

Engineering Specifications

Construction Specifications

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION CONSTRUCTION SPECIFICATION

100 - GENERAL REQUIREMENTS

SCOPE

Work shall consist of furnishing all equipment and materials and performing all operations in connection with construction of the project as shown on the drawings, described in the special provisions and as staked in the field.

RESPONSIBILITIES

Owner/Operator. The official spokesperson for the project who enters into all contractual agreements, obtains all permits and easements necessary for construction, ensures construction is in accordance with the plans, specifications and special provisions, and is financially responsible for the project. The landowner/operator is the sole person who can authorize any changes during construction that incur financial obligations.

Technical Representative. The responsible Natural Resources Conservation Service (NRCS) representative who has authority to review project construction and make necessary tests to insure that all work is in compliance with the construction plans. The technical representative makes recommendations to the owner/operator concerning changes and acceptance of the work. The technical representative maintains a job diary and/or construction notes and prepares as-built drawings of the project.

Contractor. The contractor is the individual who has an agreement with the owner/operator to construct the project. The contractor shall not make changes to the construction plan without the technical representative and landowner/operator approval. The contractor shall comply with all applicable permits and conduct the work in a safe manner.

CONSTRUCTION PLAN

Specifications. The construction specifications describe minimum acceptable quality of work and materials for the project. Commercial standards set forth the minimum acceptable quality of identified materials within the industry. If a conflict arises between the drawings and specifications, the specification governs the work and/or material.

Drawings. The drawings are a visual representation to supplement construction and material specifications. The drawings include location, profiles, sections, details and notes necessary to describe the work.

SAFETY

General. -Equipment and methods used in construction shall be in accordance with United States Department of Labor, Occupational Safety and Health Administration.

Trenching. When personnel must enter trenches or other excavations, safety requirements of

OSHA Safety and Health Standards shall be followed.

Utilities. There is great hazard to life and property from the disturbance of utilities by construction equipment. It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

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It is the owner/operator responsibility to do the following prior to construction:

- Notify all applicable aboveground and belowground utility companies of the location and kind of work to be done and proposed date that work will start.
- Request that utility owners assist in locating and staking underground utilities on-site.
- Request that a utility company employee be present during construction within the utility right-of-way.
- Notify the contractor of location of all utilities.

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

PROJECT MODIFICATIONS

Any modifications resulting in changes in the project as specified in the drawings and specifications must be approved by the owner/operator and NRCS prior to installation.

ENVIRONMENTAL CONSIDERATIONS

Construction operations shall be carried out in a manner to ensure that erosion and air and water pollution are minimized and within legal limits.

CULTURAL RESOURCES

If cultural material is discovered, construction work shall cease 50 feet from the edge of the discovery area. NRCS field office personnel shall be notified, at which time they will contact the NRCS Cultural Resource Specialist for further instructions. Work may not resume in the discovery area until approval is given by field office personnel. Cultural material includes bones, fire hearths, flakes/points/scrapers, human remains or foundations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

101 - CLEARING, GRUBBING, STRUCTURE REMOVAL

SCOPE

The work consists of clearing and grubbing and disposal of trees, snags, logs, brush, stumps, shrubs, and rubbish, and the removal, salvage and disposal of structures (including fences) from the designated areas.

PROTECTION OF EXISTING VEGETATION

Trees and other vegetation designated to remain undisturbed shall be protected from damage throughout the duration of the construction period. Any damages resulting from the contractor's operations or neglect shall be repaired by the contractor.

Earthfill, stockpiling of materials, vehicular parking, and excessive foot or vehicular traffic shall not be allowed within the drip line of vegetation designated to remain in place. Vegetation damaged by any of these or similar actions shall be replaced with viable vegetation of the same species, similar condition, and like size.

Cuts, skins, scrape, or bruises to the bark of the vegetation shall be carefully trimmed and local nursery accepted procedures used to seal damaged bark. Any limbs or branches 0.5 inch or larger in diameter that are broken, severed, or otherwise seriously damaged during construction shall be cut off at the base of the damaged limb or branch flush with the adjacent limb or tree trunk. All roots 1-inch or larger in diameter that are cut, broken, or otherwise severed during construction operations shall have the end smoothly cut perpendicular to the root. Roots exposed during excavation or other operations shall be covered with moist earth or backfilled as soon as possible to prevent the roots from drying out.

MARKING

The limits of the area(s) to be cleared and grubbed will be marked by stakes, flags, tree markings, or other suitable methods. Trees to be left standing and uninjured will be designated by special markings placed on the trunk about 6 feet above the ground surface.

CLEARING AND GRUBBING

All trees not marked for preservation and all snags, logs, brush, stumps, shrubs, rubbish, and similar materials shall be cleared from within the limits of the designated areas. Unless otherwise specified, all stumps, roots, and root clusters that have a diameter of 1 inch or larger shall be grubbed out to a depth of at least 2 feet below subgrade for concrete structures and 1 foot below the ground surface at embankment sites and other designated areas.

SALVAGE

Structures or structure parts that are designated to be salvaged shall be carefully removed and

neatly placed in the specified or approved storage location. Salvaged structures that are capable of being disassembled shall be dismantled into individual members or sections. Such structures shall be neatly and systematically match-marked with paint before disassembly. All connectors and other parts shall be marked to indicate their proper location within the structure and shall be fastened to the appropriate structural member or packed in suitable containers.

Material from fences designated to be salvaged shall be placed outside the work area on the property on which the fence was originally located. Fence wire shall be rolled into uniform rolls of suitable size and neatly piled with other salvaged materials. Posts and rails shall be neatly stacked.

DISPOSAL

All materials cleared and grubbed from the designated areas shall be disposed of at locations shown on the drawings or in the manner specified. The contractor is responsible for complying with all local rules and regulations and the payment of any and all fees that may result from disposal at locations away from the project site.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site. It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION CONSTRUCTION SPECIFICATION

102 - POLLUTION CONTROL

SCOPE

The work consists of installing measures or performing work to control erosion and minimize the production of sediment and other contaminants to water and air from construction activities.

EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

The measures and works shall include, but are not limited to, the following:

Staging of earthwork activities. The excavation and moving of soil materials shall be scheduled to minimize the size of areas disturbed and unprotected from erosion for the shortest reasonable time.

Seeding. Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of that earthwork activity.

Mulching. Mulching is designed to provide temporary protection of the soil surface from erosion.

Diversions. Diversions to divert water from work areas and to collect water from work areas for treatment and safe disposition. They are temporary and shall be removed and the area restored to its near original condition when the diversions are no longer required or when permanent measures are installed.

Stream crossings. These are culverts, bridges, or fords where equipment must cross streams. They are temporary and shall be removed and the area restored to its near original condition when the crossings are no longer required or when permanent measures are installed.

Sediment basins. Sediment basins collect, settle, and eliminate sediment from eroding areas from impacting properties and streams below the construction site(s). These basins are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

Sediment filters. Geotextile sediment fences trap sediment from areas of limited runoff.

Waterways. Waterways allow for the safe disposal of runoff from fields, diversions, and other structures or measures. These works are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

CHEMICAL POLLUTION

The contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to dispose of chemical pollutants, such as used lubricating or transmission fluids, grease,

soaps, concrete mixer wash water, or asphalt, produced as a by-product of the construction activities. At the completion of the construction work, sumps shall be removed and the area restored to its original condition. Sump removal shall be conducted without causing pollution.

Sanitary facilities, such as chemical toilets, or septic tanks shall not be located next to live streams, wells, or springs. They shall be located at a sufficient distance to prevent contamination of any water source. At the completion of construction activities, facilities shall be disposed of without causing pollution.

AIR POLLUTION

The burning of brush or slash and the disposal of other materials shall adhere to state and local regulations.

Fire prevention measures shall be taken to prevent the start or spreading of wildfires that may result from project activities. Firebreaks or guards shall be constructed and maintained at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall ensure safe construction operations at all times. If chemical dust suppressants are applied, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the engineer 5 working days before the first application.

MAINTENANCE, REMOVAL, AND RESTORATION

All pollution control measures and temporary works shall be adequately maintained in a functional condition for the duration of the construction period. All temporary measures shall be removed and the site restored to near original condition.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

103 - CONCRETE

SCOPE

Concrete work shall consist of furnishing and placing concrete to the dimensions, lines and grades as shown on the drawings. Concrete strength shall be 3,000 psi at 28 days unless otherwise specified. Proportioning given below will be accepted as meeting this strength requirement.

MATERIALS

Cement. Portland cement shall conform to the requirements of ASTM Designation of C-150 and shall be Type II unless otherwise specified and shall be free of lumps and partially set masses.

Water. Water shall be free from acid, alkali, oils or organic matter.

Aggregate. Aggregate shall be clean, hard, strong and durable, free from dirt and other substances deleterious to concrete. The fine and coarse aggregates shall be a well-graded mix approved by the Engineer. The maximum size of aggregate shall not exceed one and a half inches and conform to the requirements of ASTM C-33.

Entrained Air. Entrained air may be used; however, the air content shall not be more than six percent.

Reinforcing Steel. Reinforcing steel shall be deformed bars conforming to the requirements of ASTM Designation A-615 or A-996. Fabricated deformed steel bar mats shall conform to ASTM Designation A-184.

Plain steel welded wire fabric reinforcement shall conform to ASTM Designation A-185. Deformed steel welded wire fabric shall conform to ASTM Designation A-497. All reinforcing shall conform to the sizes and shapes shown on the drawings.

PROPORTIONING

Concrete shall be proportioned to include not more than six gallons of water per 94 lb. sack of cement. There shall be at least five and one half sacks of cement per cubic yard of concrete. Consistency of the concrete shall allow it to be worked into place without segregation and the slump shall be 3 inches + ½ inch.

When ready-mixed concrete is furnished, the supplier will provide the owner a delivery ticket that shows: time of loading; quantity of materials used, including water and any admixtures; revolution counter reading at time of loading.

MIXING

For stationary mixers, the mixing time after all cement and aggregates are in the mixer drum shall be not less than 1-1/2 minutes. When concrete is mixed in a truck mixer, the number of revolutions of the drum or blades at mixing speed shall be not less than 70 or more than 100 in 1 minute. Each batch shall be completely discharged before the mixer is recharged.

FORMS

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 covered with a form release agent or wetted and cleaned of debris prior to placement of concrete. Forms shall not be removed without the approval of the Engineer.

PLACEMENT

Concrete shall not be placed until the subgrade, forms, and reinforcing steel have been inspected by the Engineer.

Items to be embedded in the concrete shall be positioned accurately and firmly anchored to prevent displacement during placement of concrete.

All reinforcement at the time of placement shall be free from rust, oil, grease, paint or other deleterious matter.

The concrete shall be deposited as closely as possible to its final position and 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. The deposition of concrete shall be regulated so that the concrete may be consolidated with a minimum of lateral movement.

Concrete shall not be dropped more than five feet vertically unless suitable equipment is used to prevent segregation.

Consolidation of concrete may be accomplished by means of internal type mechanical vibrators, rodding, spading, or hand tamping.

CONSTRUCTION JOINTS

Construction joints shall be provided as shown in the drawings or as approved by the Engineer. Joints shall be thoroughly cleaned and laitance removed before a new placement 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 float finish. Immediately after form removal, formed surfaces shall be cleaned of all fins and irregular projections from exposed surfaces. All defective concrete shall be removed and effectively repaired.

PROTECTION AND CURING

Concrete shall be prevented from drying for a curing period of at least seven days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period. Moisture shall be maintained by sprinkling, flooding, or fog spraying or by covering with continuously moistened canvas, burlap, cloth mats, straw earth or other approved material. 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 protected by spraying with an approved curing compound. The curing compounds shall be applied in an approved manner immediately after the concrete is finished. All surfaces shall be kept moist until the compound is applied.

The curing compound shall be applied at the rate of one gallon per 175 square feet.

CONCRETING IN HOT WEATHER

When climatic or other conditions are such that the temperature of concrete may reasonably be expected to exceed 90 °F at the time of placement, or during the first 24 hours after placement, the following provisions also shall apply:

The temperature of the concrete shall be maintained below 90 °F during mixing, conveying, and placing. Methods used shall conform to "Recommended Practice for Hot Weather Concreting", ACI Standard 305.

Exposed concrete surfaces that tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or otherwise protected from drying immediately after placement.

Concrete surfaces exposed to the air shall be covered as soon as the concrete has hardened sufficiently and shall be kept continuously wet for at least the first 24 hours of the curing period, and for the entire curing period unless curing compound is applied. If moist curing is discontinued before the end of the curing period, curing compound shall be applied immediately.

STRUCTURE DRAINAGE

Graded sand and gravel filters or filter drains shall be constructed as shown on the drawings or as staked in the field.

Trenches for the filter drains shall be excavated to lines, shape and dimensions shown on the drawings. The sand and gravel shall be placed and tamped in place to the dimensions shown. When drainpipes are used, they will be installed on line and grade without displacement due to placement of filter material.

The filter material shall conform to the following gradation unless otherwise specified.

U.S. Standard

Sieve Size	Percent Passing by Weight
2"	85-90
$\frac{3}{4}$ "	50-90
No. 16	15-50
Less than No. 16	0-15

STRUCTURAL BACKFILL

The work shall consist of placement of all earthfill adjacent to the structures.

Materials. The fill materials shall be the in place excavated materials unless otherwise stated and shown on the drawings.

Placement. The fill shall be placed so that the distribution of materials will be to the limits shown on the drawings and shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material.

Fill shall not be placed until the following time has elapsed after concrete placement:

- Walls or slabs - 14 Days
- Conduits, Precast, Cradles - 2 Days
- Conduits, Precast, Bedded - 1 Day

The fill shall be placed in a manner adequate to prevent damage to the structure and allow the structure to gradually and uniformly assume the backfill loads. The fill shall be placed in not more than four-inch layers.

Moisture Content. The soil moisture of the fill material shall be sufficient to hold a ball shape when squeezed in the hand, unless otherwise stated and shown on the drawings.

Compaction. The fill material shall be compacted to a density equal to that of the adjacent materials. Compaction shall be accomplished by hand tampers or other acceptable means excluding heavy equipment. Heavy equipment shall not be operated within two feet of any structure. The passage of heavy equipment will not be allowed over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one half the clear span-width of the structure or pipe or two feet, whichever is greatest.

SURFACE DRAINAGE

After completion of the backfill operations, the surface area adjacent to and around the structures shall be graded to convey surface runoff away from the structure.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits.

The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

104 - CONCRETE BLOCK STRUCTURE

SCOPE

The work shall consist of constructing concrete block structure(s) complete with appurtenances, to the dimensions, lines, grades, and locations as shown on the drawings.

MATERIALS

Masonry units shall be Class (1) nominal weight, Type 1, units conforming to the ASTM Designation C-90 and, in addition, the requirements of the Quality Control Standards of the Concrete Masonry Association.

Portland cement shall conform to ASTM Designation C-150.

Mortar shall be freshly prepared and uniformly mixed in the ratio by volumes of 1 part cement, 1/2 part lime putty, 4 1/2 parts sand, and shall conform to ASTM Designation C-270. If plastic type cement is used, the lime putty shall be omitted.

Grout shall be of fluid consistency and mixed in the ratio by volumes, one part cement, three parts sand, or one part cement, three parts sand, two parts 3/8"-minus crushed rock. All voids in the structure shall be filled unless otherwise specified in the drawings.

Reinforcing steel shall be deformed bars conforming to ASTM Designations A-615, or A-996 except that 1/4-inch ties may be plain bars. Welded wire reinforcement shall conform to ASTM Designation A-185.

All reinforcing shall be clean and rust free and conform to the sizes and shapes shown on the drawings.

FOUNDATION

Concrete foundations and floors shall be placed in conformance with Pacific Island Construction Specification 103 - CONCRETE.

PLACEMENT

No blocks are to be placed until the subgrade and/or foundation has been inspected by the Engineer.

A mortar key shall be provided between the first row of blocks and the footing (or floor slab). Usually a depressed 2x4 section is used, or depressing the first row of blocks into the freshly placed concrete.

The blocks shall be laid true and plumb to the dimensions shown on the drawings. All horizontal and vertical joints shall be full-mortared and bonded well to both units.

Reinforcing steel shall be placed as detailed on the drawings. When continuous steel bars cannot be used, a lap or splice of at least 30-bar diameter may be used. The completed job shall be workmanlike and present a good appearance.

STRUCTURAL BACKFILL

The work shall consist of all earth backfill adjacent to the structures. Drainage system of weep holes and drain material shall be installed as shown on the drawings. The gradation of the drain fill shall conform to the requirements stated on the drawings.

Materials. The fill materials shall be the in-place excavated material unless otherwise stated and shown on the drawings. All fill shall contain no rocks greater than 2 inches and no undesirable materials.

Placement. The fill shall be placed so that the distribution of materials will be to the limits shown on the drawings and shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. No fill shall be placed until the following time has elapsed after concrete placement:

Walls or slabs- 14 days

The fill shall be placed in a manner adequate to prevent damage to the structure and allow the structure to gradually and uniformly assume the backfill loads. The fill shall be placed in not more than four-inch layers.

Moisture Content. The soil moisture of the fill material shall be sufficient to hold a ball shape when squeezed in the hand, unless otherwise stated and shown on the drawings.

Compaction. The fill material shall be compacted to a density equal to that of the adjacent materials. Compaction shall be accomplished by hand tampers or other acceptable means excluding heavy equipment. Heavy equipment shall not be operated within two feet of any structure.

SURFACE DRAINAGE

After completion of the backfill operations, the surface area adjacent to and around the structure shall be graded to convey surface runoff away from the structure.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and

air and water contamination are minimized and held within legal limits. The owner, operator, contractor, or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or non-existence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site. It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

105 - CORRUGATED METAL PIPE

SCOPE

The work shall consist of furnishing and placing circular, arched, or elliptical corrugated metal pipe and necessary fittings.

MATERIALS

Corrugated metal pipe and fittings shall conform to the requirements of the applicable Specification for the specified classes and shapes of pipe, as listed:

Corrugated steel	AASHTO M-36 ASTM A-760
Corrugated aluminum	AASHTO M-196 ASTM B-745 ASTM B-746

Coatings. Coatings shall conform to the requirements of ASTM A-849 or AASHTO M-190 for the specified material and type of coating.

Riveting. Unless otherwise specified, circumferential shop riveted seams shall have a maximum rivet spacing of 6 inches, except that 6 rivets will be sufficient for 12-inch diameter pipe.

When closed riveted pipe is specified:

- (1) Pipe shall be fabricated with circumferential seam rivet spacing that does not exceed 3 inches except that 12 rivets are sufficient to secure the circumferential seams in 12-inch pipe.
- (2) Longitudinal seams that will be within the coverage area of a coupling band, the rivets shall have flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating of the coupling bands.

Double riveting or double spot welding for pipe less than 42 inches in diameter may be required. When double riveting or double spot welding is specified, the riveting or welding shall be performed in a manner specified for pipe 42 inches or greater in diameter.

Coupling bands. Coupling bands are to be provided for each section of pipe. The hardware for fastening the coupling band tightly to the connecting pipe shall be fabricated to permit tightening sufficiently to provide the required joint tensile strength and, if required, water tightness without failure of its fastening.

Gaskets, if specified, are to be provided for each coupling band. The fabrication of coupling bands and fastening hardware, in addition to the above, shall be sufficient to provide the

required gasket seating without warping, twisting, or bending.

INSTALLATION

Laying and Bedding the Pipe. Unless otherwise specified, the pipe shall be installed in accordance with the manufacturer's recommendations. Pipe shall be installed so no reversal of grade between joints results unless otherwise shown on the drawings. The pipe shall be installed with the outside laps of circumferential joints pointing upstream and with longitudinal laps at the sides near the vertical mid-height of the pipe.

Field welding of corrugated galvanized iron or steel pipe is not permitted. The pipe sections shall be joined with fabricator-supplied coupling bands meeting the specified joint requirements. The coupling shall be installed as recommended by the fabricator.

The pipe shall be firmly and uniformly bedded throughout its full length to the depth and in the manner specified on the drawings.

The pipe shall be loaded sufficiently during backfilling to prevent displacement from line and grade and to maintain full contact with the bedding during the placement operations.

Strutting. When required, struts or horizontal ties shall be installed in the manner specified on the drawings. Struts and ties shall remain in position until the backfill has been placed above the top of the pipe to a height of 5 feet or the pipe diameter, whichever is greater, or to the surface of the completed earth backfill when the fill height is less than 5 feet above the top of the pipe. The contractor shall remove the struts or ties following completion of the earth backfill requirements that apply.

Handling the Pipe. The contractor shall furnish equipment as necessary to install the pipe without damaging the pipe or coating. The pipe shall be transported and handled in a manner to prevent damage to the pipe and coating.

Repair of damaged coating. Coated pipe shall be handled in a manner to prevent abrasion of the coating during transportation, placement, and backfilling. Pipe shall not be dropped or allowed to roll down skids without proper restraining ropes. If the pipe must be moved longitudinally along the trench, care shall be taken to assure that the pipe and the coating are not damaged. Pipe shall not be rolled or dragged on the ground. If the pipe is supported, the supports shall be of sufficient width and number and be padded, if necessary, to prevent damage to the coating.

Damaged coating shall be repaired before backfilling. Any damage to the metallic coating shall be repaired by cleaning the damaged surface area by sand blasting, power disk sanding, or wire brushing. All loose and cracked coating, dirt, and any products of corrosion shall be removed before application of paint. Oil and grease material shall be removed by use of a solvent. The surface shall be clean and dry during the painting period and until the coating has completely dried.

Painting shall be accomplished by one of the following options based upon installed exposure conditions of the pipe as determined by the engineer.

Normal exterior or interior atmospheric exposure:

- a. Zinc dust - zinc oxide primer, ASTM D-79 and D-520
- b. Single package, moisture cured urethane prime in silver metallic color, or
- c. Zinc-rich cold galvanized compound, brush, or aerosol application

Submergence in water exposure:

- a. Zinc dust - zinc oxide primer, ASTM D-79 and D-520
- b. Zinc dust paint, ASTM D-4146

When the metallic coating is damaged in any individual area larger than 12 square inches or if more than 0.2 percent of the total surface area of a single pipe section is damaged, that section of pipe will be rejected.

Buried Pipelines. Pipe shall be laid to the lines and grades as shown on the drawings and/or as staked in the field.

The trench bottom shall be uniformly excavated so that the full length of pipe contacts the bottom without bridging. Clods, rocks, and uneven spots that can cause non-uniform support shall be removed.

If trenches are excavated in soils containing rock or other hard material that might damage the pipe or coating material, the trenches shall be over excavated a minimum of four inches and then backfilled to grade with consolidated sand or fine earth bedding.

The trench at any point below the top of the pipe shall be only wide enough to permit the pipe to be easily placed and joined and to allow the initial backfill material to be uniformly placed under the haunches and along the sides of the pipe.

Hand or mechanical methods shall be used where there is a potential for live loading. Initial backfill material shall be free from rocks and hard earth clods larger than 3 inches in diameter. It shall not contain sod, cinders, or earth containing a high percentage of organic material.

At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. The initial backfill material shall be placed so that the pipe will not be displaced, excessively deformed, or damaged.

The initial fill shall be compacted firmly in 4 to 6-inch lifts around the pipe to provide adequate lateral support to the pipe. Each lift shall be shoveled and tamped between the pipe and the side of the trench to provide satisfactory pipe support. Care shall be taken to assure that backfill is placed under the haunches of the pipe sufficiently to fill all voids and provide uniform bearing. Initial backfill material shall be compacted to a density equal to or greater than the surrounding soil material.

Final backfill material shall be soil or sand, free of hard earth clods larger than 3 inches in diameter or stones greater than 1 inch in diameter, to a depth of 6 inches over the pipe. The remaining final backfill material shall be free of large rocks, and other debris greater than 3 inches in diameter. The material shall be placed and spread in approximately uniform layers so that there will be no unfilled spaces in the backfill. The backfill shall be placed to the level of the

natural ground, or to the design grade required to provide the minimum depth of cover after settlement.

Rolling equipment shall not be used to consolidate the final backfill until the specified minimum depth of cover has been placed.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

106 - EARTHFILL

SCOPE

The work shall consist of borrow excavation, hauling, placing and compacting earthfill required to construct the earthfill as shown on the drawings, or as staked in the field.

CLEARING

Earthfill and borrow sites to be cleared shall be stripped to sufficient depth to remove all vegetation, roots, brush, sod and other objectionable material. Clearing and disposal methods shall be in accordance with applicable state and county laws with due regards to the safety of persons and property.

SUBGRADE PREPARATION

The subgrade for earthfill shall be stripped to remove vegetation, roots, and other unsuitable materials. The subgrade surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled, and the surface materials of the subgrade shall be compacted and bonded with the first layer of earthfill.

Earth abutment surfaces shall be free of loose, un-compacted earth in excess of two inches in depth normal to the slope. Surfaces shall be at the moisture content so that the earthfill can be compacted against them to ensure a good bond between the fill and the abutments. Subgrade and abutment surfaces shall be no steeper than 1 horizontal to 1 vertical.

EXCAVATION

Excavated Material. To the extent they are needed, all suitable materials from the specified excavations shall be used in the construction of required permanent earthfill. The suitability of materials for specific purposes will be determined by an Engineer.

All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of at the locations shown on the drawings or at sites remote from the project.

Borrow Excavation. When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from the designated borrow areas. The extent and depth of borrow pits within the limits of the designated borrow areas shall be as shown on the drawings.

Borrow pits shall be excavated and finally dressed in manner to eliminate steep or unstable side slopes or other hazardous or unsightly conditions, and shall be free draining from any water ponding.

Bracing and Shoring. Excavated surfaces too steep to be safe and stable if unsupported shall be supported as necessary to safeguard the work and workmen, to prevent sliding or settling of

the adjacent ground, and to avoid damaging existing improvements. The width of the excavation shall be increased if necessary to provide space for sheeting, bracing, shoring, and other supporting installations.

Structure or Trench Excavation. Structure or trenched excavation shall be completed to the specified elevations and to sufficient length and width to include allowance for forms, bracing and supports, as necessary, before any concrete or earthfill is placed or any piles are driven within the limits of the excavation.

PLACEMENT

Material. All material shall be obtained from selected areas as shown on the drawings. Fill materials shall contain no sod, brush, roots, or other perishable or unsuitable material. Cobbles and rock fragments over 3 inches in diameter shall be removed from the material prior to compaction and be disposed of or placed in areas designated. Fill shall not be placed until the required excavation and subgrade preparation has been completed.

Fill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed 8-inches. Materials placed by dumping in piles or windows shall be spread uniformly to not more than the specified thickness before being compacted. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.

Fill placed around structures will be brought up at approximately uniform height on all sides of the structure.

The distribution and gradation of materials throughout the fill shall have no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. If zoned fills of substantially differing materials are specified; the zones shall be placed according to lines and grades shown on the drawings.

CONTROL OF MOISTURE CONTENT

During placement and compaction of fill, the moisture content of the materials being placed shall be maintained. The material should maintain a ball shape when squeezed in the hand. When specified, the moisture shall be maintained within 2 percentage points of optimum as determined by ASTM D-698.

The application of water to the fill materials shall be accomplished at the borrow areas insofar as practicable. Uniform moisture distribution shall be obtained by diskings. Material that is too wet when deposited on the fill shall either be removed or be dried to the specified moisture content prior to compaction.

If the top surface of the preceding layer of compacted fill or a subgrade or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond, it shall either be removed or scarified and moistened to an acceptable moisture content prior to placement of the next layer of fill.

The proper moisture content for compaction will be determined by inspection during the placement operation.

COMPACTION

Construction equipment shall be operated over each layer of fill to ensure that the required compaction is obtained. Special equipment shall be used if needed to obtain the required compaction. Compaction shall meet the requirements of the method specified as described below:

1. Sheep-foot roller - The roller shall have staggered, uniform spaced tamping feet and be equipped with suitable cleaners. The weight of the roller shall not be less than 2,500 pounds per foot of width. The maximum speed shall be less than 3 miles per hour. The entire surface of each layer placed shall receive 4 passes of this equipment.
2. Pneumatically tired equipment. A loaded scraper shall be considered a pneumatic roller. The use of this equipment must pass over 90 percent of the surface of each lift before a new lift placed. The entire surface of each layer shall receive 6 passes of this equipment.
3. Track Laying Equipment (bulldozer). The tracks of the equipment must pass over 90 percent of the surface of each lift before a new lift placed. The entire surface of each layer shall receive 8 passes of this equipment.
4. Compaction shall result in densities equal to or greater than 95 percent of the maximum obtained by laboratory compaction at optimum moisture of like soils in accordance with the procedures given in ASTM D-698, Method A.
5. Compaction shall result in densities equal to or greater than 90 percent of the maximum obtained by laboratory compaction at optimum moisture of like soils in accordance with the procedure given ASTM D-1557, Method A.

Heavy compaction equipment shall not be operated within 2 feet of any structure. The passage of heavy equipment will not be allowed:

1. Over cast-in-place conduits within 14-days after placement of the concrete,
2. Over cradled or bedded precast conduits within 7 days after placement of the concrete cradle or bedding
3. Over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one-half the clear span width of the structure or pipe or 2 feet, whichever is greater.

Fill adjacent to structures, pipe, conduits, and anti-seep collars shall be compacted to a density equivalent to that of the surrounding fill by means of hand tampers or plate vibrators. Hand directed tampers or compactors shall be used on areas not accessible to heavy compaction equipment. Fills compacted in this manner shall be placed in layers not greater than 4 inches in thickness before compaction, and shall meet the same density requirement as for the adjacent area.

Compaction of backfill adjacent to structures shall not be started until after the expiration of the following minimum time interval after placement of the concrete:

Counterforts, vertical or near-vertical walls with earth loading on one side only -	14 days
Walls and counterforts, backfilled on both sides simultaneously -	7 days

Anti-seep, collars, conduits,
and cantilever outlet bents -

3 days

TESTING

During the course of the work, tests may be made to identify materials, to determine compaction characteristics, to determine moisture content, and to determine density of fill in place. These test results will be used to verify that the fills conform to the requirements of the specifications.

Fill not meeting the specified requirements shall be reworked or removed and replaced with acceptable fill.

FINISH

After the placement of the earthfill, and spoils the sides and top shall be dressed by final passage of compaction equipment or by dragging to give a smooth surface. The surface area shall be graded to provide surface drainage to flow to desired locations.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regard to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

107 - EXCAVATION

SCOPE

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials.

CLASSIFICATION

Excavation is classified as common excavation, rock excavation, or unclassified excavation in accordance with the following definitions.

Common excavation is defined as the excavation of all materials that can be excavated, transported, and unloaded using heavy ripping equipment and wheel tractor-scrapers with pusher tractors or that can be excavated and dumped into place or loaded onto hauling equipment by excavators having a rated capacity of one cubic yard or larger and equipped with attachments (shovel, bucket, backhoe, dragline, or clam shell) appropriate to the material type, character, and nature of the materials.

Rock excavation is defined as the excavation of all hard, compacted, or cemented materials that require blasting or the use of ripping and excavating equipment larger than defined for common excavation. The excavation and removal of isolated boulders or rock fragments larger than 1 cubic yard encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation. The presence of isolated boulders or rock fragments larger than 1 cubic yard is not in itself sufficient cause to change the classification of the surrounding material.

For the purpose of these classifications, the following definitions shall apply:

- *Heavy ripping equipment* is a rear-mounted, heavy duty, single-tooth, ripping attachment mounted on a track type tractor having a power rating of at least 250 flywheel horsepower.
- *Wheel tractor-scraper* is a self-loading (not elevating) and unloading scraper having a struck bowl capacity of at least 12 cubic yards.
- *Pusher tractor* is a track type tractor having a power rating of at least 250 flywheel horsepower equipped with appropriate attachments.

Unclassified excavation is defined as the excavation of all materials encountered, including rock materials, regardless of their nature or the manner in which they are removed.

USE OF EXCAVATED MATERIAL

To the extent they are needed, all suitable material from the specified excavations shall be used in the construction of required permanent earth fill or rock fill. The suitability of material for specific purposes is determined by the engineer. The contractor shall not waste or otherwise dispose of suitable excavated material.

DISPOSAL OF WASTE MATERIALS

All surplus or unsuitable excavated materials are designated as waste and shall be disposed of at the locations shown on the drawings.

EXCAVATION LIMITS

Excavations shall comply with OSHA Construction Industry Standards (29CFR Part 1926) Subpart P, Excavations, Trenching, and Shoring. All excavations shall be completed and maintained in a safe and stable condition throughout the total construction phase.

Structure and trench excavations shall be completed to the specified elevations and to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.

Excavations outside the lines and limits shown on the drawings or specified herein required to meet safety requirements, shall be the responsibility of the contractor in constructing and maintaining a safe and stable excavation.

BORROW EXCAVATION

When the quantities of suitable material obtained from specified excavations are insufficient to construct the specified earthfill and earth backfill, additional material shall be obtained from the designated borrow areas.

Borrow pits shall be excavated and finally dressed to blend with the existing topography and sloped to prevent ponding and to provide drainage.

OVEREXCAVATION

Excavation in rock beyond the specified lines and grades shall be corrected by filling the resulting voids with Portland cement concrete made of materials and mix proportions approved by the engineer. Concrete that will be exposed to the atmosphere when construction is completed shall meet the requirements of concrete selected for use under Pacific Island Construction Specification 103, Concrete.

Concrete that will be permanently covered shall contain not less than five each, 94 lb. sacks of cement per cubic yard. The concrete shall be placed and cured as specified by the engineer.

Excavation in earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved, compacted earthfill. The exception to this is that if the earth is to become the subgrade for riprap, rock fill, sand or gravel bedding, or drain fill, the voids may be filled with material conforming to the specifications for the riprap, rock fill, bedding, or drain fill. Before correcting an over-excavation condition, the contractor shall review the planned corrective action with the engineer and obtain approval of the corrective measures.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

All disturbed areas not graveled or paved will be vegetated to control erosion.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

108 - GEOTEXTILE

SCOPE

This work consists of furnishing all material, equipment, and labor necessary for the installation of geotextile.

MATERIALS

Fibers (threads and yarns) used in the manufacture of geotextile shall be formed into a stable network of filaments or yarns retaining dimensional stability relative to each other. The geotextile shall be free of defects and conform to the physical requirements in tables 1 and 2. The geotextile shall be free of any chemical treatment or coating that significantly reduces its porosity. Fibers shall contain stabilizers and/or inhibitors to enhance resistance to ultraviolet light.

Geotextile shall be classified based on the method used to place the threads or yarns forming the fabric. The geotextile will be grouped into woven and nonwoven types.

Woven. *Fabrics* formed by the uniform and regular interweaving of the threads or yarns in two directions. Woven fabrics shall be manufactured from monofilament yarn formed into a uniform pattern with distinct and measurable openings, retaining their position relative to each other: The edges of fabric shall be selvedge or otherwise finished to prevent the outer yarn from unraveling.

Nonwoven. *Fabrics* formed by a random placement of threads in a mat and bonded by heat-bonding, resin-bonding, or needle punching. Nonwoven fabrics shall be manufactured from individual fibers formed into a random pattern with distinct, but variable small openings, retaining their position relative to each other when bonded by needle punching, heat, or resin bonding. The use of nonwoven other than the needle punched geotextile is somewhat restricted (see note 3 of **Table 2**).

STORAGE

Before use, the geotextile shall be stored in a clean, dry location out of direct sunlight, not subject to extremes of either hot or cold temperatures, and with the manufacturer's protective cover undisturbed. Each roll of geotextile shall be labeled or tagged to clearly identify the brand, class, and the individual production run.

Stored geotextile rolls shall be protected from the elements. The rolls shall be elevated and protected with a waterproof cover when stored outdoors. The geotextile shall not be exposed to ultraviolet light for more than 14 days.

Table 1 - Requirements for Woven Geotextile

Property	Test Method	Class I	Classes II & III	Class IV
Tensile Strength (lbs.)¹	ASTM D-4632 grab test	≥ 200 in any principal direction	≥ 120 in any principal direction	≥ 180 in any principle direction
Elongation of Failure (%)¹	ASTM D-4632 grab test	< 50	< 50	< 50
Puncture (lbs)¹	ASTM D-4833	≥ 90	≥ 60	≥ 60
Ultraviolet Light (% residual tensile strength) 150 hour exposure	ASTM D-4355	≥ 70	≥ 70	≥ 70
Apparent Opening Size (AOS)	ASTM D-4751	As specified, but no smaller than 0.212 mm (#70) ²	As specified, but no smaller than 0.212 mm (#70) ²	As specified, but no smaller than 0.212 mm (#70) ²
Percent Open Area	CWO-02215-86	≥ 4.0	≥ 4.0	≥ 1.0
Permittivity (sec⁻¹)	ASTM D-4491	≥ 0.10	≥ 0.10	≥ 0.10

1/ Minimum average roll value (weakest principal direction).

2/ U.S. standard sieve size.

Note: CWO is a USACE reference.

Table 2 - Requirements for Nonwoven Geotextiles

Property	Test Method	Class I	Classes II	Classes III	Class IV ³
Tensile Strength (lbs)¹	ASTM D-4632 grab test	≥ 180	≥ 120	≥ 90	≥ 115
Elongation of Failure (%)¹	ASTM D-4632 grab test	≥ 50	≥ 50	≥ 50	≥ 50
Puncture (pounds)¹	ASTM D-4833	≥ 80	≥ 60	≥ 40	≥ 40
Ultraviolet Light (% residual tensile strength) 150 hour exposure	ASTM D-4355	≥ 70	≥ 70	≥ 70	≥ 70
Apparent Opening Size (AOS)	ASTM D-4751	As specified max. #40 ²			
Permittivity (sec⁻¹)	ASTM D-4491	≥ 0.70	≥ 0.70	≥ 0.70	≥ 0.10

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 geotextile is required for all other classes.

SURFACE PREPARATION

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. It shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions, and standing or flowing water.

PLACEMENT

Before the geotextile is placed, the soil surface will be reviewed for quality assurance of the design and construction. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings. It shall be unrolled along the placement area and loosely placed, without stretching, in such a manner that it conforms to the surface irregularities when material or gabions are placed on or against it. The geotextile may be folded and overlapped to permit proper placement in designated area(s).

The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified) and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacturer, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. Pins shall be steel or fiberglass formed as a **U**, **L**, or **T** shape or contains "ears" to prevent total penetration through the geotextile. Steel washers shall be provided on all but the **U**-shaped pins.

Overlaps shall be constructed with the upstream or upslope panel placed over the downstream panel. At vertical laps, securing pins shall be inserted through the bottom layers along a line through approximately the mid-point of the overlap. At horizontal laps and across slope laps, securing shall be inserted through the bottom layer only. Securing pins shall be placed along a line about 2 inches in from the edge of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to remain in place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps or sewn joint disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used and overlaying the existing geotextile. When the geotextile seams are required to be sewn, the overlay patch shall extend a minimum of 1 foot beyond the edge of any damaged area and joined by sewing as required for the original geotextile except that the sewing shall be a minimum of 6 inches from the edge of the damaged geotextile. Geotextile panels joined by overlap shall have the patch extend a minimum of 2 feet from the edge of any damaged area.

Geotextile shall be placed in accordance with the following applicable specification according to their use.

Slope protection. The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. In no case shall material be dropped on uncovered geotextile from a height of more than 3 feet.

Subsurface drains. The geotextile shall not be placed until drainfill or other material can be used to provide cover within the same working day. Drainfill material shall be placed in a manner that prevents damage to the geotextile. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet.

Road stabilization. The geotextile shall be unrolled in a direction parallel to the roadway centerline in a loose manner permitting conformation to the surface irregularities when the roadway fill material is placed on its surface. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet. Unless otherwise specified, the minimum overlap of geotextile panels joined without sewing shall be 24 inches. The geotextile may be temporarily secured with pins recommended or provided by the manufacturer, but they shall be removed before placing the permanent covering material.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

109 - GROUTED ROCK RIPRAP

SCOPE

The work shall consist of furnishing and placing grouted rock at the locations and to the dimensions, lines, grades, and cross sections as shown on the drawings.

SUBGRADE PREPARATION

The subgrade surfaces on which the riprap, bedding, filter, or geotextile is to be placed shall be cleared and graded prior to placement of bedding, geotextile, or rock.

When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of appropriate sections of Pacific Island Conservation Construction Specification 106, Earthfill.

Filters and bedding, when required shall be spread uniformly on the prepared subgrade to the depths shown on the drawings.

MATERIALS

Rock. Rock shall be sound, dense and durable with a bulk specific gravity of not less than 2.5. Rock shall be angular to sub-rounded in shape with greatest dimension not greater than two times the least dimension. The rock shall conform to the grading limits given below unless otherwise specified on the drawing.

Size - Inches	Percent Passing, by weight
24	100
12	50
6	20
2	0

Concrete for Grout. The grout shall consist of Portland cement, fine and coarse aggregate, water, and an air entraining agent.

The cement content shall be *5-1/2 each*, 94 lb. sacks, per cubic yard, unless otherwise specified. Aggregate may be of pit run material provided it is reasonably well graded, clean, durable, and sufficiently free of undesirable substances.

Aggregate is adequately graded when not less than *1/3* and not more than *1/2* of the total weight passes through a standard *1/4* inch screen. Clay lumps and organic matter are not to exceed 3 percent of the total weight. Maximum size aggregate will not be greater than *3/4* inches.

Filter or Bedding. When filter or bedding material is shown on the drawings, the material shall be of clean, hard, and durable mineral particles free from organic matter, clay balls, or other deleterious substances. The surface of such material shall be finished reasonably to be free of mounds, dips, or windrows.

Bedding may be pit run material of sand, gravel, crushed stone, or a mixture.

Filter material shall conform to the gradation as shown on the drawing.

PLACEMENT OF ROCK

Equipment Placed Rock Riprap. The riprap shall be installed to the full course thickness in one operation and in such a manner as to avoid displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to the permanent works and to achieve the finished surface placement.

Hand Placed Riprap. Rocks shall be securely bedded firmly in contact one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

PLACING GROUT

The rock shall be washed with water to remove the fines from the rock prior to placing the grout. The rock shall be kept moist before the grouting. Grout shall not be placed in standing or flowing water.

Grout placed on inverts or other nearly level areas may be placed in one operation. On slopes, the grout shall be placed in lateral strips approximately ten (10) feet wide starting at the toe of the slope and progressing to the top.

The grout shall be delivered to the place of final deposit by approved means and discharged directly on the surface of the rock, using a splash plate of metal or wood to prevent displacement of the rock directly under the discharge. The flow of the grout shall be directed with brooms, spades or baffles to prevent it from flowing excessively along the same path and to assure that all intermittent spaces are filled. Sufficient barring shall be done to loosen tight pockets of rock and otherwise aid in the penetration of grout so that all voids shall be filled and the grout fully penetrate the lower 2/3 of the rock blanket.

All brooming on slopes shall be uphill. After the grout has stiffened, the entire surface shall be re-broomed to eliminate runs and to fill voids caused by sloughing. The surface finish, following the completion of grout installation, shall consist of one-third of the rock extended above the level of grout. The exposed rock will not have a plastered appearance.

After completion of any strip or panel, no workman or other load shall be permitted on the grouted surface for a period of 24 hours.

PROTECTION

The grouted surface shall be protected from injurious action by the sun, rain, flowing water, and/or mechanical injury. The grouted rock shall be prevented from drying for a curing period of at least 7 days after it is placed.

In lieu of water curing, the grouted rock shall be cured by spraying with an approved curing compound. The compound shall be applied in an approved manner as soon as practicable after the concrete is finished. All surfaces shall be kept moist until the compound is applied.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site. It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

110 - ROCK RIPRAP

SCOPE

The work shall consist of furnishing and installing loose rock riprap at the locations and to the lines, grades, elevations, and cross-sections as shown on the drawings.

MATERIALS

Rock. Rock shall be sound, dense, and durable with a bulk specific gravity of not less than 2.5. Rock shall be angular to sub-rounded in shape with the greatest dimension not greater than 2 times the least dimension. The rock shall conform to the grading limits given below unless otherwise specified on the drawing.

Size - Inches	Percent Passing, by weight
24	100
12	50
6	20
3	10

Filter or Bedding. When filter or bedding material is shown on the drawings, the material shall be composed of clean, hard, and durable mineral particles free from organic matter, clay balls or other deleterious substances.

Bedding may be pit run material of sand, gravel, crushed stone or a mixture thereof.

Filter material shall conform to the gradation as listed on the drawing.

Compaction of filter layers or bedding will not be required, but the surface of such material shall be finished reasonably free of mounds, dips, or windrows.

SUBGRADE PREPARATION

The subgrade surfaces on which the riprap, bedding, -filter, or geotextile is to be placed shall be cleared and graded prior to placement.

When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of appropriate sections of Pacific Islands Conservation Construction Specification 106, Earthfill.

PLACEMENT

Equipment Placed Rock Riprap. The riprap shall be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to

another with the smaller rocks and spalls filling the voids between the larger rocks.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to the permanent works and to achieve the finished surface placement.

Hand Placed Riprap. Rocks shall be securely bedded firmly in contact one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a for substitute larger rock. Flat slab rock shall be laid on edge.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

CONSTRUCTION OPERATIONS

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regard to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or nonexistence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

111 - METAL FABRICATION

SCOPE

The work shall consist of furnishing, fabricating, and erecting metalwork, including the metal parts and fasteners of composite structures, and plate-steel tanks or troughs. The work also consists of cleaning metal surfaces and applying paints and protective coatings.

METAL MATERIAL

The metalwork shall be fabricated with the material identified on the drawings and in accordance with the following:

Structural Steel. Structural steel shall conform to ASTM A-36. High-strength low-alloy structural steel shall conform to ASTM A-242 or A-588. Carbon steel plates of structural quality to be bent, formed, or shaped cold, shall conform the ASTM A-283, Grade C. Carbon steel sheets of structural quality shall conform to ASTM A-1011, Grade 40 or A-1008, Grade 40. Carbon steel strip of structural quality shall conform to ASTM A-1011, Grade 36.

Commercial or Merchant Quality Steel. Commercial or merchant quality steel shall conform to the applicable ASTM listed below:

Product	ASTM Standards
Carbon steel bars	A-575, Grade M 1015 to Grade M 1031
Carbon steel sheets	A-1011 or A-1008
Carbon steel strips	A-1011
Zinc-coated carbon steel sheets	A-653 or A-924

Bolts. Steel bolts shall conform to ASTM A-307. If high-strength bolts are specified, they shall conform to ASTM A-325.

When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to ASTM A-153; except that bolts 1/2 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to ASTM B-633, Service Condition SC 3 or ASTM A-766, unless otherwise specified.

Rivets. Unless otherwise specified, steel rivets shall conform to ASTM A-31, Grade B. Unless otherwise specified, aluminum alloy rivets shall be Alloy 6061 conforming to ASTM B-316.

PAINT MATERIAL

Unless otherwise specified or shown on the drawings, the following shall be used:

Type 4 – Epoxy polyamide primer. Epoxy polyamide primer shall be lead and chromate free. It shall have a minimum of 56 percent solids, by volume. Epoxy primer shall be able to be applied satisfactory at 4 to 6 mils dry-film thickness in one coat. Color availability shall be red, gray, and white. Epoxy primer shall conform to AWWA C-2109 and AWWA D-102.

Type 5 – Epoxy polyamide (intermediate or finish). Epoxy polyamide shall be lead free. It shall have a minimum of 56 percent solids, by volume. Epoxy polyamide shall be able to be applied satisfactory at 4 to 6 mils dry-film thickness in one coat. Finish shall be semi-gloss. Epoxy finish shall conform to AWWA C-210 and AWWA D-102.

Metal Priming. Items specified to be galvanized shall be completely fabricated for assembly before the application of the zinc coatings. Zinc coating shall conform to ASTM A-123.

FABRICATION

The metalwork shall be fabricated to the dimensions shown on the drawings. Galvanized items shall not be cut, welded, or drilled after the zinc coating is applied.

CLEANING

Surfaces to be painted shall be thoroughly cleaned prior to the application of the paint. All grease and oil shall be removed from the metal surface by steam cleaning or by solvent cleaning. All dirt, surface rust, and loose scale shall be removed by wire brushing, flame cleaning, use of rotary abrading tools, or light sand blasting.

PAINTING

Paint shall not be applied when the temperature of the item to be painted or of the surrounding air is less than 50 °F. Painting shall be done only when the humidity and temperature of the surrounding air and the temperature of the metal surfaces are such that evaporation rather than condensation will result.

Surfaces shall be painted immediately after cleaning.

One priming coat is required and may be applied by brush or spray.

A minimum of two finish coats is required. Additional finish coats may be necessary to attain a total dry-film thickness of 6 mils (0.006 inches).

The drying time between coats shall be as prescribed by the paint manufacturer, but not less than that required for the paint film to thoroughly dry. The elapsed time between coats shall not exceed 60 hours.

The finished surface of each coat shall be free from runs, drops, ridges, laps, or excessive brush marks, and shall present no variation in color, texture, and finish.

SURFACE DRAINAGE

After completion of construction, the surface area adjacent to and around the structures shall be graded to convey surface runoff away from the structure.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all the provisions of this specification and to the drawings.

WORKMANSHIP

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished. The flat bottoms and top edges of tanks and troughs shall be level.

CONSTRUCTION OPERATIONS

Construction operations shall be done in a manner and sequence that erosion, and air and water contamination are minimized and held within legal limits. The owner, operator, Contractor or other persons will conduct all work and operations in accordance with the proper safety codes for the types of construction being performed with due regard to the safety of all persons and property.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or non-existence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to insure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.