Attachments For
DSR # 051-05-044K & 045K
Walnut and Landry Pump Stations
Grand Isle, LA
Jefferson Parish

CONSTRUCTION SPECIFICATIONS

MATERIAL SPECIFICATIONS

SPECIAL PROVISIONS

1. Not all pipelines and other utilities are shown on the plans. It is the responsibility of the contractor to contact **Louisiana One Call at 1-800-272-3020** and the appropriate owner of any utility within the work area to assist him/her in the location of unmarked utilities prior to the start of his/her work. **The contractor shall provide the COTR the Louisiana One Call ticket number prior to the start of any excavation activities.**
2. **Public Property Right of Entry** – Permission and approval to access the channel from public property (i.e. streets, parks, local government parking lots, etc) or utilize public property as contractor staging areas shall be obtained by contacting the Sponsor's Representative.
3. Unless otherwise specified, the contractor shall be responsible for notifying Jefferson Parish and the respective utility owner(s) to address the protection and/or re-location of utilities within the limits of the work for the duration of the contractor's operations at the project site. The COTR shall concur with any needed adjustments to the proposed work prior to the contractor implementing said adjustments.
4. When performing work in the vicinity of utilities and/or other structures the contractor shall take extreme care not to damage said utilities and/or structures. Any damages resulting from improper construction will be the responsibility of the contractor, and repairs of such damages will be made by the contractor at his/her expense. The contractor shall further restore at his/her own expense all injured property caused by any negligent act of omission or commission on his/ her part or on the part of his/her agent, including sidewalks, curbing, sodding, shrubs, pipes, conduits, sewers, buildings, fences, property boundary markers, bridges, retaining walls, tanks, power lines, levees or any other building or private property to a condition as good as it was when he/she entered upon the right of way.
5. The convenience of the general public and of residents along the work shall be provided for in a reasonably adequate and satisfactory manner. Where existing roads are not available for use as detours, all traffic shall be permitted to pass through the work. In such cases the vehicles of the traveling public shall have precedence over the contractor's vehicles to the end that the traveling public's vehicles shall not be unduly delayed for the convenience of the contractor. The contractor shall provide and station competent flagmen whose sole duties shall consist of directing and controlling the movement of public traffic either through or around the work. A flagman shall also be stationed wherever equipment, trucks, etc., enter or leave a thoroughfare from the construction area. The design and application of all signals, pavement markings, channelizing devices and warning sign shall conform to the most current edition, as revised of the "Louisiana Manual on Uniform Traffic Control Devices."
6. The contractor shall arrange his/her work so that no undue or prolonged blocking of business establishments or private residences will occur. Material and equipment stored on the right of way and project site shall be so placed, and the work at all times shall be so conducted, as to insure minimum danger and obstruction to the traveling public.
7. In the event of any adverse weather condition such as a tropical storm, the contractor shall take the necessary precautions to insure that his equipment will not decrease the capacity of any drainage channels in the vicinity or damage any pumping stations or protection levees in the vicinity of his construction operations. Pumping stations, bridges or other structures shall not be utilized as mooring anchorages for equipment.
8. When transporting equipment, supplies, and material to and from the construction site, the contractor shall take the most direct route when leaving a major thoroughfare. When transporting high water content spoil the contractor shall utilize "water tight" trailers to prevent leakage of the material outside of the project work limits. The contractor shall be responsible for the clean up and proper disposal of leaked or spilled materials from his equipment.

9. Fire hydrants shall be accessible at all times to the Fire Department. No materials or other obstructions shall be placed closer to a fire hydrant than permitted by ordinances, rules or regulations. In the absence of such ordinances, rules or regulations, obstructions shall not be placed within fifteen (15) feet of a fire hydrant.

10. Material Certifications shall be provided to the Government Representative for all materials used in this contract prior to installation.

11. The following applies to the payment for excavation, rockfill, earthfill, geotextile, rock riprap, and mulching. The Estimated Quantities shown on the drawings are based on quantities derived from preliminary survey data and are calculated to the finished neat lines and grades on the plans. Variations in these quantities may be possible when the work is actually performed. However, modification to the contract will not be made for work performed in excess of these estimated quantities except under the following conditions:
    i) The variation must exceed 15% more than the estimated quantity or have a minimum contract value for the additional work in excess of $500.00. (The contract value is to be determined by dividing the lump sum amount in the Bid Schedule by the total applicable estimated units as shown in the contract item tables of quantities.) If the variation exceeds 15% more than the estimated quantity or $500.00, a price adjustment can be made for the amount exceeding 15% or $500.00 more than the original estimated quantity.
    ii) It shall be the contractor's responsibility to submit proof that the quantity in question exceeds the percentage and cost parameters in above Item i. Proof will consist of applicable survey data or other measurements made by a Registered Professional Engineer or Land Surveyor in accordance with recognized professional practice and standards of the surveying profession.
    iii) The survey data or other measurements as applicable shall be presented to the Natural Resources Conservation Service (NRCS) prior to any work on the contract item for which the quantity is questioned. One working day shall be provided to the NRCS to verify data prior to the beginning of work for this contract item.
    A final survey or other measurements as applicable shall be made and presented to the NRCS after the work is completed, which will allow measurement for the quantity in question. If this survey data indicates justification for a contract modification within the parameters of above Item i, it shall be made in accordance with the contract terms and conditions.
    All computations for excavation and fill items shall be computed to the neat lines and grades as shown on the drawings.

12. Soil borings and survey data is available for viewing at the Natural Resources Conservation Service, Emergency Operations Center, 2420 Athania Pkwy, Suite 300, Metairie, Louisiana 70001. Contact the Contract Specialist at 504-828-1866 Ext. 4 to schedule an appointment.

13. Unless otherwise concurred by the COTR, when a project for slope repair/stabilization consists of several sites along the same reach of channel, the contractor shall "work his way out of the project". The work shall begin at the site located the greatest travel distance from the project's entry point off a public road and proceed back towards the entry point. For example, if the access to the channel is off a public road at the north end of the project then the work shall begin at the southernmost site and proceed north. All slope repair work will be conducted to minimize the temporary storage of excavated material and backfill materials above the slope being repaired.

14. Unless otherwise concurred by the COTR, when a project consists of several slope repair/stabilization sites along a channel or canal, the contractor shall complete 80% of all the work at a site prior to beginning any work at the next site.

Construction Specification 2—Clearing and Grubbing

1. Scope
The work consists of clearing and grubbing and disposal of trees, snags, logs, brush, stumps, shrubs, and rubbish from the designated areas.

2. 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 unless otherwise approved by the contracting officer.

Any cuts, skins, scrapes, 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.

3. 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.

4. 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.

5. Disposal
All materials cleared and grubbed from the designated areas shall be disposed of at locations shown on the drawings or in a manner specified in section 7. 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.

6. Measurement and payment
Method 1—For items of work for which specific units prices are established in the contract, the cleared and grubbed area is measured to the nearest 0.1 acre. Payment for clearing and grubbing is made for the total area within the designated limits at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 2—For items of work for which specific unit prices are established in the contract, the length of the cleared and grubbed area is measured to the nearest full station (100 feet) along the line designated on the drawing or identified in the specifications. Payment for clearing and grubbing is made for the total length within the designated limits at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 3—For items of work for which specific unit prices are established in the contract, each tree, stump, and snag having a diameter of 4 inches or larger and each log having a diameter of 4 inches or larger and a length of 10 feet are measured before removal. The size of each tree and snag is determined by measuring its trunk at breast height above the natural ground surface. The size of each log is determined by measuring the butt and by measuring its length from butt to tip. The size of each stump is measured at the top. Diameter is determined by dividing the measured circumference by 3.14.

Payment for clearing and grubbing of each tree, stump, and snag having a diameter of 4 inches or larger and each log having a diameter of 4 inches or larger and a length of 10 feet or larger is made at the contract unit price for its size designation as determined by the following schedule:

Measured diameter (in)	Size designation (in)
4 to 8	6
8 to 12	10
12 to 24	18
24 to 36	30
36 to 60	48
Over 60	60

The sum of such payments shall constitute full compensation for clearing and grubbing (including the clearing and grubbing of smaller trees, stumps, snags, logs, brush, shrubs, and roots), applicable permits and associated fees, and rubbish removal. Such payment shall constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 4—For items of work for which specific lump sum prices are established in the contract, payment for clearing and grubbing is made at the contract lump sum price. Such payment shall constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

All Methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 7.

7. Items of work and construction details

7. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Subsidiary Item, Clearing and Grubbing

(1) This item shall consist of clearing and grubbing the construction area as necessary to do the levee repair work as shown on the construction drawings and as called for by the Specifications.

(2) All cleared materials and debris (trees, stumps, brush, broken concrete, and other foreign materials), above and below the ground surface, shall be removed from the repair site to the extent necessary to perform the work.

(3) All cleared materials and debris shall be loaded and hauled to the nearest approved public landfill, that meets all State and Federal requirements.

(4) No separate payment will be made for this item. Compensation for this Subsidiary Item will be included in the payment for Bid Item 3, Earthen Dike Repair.

Construction Specification 3—Structure Removal

1. Scope
The work shall consist of the removal, salvage, and disposal of structures (including fences) from the designated areas.

2. Marking
Method 1—Each structure or structure part to be removed will be marked with stakes, flags, paint, or other suitable method.

Method 2—The area boundaries from which structures must be removed will be marked using stakes, flags, paint, or other suitable method. Structures to remain undisturbed or to be salvaged will be designated by special markings.

3. Removal
Method 1—All structures designated for removal in the contract shall be removed to the specified extent and depth.

Method 2—Within the areas so marked, all visible and buried structures identified shall be removed to the specified extent and depth.

4. 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.

5. Disposal of refuse materials
Refuse materials resulting from structure removal shall be disposed of in a manner and at locations specified in section 7 of this specification or in an acceptable manner and at locations approved by the contracting officer. Disposal by burning shall be in accordance with local rules and regulations.

6. Measurement and payment
Method 1—For items of work for which specific unit prices are established by the contract, payment for the removal of each structure unit, except fences, is made at the contract unit price. Fences removed or removed and salvaged are measured to the nearest linear foot. Payment for fence removal or removal and salvage is made at the contract unit prices for each type and size of fence.

Such payment will constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the completion of the work.

Method 2—For items of work for which specific lump sum prices are established by the contract, payment for structure removal is made at the contract lump sum price.

Such payment will constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the completion of the work.

All Methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed as a contract line item number in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in section 7 of this specification.

7. Items of work and construction details

7. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Subsidiary Item, Structure Removal

1) This item shall consist of removal and disposal of steel sheet piles, timber toewalls, corrugated metal pipe and / or plastic pipe to the extent shown on the drawings.

2) Existing pipes shall be fully supported before the removal of the existing pipe supports.

3) Marking shall be by Method 1. Each structure to be removed will be marked by means of stakes, flags, painted markers or other suitable methods by the COTR.

4) Removal shall be by Method 2. The extent of depth of removal shall be that required to complete the repair as shown on the drawings. While no existing structures were detected during the inspection process if any are encountered during construction the extent of depth of removal shall be that required to complete the repair as shown on the drawings. The depth of removal of the timber toe wall shall be as a minimum of 1' below the earthfill limits at the site.

5) Salvaging of materials will not be required.

6) Refuse material resulting from structure removal shall be loaded and hauled to the nearest approved public landfill, that meets all State and Federal requirements.

7) No separate payment will be made for this item. Compensation for this Subsidiary Item will be included in the payment for Bid Item 3, Earthen Dike Repair.

Construction Specification 5—Pollution Control

1. Scope

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

2. Material

All material furnished shall meet the requirements of the material specifications listed in section 8 of this specification.

3. 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 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—Culverts or bridges 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—Straw bale filters or geotextile sediment fences trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under or around them. These filters 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.

Waterways—Waterways 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.

Other—Additional protection measures as specified in section 8 of this specification or required

by Federal, State, or local government.

4. 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 drained lubricating or transmission fluids, grease, soaps, concrete mixer washwater, 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 as specified in section 8 of this specification. 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 distance sufficient to prevent contamination of any water source. At the completion of construction activities, facilities shall be disposed of without causing pollution as specified in section 8 of this specification.

5. 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.

6. 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.

7. Measurement and payment

Method 1—For items of work for which specific unit prices are established in the contract, each item is measured to the nearest unit applicable. Payment for each item is made at the contract unit price for that item. For water or chemical suppressant items used for dust control for which items of work are established in section 8 of this specification, measurement for payment will not include water or chemical suppressants that are used inappropriately or excessive to need. Such payment will constitute full compensation for the completion of the work.

Method 2—For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds and supported by invoices presented by the contractor that reflect actual costs. If the total of all progress payments is less than the lump sum contract price for this item, the balance remaining for this item will be included in the final contract payment. Payment of the lump sum contract price will constitute full compensation for completion of the

work.

Method 3—For items of work for which lump sum prices are established in the contract, payment will be prorated and provided in equal amounts on each monthly progress payment estimate. The number of months used for prorating shall be the number estimated to complete the work as outlined in the contractor's approved construction schedule. The final month's prorate amount will be provided with the final contract payment. Payment as described will constitute full compensation for completion of the work.

All Methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items, and the items to which they are made subsidiary, are identified in section 8 of this specification.

8. Items of work and construction details

(See next page.)

8. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefor are:

a. Subsidiary Item, Pollution Control

(1) This item shall consist of all work necessary to control erosion and sediment pollution, chemical pollution, water pollution, and air pollution during the period of this contract. The contractor shall perform the work in a manner that will reduce erosion, minimize sediments and other pollutants to the water and streams, and create a minimum of air pollution.

(2) Silt fences and hay bales shall be installed in the locations necessary to prevent sediment from leaving the construction site.

(3) All paints and hazardous materials shall be kept in the original containers and tightly sealed with the manufacturer's label attached. These must be properly stored when not in use. They shall also be stored in a neat orderly manner in their original containers. Disposal of surplus materials shall be in accordance with the manufacturer's or State and Local regulations and recommended methods. Containers shall be empty before disposal.

(4) Petroleum products such as fuels and lubricants will be stored in tightly sealed containers that are clearly labeled. The storage and dispensing of all petroleum products will be in accordance with part 1926.152 of the OSHA Construction Industry Safety and Health Standards. All spills will be cleaned up on the same workday of the spill occurrence or whenever discovered.

(5) Soils contaminated with petroleum products will be removed from the site and disposed of in accordance with State and Local regulations.

(6) All onsite vehicles and equipment shall be monitored for leaks and receive regular preventive maintenance to reduce the chance for leakage. Leaks shall be repaired as soon as they are identified.

(7) Sumps used to control chemical pollution shall be sealed with plastic sheets having a minimum thickness of 20 mils.

(8) The contractor shall anchor all temporary materials used for pollution control in such a manner to prevent its being transported off the worksite by storm runoff water. Damage caused by clogging of downstream bridges and/or culverts by such temporary materials being transported downstream by storm water shall be the responsibility of the contractor.

(9) No separate payment will be made for this item. Compensation for Subsidiary Item, Pollution Control will be included in the payment for Bid Item 2, Seeding, Fertilization and Mulching.

Construction Specification 6—Seeding, Sprigging, and Mulching

1. Scope

The work consists of preparing the area for treatment; furnishing and placing seed, sprigs, mulch, fertilizer, inoculant, lime, and other soil amendments; and anchoring mulch in designated areas as specified.

2. Material

Seed—All seed shall conform to the current rules and regulations of the state where it is being used and shall be from the latest crop available. It shall meet or exceed the standard for purity and germination listed in section 7.

Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures are evidence of purity and germination. No seed will be accepted with a test date of more than 9 months before the delivery date to the site.

Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted. The percent of noxious weed seed allowable shall be as defined in the current State laws relating to agricultural seeds. Each type of seed shall be delivered in separate sealed containers and fully tagged unless exception is granted in writing by the contracting officer.

Fertilizer—Unless otherwise specified, the fertilizer shall be a commercial grade fertilizer. It shall meet the standard for grade and quality specified by State law. Where fertilizer is furnished from bulk storage, the contractor shall furnish a supplier's certification of analysis and weight. When required by the contract, a representative sample of the fertilizer shall be furnished to the contracting officer for chemical analysis.

Inoculants—The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer shall be used except four times the amount shall be used when seed is applied using a hydraulic seeder. Seed shall be sown within 24 hours of treatment and shall not remain in the hydraulic seeder longer than 4 hours.

Lime and other soil amendments—Lime shall consist of standard ground agriculture limestone, or approved equivalent. Standard ground agriculture limestone is defined as ground limestone meeting current requirements of the State Department of Agriculture. Other soil amendments shall meet quality criteria and application requirements specified in section 7.

Mulch tackifiers—Asphalt emulsion tackifiers shall conform to the requirements of ASTM D 977, Specification for Emulsified Asphalt. The emulsified asphalt may be rapid setting, medium setting, or slow setting. Nonasphaltic tackifiers required because of environmental considerations shall be as specified in section 7.

Straw mulch material—Straw mulch shall consist of wheat, barley, oat or rye straw, hay, grass cut from native grasses, or other plants as specified in section 7. The mulch material shall be air-

dry, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds is not permitted. The contractor shall provide a method satisfactory to the contracting officer for determining weight of mulch furnished.

Other mulch materials—Mulching materials, such as wood cellulose fiber mulch, mulch tackifiers, synthetic fiber mulch, netting, and mesh, are other mulching materials that may be required for specialized locations and conditions. These materials, when specified, must be accompanied by the manufacturer's recommendations for methods of application.

3. Seeding mixtures, sod, sprigs, and dates of planting

The application rate per acre for seed mixtures, sprigs, or sod and date of seeding or planting shall be as shown on the plans or as specified in section 7.

4. Seedbed preparation and treatment

Areas to be treated shall be dressed to a smooth, firm surface. On sites where equipment can operate on slopes safely, the seedbed shall be adequately loosened (4 to 6 inches deep) and smoothed. Depending on soil and moisture conditions, disking or cultipacking, or both, may be necessary to properly prepare a seedbed. Where equipment cannot operate safely, the seedbed shall be prepared by hand methods by scarifying to provide a roughened soil surface so that broadcast seed will remain in place.

If seeding is to be accomplished immediately following construction operations, seedbed preparation may not be required except on a compacted, polished, or freshly cut soil surface.

Rocks larger than 6 inches in diameter, trash, weeds, and other debris that will interfere with seeding or maintenance operations shall be removed or disposed of as specified in section 7.

Seedbed preparation shall be discontinued when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed as determined by the contracting officer's technical representative (COTR).

5. Seeding, sprigging, fertilizing, mulching, and stabilizing

All seeding or sprigging operations shall be performed in such a manner that the seed or sprigs are applied in the specified quantities uniformly in the designated areas. The method and rate of seed application shall be as specified in section 7. Unless otherwise specified, seeding or sprigging shall be accomplished within 2 days after final grading is completed and approved.

Fertilizer, lime, and other soil amendments shall be applied as specified in section 7. When specified, the fertilizer and soil amendments shall be thoroughly incorporated into the soil immediately following surface application.

The rate, amount, and kind of mulching or mesh shall be as specified in section 7. Mulches shall be applied uniformly to the designated areas. They shall be applied to areas seeded not later than 2 working days after seeding has been performed. Straw mulch material shall be stabilized within 24 hours of application using a mulch crimper or equivalent anchoring tool or by a suitable tackifier. When the mulch crimper or equivalent anchoring tool is used, it shall have straight blades and be the type manufactured expressly for and capable of firmly punching the mulch into the soil. Where the equipment can be safely operated, it shall be operated on the contour. Hand methods shall be used where equipment cannot safely operate to perform the work required.

The tackifier shall be applied uniformly over the mulch material at the specified rate, or it shall be injected into the mulch material as it is being applied. Mesh or netting stabilizing materials shall be applied smoothly, but loosely on the designated areas. The edges of these materials shall be buried or securely anchored using spikes or staples as specified in section 7.

The contractor shall maintain the mesh or netting areas until all work under the contract has been completed and accepted. Maintenance shall consist of the repair of areas damaged by water erosion, wind, fire, or other causes. Such areas shall be repaired to reestablish the intended condition and to the design lines and grades required by the contract. The areas shall be refertilized, reseeded, and remulched before the new application of the mesh or netting.

6. Measurement and payment

***Method 1*—**For items of work for which specific unit prices are established in the contract, each area treated is measured as specified in section 7 and the area calculated to the nearest 0.1 acre. Payment for treatment is made at the contract unit price for the designated treatment, which will constitute full compensation for completion of the work.

When specified as an item of work, mesh or netting is measured to the nearest square yard of surface area covered and accepted. Payment is made at the contract unit price and will constitute full compensation for completion of the work.

***Method 2*—**For items of work for which specific lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for this item is made at the contract lump sum price for the item and will constitute full compensation for the completion of the work.

***Method 3*—**For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds. Progress payments will be determined as specified in section 7. Payment of the lump sum contract price will constitute full compensation for completion of the work.

***All Methods*—**The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the item(s) to which they are made subsidiary are identified in section 7.

7. Items of work and construction details

(See next sheet)

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details therefore are:

Bid Item 2, Permanent Vegetation Seeding, Fertilization and Mulching

This item will consist of furnishing and applying seed, fertilizer and mulching according to the following specifications.

a. Permanent Vegetation Seeding

(1) This item will consist of furnishing and applying seed according to the following specifications:

(2) Seeding for permanent cover will be done on all bare areas such as channel slopes, berms, spoil placement areas and any other disturbed areas.

Fertilizer and seed will not be applied to areas with perennial ponded water.

(3) No seedbed preparation will be required if the construction equipment has produced a scarified surface and the seeding is done the day the areas to be seeded are worked.

If the construction equipment has produced a slick surface or seeding is not done the day the areas are worked, a seedbed will be prepared by scarifying the soil surface with a spike-tooth harrow or similar implement to a depth of one (1) inch on slopes 3:1 or steeper and a depth of three (3) inches on all flatter areas.

When broadcast seeding, if more than one species of vegetation is required, each species shall be seeded separately.

(4) Permanent vegetation seeding will be applied at the rates listed as follows on Page 6-5 in TABLES 1 and 2 according to the method of seed application.

TABLE 1. SEEDING RATES FOR BROADCAST APPLICATION

Seeding Period	Species	Minimum % Pure Live Seed (lb/ac)	Pure Live Seed (1b/ac)	Minimum Quality Seed (lb/ac)
Mar 1 - Aug 31	Common Bermuda grass (hulled)	83	45	55
	&			
	Brown Top Millet	72	35	45
Sep 1 - Dec 31	Tall Fescue	80	40	48
	&			
	Rye Grass	82	25	30
Jan 1 - Feb 28	Common Bermuda grass (unhulled)	80	20	24
	&			
	Common Bermuda grass (hulled)	83	20	24
	&			
	Ryegrass	82	25	30

TABLE 2. SEEDING RATES FOR HYDROSEEDING APPLCATION

Seeding Period	Species	Minimum % Pure Live Seed (lb/ac)	Pure Live Seed (1b/ac)	Minimum Quality Seed (lb/ac)
Mar 1 - Aug 31	Common Bermuda grass (hulled)	83	45	55
	&			
	Brown Top Millet	72	35	45
Sep 1 - Dec 31	Tall Fescue	80	40	48
	&			
	Rye Grass	82	41	50
Jan 1 - Feb 28	Common Bermuda grass (unhulled)	80	32	40
	&			
	Common Bermuda grass (hulled)	83	32	40
	&			
	Ryegrass	82	41	50

b. Temporary Seeding

(1) This item will consist of furnishing and applying seed and fertilizer for temporary cover according to the following specifications:

(2) Seeding for temporary cover will be done on spoil to be spread or shaped where spreading or shaping will be delayed 14 days or longer or disturbed areas where construction activities are not anticipated for 14 days, unless it is determined by the COTR that the cover period will be too short to make seeding practical.

(3) No seedbed preparation will be required if the construction equipment has produced a scarified surface, and the seeding is done the day the areas to be seeded are worked. If the construction equipment has produced a slick surface or seeding is not done the day and areas are worked, a seedbed will be prepared by scarifying the soil surface with a spike-tooth harrow or similar implement to a depth of one inch. Temporary seeding will be applied at the following rates:

Seeding Period	Species	Minimum % Pure Live Seed	Pure Live Seed (1b/ac)	Minimum Quality Seed (lb/ac)
Mar 1 - Aug 31	Brown Top Millet (hulled)	72	35	45
Sep 1 - Feb 28	Ryegrass	82	40	50

(4) Fertilizer will be applied according to section 7.c of this specification.

c. Fertilization

(1) This item will consist of furnishing and applying fertilizer to all areas to be seeded according to the following specifications:

(2) Fertilizer will be a 1-1-1 ratio of N, P, and K, and will contain at least 13 lbs. of each per 100 lbs. of material.

Fertilizer rate (13-13-13 basis) **(12 lbs. per 1000 sq ft) or (500 lbs. per acre)**

(3) One application of fertilizer will be applied at the time of planting as directed by the COTR.

d. Mulching

(1) This item consists of furnishing and applying either a lightweight erosion control blanket, as specified in Section (7) below, or hydroseeding, as specified in Section (8) below, on all slopes 6:1 or steeper and any other disturbed areas designated by the COTR to be seeded to permanent vegetation.

(2) The contractor shall submit his plan for mulching to the CO for approval at least 14 days prior to installation. The plan shall include the types and certification of the materials to be used and any manufacturer installation recommendations.

(3) The material must provide fiber reinforcement to minimize soil erosion and break up rainfall impact. The material must be able to allow water, air, and sunlight to penetrate and retain sufficient moisture to provide a microclimate for seed germination and plant growth.

(4) The material must be stable enough to survive installation and persist in the environment long enough for seed germination and initial establishment of grasses.

(5) Final graded slope shall be free of all rocks, clods, vegetation or other obstructions so that the mulching will have direct contact with soil surface.

(6) Do not drive tracked or heavy equipment over mulches areas.

(7) Lightweight Erosion Control Blanket

(a) This item shall apply if the contractor chooses to apply a lightweight erosion control blanket as the method of mulching.

(b) Seedbed preparation and seed and fertilizer rates and application methods shall be as specified in Sections 7.a. and 7.b. above.

(c) The lightweight erosion control blanket will be a flexible geosynthetic material manufactured from biodegradable polypropylene multifilament and tape yarns configured into a dimensionally stable matrix.

(d) The material weight must be in the range of 0.65 to 2.0 oz. /s.y. (minimum average roll value).

(e) Blanket will be anchored as per manufacturer's recommendations with 8 ga., 8 in x 2 in x 8 in wire staples.

(f) Blanket will be placed on areas which have been seeded and fertilized within the same workday as the seed and fertilizer application.

(g) Blanket will be installed up and down the channel slopes as per manufacturer's recommendations.

(8) Hydromulching

(a) This item shall apply if the contractor chooses to apply hydromulching as the method of mulching.

(b) Seedbed preparation and seed and fertilizer rates shall be as specified in Sections 7.a. and 7.b. above.

(c) The contractor shall submit his plan for mulching to the CO for approval at least 14 days prior to installation. The plan shall include the types and certification of the materials to be used and any manufacturer installation recommendations.

(d) The material must provide fiber reinforcement to minimize soil erosion and break up rainfall impact. The material must be able to allow water, air, and sunlight to penetrate and retain sufficient moisture to provide a microclimate for seed germination and plant growth.

(e) The material must be stable enough to survive installation and persist in the environment long enough for seed germination and initial establishment of grasses.

(f) Final graded slope shall be free of all rocks, clods, vegetation or other obstructions so that the mulching will have direct contact with soil surface.

(g) Do not drive tracked or heavy equipment over mulched areas.

(h) Seedbed preparation and seed and fertilizer rates shall be as specified in Bid Item 11, Permanent Seeding and Subsidiary Item, Fertilization.

(i) Hydro mulching shall consist of the mixing of wood fiber mulch, pre-blended mulch tackifier, grass seed, fertilizer and/or other additives, as specified, with water. It shall be mixed in standard hydraulic mulching equipment to form a homogeneous slurry.

(i) The water used in the hydromulching operation shall be clean, fresh and free of any materials which could inhibit vigorous growth of grass.

(ii) The mulch/mulch tackifier combination shall be as recommended by the manufacturer for use with the supplied product. The mulch tackifier shall adhere to the fibers, during mulch manufacturing to prevent separation during shipment and to avoid chemical agglomeration during mixing in the hydraulic mulching equipment. The mulch tackifier shall be homogeneous within the unit package. It shall have no growth or germination inhibiting factors, shall be nontoxic.

(iii) The mulch material shall consist of pure wood fibers manufactured from 100% clean green wood chips. The chips shall be processed in such a manner as to contain no trace of lead paint, varnish, printing ink, petroleum based compounds or seed germination inhibitors. The fibers shall not be produced from unknown origin recycled material such as sawdust, paper, cardboard or residue from chlorine bleached paper mills.

A minimum of 25% of the fibers shall be 0.4 inches long or longer with 50% or more being retained on a Clark fiber classifier 24-mesh screen.

The wood fiber mulch shall also conform to the following specifications:

Moisture Content (total wt. basis, maximum)	15%
Organic Matter (wood fiber) (oven dried wt. basis, minimum)	96%
Inorganic (ash) content (oven dried wt. basis, maximum)	1%
PH at 3% consistency in water slurry (average)	4.7 to 5.4
Water Holding Capacity (oven dried wt. basis, maximum) (gallons of water per pound of fiber)	1 gal./lb.
Mulch tackifier Content (weight basis, minimum)	3%

(iv) The wood fiber mulch must maintain uniform suspension in water under agitation. Upon application, the mulch material shall form a blotter-like mat covering the ground. This mat shall have the characteristics of water absorption and percolation and shall cover and bond grass seed in contact with the soil.

(v) The wood fiber mulch shall be dyed green to aid in visual metering during application. The dye shall be biodegradable, nontoxic, non-staining and not inhibit plant growth.

(vi) A soil stabilizer/ tackifier (soil tackifier) shall be added to the hydromulch mixture. The soil tackifier material shall be a linear synthetic polymer. The soil tackifier shall be of the anionic type, meeting acrylamide monomer limits of less than or equal to 0.05 percent by weight. The soil tackifier shall have a charge density of 10 to 55% by weight, and a molecular weight of 6 to 24 Mg/mole. The soil tackifier shall not be over one (1) year in age. The anionic synthetic polymer shall be environmentally benign, harmless to fish, aquatic organisms, wildlife, and plants. It shall also be non-combustible.

The application rate of the Polyacrylamide active ingredients shall be four (4) pounds per acre per single application event. The soil tackifier shall be mixed, applied, and disposed of in accordance with OSHA Material Safety Data Sheet requirements, the manufacturer's recommendations, and State and Federal requirements.

Soil tackifier should be stored in cool dry places away from direct sunlight.

Spilled soil tackifier shall be avoided by all forms of traffic. The spill shall be cleaned thoroughly with dry absorbent material (sawdust, soil, cat litter, etc.) and shall be swept or collected without washing with water.

(vii) Using standard hydraulic mulching equipment, the wood fiber mulch (with mulch tackifier), seed and fertilizer slurry shall be applied evenly over the soil surface in a one-step operation. The hydromulching shall be distributed in two intersecting directions with a hydraulic seeder. The slurry shall be sprayed, under pressure, uniformly over the soil surface at the material application rate recommended by the machine manufacturer. The hydraulic mulching equipment shall contain a motorized continuous agitation system that keeps all materials in uniform suspension throughout the mixing and distribution cycles.

Mulching rates shall conform to the specifications in the table below.

Grade Horizontal:Vertical	Wood Fibrous Mulch (dry weight) (lb/ac)	Additional Mulch Tackifier (lb/ac)
3.5:1 or flatter	1800	40
2.5:1 or flatter	2000	60
All other areas	2500	80

e. Measurement and payment shall be by Method 2. Such payment will constitute full compensation for related Subsidiary Item, Pollution Control.

Construction Specification 8—Mobilization and Demobilization

1. Scope

The work consists of the mobilization and demobilization of the contractor's forces and equipment necessary for performing the work required under the contract. It does not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling the contract requirements for commencement of work.

2. Equipment and material

Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified in section 4 of this specification.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal, and site cleanup of offices, buildings, and other facilities assembled on the site specifically for this contract.

This work includes mobilization and demobilization required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted, or added items of work for which the contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

3. Payment

Payment will be made as the work proceeds, after presentation of paid invoices or documentation of direct costs by the contractor showing specific mobilization and demobilization costs and supporting evidence of the charges of suppliers, subcontractors, and others. When the total of such payments is less than the lump sum contract price, the balance remaining will be included in the final contract payment. Payment of the lump sum contract price for mobilization and demobilization will constitute full compensation for completion of the work.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

4. Items of work and construction details

(See next page.)

4. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefor are:

a. Bid Item 1, Mobilization and Demobilization

(1) This item shall consist of mobilizing and demobilizing personnel and equipment in preparation to perform the work within the scope of this contract.

(2) This item shall not include transportation of personnel, equipment and operating supplies between and within the work limit areas of this Contract.

(3) Fences, which must be cut or removed for access, shall be repaired or replaced by the Contractor at his/her expense to equal or exceed the quality of fencing that was in place prior to cutting or removal.

(4) Access shall be as shown on the drawings. If alternate routes are obtained by the Contractor, they must be approved by the Contracting Officer prior to use. All access routes shall be restored, by the Contractor, to a condition equal to or better than the condition prior to the commencement of work under this contract.

(5) Payment will be as stated in Section 3, "Payment. Such payment will constitute full compensation for related Subsidiary Item, Traffic Control.

Construction Specification 9—Traffic Control

1. Scope

The work shall consist of establishing traffic control and maintaining safe, convenient use of public roads and rights-of-way.

2. Traffic and access

The contractor's operations shall cause no unnecessary inconvenience to the public. The public rights-of-way shall be maintained at all times unless interruption is authorized by proper local authority. Contractor's authorized closing or detour plans shall be provided to the engineer for approval.

Safe and adequate access shall be provided and maintained to all public protection devices and to all critical utility control locations. Facility access shall be continuous and unobstructed unless otherwise approved.

3. Storage of equipment and material in public streets

Construction materials and equipment shall not be stored or parked on public streets, roads, or highways. During any material or equipment loading or unloading activities that may temporarily interfere with traffic, an acceptable detour shall be provided for the duration of the activity. Any associated expense for this activity is the responsibility of the contractor.

Excavated material, including suitable material that is intended for adjacent trench backfill or other earth backfill as specified in section 5 of this specification, shall not be stored on public streets, roads, or highways that remain in service for the public. Any waiver of this requirement must be obtained from the proper local authority and approved by the engineer. All excess and unsuitable material shall be removed from the site as soon as possible. Any spillage shall be removed from roadways before they are used by the public.

4. Street closures, detours, and barricades

The contractor shall comply with the requirements of all applicable responsible units of government for closure of any street, road, or highway. The contractor shall provide the required barriers, guards, lights, signs, temporary bridges, and flaggers together with informing the public of any detours and construction hazards by the most suitable means available, such as local newspapers or radio stations. The contractor is also responsible for compliance with additional public safety requirements that may arise during construction. The contractor shall furnish, install, and, upon completion of the work, promptly remove all signs, warning devices, and other materials used in the performance of this work.

Unless otherwise specified, the contractor shall notify, in writing, the fire chief, police chief, county sheriff, state patrol, schools that operate school buses, or any other government official as may be appropriate no less than 7 days before closing, partly closing, or reopening any street, road, or highway.

Unless otherwise specified, the contractor shall furnish to the engineer a written plan showing the proposed method of signing, barricading for traffic control, and safety for street detours and closures.

All temporary detours will be maintained to ensure use of public rights-of-way is provided in a safe manner. This may include dust control, grading, and graveling as required in section 7 of this specification.

5. General and specific references

All signs, signals, barricades, use of flaggers, and other traffic control and public safety devices shall conform to the general requirements set forth in the Manual of Uniform Traffic Control Devices (MUTCD) and the latest edition of *Standard Highway Signs and Standard Alphabets for Highway Signs* and/or OSHA *Construction Industry Standards (29 CFR Part 1926), Subpart G, Signs, Signals, and Barricades* unless otherwise specified in section 7 of this specification.

6. Measurement and payment

For items of work for which specific lump sum prices are established in the contract, payment for the work is made at the contract lump sum price. Progress payments will be made based upon the percentage of estimated total time that traffic control will be required unless otherwise specified in section 7 of this specification. Payment will constitute full compensation for all flaggers, labor, materials, equipment, and all other items necessary and incidental to completion of the work.

Compensation for any item of work described in the contract, but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in section 7 of this specification.

7. Items of work and construction details

(See next page.)

7. Items of Work

Items of work to be performed in conformance with this specification are:

a. Subsidiary Item, Traffic Control

(1) This item shall consist of providing the necessary traffic control devices (signs, signals, markings, personnel, etc.) where needed, to allow for the safe and expeditious movement of traffic through and adjacent to the construction area for the completion of this contract.

(2) The contractor, shall have a comprehensive traffic control plan. The plan shall address, as a minimum, the following requirements:

(a) The design and application of all signals, pavement markings, channelizing devices, and warning signs shall conform to the *"Louisiana Manual on Uniform Traffic Control Devices*", as revised.

(b) Channelizing and delineation devices shall be used to mark all construction areas. These shall be Type II and/or Type III barricades, and/or barrels, all fully reflectional with lights, and weighted with sandbags.

(c) Any traffic control devices (signs, signals, markings) which exist as part of the normal pre-construction scheme, and that do not apply to an appropriate situation, or are in the way of construction, shall be covered, removed, or relocated by the contractor.

(d) The roadway and all traffic control devices shall be restored to original conditions by the contractor.

(e) All excavations shall be covered, backfilled, or protected, (see “b”, above) at night and when work is not in progress. Excavated pits, etc., shall be fully fenced or barricaded (see “b”, above) to prevent access by pedestrians.

(f) All materials/machines shall be stored outside of the road surface, creating no sight distance problems, and fully delineated as in “b”, above.

(g) If sections of roadway are totally closed, the contractor shall notify the sheriff's traffic division, 911 operators, the fire department, and any major traffic generators (i.e. schools, etc.). A three working day, minimum, advance notice will be required.

(h) On totally closed sections of the roadway, the contractor shall provide access for local traffic only.

(i) The contractor shall check traffic control devices on a daily basis as a minimum when beginning and ending the work day, to insure adherence to the plans and proper adequacy of devices for day and night visibility. On weekends, devices shall be checked a minimum once per day.

(j) Flagman and/or sheriff's control shall be provided as specified by the COTR.

(k) Yellow, high visibility pennant barrier flagging (nylon rope with plastic pennants) shall be strung between Type II barricades and barrels/drums, only as directed by the COTR.

(l) This traffic control device plan indicates general traffic control devices to be used on this project. It is anticipated that conditions will vary depending on the phase under construction and that the arrangement of those devices will be reviewed on a daily basis. Should the contractor have any question as to the arrangement of those devices, the COTR shall be notified to make an inspection of the site.

(m) Contractor shall provide for the movement of pedestrians for the entire length of the contract. As much as possible, the contractor shall not obstruct existing sidewalks, thereby obstructing pedestrian movements. If existing sidewalks must be obstructed, the contractor shall provide for the movement of pedestrians by posting appropriate signing, such as, "Sidewalk Closed-Use Other Side of Street". Signing shall be reflectorized and lighted at night.

(n) Also, where trenches are excavated outside the roadway surface, the contractor shall provide each dwelling at least one accessible crossing of the backfilled trench area, for use by pedestrians.

(o) As much as possible, the contractor shall provide access to area businesses.

(3) No separate payment will be made for this item. Compensation for Subsidiary Item, Traffic Control will be included in the payment for Bid Item 1, Mobilization and Demobilization.

Construction Specification 21—Excavation

1. Scope

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

2. 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 unless otherwise specified in section 10.

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.

3. Blasting

The transportation, handling, storage, and use of dynamite and other explosives shall be directed and supervised by a person(s) of proven experience and ability who is authorized and qualified to conduct blasting operations.

Blasting shall be done in a manner as to prevent damage to the work or unnecessary fracturing of the underlying rock materials and shall conform to any special requirements in section 10 of this specification. When specified in section 10, the contractor shall furnish the engineer, in writing, a blasting plan before blasting operations begin.

4. Use of excavated material

***Method 1*—**To the extent they are needed, all suitable material from the specified excavations shall be used in the construction of required permanent earthfill or rockfill. The suitability of material for specific purposes is determined by the engineer. The contractor shall not waste or otherwise dispose of suitable excavated material.

***Method 2*—**Suitable material from the specified excavations may be used in the construction of required earthfill or rockfill. The suitability of material for specific purposes is determined by the engineer.

5. Disposal of waste materials

***Method 1*—**All surplus or unsuitable excavated materials are designated as waste and shall be disposed of at the locations shown on the drawings.

***Method 2*—**All surplus or unsuitable excavated materials are designated as waste and shall be disposed of by the contractor at sites of his own choosing away from the site of the work. The disposal shall be in an environmentally acceptable manner that does not violate local rules and regulations.

6. 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.

7. Borrow excavation

When the quantities of suitable material obtained from specified excavations are insufficient to construct the specified earthfills and earth backfills, additional material 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 specified in section 10 or as approved by the engineer.

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

8. 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 Construction Specification 31, Concrete for Major Structures, or 32, Structure Concrete, as appropriate.

Concrete that will be permanently covered shall contain not less than five bags 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, rockfill, sand or gravel bedding, or drainfill, the voids may be filled with material conforming to the specifications for the riprap, rockfill, bedding, or drainfill. Before correcting an overexcavation condition, the contractor shall review the planned corrective action with the engineer and obtain approval of the corrective measures.

9. Measurement and payment

For items of work for which specific unit prices are established in the contract, the volume of each type and class of excavation within the specified pay limits is measured and computed to the nearest cubic yard by the method of average cross-sectional end areas or by methods outlined in section 10 of this specification. Regardless of quantities excavated, the measurement for payment is made to the specified pay limits except that excavation outside the specified lines and grades directed by the engineer to remove unsuitable material is included. Excavation required because unsuitable conditions result from the contractor's improper construction operations, as determined by the engineer, is not included for measurement and payment.

***Method 1*—**The pay limits shall be as designated on the drawings.

***Method 2*—**The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed before the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill, the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
b. The lower and lateral limits shall be the neat lines and grades shown on the drawings.

***Method 3* —**The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed before the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill, the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
b. The lower and lateral limits shall be the true surface of the completed excavation as directed by the engineer.

***Method 4*—**The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed before the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill, the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
b. The lower limit shall be at the bottom surface of the proposed structure.
c. The lateral limits shall be 18 inches outside of the outside surface of the proposed structure or shall be vertical planes 18 inches outside of and parallel to the footings, whichever gives the larger pay quantity, except as provided in d below.
d. For trapezoidal channel linings or similar structures that are to be supported upon the sides of the excavation without intervening forms, the lateral limits shall be at the underside of the proposed lining or structure.
e. For the purposes of the definitions in b, c, and d, above, any specified bedding or drainfill directly beneath or beside the structure will be considered to be a part of the structure.

***All methods*—**The following provisions apply to all methods of measurement and payment.

Payment for each type and class of excavation is made at the contract unit price for that type and class of excavation. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work except that extra payment for backfilling overexcavation will be made in accordance with the following provisions.

Payment for backfilling overexcavation, as specified in section 8 of this specification, is made only if the excavation outside specified lines and grades is directed by the engineer to remove unsuitable material and if the unsuitable condition is not a result of the contractor's improper construction operations as determined by the engineer.

Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 10 of this specification.

10. Items of work and construction details

10. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefor are:

a. Subsidiary Item, Excavation

(1) This item shall consist of all excavation required to perform the work as shown in the plans, as called for in the specifications and as staked in the field. Excavation shall be classified as *Common Excavation.*

(2) If the contractor elects to perform any of the excavation in the wet (under normal water level conditions) he will assure that the final excavated surface shall be uniform and free from any abrupt changes in grade. The lines and grades shown on the drawings or staked in the field shall be adhered to.

(3) All unconsolidated and undesirable loose material, as determined by the COTR, shall be removed from the damaged slope area. The final surface of the excavated area shall be undisturbed soil and have a slope no steeper than two horizontal to one vertical (2:1).

(4) Use of excavated material shall be by Method 1.

(5) Disposal of waste material shall be by Method 2. If approved by the COTR excavated soil maybe used at the construction site to fill holes along the levee berm within the work limits. Any soil used in this manner will be bucket dressed and left in a smooth and neat condition".

(6) The excavated area shall not remain exposed for a period of time exceeding 24 hours prior to the placement of the earthfill.

(7) No separate payment will be made for this item. Compensation for this Subsidiary Item will be included in the payment for Bid Item 3, Earthen Dike Repair.

Construction Specification 23—Earthfill

1. Scope

The work consists of the construction of earth embankments, other earthfills, and earth backfills required by the drawings and specifications.

Earthfill is composed of natural earth materials that can be placed and compacted by construction equipment operated in a conventional manner.

Earth backfill is composed of natural earth material placed and compacted in confined spaces or adjacent to structures (including pipes) by hand tamping, manually directed power tampers or vibrating plates, or their equivalent.

2. Material

All fill material shall be obtained from required excavations and designated borrow areas. The selection, blending, routing, and disposition of material in the various fills shall be subject to approval by the engineer.

Fill materials shall contain no frozen soil, sod, brush, roots, or other perishable material. Rock particles larger than the maximum size specified for each type of fill shall be removed prior to compaction of the fill.

The types of material used in the various fills shall be as listed and described in the specifications and drawings.

3. Foundation preparation

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable material or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface material of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of 2 inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to produce a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose material by hand or other effective means and shall be free of standing water when fill is placed upon them. Occasional rock outcrops in earth foundations for earthfill, except in dams and other structures designed to restrain the movement of water, shall not require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be no steeper than one horizontal to one vertical unless otherwise specified. Test pits or other cavities shall be filled with compacted earthfill conforming to the specifications for the earthfill to be placed upon the foundation.

4. Placement

Earthfill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the engineer. Earthfill shall not be placed upon a frozen surface nor shall snow, ice, or frozen material be incorporated in the earthfill matrix.

Earthfill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed the maximum thickness specified in section 10 or shown on the drawings. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted.

Hand compacted earth backfill shall be placed in layers whose thickness before compaction does not exceed the maximum thickness specified for layers of earth backfill compacted by manually directed power tampers.

Earth backfill shall be placed in a manner that prevents damage to the structures and allows the structures to assume the loads from the earth backfill gradually and uniformly. The height of the earth backfill adjacent to a structure shall be increased at approximately the same rate on all sides of the structure.

Earthfill and earth backfill in dams, levees, and other structures designed to restrain the movement of water shall be placed to meet the following additional requirements:

(a) The distribution of materials throughout each zone shall be essentially uniform, and the earthfill shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material. Zone earthfills shall be constructed concurrently unless otherwise specified.

(b) 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.

(c) The top surface of embankments shall be maintained approximately level during construction with two exceptions: A crown or cross-slope of about 2 percent shall be maintained to ensure effective drainage, or as otherwise specified for drainfill or sectional zones.

(d) Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of streamflow during construction are specifically authorized in the contract.

(e) Embankments built at different levels as described under (c) or (d) above shall be constructed so that the slope of the bonding surfaces between embankment in place and embankment to be placed is not steeper than 3 feet horizontal to 1 foot vertical. The bonding surface of the embankment in place shall be stripped of all material not meeting the requirements of this specification and shall be scarified, moistened, and recompacted when the new earthfill is placed against it. This ensures a good bond with the new earthfill and obtains the specified moisture content and density at the contact of the inplace and new earthfills.

5. Control of moisture content

During placement and compaction of earthfill and earth backfill, the moisture content of the material being placed shall be maintained within the specified range.

The application of water to the earthfill material shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the material after placement on the earthfill, if necessary. Uniform moisture distribution shall be obtained by disking.

Material that is too wet when deposited on the earthfill 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 earthfill or a foundation or abutment surface in the zone of contact with the earthfill becomes too dry to permit suitable bond, it shall either be removed or scarified and moistened by sprinkling to an acceptable moisture content before placement of the next layer of earthfill.

6. Compaction

Earthfill—Earthfill shall be compacted according to the following requirements for the class of compaction specified:

***Class A compaction*—**Each layer of earthfill shall be compacted as necessary to provide the density of the earthfill matrix not less than the minimum density specified in Section 10 or identified on the drawings. The earthfill matrix is defined as the portion of the earthfill material finer than the maximum particle size used in the compaction test method specified.

***Class B compaction*—**Each layer of earthfill shall be compacted to a mass density not less than the minimum density specified.

***Class C compaction*—**Each layer of earthfill shall be compacted by the specified number of passes of the type and weight of roller or other equipment specified or by an approved equivalent method. Each pass shall consist of at least one passage of the roller wheel or drum over the entire surface of the layer.

Earth backfill—Earth backfill adjacent to structures shall be compacted to a density equivalent to that of the surrounding inplace earth material or adjacent required earthfill or earth backfill. Compaction shall be accomplished by hand tamping or manually directed power tampers, plate vibrators, walk-behind, miniature, or self-propelled rollers. Unless otherwise specified heavy equipment including backhoe mounted power tampers or vibrating compactors and manually directed vibrating rollers shall not be operated within 2 feet of any structure. Towed or self-propelled vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from a crane or hoist is not permitted.

The passage of heavy equipment will not be allowed:

- Over cast-in-place conduits within 14-days after placement of the concrete
- Over cradled or bedded precast conduits within 7 days after placement of the concrete cradle or bedding
- 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, except as may be specified in section 10.

Compacting of earth backfill adjacent to structures shall not be started until the concrete has attained the strength specified in section 10 for this purpose. The strength is determined by compression testing of test cylinders cast by the contractor's quality control personnel for this purpose and cured at the work site in the manner specified in ASTM C 31 for determining when a structure may be put into service.

When the required strength of the concrete is not specified as described above, compaction of earth backfill adjacent to structures shall not be started until the following time intervals have elapsed after placement of the concrete.

Structure	Time interval (days)
Vertical or near-vertical walls with earth loading on one side only	14
Walls backfilled on both sides simultaneously	7
Conduits and spillway risers, cast-in-place (with inside forms in place)	7
Conduits and spillway risers, cast-in-place (inside forms removed)	14
Conduits, pre-cast, cradled	2
Conduits, pre-cast, bedded	1
Cantilever outlet bents (backfilled both sides simultaneously)	3

7. Reworking or removal and replacement of defective earthfill

Earthfill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable earthfill. The replacement earthfill and the foundation, abutment, and earthfill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction.

8. Testing

During the course of the work, the engineer will perform quality assurance tests required to identify material; determine compaction characteristics; determine moisture content; and determine density of earthfill in place. Tests performed by the engineer will be used to verify that the earthfills conform to contract requirements of the specifications and not as a replacement for the contractor's quality control program.

Densities of earthfill requiring Class A compaction will be determined in accordance with ASTM D 1556, D 2167, D 2922, or D 2937 except that the volume and moist weight of included rock particles larger than those used in the compaction test method specified for the type of fill will be determined and deducted from the volume and moist weight of the total sample before computation of density or, if using the nuclear gauge, added to the specified density to bring it to the measure of equivalent composition for comparison (see ASTM D 4718). The density so computed is used to determine the percent compaction of the earthfill matrix. Unless otherwise specified, moisture content is determined by one of the following methods: ASTM D 2216, D 3017, D 4643, D 4944, or D 4959.

9. Measurement and payment

For items of work for which specific unit prices are established in the contract, the volume of each type and compaction class of earthfill and earth backfill within the specified zone boundaries and pay limits is measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Unless otherwise specified in section 10, no deduction in volume is made for embedded items, such as, but not limited to, conduits, inlet structures, outlet structures, embankment drains, sand diaphragm and outlet, and their appurtenances.

The pay limits shall be as defined below, with the further provision that earthfill required to fill voids resulting from overexcavation of the foundation, outside the specified lines and grades, will be included in the measurement for payment only under the following conditions:

- Where such overexcavation is directed by the engineer to remove unsuitable material, and
- Where the unsuitable condition is not a result of the contractor's improper construction operations as determined by the engineer.

Earthfill beyond the specified lines and grades to backfill excavation required for compliance with OSHA requirements will be considered subsidiary to the earthfill bid item(s).

Method 1—The pay limits shall be as designated on the drawings.

Method 2—The pay limits shall be the measured surface of the foundation when approved for placement of the earthfill and the specified neat lines of the earthfill surface.

Method 3—The pay limits shall be the measured surface of the foundation when approved for placement of the earthfill and the measured surface of the completed earthfill.

Method 4—The pay limits shall be the specified pay limits for excavation and the specified neat lines of the earthfill surface.

Method 5—The pay limits shall be the specified pay limits for excavation and the measured surface of the completed earthfill.

Method 6—Payment for each type and compaction class of earthfill and earth backfill is made at the contract unit price for that type and compaction class of earthfill. Such payment will constitute full compensation for all labor, material, equipment, and all other items necessary and incidental to the performance of the work.

Method 7—Payment for each type and compaction class of earthfill and earth backfill is made at the contract unit price for that type and compaction class of earthfill. Such payment will constitute full compensation for all labor, material, equipment, and all other items necessary and incidental to the performance of the work except furnishing, transporting, and applying water to the foundation and earthfill material. Water applied to the foundation and earthfill material is measured and payment made as specified in Construction Specification 10.

All methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 10 of this specification.

10. Items of work and construction details

10. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Subsidiary Item, Earthfill

(1) This item shall consist of all work necessary to furnish, haul, place and shape the necessary earthfill needed to complete the levee and berm repair as shown on the drawings and specified herein.

(2) When on-site earthfill is not sufficient to complete the work, or when existing earthfill is deemed unsuitable by the COTR, the contractor shall provide earthfill from off-site borrow areas. Earthfill, delivered to the site, shall be friable surface soil reasonably free of grass, roots, weeds, sticks, stones or other foreign material. It shall be classified as CL or CH on the Unified Soil Classification System. **All fill shall be approved by the COTR before placement**. All rejected earthfill will be removed from the construction site at the contractor's expense.

(3) Class C compaction shall apply for earthfill. Once the surface of the levee to be repaired has been approved by the COTR, the earthfill will be spread in uniform layers, not to exceed nine (9) inches, before compaction. Compaction shall be accomplished by routing the hauling or placing equipment in such a manner that the entire surface of each layer shall be covered by at least two passes of the wheel or track of the equipment, or an equivalent method approved by the COTR, to ensure a homogeneous mass, to the lines and grade shown on the drawings. The finished surface of the Earthfill shall have a smooth surface free of clods".

(4) The moisture content of the fill shall be homogeneous and shall be maintained at a level which will:

a. Prevent bulking or dilatant behavior of the material under the action of the hauling or placing equipment. Dilatant behavior is exhibited when a soil sample is shaken and the surface shines due to the movement of free water.

b. Prevent adherence of the fill material to the hauling or placing equipment.

c. Ensure the crushing and blending of the soil clods into a homogenous mass.

d. Allow a sample to be hand molded and will form a ball that does not readily separate and does not ooze through the fingers.

(5) No separate payment will be made for this item. Compensation for this Subsidiary Item will be included in the payment for Bid Item 3, Earthen Dike Repair.

Construction Specification 45—Plastic Pipe

1. Scope
The work consists of furnishing and installing plastic pipe (except corrugated polyethylene tubing) and the necessary fittings and appurtenances as shown on the drawings or as specified herein.

2. Material
Pipe, fittings, and gaskets shall conform to the requirements of Material Specification 547, Plastic Pipe, and as specified in section 14 of this specification or as shown on the drawings.

Perforated pipe shall conform to the requirements of Material Specification 547, Plastic Pipe, and as specified in section 14 of this specification or as shown on the drawings.

Unless otherwise specified, concrete shall conform to the requirements of Construction Specification 32, Structure Concrete, and section 8 of this specification.

Unless otherwise specified, earth backfill shall conform to the requirements of Construction Specification 23, Earthfill.

Unless otherwise specified, drainfill shall conform to the requirements of Construction Specification 24, Drainfill.

3. Handling and storage
Pipe shall be delivered to the job site and handled by means that provide adequate support to the pipe and do not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal edges and/or surface or rocks). The manufacturer's special handling requirements shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at a temperature of 40 degrees Fahrenheit or less.

Pipe shall be stored on a relatively flat surface so that the barrels are evenly supported. Unless the pipe is specifically manufactured to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for 15 days or longer.

4. Excavation
Excavation shall be in accordance with Construction Specification 21, Excavation, and section 14 of this specification or as shown on the drawings.

The pipe foundation shall be excavated a minimum of 4 inches lower than the pipe grade shown on the drawings or staked in the field whenever bedrock, boulders, cobbles, or other material that may cause pipe damage is encountered at planned pipe grade.

5. Laying the pipe
Plastic pipe conduits complete with fittings and other related appurtenances shall be installed to the lines and grades shown on the drawings or specified in section 14 of this specification. The pipe shall be installed so that there is no reversal of grade between joints unless otherwise shown on the drawings. The pipe shall not be dropped or dumped on the bedding or into the pipe trench. The ground surface near the pipe trench shall be free of loose rocks and stones greater than 1 inch in diameter. This ensures that rock will not be displaced and impact the pipe.

Just before placement, each pipe section shall be inspected to ensure that all foreign material is removed from inside the pipe. The pipe ends and the couplings shall be free of foreign material when assembled. At the completion of a work shift, all open ends of the pipeline shall be temporarily closed off using a suitable cover or plug.

Care shall be taken to prevent distortion and damage during hot or cold weather. During unusually hot weather (daytime high temperature of more than 90 °F), the pipe assembled in the trench shall be lightly backfilled or shaded to keep it as near to ground temperature as possible until final backfill is placed. Backfill operations should be performed during daily construction periods when the ground temperature and the temperature of the pipe do not vary more than 40 degrees Fahrenheit.

Perforated pipe shall be installed with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions on the inside and outside of the pipe when the pipe is approved by the engineer for backfill.

During installation, the pipe shall be firmly and uniformly bedded throughout its entire length, to the depth and in the manner specified in section 14 of this specification or as shown on the drawings. Bell-holes shall be placed in bedding material under bells, couplings, and other fittings to assure the pipe is uniformly supported throughout its entire length. Blocking or mounding beneath the pipe to bring the pipe to final grade is not permitted.

6. Pipe embedment

Earth bedding—The pipe shall be firmly and uniformly placed on compacted earthfill bedding or an inplace earth material bedding of ample bearing strength to support the pipe without noticeable settlement. The earth material on which the pipe is placed shall be of uniform density to prevent differential settlement.

Unless otherwise specified, a groove that closely conforms to the outside surface of the pipe shall be formed in the bedding. The depth of the groove shall be equal to or greater than 0.3 of the pipe diameter.

Earth bedding shall be compacted to a density not less than adjacent undisturbed inplace earth material or be compacted earth backfill. Earthfill material used for compacted earth bedding shall be free of rocks or stones greater than 1 inch in diameter and earth clods greater than 2 inches in diameter. The pipe shall be loaded sufficiently during the compaction of bedding under the haunches and around the sides of the pipe to prevent displacement from its final approved placement.

Sand, gravel, or crushed rock bedding—When sand, gravel, or crushed rock bedding is specified, the pipe shall be firmly and uniformly placed on the bedding material. Material for bedding shall not exceed 1 inch in diameter. Unless otherwise specified in section 14 of this specification or shown on the drawings, the coarse-grained bedding material shall be carefully placed and compacted to a depth equal to or greater than 0.3 of the diameter of the pipe above the bottom of the pipe. The pipe shall be loaded sufficiently during backfilling and compaction around the sides to prevent displacement of the pipe from its final approved placement.

Pipe encased in drainfill—The pipe shall be firmly and uniformly placed on bedding of specified drainfill. Drainfill shall be placed and compacted as specified in section 14 of this specification or as shown on the drawings to form a continuous uniform support around the entire circumference of the pipe. The pipe shall be loaded sufficiently during backfilling around the sides and during compaction to prevent displacement of the pipe.

7. Backfill

Initial backfill—Unless otherwise specified, initial backfill to 6 inches above the top of the conduit is required. Earth haunching and initial backfill material shall consist of soil material that is free of rocks, stones, or hard clods more than 1 inch in diameter. Coarse backfill material shall be the specified sand, gravel, crushed rock, or drainfill material.

Initial backfill shall be placed in two stages. In the first stage (haunching), backfill is placed to the pipe spring line (center of pipe). In the second stage, it is placed to 6 inches above the top of the pipe.

The first stage material shall be worked carefully under the haunches of the pipe to provide continuous support throughout the entire pipe length. The haunching backfill material shall be placed in layers that have a maximum thickness of about 6 inches and are compacted as specified in section 14 of this specification or as shown on the drawings. During compaction operations, care shall be taken to ensure that the tamping or vibratory equipment does not come in contact with the pipe and the pipe is not deformed or displaced.

When pressure testing is not specified, the pipe shall be covered with a minimum of 6 inches of backfill material as soon as possible following assembling of the pipe in the trench, but not later than within the same day that placement has occurred. When pressure testing is specified, sufficient backfill material shall be placed over the pipe to anchor the conduit against movement during pressure testing activities.

Final backfill—Final backfill shall consist of placing the remaining material required to complete the backfill from the top of the initial backfill to the ground surface, including mounding at the top of the trench. Final backfill material within 2 feet of the top of the pipe shall be free of debris or rocks larger than 3 inches nominal diameter. Coarse backfill material shall be the specified sand, gravel, crushed rock, or drainfill. Final backfill shall be placed in approximately uniform, compacted layers. Final backfill compaction requirements shall be as specified in section 14 of this specification or as shown on the drawings.

Vehicles or construction equipment shall not be allowed to cross the pipe until the minimum earth cover and required density as specified in section 14 of this specification has been obtained.

8. Pipe encasement in concrete

Concrete encasement shall be carefully placed to form a continuous uniform support around the entire circumference of the pipe as specified in section 14 of this specification or as shown on the drawings. Pipes encased in concrete shall be securely anchored to prevent movement of the pipe during concrete placement. A clear distance of 1.5 inch shall be maintained between the pipe and the reinforcing steel.

The concrete for the encasement shall conform to the requirements of Construction Specification 32, Structure Concrete, for Class 3000M concrete unless otherwise specified.

9. Joints

Unless otherwise specified in section 14 of this specification or shown on the drawings, joints shall be either bell and spigot type with elastomeric gaskets, coupling type, solvent cement bell and spigot, or jointed by butt heat fusion. When a lubricant is required to facilitate joint assembly, it shall be a type having no deleterious affect on the gasket or pipe material.

Pipe joints shall be watertight at the pressures specified except where unsealed joints are indicated.

Pipe shall be installed and joined in accordance with the manufacturer's recommendations. Laying deflections and joint fitting or stab depths shall be within the manufacturer's recommended tolerances.

When solvent cement joints are specified for PVC or ABS pipe and fittings, they shall be made in accordance with the following ASTMs and the related appendix of each ASTM; D 2855 for PVC pipe and fittings and D 2235 for ABS pipe and fittings.

Flanged, banded, heat-fusion, or elastomeric-sealed mechanical joints shall be used when joining polyethylene (PE) and high density polyethylene (HDPE) pipe and fittings unless otherwise specified in section 14 of this specification or as shown on the drawings.

Pipe ends shall be cut square and be deburred to provide a uniform, smooth surface for the jointing process. Reference marks shall be placed on the spigot ends to assist in determining when proper seating depth has been achieved within the joint.

10. Fittings

Unless otherwise specified, steel fittings, valves, and bolted connections shall be painted or coated as recommended by the manufacturer.

Fittings for nonpressure pipe shall be of the same or similar material as the pipe and shall provide the same durability, watertightness, and strength as the pipe unless otherwise specified.

11. Thrust blocks and anchors

When specified, concrete thrust blocks and anchors shall be installed as shown on the drawings or specified in section 14 of this specification.

The concrete for the thrust blocks and anchors shall conform to the requirements of Construction Specification 32, Structure Concrete, for Class 3000M concrete unless otherwise specified in section 14 of this specification.

The thrust block cavity shall be hand dug into undisturbed soil or previously placed compacted backfill. The cavity shall be formed with soil or wood to hold the freshly placed concrete without displacement until an initial set has occurred.

When excavation beyond the designated trench widths and depths as shown on the drawings or specified in section 14 of this specification occurs at locations where installation of concrete thrust blocks is required, the contractor shall install an alternative thrust block provision. The concrete thrust block shall have a thickness of one pipe diameter and a contact face area that shall be formed against the pipe as shown on the drawings or specified in section 14 of this specification. Backfill shall be placed on all sides of the thrust block and to the sides of the excavation. It shall be compacted as specified for initial backfill.

12. Pressure testing

Method 1—Pressure testing of the completed conduit is not required.

Method 2—The conduit shall be tested for leaks in the following manner:

a. Before pressure testing:
   (1) Joints of the assembled pipeline shall be allowed to cure as recommended by the manufacturer.
   (2) Pipeline shall be flushed and cleaned.
   (3) All concrete anchors and thrust blocks shall be in place and allowed to cure for a minimum of 3 days.
   (4) Earth backfill shall be sufficient to anchor the conduit against movement during the pressure testing and shall be compacted as specified in Section 14 of this specification or as shown on the drawings.

(5) The conduit shall be braced, anchored, or both, at each end to restrict all potential pipe movement.

(6) The ends of the conduit shall be plugged. The upstream plug shall have a standpipe installed vertically having a minimum diameter of 2 inches and shall be equipped with a shutoff valve. All high points in the line shall be vented to evacuate air pockets. The conduit and the standpipe shall be slowly filled with water such that no air is entrapped during the filling operation. After filling is complete, all vents shall be closed.

b. During pressure testing, the water level in the standpipe shall be continuously maintained at a minimum of 10 feet above the highest invert elevation of the conduit for no less than 2 hours unless otherwise specified in section 14 of this specification or as shown on the drawings.

The volume of water leakage in the 2-hour test period shall be recorded. The maximum allowable leakage (L) in gallons per hour shall not exceed 0.02 times the nominal pipe diameter (D) in inches for each 1,000 feet of pipe line, which is about 50 pipe joints (L = 0.02 x D).

c. When observed leakage exceeds the allowable, leaks shall be sealed by replacement of pipe and fittings as necessary. The conduit shall be retested as described above. This procedure shall be repeated until the conduit leakage does not exceed the allowable specified above.

The contractor shall be fully responsible for any and all work required to correct leakage exceeding the amount specified.

***Method 3*—**The conduit shall be tested for leaks in the following manner:

a. Before pressure testing:

(1) Joints of the assembled pipeline shall be allowed to cure as recommended by the manufacturer.

(2) Pipeline shall be flushed and cleaned.

(3) All concrete anchor and thrust blocks shall be in place and allowed to cure for at least 3 days.

(4) Earth backfill shall be sufficient to anchor the conduit against movement during the pressure testing and compacted as specified in section 14 of this specification or as shown on the drawings.

(5) The conduit shall be braced and/or anchored at each end to prevent all potential pipe movement.

(6) The ends of the conduit shall be plugged, and a pressure gauge shall be attached to the upstream and downstream ends. All high points along the pipeline shall be vented to permit the complete removal of all air within the pipeline. The conduit shall be slowly filled with water such that no air is entrapped during the filling operations.

b. The testing pressure specified in section 14 of this specification shall be continuously maintained at the upstream gauge for a minimum of 2 hours. The pressure at the downstream gauge shall not exceed the pressure rating of the pipe.

c. The volume of water leakage for the 2-hour test period shall be recorded. Maximum allowable leakage shall be in accordance with the following:

Allowable leakage for plastic pipe
(gal/hr/1,000 feet, or 50 pipe joints) 1/

Nominal pipe size (in)	Test pressure in the pipeline (lb/in²) 50	100	150	200
	Allowable leakage			
4	.19	.27	.33	.38
6	.29	.41	.50	.57
8	.38	.54	.66	.76
10	.48	.68	.83	.96
12	.57	.81	.99	1.15
14	.67	.95	1.16	1.34
15	.72	1.02	1.25	1.44
16	.76	1.07	1.32	1.52
18	.86	1.22	1.49	1.72

1/ Computation basis $L = \frac{ND\sqrt{P}}{7{,}400}$

where:
L = allowable leakage in gallons per hour
N = number of joints (pipe and fittings)
D = nominal diameter of pipe in inches
P = test pressure in pounds per square inch

d. When observed leakage exceeds the allowable, leaks shall be sealed by replacement of pipe and fittings as necessary. The conduit shall be retested as described in this section. The procedure shall be repeated until the conduit leakage does not exceed the allowable specified above.

The contractor shall be fully responsible for any and all work required to correct leakage exceeding the amount specified.

13. Measurement and payment

Method 1—For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe is determined to the nearest foot by measurement of the laid length along the crown centerline of the conduit. Payment for each kind, size, and class of pipe is made at the contract unit price for that kind, size, and class. Such payment constitutes full compensation for furnishing, transporting, and installing the pipe including excavation, shoring, backfill, bedding, thrust blocks, and all fittings, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule is made at the contract prices for those items.

Method 2—For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe is determined as the sum of the nominal laying lengths of the sections used. Payment for each kind, size, and class of pipe is made at the contract unit price for the kind, size, and class. Such payment constitutes full compensation for furnishing, transporting, and installing the pipe including excavation, shoring, backfill, bedding, thrust blocks, and all fittings, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule is made at the contract prices for those items.

***Method 3*—**For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe is determined to the nearest foot by measurement of the laid length along the crown centerline of the conduit. Payment for each kind, size, and class of pipe is made at the contract unit price for the kind, size, and class. Such payment constitutes full compensation for furnishing, transporting, and installing the pipe including shoring, all fittings, thrust blocks, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule is made at the contract prices for those items.

***Method 4*—**For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe is determined as the sum of the nominal laying lengths of the pipe sections used. Payment for each kind, size, and class of pipe is made at the contract unit price for that kind, size, and class. Such payment constitutes full compensation for furnishing, transporting, and installing the pipe including shoring, all fittings, thrust blocks, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule is made at the contract prices for those items.

***Methods 3 and 4*—**Excavation, backfill, and bedding is paid separately under their respective bid items.

***All measurement and payment methods*—**Compensation for any items of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in section 14 of this specification.

14. Items of work and construction details

14. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Bid Item 4, Plastic Pipe

1) This item shall consist of furnishing and installing the plastic pipe and necessary fittings to extend the existing plastic pipe at the locations shown in the drawings. Final location will be determined in the field by the COTR.

2) It shall be the contractor's responsibility to field verify the locations, numbers, pipe sizes (diameter, SDR, length), material types and coupler or banding types prior to procuring the pipe, fittings and pipe support materials for use in this contract.

3) Any additional plastic pipes and fittings needed to complete the rerouting shall be Poly Vinyl Chloride. The SDR shall be the same as existing pipe and shall meet Material Specification 547.

4) Joints per Section 9 shall be solvent cement bell and spigot.

5) Pressure testing as per Section 12 shall not be necessary and Method 1 will apply.

6) Section 13, "Measurement and Payment", of this specification is deleted in its entirety and is replaced as follows:

For items of work for which specific lump sum prices are established in the contract, payment for plastic pipe structures is made at the contract lump sum price. Such payment constitutes full compensation for furnishing, transporting, and installing the pipe including shoring, all fittings, thrust blocks, appurtenances, and other items necessary and incidental to the completion of the work, which includes, except as otherwise specified, required excavation, dewatering, and earth backfill.

Such payment will constitute full compensation for related Subsidiary Item, Timber Fabrication, Timber Pipe Support.

Construction Specification 83—Timber Fabrication and Installation

1. Scope

The work shall consist of the construction of timber structures and timber parts of composite structures.

2. Material

Structural timber and lumber shall conform to the requirements of Material Specification 584. Treated timber and lumber shall be impregnated with the specified type and quantity of preservative and in the manner specified in Material Specification 585.

Hardware, except cast iron, shall be galvanized as specified for iron and steel hardware in Material Specification 582. Unless otherwise specified, structural steel shapes, plates, and rods shall not be galvanized. Nuts, driftbolts, dowels, and screws shall be either wrought iron or steel.

Steel bolts shall conform to the requirements of ASTM A 307. When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of Material Specification 582.

Washers shall be ogee gray iron castings or malleable iron castings unless washers cut from medium steel or wrought iron plate are specified on the drawings or in section 7 of this specification. Cast washers shall have a thickness equal to the diameter of the bolt and a diameter equal to four times the thickness. The thickness for plate washers shall be equal to half the diameter of the bolt, and the sides of the square shall be equal to four times the diameter of the bolt. Holes in washers shall have a maximum diameter of 1/8 inch larger than the diameter of the bolt. Split ring connectors, tooth ring connectors, and pressed steel shear plate connectors shall be manufactured from hot-rolled, low carbon steel conforming to the requirements of ASTM A 711, Grade 1015. Malleable iron shear plate connectors and spike grid connectors shall be manufactured in conformance with the requirements of ASTM A 47, Grade No. 35018. All connectors shall be of approved design and the type and size specified.

Structural shapes, rods, and plates shall be structural steel conforming to the requirements of Material Specification 581. No welds are permitted in truss rods or other main members of trusses or girders.

3. Workmanship

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to a close fit and shall have even bearing over the entire contact surface. No open or shimmed joints will be accepted. Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood. Deep hammer marks in wood surfaces shall be considered evidence of poor workmanship and may be sufficient cause for rejection of the work.

Holes for round driftpins and dowels shall be bored with a bit 1/16 inch smaller in diameter than that of the driftpin or dowel to be installed. The diameter of holes for square driftpins or dowels shall be equal to one side of the driftpin or dowel. Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood. Cast iron washers shall be used when the bolt will be in contact with earth. All nuts shall be checked or burred effectively with a pointed tool after finally tightened.

Unless otherwise specified, surfacing, cutting, and boring of timber and lumber shall be completed before treatment. If field cutting or field repair of treated timber and lumber is approved, all cuts and abrasions shall be carefully trimmed and coated with two paint-on or swab-applied applications of a wood

preservative that is not less than 5 percent (by weight) pentachlorophenol. A copper metal solution of 2 percent (by weight) copper naphthenate may be used as a replacement for pentachlorophenol, which is a controlled substance. After timber assembly, any unfilled holes shall be plugged with tightly fitting wooden plugs that have been treated with preservative as specified.

4. Handling and storing material

All timber and lumber stored at the site of the work shall be neatly stacked on supports a minimum of 12 inches above the ground surface and protected from the weather by suitable covering(s). Untreated material shall be staked and stripped to permit free circulation of air between the tiers and courses. Treated timber may be close-staked. The ground surface for the stockpile of timber and lumber shall be free of weeds and rubbish. The use of cant hooks, peavies, or other pointed tools except end hooks is not permitted in the handling of structural timber and/or lumber. Treated timber shall be handled with rope slings or by other methods that prevent the breaking or bruising of outer fibers or penetration of the surface in any manner.

5. Painting

Except as otherwise specified, surfaces designated for painting shall be prepared and painted in accordance with Construction Specification 84.

6. Measurement and payment

Method 1—The unit of measurement of lumber and timber is the number of thousand feet board measure (MBM) of each type, size, species, and grade of lumber and timber installed in the completed structure. The quantity of each type, size, species, and grade is computed from the nominal dimensions and actual lengths of the pieces in the completed structure and does not include waste timber used for erection purposes (such as falsework or temporary sheeting and bracing) or any part of any pile or other round timber. The total quantity of lumber and timber in each type, size, species, and grade is computed to the nearest 0.01 MBM.

The unit of measurement of plywood is the number of square feet of each type, species, grade, and thickness installed in the completed structure.

Payment for each type, size, species, and grade of lumber and timber is made at the contract unit price for that type, size, species, and grade. Payment for each type, species, grade, and thickness of plywood is made at the contract unit price for that type, species, grade, and thickness. Such payment is considered full compensation for completion of the work.

Method 2—No measurement of material quantities is made. Payment for each structure, complete in place, is made at the contract lump sum price for that structure. Such payment is considered full compensation for completion of the work.

Method 3—For items of work for which specific unit prices are established in the contract, measurement and payment for each structure unit except those for which a linear foot payment is established is counted and payment made at the contract unit price. Items for which a linear foot payment is established are measured to the nearest linear foot, and payment is made at the contract unit prices as appropriate. Such payment is considered full compensation for completion of the work.

All methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 7 of this specification.

7. Items of work and construction details

7. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Subsidiary Item, Timber Fabrication, Timber Pipe Supports

(1) This item shall consist of furnishing all timber piles, pipe supports and other related materials and labor necessary for the construction and installation of the pipe supports as shown on the drawings and/or as staked in the field.

(2) All lumber and pipe supports shall be No 2 Southern Yellow Pine or Douglas Fir, meeting Material Specifications 512 and 584. Piles shall have the minimum diameter shown on the drawings. All lumber and pipe support piles shall be pressure treated to a minimum of 0.4 pounds per cubic foot net retention with chromated copper arsenate (CCA) conforming to Material Specification 585. Testing of lumber as directed by the Contracting Officer shall be at the contractor's expense.

(3) All nails, bolts, washers and other metal hardware shall be as shown on the drawings and shall be galvanized and conform to Material Specification 582.

(4) No separate payment will be made for this item. Compensation for Subsidiary Item, "Timber Pipe Supports" will be included in the payment for Bid Item 4, Plastic Pipe, to which it is associated.

Construction Specification 205—Embankment Repair

1. Scope

The work shall consist of constructing, shaping and dressing the embankment to the lines and grades shown on the drawings.

2. Access

Access shall be as shown on the site map or as designated by the contracting officer unless alternate routes are obtained by the contractor and approved by the contracting officer. All access routes shall be restored by the Contractor to the condition prior to the commencement of work under this contract.

3. Limits of Work

The limits of the damaged area at each site will be referenced to identified roads or other structures or landmarks or be marked by the contracting officer by means of stakes, flags, or

4. Materials

Material required to construct and shape the embankment shall be obtained from excavation within the borrow area as shown on the drawings or hauled as specified in Section 7 of this specification.

5. Placement

The embankment material shall be deposited in approximate 12" horizontal layers and compacted to the final grade. Compaction will be as specified in Section 7 of this specification.

6. Measurement and payment

Method 1 - For items of work for which specific unit prices are established in the contract, the quantity will be determined to the nearest 1.0 foot by measurement of the completed levee along the centerline. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work.

Method 2 - For items of work for which specific lump sum prices are established in the contract, payment for embankment construction will be made at the lump sum price. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. Items of work and construction details

(See next page.)

7. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefor are:

a. Bid Item 3, Earthen Dike Repair

(1) This item shall consist of shaping areas for earthfill and excavation, placing the earthfill to repair the dike (embankment) at the location and to the lines and grades shown on the drawings and as staked in the field.

(2) Before any earthfill is placed onto the existing embankment for compaction, the surface of the existing embankment shall be scarified and all vegetative matter removed to a depth of six (6) inches. The area of embankment to be repaired will be grubbed and shaped. All areas to receive fill will be sloped to a 2:1 side slope or flatter before placement of fill.

(3) All earthfill shall be provided in accordance with Construction Specification 23, Earthfill.

(4) The finished grade of the fill will be as shown on the typical section and blend into the adjacent undisturbed areas.

(5) Areas, including access roads and berms, that are damaged during construction will be repaired to original condition.

(6) Contractor shall use low ground pressure equipment in order to minimize the amount of damage to the existing embankment. Any damage will be repaired at the contractor's expense.

(7) Construction site shall be cleaned up upon completion of work. All debris from clearing operations will be stacked on the marsh side of the embankment.

(8) Payment shall be by Method 1. Such payment will constitute full compensation for related Subsidiary Items, "Clearing and Grubbing", "Structure Removal", "Excavation", and "Earthfill".

Material Specification 302—Coconut Fiber Erosion Control Revegetation Mat

1. Scope

The specification covers the type and quality of erosion control revegetation mat.

2. Materials

The Erosion Control and Revegetation Mat (ECRM) shall consist of a consistent thickness with the coconut fiber evenly distributed over the entire area of the mat. The coconut fibers shall be covered on the top and bottom with heavy weight photodegradable polypropylene netting having ultraviolet additives to delay the breakdown. The mat shall be sewn together on 1.5 inch centers with polyester thread.

3. Physical Properties

The Erosion Control and Vegetation Mat shall also conform to the following physical properties.

PROPERTY	MARV (a)
Weight (lbs./sq. yd.)	0.5
Polypropylene Netting Opening Dimensions (in)	5/8 x 5/8

4. Shipping and storage

The ECRM shall be shipped/transported in rolls wrapped with a cover for protection from moisture, dust, dirt, debris, and ultraviolet light. The cover shall be maintained undisturbed to the maximum extend possible before placement.

Each roll of ECRM shall be labeled or tagged to clearly identify the manufacturer, brand, type, and the individual production run.

Material Specification 512—Wood Piles

1. Scope
This specification covers the quality of wood piles.

2. Quality of piles
The piles shall conform to the requirements of ASTM D 25 for the specified classes and sizes of piles.

3. Treatment
Piles shall be treated with the specified type and amount of preservative and in conformance with the requirements of Material Specification 585.

4. Marking
Each treated pile delivered to the job site shall be marked as specified in Material Specification 585.

Material Specification 547—Plastic Pipe

1. Scope

This specification covers the quality of Poly Vinyl Chloride (PVC), Polyethylene (PE), High Density Polyethylene (HDPE), and Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe, fittings, and joint materials.

2. Material

***Pipe*—**The pipe shall be as uniform as commercially practicable in color, opaqueness, density, and other specified physical properties. It shall be free from visible cracks, holes, foreign inclusions, or other defects. The dimensions of the pipe shall be measured as prescribed in ASTM D 2122.

Unless otherwise specified, the pipe shall conform to the requirements listed in this specification and the applicable reference specifications in table 547–2, the requirements specified in Construction Specification 45, Plastic Pipe, and the requirements shown on the drawings.

***Fittings and joints*—**Fittings and joints shall be of a schedule, SDR or DR, pressure class, external load carrying capacity, or pipe stiffness that equals or exceeds that of the plastic pipe. The dimensions of fittings and joints shall be compatible with the pipe and measured in accordance with ASTM D 2122. Joint and fitting material shall be compatible with the pipe material. The joints and fittings shall be as uniform as commercially practicable in color, opaqueness, density, and other specified physical properties. It shall be free from visible cracks, holes, foreign inclusions, or other defects.

Fittings and joints shall conform to the requirements listed in this specification, the requirements of the applicable specification referenced in the ASTM or AWWA specification for the pipe, the requirements specified in Construction Specification 45, and the requirements shown on the drawings.

***Solvents*—**Solvents for solvent welded pipe joints shall be compatible with the plastic pipe used and shall conform to the requirements of the applicable specification referenced in the ASTM or AWWA specification for the pipe, fitting, or joint.

***Gaskets*—**Rubber gaskets for pipe joints shall conform to the requirements of ASTM F 477, Elastomeric Seals (Gaskets) for Jointing Plastic Pipe.

3. Perforations

When perforated pipe is specified, perforations shall conform to the following requirements unless otherwise specified in Construction Specification 45 or shown on the drawings:

a. Perforations shall be either circular or slots.

b. Circular perforations shall be 1/4 ± 1/16-inch diameter holes arranged in rows parallel to the axis of the pipe. Perforations shall be evenly spaced along each row such that the center-to-center distance between perforations is not less than eight times the perforation diameter. Perforations may appear at the ends of short and random lengths. The minimum perforation opening per foot of pipe shall be as shown in table 547–1.

Table 547–1 Perforations

Nominal pipe size (inches)	Minimum number of rows		Minimum opening/foot (square inches)
	circular	slot	
4	2	2	0.22
6	4	2	0.44
8	4	2	0.44
10	4	2	0.44
12	6	2	0.66

Rows shall be arranged in two equal groups at equal distance from the bottom on each side of the vertical centerline of the pipe. The lowermost rows of perforations shall be separated by an arc of not less than 60 degrees or more than 125 degrees. The uppermost rows of perforations shall be separated by an arc not to exceed 166 degrees. The spacing of rows between these limits shall be uniform. The minimum number of rows shall be as shown in table 547–1.

c. Slot perforations shall be symmetrically located in two rows, one on each side of the pipe centerline. Slot perforations shall be located within the lower quadrants of the pipe with slots no wider than 1/8 inch and spaced not to exceed 11 times the perforation width. Minimum perforation opening per lineal foot of pipe shall be as shown in table 547–1.

d. On both the inside and outside of the pipe, perforations shall be free of cuttings or frayed edges and of any material that would reduce the effective opening.

Table 547–2 Pipe specification

Pipe	Specification
Poly vinyl chloride (PVC) pipe	
Plastic pipe - Schedules 40, 80, 120	ASTM D 1785 ASTM D 2466
Pressure rated pipe - SDR Series	AWWA C 900 ASTM D 2241
Plastic drain, waste, and vent pipe and fittings	ASTM D 2665
Joints for IPS PVC pipe using solvent weld cement	ASTM D 2672
Composite sewer pipe	ASTM D 2680
Type PSM PVC sewer pipe and fittings	ASTM D 3034
Large-diameter gravity sewer pipe and fittings	ASTM F 679
Smooth-Wall Underdrain Systems for Highway, Airport, and Similar Drainage	ASTM F 758
Type PS-46 gravity flow sewer pipe and fittings	ASTM F 789
Profile gravity sewer pipe and fittings based on controlled inside diameter	ASTM F 794
Corrugated sewer pipe with a smooth interior and fittings	ASTM F 949
Pressure pipe, 4-inch through 12-inch for water distribution	AWWA C 900
Water transmission pipe, nominal diameters 14-inch through 36-inch	AWWA C 905
Polyethylene (PE) plastic pipe	
Schedule 40	ASTM D 2104
SIDR-PR based on controlled inside diameter	ASTM D 2239
Schedules 40 and 80 Based on outside diameter	ASTM D 2447
SDR-PR based on controlled outside diameter	ASTM D 3035
High density polyethylene (HDPE) plastic pipe	
Plastic pipe and fittings	ASTM D 3350
SDR-PR based on controlled outside diameter	ASTM F 714
Plastic moldings and extrusion compounds	ASTM D 1248
Heat joining polyolefin pipe and fittings	ASTM D 2657
Acrylonitrile-butadiene-styrene (ABS) pipe	
Plastic pipe, schedules 40 and 80	ASTM D 1527
Plastic pipe, SDR-PR	ASTM D 2282
Schedule 40 plastic drain, waste, and vent pipe	ASTM D 2661
Composite sewer pipe	ASTM D 2680
Sewer pipe and fittings	ASTM D 2751

Material Specification 581—Metal

1. Scope
This specification covers the quality of steel and aluminum alloys.

2. Structural steel
- Structural steel shall conform to the requirements of 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 Standard A 1011, Grade 40, or A 1008, Grade 40.
- Carbon steel strip of structural quality shall conform to ASTM Standard A 1011, Grade 36.

3. Commercial or merchant quality steel
Commercial or merchant quality steel shall conform to the requirements of 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
Carbon steel strips	A 1011
Zinc-coated carbon steel sheets	A 653 or A 924

4. Aluminum alloy
Aluminum alloy products shall conform to the requirements of the applicable ASTM standard listed below. Unless otherwise specified, alloy 6061-T6 shall be used.

Product	ASTM standard
Standard structural shape	B 308
Extruded structural pipe and tube	B 429
Extruded bars, rods, shapes, and tubes	B 221
Drawn seamless tubes	B 210
Rolled or cold-finished bars, rods, and wire	B 211
Sheet and plate	B 209

5. Bolts
Steel bolts shall conform to the requirements of ASTM Standard A 307. If high-strength bolts are specified, they shall conform to the requirements of ASTM A 325.

When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of ASTM Standard A 153 except that bolts 0.5 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to the requirements of ASTM Standard B 633, Service Condition SC 3, or ASTM B 766, unless otherwise specified.

6. Rivets
Unless otherwise specified, steel rivets shall conform to the requirements of ASTM Specification A 31, Grade B. Unless otherwise specified, aluminum alloy rivets shall be Alloy 6061 conforming to the requirements of ASTM Standard B 316.

7. Welding electrodes
Steel welding electrodes shall conform to the requirements of American Welding Society Specification AWS A5.1, "Specification for Mild Steel Covered Arc-Welding Electrodes," except that they shall be uniformly and heavily coated (not washed) and shall be of such a nature that the coating does not chip or peel while being used with the maximum amperage specified by the manufacturer.

Aluminum welding electrodes shall conform to the requirements of American Welding Society Specification AWS A5.10, "Specification for Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes."

Material Specification 582—Galvanizing

1. Scope

This specification covers the quality of zinc coatings applied to iron and steel productions.

2. Quality

Zinc coatings shall conform to the requirements of ASTM A 123 for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products or as otherwise specified in the items of work and construction details of the Construction Specification.

ASTM A 123 covers both fabricated and nonfabricated products; e.g., assembled steel products, structural steel fabrications, large tubes already bent or welded before galvanizing, and wire work fabricated from noncoated steel wire. It also covers steel forgings and iron castings incorporated into pieces fabricated before galvanizing or which are too large to be centrifuged (or otherwise handled to remove excess galvanizing bath metal).

Items to be centrifuged or otherwise handled to remove excess zinc shall meet the requirements of ASTM A 153, except bolts, screws, and other fasteners 0.5 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to the requirements of ASTM B 766, coating thickness Class 5, Type III, or ASTM B 633, Service Condition SC-3, unless otherwise specified.

Material Specification 584—Structural Timber and Lumber

1. Scope
The specification covers the quality of structural timber, lumber, and plywood.

2. Grading
Structural timber and lumber shall be graded in accordance with the grading rules and standards, applicable to the specified species adopted by a lumber grading or inspection bureau or agency recognized as being competent and that conform to the basic principles of ASTM Standard D 245. The material supplied according to the commercial grading rules shall be of equal or greater stress value than the specified stress-grade.

3. Quality of material
All material shall be sound wood free from decay and disease damage. Boxed heart pieces of Douglas fir or redwood shall not be used in stringers, floor beams, caps, posts, sills, or other principal structural members. Boxed heart pieces are defined as timber so sawed that at any section in the length of a sawed piece the pith lies entirely inside the four faces.

4. Heartwood requirements
All timber and lumber specified for use without preservative treatment shall contain a minimum of 75 percent heartwood on any diameter or on any side or edge, measured at the point where the greatest amount of sapwood occurs. This requirement shall not apply to timber and lumber for which pressure treatment with wood preservative is specified.

5. Sizes
The sizes specified are nominal sizes. Unless otherwise specified, the material shall be furnished in American Standard dressed sizes.

6. Marking
Each piece of timber and lumber shall be legibly stamped or branded with an official grade identification. Plywood shall be legibly stamped with an official mark designating the grade, type, and surface finish as described in the cited Product Standard.

Material Specification 585—Wood Preservatives and Treatment

1. Scope
This specification covers the quality of wood preservatives and methods of treatment of wood products.

2. Treating practices
Treating practices and sampling, inspection, and test procedures shall conform to the requirements of ASTM D 1760, "Standard Specification for Pressure Treatment of Timber Products."

3. Preservatives
The wood shall be treated with the specified type of preservative. Wood preservatives shall conform to the requirements of the applicable specifications list in ASTM D 1760.

4. Quality of treated material
Treated lumber, timber, piles, poles, or posts shall be free from heat checks, water bursts, excessive checking, results of chafing, or from any other damage or defects that would impair their usefulness or durability for the purpose intended. The use of s-irons is not permitted. Holes bored for tests shall be filled with tight fitting, treated wood plugs.

5. Marking
Each treated wood item delivered to the job site shall be marked as specified in ASTM D 1760, unless otherwise specified.