Livestock Water Development
Request for Proposal # 19-2099c

The Nez Perce Soil and Water Conservation District (NPSWCD), will accept proposals for the construction of a livestock water development near Webb Ridge Road, in Nez Perce County, Idaho. Proposals will be accepted until Wednesday, October 2, 2019 at 4 pm.

The proposals will be reviewed at the Nez Perce Soil and Water Conservation District office at 27880 Chambers Road on October 3, 2019.

A contract will not be awarded to a firm in which any official of the Nez Perce Soil and Water Conservation District or its representatives, or any member of such person’s immediate family has direct or indirect interest in the pecuniary profits or contracts.

Description of Work

Construction of one livestock water development with the following components: pipeline, rock pad, trough, collection system, collection boxes. See attachment 1 – Project Drawings

Time Schedule

Work will begin as soon as the contract is awarded and be completed by 10/31/2019.

The Proposals may be submitted to the NPSWCD using one of the following methods:

Mail: NPSWCD; PO Box 131, Culdesac, Idaho 83524
Email: npswcd@co.nezperce.id.us
Fax: 208-843-2234

Responders who choose to submit their proposal by email or fax are responsible to ensure it’s receipt by the NPSWCD by either phone 208-843-2931 or email at npswcd@co.nezperce.id.us.

Contract documents and specifications may be obtained Monday – Thursday 9 AM to 3 p.m., by contacting Nikki Lane at (208) 843-2931 or npswcd@co.nezperce.id.us or on line at www.nezperceswcd.org/bids.

Proposals must include:

A signed copy of the bid form and schedule (attached)

Successful proposals will require an agreement for services document.
## Nez Perce Soil and Water Conservation District
### Proposal Form and Schedule
#### RFP # 19-2099c
**Bid Submission Deadline: 4 pm Wednesday, October 2, 2019**

<table>
<thead>
<tr>
<th>WORK</th>
<th>SPECIFICATION</th>
<th>UNIT</th>
<th>UNIT PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Spring Development</td>
<td>574</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Includes development of 2 springs. Includes all materials, equipment and labor.</td>
<td></td>
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<tr>
<td>2) Trough and rocked pad</td>
<td>561,614</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>The Trough will be supplied by the NPSWCD. Includes all materials and labor.</td>
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<tr>
<td>3) Pipeline</td>
<td>516A</td>
<td></td>
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<tr>
<td></td>
<td>Includes all materials, equipment and labor.</td>
<td></td>
<td></td>
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<tr>
<td>4) Total Project Costs</td>
<td>Lump Sum</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Equipment to be used:</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Work to be completed by subcontractor:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL BID** $___________________
NOTES:

Route overflow to a natural drainage.
Provisions should be made for a wildlife escape ramp
Drawing not to scale.
GENERAL NOTES

All concrete shall be reinforced with #4 rebar @ 12" c-c, both ways.
Place perforated CMP pipe sections in water bearing strata.
Connect supply line to tank, trough or other water supply structure.
Provide air passage into spring box by placing three 1/2" holes in cover.
Provide 2" overflow from spring box.
Corrugated metal pipe or porous concrete rings shall be used.
Perforated spring box shall have a minimum of a 12" thick gravel pack around it.
Perforation/Holes shall be 1/2" to 3/4" @ 6" centers.
TROUGH/PIPELINE DETAILS

2.0" overflow line, PVC below ground, galv. steel above ground

1/4" dia. vent hole

10" to daylight
20" min.

700 gallon (min.)
typical steel rectangular trough
8 foot round steel trough may also be used

2 x 6 min. (section broken out to show plumbing)

6" min. dia. post

Frost-free hydrant

2" air space

3 x 3 x 3/16 angle
3" long w/3" lag screw

1.5" Galv.

1.5" supply line. PVC below ground, galv. steel above ground

TRough INSTALLATION

nourd 4" to 6" with topsoil above natural ground

natural ground
final backfill

select backfill

bedding

PIPELINE DETAILS
FOR 1.25", 1.5" & 2.0"

WILDLIFE ESCAPE
RAMP DETAIL

NOTES:

Type II Non-woven geotextile shall be placed under apron area. See MS-209.
The rock or gravel pad will extend out a min. of 8 feet in all directions from trough. Rock shall be dirty pit run with a optional gravel capping of 2-3 inches.

15yd^3 of Dirty Pit Run required per Trough.
3.5 yd^3 gravel required per Trough (Optional).

Route overflow to a natural drainage.
Provisions should be made for a wildlife escape ramp.
Drawing not to scale.
CONSTRUCTION SPECIFICATIONS
OPERATION AND MAINTENANCE
&MATERIAL SPECIFICATION 209
NATURAL RESOURCES CONSERVATION SERVICE
Idaho
CONSTRUCTION SPECIFICATIONS
FOR
PIPELINE

Ben Forsman

GENERAL
Installation shall be in accordance with an approved design and plan. Details of construction shown on the drawings, but not included herein, shall be considered as part of these specifications. Construction activities shall be in accordance with Department of Labor, Occupational Safety and Health Administration (OSHA) regulations. This construction specification pertains to buried installations.

MATERIALS
Only new materials will be used in construction of this project.

Pipe shall be of the type, size and pressure rating shown on the drawings and shall meet the requirements of the appropriate material specifications.

Steel pipe and fittings shall be galvanized and meet the requirements of AWWA Specification C-200.

Plastic pipe shall comply with ASTM Specifications:

- D 1527 or D 2282 for AcrylonitrileButadiene-Styrene (ABS).
- D 2104, D 2239, D 2447, D 2737 or D 3035 for Polyethylene (PE).
- D 1785, D 2241, D 2672 or D 2740 for Polyvinyl Chloride (PVC).
- D 2513 for Thermoplastic Gas Pressure Pipe.
- D3350 and D 2837 for PE3408 HDPE Pipe.

The pressure rating of fittings shall meet or exceed the strength requirements of the pipe. All fittings shall be of a material that is recommended for use with the type of pipe that is specified. As appropriate, plastic pressure pipe fittings shall conform to ASTM Specifications: D 2464, D 2466, D 2467, D 2468, D 2609, D 2683, D 3139 and/or D 3261.

Solvents for solvent-welded plastic pipe joints shall conform to one of the following ASTM specifications as appropriate: D 2235, D 2564, or D 2855. Rubber joints for pipe joints shall conform to ASTM F 477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

Pipelines to convey water that may be used for human consumption shall meet the requirements of the Idaho Department of Health and Welfare for material and installation, and plastic pipe shall be marked with NSF approval.

INSTALLATION
The pipe trench shall be excavated at the required location and depth as shown on the drawings and/or staked in the field. The bottom of the trench shall be reasonably smooth so that pipe will be properly supported.

All above-ground pipe shall be steel, galvanized or HDPE. No PVC is to be installed above ground.

Trenches for pipelines shall be free of rocks and other sharp edged materials. Plastic pipe shall be placed in a "snake" like position. Semi-rigid pipe may require expansion joint couplers.

Plastic pipelines may be placed by "plow-in" equipment where soils are suitable and rocks and boulders will not be detrimental to the pipe.

Pipelines shall be placed so they are protected against hazards imposed by traffic, farm operations, freezing temperatures or soil cracking.

Pipelines shall have a minimum cover of 18 inches. Other means of protection must be provided where the depth required for protection is impractical due to shallow soils over rock or

Livestock Watering

NRCS, Idaho
March, 2012
NATURAL RESOURCES CONSERVATION SERVICE
Idaho
CONSTRUCTION SPECIFICATIONS
FOR
HEAVY USE AREA PROTECTION

Ben Forsman
(Owner/Operator)

Livestock Watering
(Project Title)

GENERAL
Installation shall be in accordance with an
approved design and plan. Details of
construction shown on the drawings but not
included herein are considered as a part of this
specification. Construction activities shall be in
accordance with U.S. Department of Labor,
Occupational Safety and Health Administration
(OSHA) regulations.

SITE PREPARATION
The area shall be cleared and stripped of all
brush, roots, sod, large rock or other material not
suited for foundation material for the designated
heavy use area protection materials. All
unsuitable materials shall be removed and
disposed of in designated areas. Excavations
and/or compacted fills shall be completed as
necessary to install the materials to specific
elevations and grades when specified.

INSTALLATION OF TREATMENT
Materials shall be of the type, size and quality as
specified on the drawings or in the
ADDITIONAL SPECIFICATIONS. Unless
otherwise specified, concrete will meet the
requirements of Construction Specification
587B.

ADDITIONAL SPECIFICATIONS
NATURAL RESOURCES CONSERVATION SERVICE
Idaho
CONSTRUCTION SPECIFICATIONS
FOR
SPRING DEVELOPMENT

Ben Forsman
(Owner/Operator)

Watering Facility
(Project Title)

- AASHTO M252, Standard Specification for Corrugated Polyethylene Drainage Pipe
- AASHTO M294, Standard Specification for Corrugated Polyethylene Pipe, 300-to 1500-mm (12- to 60-inch)
- ASTM F949, Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
- ASTM D2729, Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- ASTM D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- ASTM C118, Standard Specification for Concrete Pipe for Irrigation and Drainage
- ASTM C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- ASTM A760, Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
- ASTM A762, Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
- ASTM B745, Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains

The casing pipe for horizontal wells shall be standard weight, galvanized steel pipe

NRCS Idaho
March 2015
NATURAL RESOURCES CONSERVATION SERVICE
Idaho
CONSTRUCTION SPECIFICATIONS
FOR
WATERING FACILITY

Ben Forsman
(Owner/Operator)

Watering Facility
(Project Title)

GENERAL
Installation shall be in accordance with an approved design and plan. Details of construction shown on the drawings but not included herein are considered as a part of this specification. Construction activities shall be in accordance with applicable Occupational Safety and Health Administration (OSHA) regulations.

EXCAVATION
The foundation area will be cleared of all roots, brush, sod and debris. The base materials for the trough shall be placed on a firm foundation. Unsuitable materials shall be removed. Gravel, rock or other material, as shown on the drawings, shall be placed under and around the trough to provide drainage and minimize trampling by livestock.

MATERIAL
The trough shall be constructed of the materials as specified on the drawings. No used material is allowed in the installation. PE and HDPE are the only plastic trough materials that will be accepted. No fiberglass troughs will be accepted.

CONCRETE
Concrete work under these specifications shall be constructed to the dimensions, lines and grades as shown on the drawings. Concrete shall have a consistency such that it can be worked into corners and around reinforcement, but without permitting the materials to segregate or excess water to collect.

Concrete compressive strength shall be at least 3000 psi at 28 days. The mix design shall be in accordance with ASTM C 94 and this specification.

Cement shall be low alkali Type II or IIA Portland cement.

Fly ash shall conform to requirements of ASTM C 618 as applicable.

Water reducing admixtures shall be Type "A" meeting the requirements of ASTM C 494.

Coarse aggregate shall be a maximum size of 1-1/2 inches per designations in ASTM C 33.

Air entrainment conforming to the requirements of ASTM C 260 shall be used. The air content shall be 5 to 7 percent.

Forms shall conform to the shapes, lines and dimensions as shown on the drawings. They shall be braced and/or tied together so as to maintain position and shape, and be sufficiently tight to prevent leakage of mortar. Forms shall be thoroughly oiled or wetted and cleaned of debris prior to placement of concrete. Forms shall not be removed without the approval of the Technician.

Reinforcing steel deformed bars shall meet the requirements of ASTM A 615 and welded wire reinforcement shall meet the requirements of ASTM A 185. All reinforcement shall be free from rust, oil, grease, paint or other deleterious matter. Items to be embedded in the concrete shall be positioned accurately and firmly anchored to prevent displacement during placement of concrete. The minimum splice length for deformed bars is 30 bar diameters, and for welded wire mesh the larger of 6 inches or 2 mesh spacings.

Concrete shall be deposited as closely as possible to its final position and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner...
to prevent segregation of aggregates or excessive laitance. Consolidation of concrete shall be accomplished by means of internal type mechanical vibrators, rodding, spading or hand tamping. Concrete slump shall be in the range of 3 inches plus or minus 1 inch, unless cylinder test break data is submitted showing that compressive strength can be achieved with the higher slump.

Construction joints shall be provided as shown in the plans or as approved by the engineer. Joints shall be thoroughly cleaned and laitance removed before a new pour is made. Each joint shall be wetted immediately before the placing of new concrete.

Finishing. After the concrete has been consolidated, the unformed surfaces shall be given a wood float finish. Immediately after form removal, formed surfaces shall be cleaned of all defective concrete and effectively repaired. Snap ties shall be removed and the holes mortared.

Protection and Curing. Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period. For formed surfaces, the protection may be accomplished by leaving the forms in place and keeping them wet for the entire curing period. In lieu of water curing, the concrete shall be cured by spraying with an approved sealing compound. The sealing compound shall be applied as soon as practicable after the concrete is finished. The sealing compound shall meet or exceed the requirements of ASTM C 309. All surfaces shall be kept moist until the compound is applied.

Concreting in Cold Weather. Before any concrete is placed, all ice, snow and frost shall be completely removed from all surfaces to be in contact with the new concrete and the temperature of these surfaces shall be raised to as close as may be practical to the temperature of the new concrete that is to be placed thereon. No concrete shall be placed on a frozen subgrade or on one that contains frozen materials. Concrete shall not be mixed or placed when daily minimum atmospheric temperature is less than 40 degrees F., unless facilities are provided to ensure the adequate protection of the concrete. Temperature of the concrete at the time of placing shall not be less than 50 degrees F. or more than 90 degrees F. The use of accelerators or antifreeze compounds will not be allowed.

WOOD ITEMS

Unless otherwise specified on the drawings, all timber and lumber shall not be less than select merchantable boards, construction grade beams or timbers.

METAL ITEMS

Steel shall be a minimum thickness of 20 gage. All metal items, with the exception of galvanized or aluminum, shall be painted with two coats of synthetic primer paint and one coat of aluminum paint or equivalent protective coatings.

FROST FREE PLASTIC TROUGHS

Commercial frost-free stock troughs may be used when specified on the drawings. The manufacturer’s installation instruction shall be followed. However, the piping, foundation and site preparation shall also meet the minimum requirements of this specification.

RUBBER TIRE TROUGHS

Large rubber tires with concrete floors may be used when specified on the drawings.

WATER CONTROL

Float controls shall be installed when shown on the drawings. Float controls shall be protected from damage by livestock. The piping shall be of the size, type and pressure class shown on the drawings.

CLEAN-UP

The site shall be cleared of all unused materials, forms, etc. needed for the construction. Waste earth material shall be smoothed and seeded.

PIPES

Pipe shall be of the type, size and pressure rating shown on the drawings and shall meet the requirements of the appropriate material specifications.

Steel pipe and fittings shall be galvanized and meet the requirements of AWWA Specification C-200.
Plastic pipe shall comply with ASTM Specifications:
- D 1527 or D 2282 for AcrylonitrileButadiene-Styrene (ABS).
- D 2104, D 2239, D 2447, D 2737 or D 3035 for Polyethylene (PE).
- D 1785, D 2241, D 2672 or D 2740 for Polyvinyl Chloride (PVC).
- D 2513 for Thermoplastic Gas Pressure Pipe.
- D3350 and D 2837 for PE3408 HDPE Pipe.

The pressure rating of fittings shall meet or exceed the strength requirements of the pipe. All fittings shall be of a material that is recommended for use with the type of pipe specified. As appropriate, plastic pressure pipe fittings shall conform to ASTM Specifications D 2464, D 2466, D 2467, D 2468, D 2609, D 2683, D 3139 and/or D 3261.

Solvents for solvent-welded, plastic pipe joints shall conform to one of the following ASTM specifications as appropriate: D 2235, D 2564 or D 2855. Rubber joints for pipe joints shall conform to ASTM F 477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

Pipelines to convey water that may be used for human consumption shall meet the requirements of the Idaho Department of Health and Welfare for material and installation, and plastic pipe shall be marked with NSF approval.

Installation

The pipe trench shall be excavated at the required location and depth as shown on the drawings and/or staked in the field. The bottom of the trench shall be reasonably smooth so that pipe will be properly supported.

Trenches for pipelines shall be free of rocks and other sharp-edged materials. Plastic pipe shall be placed in a "snake" like position. Semi-rigid pipe may require expansion joint couplers.

Plastic pipelines may be placed by "plow-in" equipment where soils are suitable, and rocks and boulders will not be detrimental to the pipe.

Pipelines shall be placed so they are protected against hazards imposed by traffic, farm operations, freezing temperatures or soil cracking.

Pipelines shall have a minimum cover of 18 inches. Other means of protection must be provided where the depth required for protection is impractical due to shallow soils over rock or for other reasons, i.e., mounding of backfill. Pipelines designated for winter use shall be buried the greater of (1) a minimum of three (3) feet, (2) below the depth of the anticipated frost line or (3) minimum depth shown on the drawings or specified in the plan.

To minimize thermal stresses, installation should be planned to avoid exposing pipe to high temperatures prior to backfilling.

ADDITIONAL SPECIFICATIONS
conforming to ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless. The liner pipe shall be Schedule 80 PVC plastic pipe conforming to ASTM D 1785, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120. The pipe through the water bearing formation shall be either slotted or perforated with a minimum of 2 square inches of opening area per linear foot of pipe.

CONCRETE

Concrete work under these specifications shall be constructed to the dimensions, lines, and grades as shown on the drawings. The subgrade for concrete shall be prepared as shown on the drawings.

Concrete compressive strength shall be at least 4000 psi at 28 days. The mix shall be in accordance with ASTM C94, Standard Specification for Ready-Mixed Concrete, and this specification. The concrete supplier shall furnish design mix and cylinder break test data when requested by the designer.

Cement shall be low alkali Type II Portland cement.

Coarse aggregate shall have a maximum size of 1-1/2 inches and conform to one of the grading requirements for coarse aggregates specified in ASTM C33, Standard Specification for Concrete Aggregates.

Air entrainment conforming to the requirements of ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete, shall be used. The air content shall be 5 to 7 percent.

Forms shall conform to the shapes, lines, and dimensions as shown on the drawings. They shall be braced and/or tied together to maintain position and shape; and be sufficiently tight to prevent leakage of mortar. Forms shall be thoroughly oiled or wetted and cleaned of debris prior to placement of concrete. Forms shall not be removed without the approval of the designer. Unless otherwise specified, forms shall not be removed until three days after concrete placement is complete.

Reinforcing steel shall be deformed bars and be free from rust, oil, grease, paint or other deleterious matter. Items to be embedded in the concrete shall be positioned accurately and firmly anchored to prevent displacement during placement of concrete.

Placement. The concrete shall be deposited as closely as possible to its final position and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. Consolidation of concrete may be accomplished by means of internal type mechanical vibrators, rodding, spading, or hand tamping.

Construction joints shall be provided as shown in the plans or as approved by the designer. Joints shall be thoroughly cleaned and laitance removed before a new pour is made. Each joint shall be wetted immediately before the placing of new concrete.

Finishing. After the concrete has been consolidated, the unformed surfaces shall be given a wood float finish. Immediately after form removal, formed surfaces shall be cleaned of all defective concrete and effectively repaired. Snap ties shall be removed and the holes mortared.

Protection and Curing. Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period. For formed surfaces, the protection may be accomplished by leaving the forms in place and keeping them wet for the entire curing period. Moisture shall be maintained by sprinkling, flooding, or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, earth, or other approved material. In lieu of water curing, the concrete shall be cured by spraying with a sealing compound approved by the designer. The sealing compounds shall be applied as soon as practicable after the concrete finishing is completed. All surfaces shall be kept moist until the compound is applied.

Concreting in Cold Weather. Before any concrete is placed, all ice, snow and frost shall
be completely removed from all surfaces to be in contact with the new concrete and the temperature of these surfaces shall be raised to as close as may be practical to the temperature of the new concrete that is to be placed thereon. No concrete shall be placed on a frozen subgrade or on one that contains frozen materials. Concrete shall not be mixed or placed when daily minimum atmospheric temperature is less than 40 degrees F unless facilities are provided to ensure the adequate protection of the concrete. Temperature of the concrete at the time of placing shall not be less than 50 degrees F nor more than 90 degrees F. The temperature of all aggregates and mixing water shall be not more than 100 degrees F when introduced into the mixer. The use of accelerators or antifreeze compounds will not be allowed.

FILTER MATERIALS
Sand-gravel filters shall be clean, hard material which does not decompose in air or water. Unless otherwise specified materials shall be 1-1/2 inch maximum size with 90 percent by weight passing a ¾ inch sieve and with less than 10 percent passing a #60 sieve (0.25 mm).

LUMBER
All lumber used shall be redwood, red cedar or be treated with a cold soak or pressure wood preservative meeting the requirements and restrictions of applicable law and regulations.

FENCING
Fencing installation shall meet details on the design and the fence specification included therein.

SEEDING
Seed the disturbed areas unless suitable vegetation already exists. Seedbed preparation, seed mixture, fertilizer, mulch, and application rates shall be in accordance with the attached specification for Seeding.

CLEAN-UP
Waste earth material shall be smoothed and seeded.

ADDITIONAL SPECIFICATIONS
for other reasons, i.e., mounding of backfill. Pipelines designated for winter use shall be buried the greater of (1) a minimum of three (3) feet, (2) below the depth of the anticipated frost line or (3) minimum depth shown on the drawings or specified in the ADDITIONAL SPECIFICATIONS.

To minimize thermal stresses, installation should be planned to avoid exposing pipe to high temperatures prior to backfilling.

METAL PROTECTION

Whenever steel tees, ells or risers are used, they shall be adequately protected from corrosion by wrapping with plastic tape, galvanizing or other approved corrosion preventatives. Clamps and steel fittings may either be stainless steel or steel properly protected from corrosion.

APPURTENANCES

Pipeline appurtenances shall be of the type, size, pressure class and material as shown on the drawings.

TESTING

Before backfilling, the pipe shall be filled with water and at design working head or a minimum-testing head of ten (10) feet, whichever is greater. All leaks shall be repaired and test repeated before backfilling begins.

Plowed in pipelines shall be pressure tested at the working pressure for two (2) hours. The allowable leakage shall not be greater than one (1) gallon per diameter inch per mile. Should the test exceed this rate, the defect shall be repaired until retests show that the leakage is within the allowable limits.

BACKFILLING

All backfilling shall be completed before the pipeline is placed into service.

The initial backfill within three (3) inches of the pipe shall be of selected materials, free from debris, rocks or other sharp edged material that could damage the pipe. The completed trench backfill shall be mounded for settlement. Backfill of plastic pipe should be done after the pipe reaches the same temperature as the water or soil. This can be done by filling with water or by leaving the trench open overnight prior to starting the backfill operations. Deformation or displacement of the pipe must not occur during backfilling.

EROSION CONTROL

Disturbed areas shall be treated as listed in ADDITIONAL SPECIFICATIONS to prevent erosion and re-establish protective cover.

ADDITIONAL SPECIFICATIONS
MATERIAL SPECIFICATION
MS-209: “WOVEN AND NON-WOVEN FABRICS”

209.1 SCOPE

This specification governs the quality of structural woven and non-woven fabrics.

209.2 FABRIC

The fabric material shall be polypropylene material with long chain polymeric filaments or fibers. The material properties are defined in the following tables and the type of material selected is shown on the drawings.

a. Table 1, Non-Woven Fabric Material

<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV 3/</th>
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<tbody>
<tr>
<td>Tensile strength (lb/v)</td>
<td>ASTM D 4632</td>
<td>180 minimum</td>
<td>120 minimum</td>
<td>90 minimum</td>
<td>115 minimum</td>
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<tr>
<td></td>
<td>grab test</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Elongation at failure(%) v</td>
<td>ASTM D 4632</td>
<td>≥ 50</td>
<td>≥ 50</td>
<td>≥ 50</td>
<td>≥ 50</td>
</tr>
<tr>
<td>Puncture (pounds)</td>
<td>ASTM D 4833</td>
<td>80 minimum</td>
<td>60 minimum</td>
<td>40 minimum</td>
<td>40 minimum</td>
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<tr>
<td>Ultraviolet light (%) residual</td>
<td>ASTM D 4355</td>
<td>70 minimum</td>
<td>70 minimum</td>
<td>70 minimum</td>
<td>70 minimum</td>
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<tr>
<td>(tensile strength)</td>
<td>150-hr exposure</td>
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<td>Apparent opening max. #40 2/</td>
<td>ASTM D 4751</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
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<tr>
<td>size (AOS)</td>
<td>max. #40 2/</td>
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<tr>
<td>Permeability sec⁻¹</td>
<td>ASTM D 4491</td>
<td>0.70 minimum</td>
<td>0.70 minimum</td>
<td>0.70 minimum</td>
<td>0.10 minimum</td>
</tr>
</tbody>
</table>

1/ Minimum average roll value (weakest principal direction).
2/ U.S. standard sieve size.
3/ Heat-bonded or resin-bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle-punched geotextiles are required for all other classes.
b. Table 2, Woven Fabric Material

<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Class I</th>
<th>Class II &amp; III</th>
<th>Class IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength (pounds) / grab test</td>
<td>ASTM D 4632</td>
<td>200 minimum in any principal direction</td>
<td>120 minimum in any principal direction</td>
<td>180 minimum in any principal direction</td>
</tr>
<tr>
<td>Elongation at failure (percent) / grab test</td>
<td>ASTM D 4632</td>
<td>&lt;50</td>
<td>&lt;50</td>
<td>&lt;50</td>
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<tr>
<td>Puncture (pounds) / y</td>
<td>ASTM D 4833</td>
<td>90 minimum</td>
<td>60 minimum</td>
<td>60 minimum</td>
</tr>
<tr>
<td>Ultraviolet light (% residual tensile strength)</td>
<td>ASTM D 4355</td>
<td>70 minimum</td>
<td>70 minimum</td>
<td>70 minimum</td>
</tr>
<tr>
<td>Apparent opening size (AOS)</td>
<td>ASTM D 4751</td>
<td>As specified, but</td>
<td>As specified, but</td>
<td>As specified, but</td>
</tr>
<tr>
<td></td>
<td>no smaller than 0.212 mm (#70) 2/</td>
<td>no smaller than 0.212 mm (#70) 2/</td>
<td>no smaller than 0.212 mm (#70) 2/</td>
<td></td>
</tr>
<tr>
<td>Percent open area (percent)</td>
<td>CWO-02215-86</td>
<td>4.0 minimum</td>
<td>4.0 minimum</td>
<td>1.0 minimum</td>
</tr>
<tr>
<td>Permittivity sec⁻¹</td>
<td>ASTM D 4491</td>
<td>0.10 minimum</td>
<td>0.10 minimum</td>
<td>0.10 minimum</td>
</tr>
</tbody>
</table>

1/ Minimum average roll value (weakest principal direction).
2/ U.S. standard sieve size.
Note: CWO is a USACE reference.

209.3 ENVIRONMENTAL RESISTANCE

The fabric shall be inert to commonly encountered chemicals within a pH range of 4 to 10. The ultra-violet light resistance shall not be less than the percentage shown for the specified fabric. The fabric shall also be resistant to mildew, rot and damage caused by rodents.