Grab Strength	> 315 lbs (Class 1) > 250 lbs (Class 2) > 180 lbs (Class 3)	> 200 lbs (Class 1) > 160 lbs (Class 2) > 110 lbs (Class 3)	From AASHTO M 288
ASTM D 4632	Sewn Seam Strength (3)	> 270 lbs (Class 1) > 220 lbs (Class 2) > 160 lbs (Class 3)	> 180 lbs (Class 1) > 140 lbs (Class 2) > 100 lbs (Class 3)	From AASHTO M 288
ASTM D 4533	Tear Strength (4)	> 110 lbs (Class 1) > 90 lbs (Class 2) > 70 lbs (Class 3)	> 110 lbs (Class 1) > 90 lbs (Class 2) > 70 lbs (Class 3)	From AASHTO M 288
ASTM D 4833	Puncture Strength	> 110 lbs (Class 1) > 90 lbs (Class 2) > 70 lbs (Class 3)	> 110 lbs (Class 1) > 90 lbs (Class 2) > 70 lbs (Class 3)	From AASHTO M 288
ASTM D 4751	Apparent Opening Size	Between 0.55mm and 2mm		Maximum allowable value
ASTM D 4491	Permittivity and Permeability	Per 0.25cm/s		Minimum allowable value
ASTM D 4355	Degradation by Ultraviolet Light	> 50% strength retained after 500 hours of exposure		Minimum allowable value
ASTM D 4873	Guide for Identification, Storage, and Handling			Provides information on identification, storage, and handling of geotextiles.
ASTM D 4759	Practice for the Specification Conformance of Geosynthetics			Provides information on procedures for ensuring that geotextiles at the jobsite meet the design specifications.

(1) Required geotextile class for permanent erosion control design is designated below for the indicated application. The severity of installation conditions generally dictates the required geotextile class. The following descriptions have been modified from AASHTO M 288:

- *Class 1* is recommended for harsh or severe installation conditions where there is a greater potential for geotextile damage, including when placement of riprap must occur in multiple lifts, when drop heights may exceed 1 ft (0.3 m) or when repeated vehicular traffic on the installation is anticipated.
- *Class 2* is recommended for installation conditions where placement in regular, single lifts are expected and little or no vehicular traffic on the installation will occur, or when placing individual rocks by clamshell, orange-peel grapple or specially equipped hydraulic excavator with drop heights less than 1 ft.
- *Class 3* is specified for the least severe installation environments, with drop heights less than 1 ft onto a bedding layer of select sand, gravel or other select imported material.

(2) As measured in accordance with ASTM D 4632.

(3) When seams are required.

(4) The required Minimum Average Roll Value (MARV) tear strength for woven monofilament geotextiles is 55 lbs. The MARV corresponds to a statistical measure whereby 2.5% of the tested values are less than the mean value minus two standard deviations (Koerner 1998).

3.0 Material Requirements – Granular Fill Material. Granular fill material may be any clean granular material that will not wash away under the ambient river current conditions.

4.0 Construction Requirements – Sand Filled Filter Bag. Each sand filled filter bag should be filled with sand to no more than 80% its total volume so that it remains flexible and “floppy.” The size of the bags shall be selected to ensure that the bags do not wash downstream when placed in the ambient river current.

5.0 Construction Requirements – Granular Fill Material. The granular fill material shall be selected to ensure that the fill material does not wash downstream when placed in the ambient river current.

6.0 Method of Measurement. Measurement will be made based on material receipts from the material source for sand filled filter bags as approved by the Engineer.

7.0 Basis of Payment. All labor, equipment, material costs, and time required to furnish and place the sand filled filter bag fill material to the lines and grades indicated on the plans, including the areas requiring fill beyond the limits of the required three foot sand filled filter bags shall be completely covered by item number:

Item No.	Item Description	Units
704-99.07	Sand Filled Filter Bags	CY
704-99.07	Granular Fill Material	CY

N. CLASS VIII RIPRAP

1.0 Description. This item shall consist of furnishing and placing riprap to the lines and grades indicated on the plans.

2.0 Material Requirements. The rock shall be suitable in all respects for the purpose intended. Rock sources shall be selected well in advance of the time the rock will be required and shall be pre-approved by the Engineer. Rock used for riprap shall be hard, durable, and angular in shape and consist of clean field rock or rough unhewn quarry rock as nearly uniform in section as practicable. Neither the width nor the thickness of a single rock shall be less than one third of its length. The rocks shall be dense, resistant to weathering and water action, and free of overburden, spoils, shale, and organic material. Shale, chalk, and limestone with shale or chalk seams shall not be acceptable. Rounded rock (river rock) shall not be acceptable.

Rocks used for riprap should break only with difficulty, have no earthy odor, not have closely spaced discontinuities (joints or bedding planes), and not absorb water easily. Rocks composed of appreciable amounts of clay, such as shales, mudstones, and claystones, are not acceptable for use as riprap. Table 2 summarizes the recommended tests and allowable values for rock and aggregate.

Table 2 Recommended tests for rock quality.

Test Designation	Property	Allowable value	Frequency (1)	Comments
AASHTO TP 61	Percentage of Fracture	< 5%	1 per 20,000 tons	Percentage of pieces that have fewer than 50% fractured surfaces
AASHTO T 85	Specific Gravity and Water Absorption	Average of 10 pieces: S_g > 2.5 Absorption < 1.0%	1 per year	If any individual piece exhibits an S_g less than 2.3 or water absorption greater than 3.0%, an additional 10 pieces shall be tested. If the second series of tests also exhibits pieces that do not pass, the riprap shall be rejected.
AASHTO T 103	Soundness by Freezing and Thawing	Maximum of 10 pieces after 25 cycles: < 0.5%	1 per 2 years	Recommended only if water absorption is greater than 0.5% and the freeze-thaw severity index is greater than 15 per ASTM D 5312.
AASHTO T 104	Soundness by Use of Sodium Sulfate or Magnesium Sulfate	Average of 10 pieces: < 17.5%	1 per year	If any individual piece exhibits a value greater than 25%, an additional 10 pieces shall be tested. If the second series of tests also exhibits pieces that do not pass, the riprap shall be rejected.
AASHTO TP 58	Durability Index Using the Micro-Deval Apparatus	Value / Application > 90 / Severe > 80 / Moderate > 70 / Mild	1 per year	Severity of application per Section 5.4, CEN (2002). Most riverine applications are considered mild or moderate.
ASTM D 3967	Splitting Tensile Strength of Intact Rock Core Specimens	Average of 10 pieces: > 6 MPa	1 per year	If any individual piece exhibits a value less than 4 MPa, an additional 10 pieces shall be tested. If the second series of tests also exhibits pieces that do not pass, the riprap shall be rejected.
ASTM D 5873	Rock Hardness by Rebound Hammer	See Note (2)	1 per 20,000 tons	See Note (2)
Shape	Length to Thickness Ratio A/C	< 10%, d_{50} < 24 in < 5%, d_{50} > 24 in	1 per 20,000 tons	Percentage of pieces that exhibit A/C ratio greater than 3.0 using the Wolman count method (Lagasse et al., 2006)
ASTM D 5519	Particle Size Analysis of Natural and Man-Made Riprap Materials		1 per year	See Note (3)
Gradation	Particle Size Distribution Curve		1 per 20,000 tons	Determined by the Wolman count method (Lagasse et al., 2006), where particle size, d, is based on the intermediate (B) axis.

(1) Testing frequency for acceptance of riprap from certified quarries, unless otherwise noted. Project- specific tests exceeding quarry certification requirements, either in performance value or frequency of testing, must be specified by the **Engineer.**

(2) Test results from D 5873 should be calibrated to D 3967 results before specifying quarry-specific minimum allowable values.
(3) Test results from D 5519 should be calibrated to Wolman count (Lagasse et al., 2006) results before developing quarry-specific relationships between size and weight; otherwise, assume W = 85% that of a cube of dimension d having a specific gravity of S_g.

The rock riprap material shall meet the gradation of larger and smaller rock sizes associated with a rock class or median diameter (D50) as specified in the table below. Rock diameter for angular material represents the length of the intermediate axis of an individual rock. The material gradation shall conform to table below for the class size corresponding to the D50. The D15, D50, D85, and D100 are the rock sizes for which 15%, 50%, 85%, and 100% of the total sample are of equal size or smaller, respectively.

Rock Riprap Gradation Table (Reference: NCHRP Report 568)								
Rock Riprap Class by Median Particle Diameter (D50)		D15 (in)		D50 (in)		D85 (in)		D100 (in)
Class	Diameter (in)	Min	Max	Min	Max	Min	Max	Max
VIII	30	18.5	26.0	28.5	34.5	39.0	46.0	60.0

Conformance of rock riprap to the gradation requirements shall be accomplished by field tests for rock sizes that cannot be analyzed via sieve or mechanical sorting machines. Gradation field tests shall follow the equal interval test procedure in NCHRP Report 568, Section 3.2.3 or ASTM D 5519.

The Contractor shall provide a sample of the rock riprap material meeting the gradation for the size class specified. An approved sample shall be stored onsite as a reference for ongoing visual inspection of additional materials supplied. Supplementary tests may be required for supply materials where visual inspection determines there may be a deviation from the required gradation. Labor, equipment and site location needed to assist in checking gradation shall be provided by the contractor at no additional cost to the Owner.

3.0 Construction Requirements. The mass of rock riprap shall be placed as to be in conformance with the required gradation mixture, to the lines, grades and layer thickness that is shown on the drawings. Rock riprap shall be machine placed and distributed such that there will be no large accumulations of either larger or smaller sizes.

4.0 Method of Measurement. Measurement will be made based on material receipts from the material source as approved by the Engineer.

5.0 Basis of Payment. All labor, equipment, material costs, and time required to complete the described work shall be completely covered by item numbers:

Item No.	Item Description	Units
704-99.07	Class VIII Riprap	CY