MISSISSIPPI DEPARTMENT OF AGRICULTURE & COMMERCE
INVITATION FOR BID

SOLICITATION NUMBER:	**Invitation for Bid # 1401-15-RIFB-00002** **RFx # 3160000141**
DESCRIPTION:	**Conservation Practices Construction Projects at MS Agriculture & Forestry Museum**
OFFER DUE DATE AND TIME:	**10:00 A.M. Tuesday November 25, 2014**

Bids for the services specified will be received by the Mississippi Department of Agriculture & Commerce at the below specified location until the time and date cited. Bids received by the correct time and date will be opened and the name and the amount of each bid will be publicly read.

Bid Opening and Submittal Location:

Mississippi Dept. of Agriculture & Commerce
Attn: Hewitt Pittman, Purchasing Director
121 North Jefferson Street
Jackson, MS 39201

Bids must be in the actual possession of the Purchasing Department of The Mississippi Department of Agriculture & Commerce on or prior to the time and date, and at the location indicated above. Late bids will not be considered. Bids must be submitted in a sealed envelope with the Solicitation Number and the bidder's name and address clearly indicated on the envelope. Bidders must give full firm name and address and be manually signed by a person having authority to bind his/her firm in a contract. Each page of the bid and all attachments shall be identified with the name of the bidder. Failure to do so will disqualify your offer. (Please See Section the Addendum attached herein and Conditions and the Bid Submission Requirements Section) Any costs associated with the putting together of this bid will be at the sole expense of the bidder. See Bid Submission Requirement Section for items to include in the bids. Failure to meet bid requirements may be grounds for disqualification.

BIDDERS ARE STRONGLY ENCOURAGED TO CAREFULLY READ THE ENTIRE SOLICITATION.

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1.0 Introduction

The Mississippi Department of Agriculture and Commerce, hereinafter referred to as ("Department") is soliciting bids from all persons or entities interested in entering into a contract with the Department for the purpose of providing conservation construction projects on sites at the Mississippi Agriculture & Forestry Museum, hereinafter referred to as ("Museum"). Museum is located at 1150 Lakeland Drive in the City of Jackson, MS 39216. **Bidders must submit a bid on all sites priced individually, failure to do so will be grounds for disqualification**. The Department will award this contract in full or part to the person or entity submitting the bid that is most advantageous to the Department, Museum and the taxpayers of this state. Any cost associated with the putting together this bid will be at the sole expense of the bidder/bidder.

The specifications, including experience and qualifications requirements, the terms and conditions provided in the bid, hereby become part of the final contract awarded to the successful bidder. The Department retains the right to include in the contract the specifications and terms and conditions in part or in full as listed in the bid package which it deems necessary for the successful completion of the project.

In accordance to state and federal law, the final contract will include an E-Verify Section.

2.0 Specifications

The following conservation projects are provided to address multiple resource concerns on the Museum grounds, also included is Addendum 1 an Aerial Photograph of the Project Sites and a bid schedule. Below is a brief description of the projects.

2.1 Site Descriptions

Site 1: Farmstead Area Drainage and Re-Vegetation. The farmstead area has an existing drop inlet attached to a 12" CPP that currently drains out to the south fence of the mule pen. Plans are to install an additional drop box (2' x 2') between the farmstead buildings with 12" CPP running from this box to a tee where it will connect to the existing pipe. From this tee the pipe will change to 15" CPP via an adapter and run 150 feet east/west to the planned outlet area just south of the raised bed garden. All pipe connections will have concrete collars poured around them. A 90 foot long grassed waterway will be installed between several farmstead buildings to ensure water flows to the newly installed drop box. Also the existing 175 feet of berm along the north edge of the farmstead will be re-worked to correct the toe grade and cross-section. The sandy soil currently in the mule pens will be excavated, hauled offsite, and replaced with good soil material brought in from offsite and a top layer of topsoil. All areas of the mule pens will be graded for drainage and excavation/earth-fill and topsoil placed. These disturbed areas will be limed, fertilized, and seeded according to the attached specifications and amounts (See Material Note).

A crushed limestone heavy use area 12 foot by 22 foot will be installed in the cross-fence and a Miraco Lil Spring 2900 water trough (green in color) will be installed on a 34" by 20" by 4" thick concrete pad. See drawings and specifications (See Material Note). **The detailed construction specifications are included in Addendum.**

Site 2: Syrup House Site. This area will be excavated to a uniform grade and geotextile with cellular blocks will be placed in the drain. The length of drain to receive cellular blocks is 45 feet and will be staked prior to construction to show extent. **The detailed construction specifications are included in Addendum.**

Site 3: Entrance to Rock Chute – adjacent to Sports Museum. The entrance area to the existing rock chute and the flow line of the diversion will be protected with a permanent turf reinforcement mat. These areas will be seeded for establishment of permanent grass cover over the mats. Grass establishment over the TRM will follow manufacturer's recommendations for the particular TRM. **The detailed construction specifications are included in Addendum.**

Site 4: Pollinator Walking Trail. Construction of a 365 foot long walking trail made out of a geotextile base with crushed limestone rock. Some tree removal will be necessary in this area. The trail path will be staked prior to construction. **The detailed construction specifications are included in Addendum.**

Site 5: New Pasture Areas and Selective Tree Removal Existing Pastures. Install 1,520 linear feet of woven wire fence constructed to NRCS standards (see drawings). Fence and gate location will be staked prior to construction. In this section there will be selective tree removal in some of the existing pastures and areas where new pastures will be made. Stumps will be removed. Downed trees, stumps, and limbs will be removed offsite.

Two additional heavy use areas constructed out of crushed limestone will be installed in the new fence crossing of the new mule pen/goat pen (see drawings for dimensions). Another heavy use area will be constructed in the steer pen cross fence. Miraco Lil Spring 2900 (green in color) waterers will be installed on both of these heavy use areas (see drawings). See material note at bottom of page regarding water supply pipeline (See Material Note).

A small stream crossing will be installed according to the attached drawings. The stream crossing location will be staked prior to construction. **The detailed construction specifications are included in Addendum.**

Site 6: Pasture Irrigation in New and Existing Pastures. This item will include the installation of sprinkler irrigation with vertical risers along the fences. Waterline source will be marked for tie in. (See Material Note). **The detailed construction specifications are included in Addendum.**

Site 7: Composter for Waste Material. Installation of an 8 foot by 10 foot composter shed with a concrete floor. Treated boards will be used in the construction. See drawings. Location will be marked prior to construction. **The detailed construction specifications are included in Addendum.**

Site 8: Solar Powered Electric Fence in Existing Pony Pasture. This item will include approximately 500 feet of solar powered electric fence. Location will be marked prior to construction and configuration discussed at site showing. **The detailed construction specifications are included in Addendum.**

Site 9: Shade Structures in Existing Pony Pasture. This item will consist of construction of 2 portable shade structures 10 foot wide by 12foot long. See drawings and specifications. **The detailed construction specifications are included in Addendum.**

Site 10: Concrete Berm on Existing Swine Pen. This item consists of constructing a 5" tall concrete berm along the south side of the existing concrete slab of the swine pen. The berm will prevent the wash water from flowing into the adjacent pen. **The detailed construction specifications are included in Addendum.**

NOTE: Mississippi One Call must be notified prior to any construction activities!

MATERIAL NOTE 1: All PVC piping and fittings to connect the water troughs to the existing water source should be included in the bid for the water trough. Water source locations will be shown at the site showing for estimated lengths of pipe needed.

MATERIAL NOTE 2: The timing of the construction activities involving excavation, earth fill, and grass establishment in the mule pen and creation of additional grazing cells may require the temporary seeding of cool season grasses and follow-up in spring with the establishment of permanent grasses (See page 22)

MATERIAL NOTE 3: Pasture irrigation will consist of vertical risers secured to the fence with sprinkler heads capable of 180 degree rotation. Sprinkler heads will be staggered to cover the most ground possible. The intent is to not have any buried sprinklers in the middle of the pasture areas so it is understood that in some pasture areas full coverage of water may not be possible.

2.2 General Conditions

It is the responsibility of the prospective bidders to review the entire bid packet and to notify The Mississippi Department of Agriculture and Commerce if the specifications and instructions are formulated in a manner which would unnecessarily restrict competition. Any protest, concerns or questions concerning the specifications, instructions or bid procedures must be received by The Mississippi Department of Agriculture and Commerce not less than 72 hours prior to the time and date set for the bid opening.

Any requests or questions concerning this bid solicitation or the bid process should be in writing and addressed to:

Hewitt Pittman, Purchasing Director
Mississippi Department of Agriculture and Commerce
P.O. Box 1609
Jackson, Mississippi 39215 – 1609

OR

Hewitt Pittman, Purchasing Director
Mississippi Department of Agriculture and Commerce
121 North Jefferson Street
Jackson, Mississippi 39201

FAX NUMBER (601) 354-6502
Email Address – hewitt@mdac.ms.gov

The Mississippi Department of Agriculture and Commerce reserves the right to reject any and/or all bids, to waive any informality in bids, and unless otherwise specified by the bids, to accept any items on the bids. All purchases by the Mississippi Department of Agriculture and Commerce are dependent upon availability of funds.

No bid shall be altered or amended after the specified time for opening of bids.

Contracts and purchases will be made or entered into with the lowest, responsible bidder meeting the specifications.

Bid openings shall be conducted open to the public. However, they will serve only to open bids. Bids received by the correct time and date will be opened and the name of each bidder as well as the amount will be publicly read. No discussion will be entered into with any vendor/bidder as to the quality or provisions of the specifications, and no award will be made either stated or implied at the bid opening. All bidders are invited and encouraged to attend the bid opening meeting. After the close of the bid opening meeting, the bids will be considered to be in the evaluation process and will not be available for review by the bidders. Questions will not be answered as a result of telephone inquiries. A notice of award will be mailed to all bidders.

Invoices are to be mailed to: Mississippi Department of Agriculture and Commerce
Attn: Jim Lipe
P.O. Box 1609
Jackson, MS 39215-1609

Payment will be made 45 (forty-five) days after completion (approved and accepted) and an original invoice is submitted for payment.

Sealed bids must be received by the Mississippi Department of Agriculture and Commerce at the addresses set forth on page 1 of the request for bid no later than:

Tuesday November 25, 2014 10:00 A.M.

**** ALL BIDS MUST BE SIGNED BY A PERSON HAVING THE LEGAL AUTHORITHY TO BIND THEIR FIRM IN A CONTRACT.**

If the agency is closed for any reason, including but not limited to: acts of God, strikes, lockouts, riots, acts of war, epidemics, governmental regulations superimposed after the fact, fire, earthquakes, floods, or other natural disasters (the "Force Majeure Events"), which closure prevents the opening of bids at the advertised date and time, all bids received shall be publicly

opened and read aloud on the next business day that the agency shall be open and at the previously advertised time. The new date and time of the bid opening, as determined in accordance with this paragraph, shall not be advertised, and all Vendors/Contractors, upon submission of a bid proposal, shall be deemed to have knowledge of and shall have agreed to the provisions of this paragraph. Bids shall be received by the agency until the new date and time of the bid opening as set forth herein. **The agency shall not be held responsible for the receipt of any bids for which the delivery was attempted and failed due to the closure of the agency as a result of a Force Majeure Event.** Each Vendor/Contractor shall be required to ensure the delivery and receipt of its bid by the agency prior to the new date and time of the bid opening.

The successful bidder shall be held responsible for the safety of his/her employees and any unsafe acts or conditions that may cause injury or damage to any persons or property within and around the area under the contract.

2.3 Term

The contract has a tentative starting date of December 1, 2014 and ending date is August 31, 2015 contractor must have projects completed by contract ending date.

2.4 Confidentiality

Each bidder may designate those portions of his/her bids which contain trade secrets or other proprietary data which may remain confidential in accordance with Miss. Code Ann. §§25-61-9 and 79-23-1, which pertains to the public records act.

2.5 Right to Reject Award

The Department reserves the right to reject any or all bids, to waive any or all irregularities, and to make such awards of contract as may be deemed to be the highest, best and most advantageous to the Department, Museum and Taxpayers of the State of Mississippi.

2.6 Site Visit

All bidders are encouraged to attend the site visit held at The Mississippi Agriculture & Forestry Museum located at 1150 Lakeland Drive in the City of Jackson, MS 39216 on Wednesday *November 12, 2014 at 10:00 A.M. The purpose of the site visit is to familiarize the bidders with the Museum grounds and scope of the projects. No verbal questions will be answered at the visit all questions must be in writing and submitted as required in section 2.2 General Terms and Conditions of the bid solicitation.

***Site visit has changed from November 12, 2014 to Thursday November 13, 2014**

2.7 Museum Inconvenience

A. All work shall be performed Monday through Friday, 8:00 am – 4:30 pm. Work shall not be performed on the weekends or valid State holidays.

B. The work described in this bid solicitation shall be done with the least inconvenience to the Museum. Vehicles must have egress capabilities at all times. The amount of time that normal

operations are interrupted must be kept to a minimum and shall be coordinated with the Museum.

C. The Contractors are responsible to protect all existing and newly installed work, materials, equipment, improvements, utilities, structures, and vegetation at all times during the course of this contract. Any property or incidentals damaged during the course of this contract shall be repaired or replaced at contractor's expense to the satisfaction of the Department and Museum.

2.8 Permits, Licenses, Taxes, Inspections and Liens

A. Contractor is responsible for meeting all state and local codes, permits, licenses and taxes for the successful completion of the projects.
B. The Department and Museum reserves the right to make unannounced periodic inspections of the work in progress. Contractor will contact Museum Director and Department representative prior to commencement of work.
C. Contractor will be responsible for all liens by subcontractors relating to the projects.

2.9 Construction Schedule

Bidders shall provide a detailed Schedule of Construction as possible with their bids. This schedule shall include construction milestones, finish work and inspections. The schedule shall also include work to be performed by others under subcontract and provide ample time for anticipated inspections

2.10 Progress Payments and Retain age

During the course of the contract the Contractor may if necessary make a progress payment against work in progress in the following manner.

A. Contractor will submit a detailed written request for the progress payment to "Department" representative. The progress payment request shall include a recap of material and labor used on the projects.
B. Contractor must complete at a minimum 20% of projects before requesting a progress payment.
C. The "Department" representative upon receipt of the detailed written progress payment request will review the request. They will also inspect the work to verify work completed. The "Department" representative may enlist NRCS personnel or other resources to verify work completed.
D. Upon agreement that the work performed meets the written progress payment request the "Department" representative will send Contractor a written request for an invoice for the progress payment.
E. Contractor will submit an invoice to the "Department" representative for submission to Department Accounting for payment.
F. Department will retain 5% of the contract price to assure faithful performance of the contract. All amounts withheld may be included in the final payment. Any subcontract, which provides for similar progress payments, shall be subject to the same limitations.

2.11 Final Inspection

1) When the Contractor considers the work has reached final completion, they shall submit to the Department representative in writing a notice for inspection. The request must contain the following.
   a. The work has been completed according to the contract specifications in the bid solicitation.
   b. The projects are completed and ready for final inspection by the Department and NRCS representatives.

2) One week advance notice of final inspection is required.

3) The Department and NRCS representatives will make the final inspection. The Department will develop a list of any items to be corrected or finished and distribute the punch list to the Contractor and the inspection party.

4) The Contractor shall have ten (10) working days from the receipt of the punch list to complete all items, unless otherwise directed by Department representative.

5) Final acceptance shall not occur until all punch list items are completed.

6) Punch list items which are outstanding after the ten (10) working day period may be charged the liquidated damages penalty as set forth in Natural Resources Conservation Service (NRCS) Special Provisions.

7) When the Contractor considers the punch list items done then they shall follow the procedures set forth above for a re-inspection.

8) The Department representative after a final successful inspection will issue a notice of acceptance in writing to the Contractor.

9) Contractor will issue an invoice less any progress payments made, to the Department representative for submission to Department Accounting for payment.

2.12 Correction of Work after Final Payment

Payment to the contractor shall not relieve the Contractor of responsibility for faulty materials and workmanship. Unless otherwise specified, they shall remedy any defects and pay for any damage to other work resulting there from, which shall appear within the guarantee period of one year from date of final acceptance.

3.0 Experience and Qualifications

Each bidder should set forth in their bid any experience they have had in, and any special qualifications they may have for, construction of conservation practices and erosion control measures on the scale required for this contract. Each bidder must provide the continuous number of years that they have engaged in construction business. Each bidder must be in good standing and provide evidence of its authority to do business in the State of Mississippi from the Mississippi Secretary of State's Office and must provide a copy of its articles of incorporation, and/or a Certificate of Existence/Authority or partnership agreement from the state in which it

was incorporated or formed, if applicable. Each bidder must have a valid Certificate of Responsibility from the Mississippi State Board of Contractors and provide a copy of the Certificate with their bid. Contractor will be responsible for obtaining a valid Materials Purchase Certificate from the Mississippi Department of Revenue if applicable.

Bidders shall also be required to provide a listing of other contracts in date order that they were the general contractor under which services similar in scope, size or discipline to the required services were performed or undertaken within the last three (3) years

The bidder must state whether he/she has ever declared bankruptcy. If yes, state the date and the court jurisdiction.

3.1 References

1) The bidder must provide a list of four (4) references from persons or firm's that it has conducted business with during the last three years relating to conservation practices and erosion control contracts. *Upon submittal of this information, the bidder may designate that this information must remain confidential in accordance with Miss. Code Ann. Sections 25-61-9 and 79-23-1, which pertains to the Public Records Act.* The references shall not be for any contracts less than $50,000. The references shall contain the following information.

    a. Name of Organization
    b. Contact Person
    c. Title
    d. Phone
    e. Fax
    f. E-mail Address
    g. $ Amount of the Contract

2) The Department reserves the right to request additional or alternative information concerning the above submittal if it deems it necessary for concluding its evaluation regarding this section.

3.2 Insurance and Bond Requirements

The successful bidder will be required to procure and maintain the following insurance. The Department and the Museum shall be a named insured in the insurance policy. Evidence of the existence of said policy shall be furnished to the Department on the day this contract is made.

The policies may provide coverage which contains deductibles. The successful bidder shall be responsible for the payment of such deductibles by a surety bond or an irrevocable and unconditional letter of credit.

The successful bidder shall provide 30 days written notice to the Department before any cancellation, suspension or void of coverage in whole or in part.

Commercial General Liability Insurance
$600,000 General Aggregate Limit
$300,000 Each Occurrence Limit.

Workers' Compensation Insurance
As required by applicable State of Mississippi Law.

Automobile Liability
Commercial/Business Automobile Liability insurance with a combined single limit for bodily injury and property damages of not less than $500,000 each occurrence, regarding any owned, hired and non-owned vehicles assigned to or used in performance of the service.

Performance Bond
A commitment letter from the bidder that, if selected, a performance bond in the amount of $50,000 made payable to the Mississippi Department of Agriculture & Commerce shall be maintained during the term of this Agreement to be exercised in the event of default by the Contractor.

4.0 Addendum (Standard Terms and Conditions)

The following Addendum is attached hereto, incorporated by reference, and made a part of this document and contains the Standard Terms and Conditions. Bidder acknowledges that he/she has read the attached Addendum and understands that the terms contained therein are made a part of this document.

4.1 Rejection of Bids

Bids, which do not conform, to the requirements set forth in this bid solicitation may be rejected by the Department. Bids rejected for reasons, which include, but are not limited to, the following:

(1) The bid contains unauthorized amendments to the requirements of the bid solicitation.
(2) The bid is conditional.
(3) The bid is incomplete or contains irregularities, which make the bid indefinite or ambiguous.
(4) The bid is received late.
(5) An authorized representative of the party does not sign the bid.
(6) The bid contains false or misleading statements or references.
(7) The bid does not offer to provide all services required by the bid solicitation.

4.2 Acceptance of Bids

The Department reserves the right, in its sole discretion, to waive minor irregularities in bids. A minor irregularity is a variation of the bid solicitation, which does not affect the price of the bid, or give one party an advantage or benefit not enjoyed by the other parties, or adversely impact the interest of the Department. Waivers, when granted, shall in no way modify the bid solicitation requirements or excuse the party from full compliance with the bid solicitation specifications and other contract requirements, if the party is awarded the contract.

4.3 Disposition of Bids

All submitted bids become the property of the State of Mississippi.

4.4 BID SOLICITATION Does Not Constitute Acceptance of Offer

The release of the Invitation for Bids does not constitute an acceptance of any offer, nor does such release in any way obligate the Department to execute a contract with any other party. The Department reserves the right to accept, reject or negotiate any or all offers on the basis of the evaluation criteria contained within this document.

The final decision to execute a contract with any party rests solely with the Department.

4.5 Exceptions and Deviations

Bidders taken exception to any part or section of the solicitation shall indicate such exceptions on the bid and shall be fully described. Failure to indicate any exception will be interpreted as the bidder's intent to comply fully with the requirements as written. Conditional or qualified bidders, unless specifically allowed, shall be subject to rejection in whole or in part.

4.6 Nonconforming Terms and Conditions

A bid that includes terms and conditions that do not conform to the terms and conditions in the Invitation for Bid is subject to rejection as non-responsive. The Department reserves the right to permit the offertory's to withdraw nonconforming terms and conditions from its bid prior to a determination by the Department of non-responsiveness based on the submission of nonconforming terms and conditions.

4.7 Bid Acceptance Period

The original and four (4) copies of the bid and all attachments (five (5) copies total) shall be signed and submitted in a sealed envelope or package to Hewitt Pittman Purchasing Director, of the Mississippi Department of Agriculture & Commerce, at location listed on page 1 of the bid no later than 10:00 AM on Tuesday November 25, 2014. Timely submission of the bid is the responsibility of the bidder. Offers received after the specified time shall be rejected and returned to the bidder unopened. The envelope or package shall be marked with the bid opening date and time, contractors Certificate of Responsibility number and the number of the Invitation for Bid. The bidder's name and address must be clearly indicated on the envelope. The Department shall indicate the time and date of receipt on the envelope or package. Each page of the bid and all attachments shall be identified with the name of the bidder.

4.8 Expenses Incurred in Preparing Offers

The Department accepts no responsibility for any expense incurred by the bidder in the preparation and presentation of an offer. Such expenses shall be borne exclusively by the bidder.

4.9 Proprietary Information

The bidder/bidder should mark any and all pages of the bid considered to be proprietary information. Any pages not marked accordingly will be subject to review by the general public after award of the contract. Request to review the proprietary information will be handled in accordance with applicable legal procedures.

4.10 Additional Information

Questions about the request for bids document must be submitted in writing to Hewitt Pittman Purchasing Director, of the Mississippi Department of Agriculture & Commerce. Bidders are cautioned that any statements made by the contact person that materially change any portion of the Invitation for Bids shall not be relied upon unless subsequently ratified by a formal written amendment to the Invitation for Bids.

4.11 Acknowledgement of Amendments

Bidders shall acknowledge receipt of any amendment to the solicitation by signing and returning the amendment with the bid, by identifying the amendment number and date in the space provided for this

purpose on the bid form, or by letter. The acknowledgement must be received by the Department by the time and at the place specified for receipt of bids.

4.12 Debarment

By submitting a bid, the bidder certifies that it is not currently debarred from submitting bids for contracts issued by any political subdivision or agency of the State of Mississippi and that it is not an agent of a person or entity that is currently debarred from submitting bids for contracts issued by any political subdivision or agency of the State of Mississippi.

4.13 Certification of Independent Price Determination

The bidder certifies that the prices submitted in response to the solicitation have been arrived at independently and without – for the purpose of restricting competition – any consultation, communication, or agreement with any other bidder or competitor relating to those prices, the intention to submit a bid, or the methods or factors used to calculate the prices bid.

4.14 Prospective Contractors Representation Regarding Contingent Fees

(Bidder must state the following in his/her bid)

I represent that in preparing this bid for grade stabilization and erosion control for the Museum, that I have not retained any person(s) or agency on a percentage, commission, or other contingent arrangement to secure this contract. **(Please see the Bid Submission Requirement Section)**

4.15 Applicable Law

The contract shall be governed in all respects by and construed in accordance with the laws of the State of Mississippi, excluding its conflicts of laws provisions, and any litigation with respect thereto shall be brought in the courts of the State of Mississippi, Hinds County. The successful bidder shall comply with applicable federal, state and local laws regulations. The successful bidder shall also abide by all rules, regulations and directives issued by the Department and the Museum.

The successful bidder must comply with all federal, state and local laws, ordinances and regulations in its operations under the contract.

The successful bidder shall be responsible for all licenses and permits necessary to comply with all local, state and federal mandates.

4.16 Availability of Funds

It is expressly understood and agreed that the obligation of the Department to proceed under this agreement is conditioned upon the appropriation of funds by the Mississippi State Legislature and the receipt of state and/or federal funds. If the funds anticipated for the continuing fulfillment of the agreement are, at any time not forthcoming or insufficient, either through the failure of the federal government to provide funds or of the State of Mississippi to appropriate funds or the discontinuance or material alteration of the program under which funds were provided or if funds are not otherwise available to the state, the state shall have the right upon ten (10) working days written notice to the contractor, to terminate this agreement without damage, penalty, cost or expenses to the state of any kind whatsoever. The effective date of termination shall be as specified in the notice of termination.

4.17 Confidentiality

The successful bidder shall agree to assure the confidentiality of any records obtained from the Department required by state and federal privacy laws. No information, documents or other material provided to or prepared by the successful bidder deemed confidential by the Department pursuant to state and federal privacy laws, shall be made available to any person or organization without the prior approval of the Department. Any liability resulting from the wrongful disclosure of confidential information on the part of the successful bidder shall rest with the successful bidder.

4.18 Changes in Scope of Work

The Department may order changes in the work consisting of additions, deletions, or other revisions within the general scope of the contract. No claims may be made by the Contractor that the scope of the project or of the Contractor's services has been changed, requiring changes to the amount of compensation to the Contractor or other adjustments to the contract, unless such changes or adjustments have been made by written amendment to the contract signed by the Mississippi State Personnel Board and the Contractor.

If the Contractor believes that any particular work is not within the scope of the project, is a material change, or will otherwise require more compensation to the Contractor, the Contractor must immediately notify the Department in writing of this belief. If the Department believes that the particular work is within the scope of the contract as written, the Contractor will be ordered to and shall continue with the work as changed and at the cost stated for the work within the scope.

4.19 Stop Work Order

(1) *Order to Stop Work.* The Procurement Office of the Mississippi Department of Agriculture & Commerce, may, by written order to the successful bidder at any time, and without notice to any surety, require the successful bidder to stop all or any part of the work called for by this contract. This order shall be for a specified period not exceeding 90 days after the order is delivered to the successful bidder, unless the parties agree to any further period. Any such order shall be identified specifically as a stop work order issued pursuant to this clause. Upon receipt of such an order, the successful bidder shall forthwith comply with its term and take all reasonable steps to minimize the occurrence of costs allocable to the work covered by the order during the period of work stoppage. Before the stop work order expires, or within any further period to which the parties shall have agreed, the Procurement Officer shall either:

(a) Cancel the stop work order; or
(b) Terminate the work covered by such order as provided in the 'Termination for Default Clause' or the 'Termination for Convenience Clause' of this contract.

(2) *Cancellation or Expiration of the Order.* If a stop work order issued under this clause is cancelled at any time during the period specified in the order, or if the period of the order or any extension thereof expires, the successful bidder shall have the right to resume work. An appropriate adjustment shall be made in the delivery schedule or the successful bidder's price, or both, and the contract shall be modified in writing accordingly, if:

(a) The stop work order results in an increase in the time required for, or in the successful bidder's cost properly allocate to, the performance of any part of this contract; and
(b) The successful bidder's asserts a claim for such an adjustment within 30 days after the end of the period of work stoppage; provided that, if the Procurement Officer decides that

the facts justify such action, any such claim asserted may be received and acted upon at any time prior to final payment under this contact.

(3) *Termination of Stopped Work.* If a stop work order is not cancelled and the work covered by such order is terminated for default or convenience, the reasonable costs resulting from the stop work order shall be allowed by adjustment or otherwise.

4.20 Compliance with Laws

The successful bidder understands that the Department is an equal opportunity employer and therefore maintains a policy, which prohibits unlawful discrimination based on race, color, creed, sex, age, national origin, physical handicap, disability, or any other consideration made unlawful by federal, state, or local laws. All such discrimination is unlawful and the successful bidder agrees during the term of the agreement that he/she will strictly adhere to this policy in its employment practices and provision of services. The successful bidder shall comply with, and all activities under this agreement shall be subject to, all applicable federal, State of Mississippi, and local laws and regulations, as now existing and as may be amended or modified.

4.21 Representations Regarding Gratuities

The bidder, or successful bidder represents that he/she has not violated, is not violating, and promises that he/she will not violate the prohibition against gratuities set forth in Section 7-204 (Gratuities) of the Mississippi Personal Service Contract Procurement Regulations.

4.22 Anti-Assignment/Subcontracting

The successful bidder acknowledges that it was selected by the Department to perform the services required hereunder based, in part, upon the special skills and expertise. The successful bidder shall not assign, subcontract or otherwise transfer this agreement in whole or in part without the prior written consent of the Department, which the Department may, in its sole discretion, approve or deny without reason. Any attempted assignment or transfer of its obligations without such consent shall be null and void. Subcontracts shall be subject to the terms and conditions of this agreement and to any conditions of approval that the Department may deem necessary. Subject to the foregoing, this agreement shall be binding upon the respective successors and assigns of the parties.

4.23 Attorneys' Fees, Expenses and Jurisdiction

Subject to other terms and conditions of this agreement, in the event the successful bidder defaults in any obligations under this agreement, the successful bidder shall pay to the State all costs and expenses (including, without limitation, investigative fees, court costs, and attorney's fees) incurred by the State in enforcing this agreement or otherwise reasonably related thereto. The successful bidder agrees that under no circumstances shall the Department be obligated to pay any attorneys' fees or costs of legal action to the successful bidder. All suits against the Department are to be filed in the State of Mississippi, Hinds County.

4.24 Authority to Contract

The successful bidder warrants (a) that it is a validly organized business with valid authority to enter into this agreement; (b) that it is qualified to do business and in good standing in the State of Mississippi; (c) that entry into and performance under this agreement is not restricted or prohibited by any loan, security, financing, contractual, or other agreement of any kind, and (d) notwithstanding any other provision of this agreement to the contrary, that there are no existing legal proceedings or prospective legal proceedings, either voluntary or otherwise, which may adversely affect its ability to perform its obligations under this agreement.

4.25 Failure to Deliver

In the event of failure of the successful bidder to deliver services in accordance with the contract terms and conditions, the Department, after due oral or written notice, may procure the services from other sources and hold the successful bidder responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies that the Department may have.

4.26 Failure to Enforce

Failure by the Department at any time to enforce the provisions of the contact shall not be construed as a waiver of any such provisions. Such failure to enforce shall not affect the validity of the contract or any part thereof or the right of the Department to enforce any provision at any time in accordance with its terms.

4.27 Force Majeure

Each party shall be excused from performance for any period and to the extent that it is prevented from performing any obligation or service, in whole or in part, as a result of causes beyond the reasonable control and without the fault or negligence of such party and/or its Subcontractors. Such acts shall include without limitation acts of God, strikes, lockouts, riots, acts of war, epidemics, governmental regulations superimposed after the fact, fire, earthquakes, floods, or other natural disasters (the "Force Majeure Events"). When such a cause arises, the successful bidder shall notify the Department immediately in writing of the cause of its inability to perform; how it affects its performance, and the anticipated duration of the inability to perform. Delays in delivery or in meeting completion dates due to Force Majeure Events shall automatically extend such dates for a period equal to the duration of the delay caused by such events, unless the Department determines it to be in its best interest to terminate the agreement.

4.28 Indemnification

To the fullest extent allowed by the law, the successful bidder shall indemnify, defend, save and hold harmless, protect, and exonerate the Mississippi Department of Agriculture (including the Mississippi Agriculture & Forestry Museum), its Commissioner, its Board Members, officers, employees, agents, and representatives, and the State of Mississippi from and against all claims, demands, liabilities, suits, actions, damages, losses, and costs of every kind and nature whatsoever, including, without limitation, court costs, investigative fees and expenses, and attorneys' fees, arising out of or caused by the successful bidder and/or its partners, principals, agents, employees and/or Subcontractors in the performance of or failure to perform this agreement. In the State's sole discretion, the successful bidder may be allowed to control defense of any such claim, suit, etc. In the event the successful bidder defends said claim, suit, etc., he/she shall use legal counsel acceptable to the State; the successful bidder shall be sole responsible for all costs and/or expenses associated with such defense, and the State shall be entitled to participate in said defense. The successful bidder shall not settle any claim, suit, etc., without the State's concurrence, which the State shall not unreasonably withhold.

4.29 Insurance

The successful bidder will be required to procure and maintain insurance coverage. The Department and the Museum shall be a named insured in the insurance policy. Evidence of the existence of said policies shall be furnished to the Department on the day this contract is made. The successful bidder will also be required to procure and maintain Worker's Compensation Insurance, General Liability Insurance, Automobile Liability and Performance Bond as set forth in section 3.2. The successful bidder shall provide 30 days written notice to the Department before any cancellation, suspension or void of coverage in whole or in part.

4.30 Independent Contractor Status

The successful bidder shall, at all times, be regarded as an Independent Contractor and shall at no time act as an agent for the Department or Museum. Nothing contained herein shall be deemed or construed by the Department, the Contractor, or any third party as creating the relationship of principal and agent, master and servant, partners, joint venturers, employer and employee, or any similar such relationship between the Department and the Contractor. Neither the method of computation of fees or other charges, nor any other provision contained herein, nor any acts of the Department, or the Contractor hereunder, creates or shall be deemed to create a relationship other than the independent relationship of the Department and the Contractor. The Contractor's personnel shall not be deemed in any way, directly or indirectly, expressly or by complication, to be employees of the State. Neither the Contractor nor its employees shall, under any circumstances, be considered servants, agents or employees of the Department; and the Department shall be at no time legally responsible for any negligence or other wrongdoing by the Contractor, its servants, agents, or employees. Further, the Department shall not provide to the Contractor any insurance coverage or other benefits, including Workers' Compensation, normally provided by the State for its employees.

4.31 No Limitation of Liability

Nothing in the Agreement shall be interpreted as excluding or limiting any tort liability of the Contractor for harm caused by the intentional or reckless conduct of the Contractor or for damages incurred through the negligent performance of duties by the Contractor or the delivery of products that are defective due to negligent construction.

4.32 Oral Statements

No oral statements of any person shall modify or otherwise affect the terms, conditions, or specifications stated in this contract. The Department must make all modifications to the contract in writing.

4.33 Record Retention and Access to Records

Provided the Contractor is given reasonable advance written notice and such inspection is made during normal business hours of the Contractor, the Department or any duly authorized representatives, shall have unimpeded, prompt access to any of the Contractor's books documents, papers, and/or records which are maintained or produced as a result of the contract for the purpose of making audits, examinations, excerpts, and transcriptions. The Contractor shall retain all records related to this Agreement for three (3) years after final payment is made under this Agreement and all pending matters are closed. However, if any audit, litigation or other action arising out of or related in any way to this contact is commenced before the end of the three (3) year period, the records shall be retained for one (1) year after all issues arising out of the action are finally resolved or until the end of the three (3) year period, whichever is later.

4.34 Right to Inspect Facility

The Department may at reasonable times inspect the place of business of the Contractor or Subcontractor for which is related to the performance of any Contact awarded by the State.

Department and/or Museum, representatives shall have the right to have access to all spaces occupied by the successful bidder during the time events are in operation and all times when successful bidder's employees are present. The successful bidder, or a representative, must be on the premises when deemed necessary by the Museum.

4.35 State Property

Successful Bidder will be responsible for the proper custody and care of any State-owned property furnished for Successful Bidder's use in connection with the performance of this agreement. Successful Bidder will reimburse the Department or the State for any loss or damage, normal wear and tear expected.

Bidder will be responsible for all damages to the Department's property known as the Museum by any of bidder's employees or officers. The successful bidder shall be held responsible for the safety of their employees and any unsafe acts or conditions that may cause injury or damage to any persons or property within and around the area under the contract. The successful bidder shall be required to comply with OSHA, State and County Safety and Occupational Health Standards.

4.36 Termination for Convenience Clause

Termination. The Commissioner of the Mississippi Department of Agriculture & Commerce, may, when the interest of the State so require, terminate this contract in whole or in part, for the convenience of the State. The Commissioner shall give written notice of the termination to the Successful Bidder specifying the part of the contract terminated and when termination becomes effective.

Contractor's Obligation. The Contractor shall incur no further obligations in connection with the terminated work and on the date set in the notice of termination the Contractor will stop work to the extent specified. The Contractor shall also terminate outstanding orders and subcontracts as they relate to the terminated work. The Contractor shall settle the liabilities and claims arising out of the termination of subcontracts and orders connected with the terminated work. The Procurement Officer may direct the Contractor to assign the Contractor's right, title, and interest under terminated orders or subcontracts to the Department. The Contractor must still complete the work not terminated by the notice of termination and may incur obligations as are necessary to do so.

4.37 Termination for Default Clause

Default. If the Contractor refuses or fails to perform any of the provisions of this contract with such diligence as will ensure its completion within the time specified in this contract, or any extension thereof otherwise fails to timely satisfy the contract provisions, or commits any other substantial breach of this contract, the Department may notify the Contractor in writing of the delay or nonperformance and if not cured in thirty days or any longer time specified in writing by the Department, may terminate the Contractor's right to proceed with the contract or such part of the contract as to which there has been delay or a failure to properly perform. The contract may be terminated by the Department if the Contractor violates any of the contract terms, or if the products and services it provides are unsatisfactory or sub-standard.

Contractor's Duties. Notwithstanding termination of the contract and subject to any directions from the Procurement Officer, the Contractor shall take timely, reasonable, and necessary action to protect and preserve property in the possession of the Contractor in which the State has an interest.

Excuse for Nonperformance or Delayed Performance. Except with respect to defaults of Subcontractors (Example – Wholesaler, Supplier of Ice, etc.), the Contractor shall not be in default by reason of any failure in performance of this contract in accordance with its terms (including any failure by the Contractor to make progress in the prosecution of the work hereunder which endangers such performance) if the Contractor has notified the Procurement Officer within 15 days after the cause of the delay and the failure arises out of causes such as: acts of God; acts of the public enemy; acts of the State and any other governmental entity in its sovereign or contractual capacity; fires; floods; epidemics; quarantine restrictions; strikes or other labor disputes; freight embargoes; or unusually severe weather. If

the failure to perform is caused by the failure of a Subcontractor to perform or to make progress, and if such failure arises out of causes similar to those set forth above, the Contractor shall not be deemed to be in default, unless the services to be furnished by the Subcontractor were reasonably obtainable from other sources in sufficient time to permit the Contractor to meet the contract requirements.

Erroneous Termination for Default. If, after notice of termination of the Contractor's right to proceed under the provisions of this clause, it is determined for any reason that the contract was not in default under the provisions of this clause, or that the delay was excusable under the provisions of the paragraph, Excuse for Nonperformance or Delayed Performance, the rights and obligations of the parties shall, if the contract contains a clause providing for termination for convenience of the State, be the same as if the notice of termination had been issued pursuant to such clause.

Additional Rights and Remedies. The rights and remedies provide in this clause are in addition to any other rights and remedies provided by law or under the contract.

4.38 Third Party Action Notification

The Contractor shall give the Department prompt notices in writing of any action or suit filed, and prompt notice of any claim made against the Contractor by any entity that may result in litigation related in any way to this agreement.

4.39 Unsatisfactory Work

If at any time during the contract term, the service performed or work done by the Contractor is considered by the Department to create a condition that threatens the health, safety, or welfare of the citizens and/or employees of the State of Mississippi, the Contractor shall, on being notified by the Department, immediately correct such deficient services to work. In the event the Contractor fails, after notice, to correct the deficient service or work immediately, the Department shall have the right to order the correction of the deficiency by separate contract or with its own resources at the expense of the Contractor.

4.40 Waiver

No delay or omission by either party to this agreement in exercising any right, power, or remedy hereunder or otherwise afforded by contract, at law, or in equity shall constitute an acquiescence therein, impair any other right, power or remedy hereunder or otherwise afforded by any means, or operate as a waiver of such right, power, or remedy. No waiver by either party to this agreement shall be valid unless set forth in writing by the party making said waiver. No waiver of or modification to any term or condition of this agreement will void, waive, or change any other term or condition. No waiver by one party to this agreement of a default by the other party will imply, be construed as or require waiver of future or other defaults.

4.41 Employment Protection Act

The successful bidder represents and warrants that it will ensure its compliance with the Mississippi Employment Protection Act (*Miss. Code Ann.* §71-11-1 *et seq.*) and will register and participate in the status verification system for all newly hired employees. The terms "employee" as used herein means any person that is hired to perform work within the State of Mississippi. As used herein, "status verification system" means the Illegal Immigration Report and Immigration Responsibility act of 1996 that is operated by the United States Department of Homeland Security, also known as the E-Verify Program, or any other successor electronic verification system replacing the E-Verify Program. The successful bidder agrees to maintain the records of such compliance and, upon request of the State, to provide a copy of each such verification to the State. The successful bidder further represents and warrants that any person

assigned to perform these services hereunder meets the employment eligibility requirements of all immigration laws of the State of Mississippi. The successful bidder understands and agrees that any breach of these warranties may subject the successful bidder to the following: (a) termination of this Agreement and ineligibility for any state or public contract in Mississippi for up to three (3) years, with notice of such cancellation/termination being made public, or (b) the loss of any license, permit, certification or other document granted to the successful bidder by an agency, department or governmental entity for the right to do business in Mississippi for up to one (1) year, or (c) both. In the event of such termination/cancellation, the successful bidder would also be liable for any additional costs incurred by the State due to contract cancellation or loss of license or permit.

4.42 E-Payment. And E-Invoicing

The State requires the Contractor to submit invoices electronically throughout the term of the agreement. Vendor invoices shall be submitted to the state agency using the processes and procedures identified by the State. Payments by state agencies using the Statewide Automated Accounting System (SAAS), or any specific successor system (MAGIC) shall be made and remittance information provided electronically as directed by the State. These payments shall be deposited into the bank account of the Contractor's choice. Contractor understands and agrees that the State is exempt from the payment of taxes. All payments shall be in United States currency.

4.43 Drug-Free Workplace

The successful bidder shall provide a drug-free workplace for the bidder's employees. Employees will be prohibited from the unlawful manufacture, sale, distribution, dispensation, possession, or use of alcohol or any controlled substances during the performance of the contract.

4.44 Severability.

If any term or provision of this Contract is prohibited by the laws of this State of Mississippi or declared invalid or void by a court of competent jurisdiction, the remainder of this Contract shall not be affected thereby and each term and provision of this Contract shall be valid and enforceable to the fullest extent permitted by law.

4.45 Conflict of Interest.

Contractor shall notify the Department of any potential conflict of interest resulting from the representation of or service to other clients. If such conflict cannot be resolved to the Department's satisfaction, the Department reserves the right to terminate this Contract.

4.46 Sovereign Immunity.

By entering into this Contract with Contractor, the State of Mississippi does, in no way, waive its sovereign immunities or defenses, as provided by law.

4.47 Transparency

In accordance with the Mississippi Accountability and Transparency Act of 2008, 27-104-151, et seq., of the Mississippi Code of 1972, as Amended, the American Accountability and Transparency Act of 2009 (P.L. 111-5), where applicable, and 31-7-13, of the Mississippi Code

of 1972, as amended, where applicable, a fully executed copy of this agreement shall be posted to the State of Mississippi's accountability website at: https://merlin.state.ms.us.

4.48 Contractor Personnel

The Department shall, throughout the life of the contract, have the right of reasonable rejection and approval of staff or Subcontractors assigned to the work by the Contractor. If the Department reasonably rejects staff or Subcontractors, the Contractor must provide replacement staff or Subcontractors satisfactory to the Department in a timely manner and at no additional cost to the Department. The day-to-day supervision and control of the Contractor's employees and Subcontractors is the sole responsibility of the Contractor.

4.49 Notices.

All notices required or permitted to be given under this Contract must be in writing and personally delivered or sent by facsimile provided that the original of such notice is sent by certified United States mail postage prepaid, return receipt requested, or overnight courier with signed receipt, to the party to whom the notice should be given at the address set forth below. Notice shall be deemed given when actually received or when refused. The parties agree to promptly notify each other in writing of any change of address.

For the Department: Mississippi Department of Agriculture and Commerce
Attn: Jim Lipe
P.O. Box 1609
Jackson, MS 39215-1609

For the Contractor _____

_____

_____

FALL PLANTING OF COOL SEASON ANNUAL FORAGES (ANNUAL RYEGRASS, WHEAT):

-Seedbed preparation: Site shall be conventionally tilled by disking, etc. to ensure a well prepared clean, smooth and firm seedbed. Existing pasture shall be clipped or grazed close [1"-2" in height].
-Planting time: September 15 – October (may extend through November if project timing/conditions require later than optimum planting schedule)
-Planting rate new pastures: Plant in a mixture 35 lbs/acre annual ryegrass mixed with 90 lbs. of wheat/ acre. (Seed shall be covered by "harrowing in" to approximately ½ - 1 inch)
-Planting rate existing pasture: Over-seed ryegrass only at 50 lbs/ac without tillage. October 15th or no sooner than 3 weeks prior to average frost
-Apply fertilizer according to soil test results or at a minimum apply 600 lbs. of 13-13-13 or its equivalent (78-78-78) actual pounds of each nutrient [N-P-K] respectively.
-Apply lime according to soil test results or at a minimum apply 2 tons of agriculture lime per acre (pelletized lime may be substituted [500 lbs pelletized is equivalent of 1 ton agriculture lime])
-When planting on a prepared seedbed; apply lime, fertilizer and seed; harrow to incorporate with soil and cover seed and smooth / firm seedbed (lime will be applied as a separate component; fertilizer and seed may be mixed together and applied as a single operation).
-During the growing season between February 15 and March 1; apply 60 actual pounds of nitrogen (Example: 176 lbs. of ammonium nitrate/acre or 136 lbs of urea/acre)
-Start grazing when forage is a minimum of 6-8 inches in height

SPRING PLANTING OF WARM SEASON PERENNIAL FORAGE (HULLED COMMON BERMUDA):

-Seedbed preparation: Site shall be conventionally tilled by disking, etc. to ensure a well prepared clean, smooth and firm seedbed.
-Planting time: March – May
-Planting rate: 10 lbs. of hulled common bermudagrass/acre
-Apply fertilizer according to soil test results or at a minimum apply 600 lbs. of 13-13-13 or its equivalent (78-78-78) actual pounds of each nutrient [N-P-K] respectively.
-Apply lime according to soil test results or at a minimum apply 2 tons of agriculture lime per acre (pelletized lime may be substituted [500 lbs pelletized is equivalent of 1 ton agriculture lime)
-At planting on a prepared seedbed; apply lime, fertilizer; harrow to incorporate lime and fertilizer with soil and smooth / firm seedbed; lime and fertilizer may be combined and shall be applied as a separate operation from the seed; spread seed on previously harrowed and firmed area and harrow one final time to insure good seed to soil contact.
-Desired seeding depth for Common Bermuda is not to exceed ¼ inch deep due to the small diameter of the seed

BID SUBMISSION REQUIREMENTS

INSTRUCTIONS

Bids must be submitted in sealed envelope (securely bound) with Solicitation Number (BID SOLICITATION #) and the bidder's name and address clearly indicated on the envelope. Bids must give full firm name and address of bidder and be manually signed by a person having authority to bind his/her firm in a contract. Each page of the bid and all attachments must be identified with the name of the bidder. (See Section 4.14 of the Terms and Conditions.)

Bid Submission

All bids shall be submitted in writing in five (5) counterparts on or before 10:00 A.M. on Tuesday November 25, 2014 to the Mississippi Department of Agriculture and Commerce, Attn: Hewitt Pittman, Purchasing Director, P.O. Box 1609, Jackson, MS 39215 or 121 North Jefferson Street, Jackson, MS 39201. Timely submission of the bid is the responsibility of the bidder. Bids received after the specified time shall be rejected and returned to the bidder unopened. The envelope or package shall be marked with the bid opening date and time, contractors Certificate of Responsibility number and the number of the Invitation for Bid. The bidder's name and address must be clearly indicated on the envelope. The "Department", will choose the bid of the lowest responsive, responsible bidder.

The Department shall have the right to reject any/all bids.

Bidder needs to review Section 4.1, 4.2 and 4.3 of Addendum Standard Terms and Conditions

Contents of Bid

Each bid shall be written and must contain the following information at a minimum:

Experience and Qualification Information

1) The name of the bidder, the location of the bidder's principal place of business.
2) List Bidder Information/Business Type:

   Corporation_____ Partnership_____ Joint Venture _____ Sole Proprietorship_____

3) Continuous number of years that they have engaged in construction business.
4) Each bidder must be in good standing and provide evidence of its authority to do business in the State of Mississippi from the Mississippi Secretary of State's Office.
5) Bidder must provide a copy of its articles of incorporation, and/or a Certificate of Existence/Authority or partnership agreement from the state in which it was incorporated or formed, if applicable.
6) Copy of valid Certificate of Responsibility from the Mississippi State Board of Contractors.

7) A listing of other contracts in date order that they were the general contractor under which services similar in scope, size or discipline to the required services were performed or undertaken within the last three (3) years.
8) The bidder must state whether he/she has ever declared bankruptcy. If yes, state the date and the court jurisdiction.
9) Prospective Contractors Representation Regarding Contingent Fees (See Section 4:15)
10) Certification of Independent Price Determination (See Section 4:14)
11) Representations Regarding Gratuities (See Section 4:22)

References

1) The bidder must provide a list of four (4) references from persons or firm's that it has conducted business with during the last three years relating to grade stabilization and erosion control contracts of no less than $50,000 as set forth in Section 3.2.
2) Bidder should review Section 3.2 for Insurance and Bond Requirements.

Site Bid Cost and Construction

1) Bidders shall provide a detailed Schedule of Construction as possible with their bid (See Section 2:10).
2) Prices of Sites 1-10 on Invitation for Bid Schedule Form
3) Bid will be signed by a person having the legal authority to bind their firm in a contract.

Discussions may be conducted with bidders who submit bids determined to be reasonably susceptible of being selected for award, but bids may be accepted without such discussions.

INVITATION FOR BID SCHEDULE FORM
AGRICULTURAL & FORESTRY MUSEUM PROJECTS SITES 1 - 10

Ag Museum Site #1 Farmstead Area Drainage and Re-Vegetation.

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Excavation	511	C.Y.	$_____	$_____
2.	Earth Fill offsite material	357	C.Y.	$_____	$_____
3	Earth Fill offsite topsoil	345	C.Y.	$_____	$_____
4.	12" Diam. CPP Double Wall	45	L.F.	$_____	$_____
5.	12" Diam. removal for reuse	80	L.F.	$_____	$_____
6.	15" Diam. CPP Double Wall	150	L.F.	$_____	$_____
7.	2ft x 2ft Prefab Storm Drain	1	Each	$_____	$_____
8.	12" Diam. Tee	1	Each	$_____	$_____
9.	12" to 15" Diam. Reducer	1	Each	$_____	$_____
10.	15" Diam. 30 degree angles	2	Each	$_____	$_____
11.	Concrete	3	C.Y.	$_____	$_____
12.	Crushed Limestone for HUA	7.5	Tons	$_____	$_____
13.	Geotextile	30	S.Y.	$_____	$_____
14.	Lil Spring 2900 Waterer (Green Color)	1	Each	$_____	$_____
15.	Vegetation	1	L. S.	$_____	$_____
				TOTAL ----	$_____

Ag Museum Site #2 Syrup House Site.

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Excavation	41	C.Y.	$_____	$_____
2.	Cellular Blocks	500	Sq. Ft	$_____	$_____
3.	Geotextile	60	S.Y.	$_____	$_____
				TOTAL ----	$_____

Ag Museum Site #3 Entrance to Rock Chute – adjacent to Sports Museum

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Earth Fill offsite topsoil	2	C.Y.	$_____	$_____
2.	Turf Reinforcement Mat	50	S.Y.	$_____	$_____
3.	Vegetation	1	L.S.	$_____	$_____
			.	TOTAL ----	$_____

Ag Museum Site #4 Pollinator Walking Trail.

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Crushed Limestone -610	18	C.Y.	$_____	$_____
2.	Geotextile	203	S.Y.	$_____	$_____
				TOTAL ----	$_____

Ag Museum Site #5 New Pasture Areas and Selective Tree Removal Existing Pastures

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Removing Trees	0.5	Acres	$_____	$_____
2.	Fencing to NRCS Standards	1520	L.F.	$_____	$_____
3	Lil Spring 2900 Waterer (Green Color)	2	Each	$_____	$_____
4.	Crushed Limestone for HUA	7	C.Y.	$_____	$_____
5.	Geotextile	58	S.Y.	$_____	$_____
6.	Gates -12 Feet Wide	6	Each	$_____	$_____
7.	Gates 6 Feet Wide	1	Each	$_____	$_____
8.	Stream crossing riprap Gabion size	23	Tons	$_____	$_____
9.	Geotextile under stream crossing	72	S.Y.	$_____	$_____
10.	Crushed Limestone on crossing	7	C.Y	$_____	$_____
11.	Concrete	1	C.Y.	$_____	$_____
				TOTAL ----	$_____

Ag Museum Site #6 Pasture Irrigation in New and Existing Pastures

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Irrigation System with above risers	2	Acres	$_____	$_____
				TOTAL ----	$_____

Ag Museum Site #7 Composter for Waste Material

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Concrete	1.5	C.Y.	$_____	$_____
2.	4" x 6" x 8 ft. Treated Posts	7	Each	$_____	$_____
3.	2" x 12" 10 ft. Treated Boards	11	Each	$_____	$_____
4.	2" x 12" 12 ft. Treated Boards	10	Each	$_____	$_____
5.	Metal Roof	1	L.S.	$_____	$_____
				TOTAL ----	$_____

Ag Museum Site #8 Solar Powered Electric Fence in Existing Pony Pasture.

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Solar powered electric fence	500	Feet	$_____	$_____
				TOTAL ----	$_____

Ag Museum Site #9 Portable Shade Structure in Existing Pony Pasture

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Portable livestock shade structure	2	Each	$_____	$_____
				TOTAL ----	$_____

Ag Museum Site #10 Concrete Berm on Existing Swine Pen

Item No.	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Concrete	1	C.Y.	$_____	$_____
				TOTAL ----	$_____

INVITATION FOR BID SCHEDULE FORM
AGRICULTURAL & FORESTRY MUSEUM PROJECTS SITES 1 - 10

Ag Museum Site #1 **Total:** _____

Ag Museum Site #2 **Total:** _____

Ag Museum Site #3 **Total:** _____

Ag Museum Site #4 **Total:** _____

Ag Museum Site #5 **Total:** _____

Ag Museum Site #6 **Total:** _____

Ag Museum Site #7 **Total:** _____

Ag Museum Site #8 **Total:** _____

Ag Museum Site #9 **Total:** _____

Ag Museum Site #10 **Total:** _____

Total: _____

INVITATION FOR BID SCHEDULE FORM
AGRICULTURAL & FORESTRY MUSEUM PROJECTS SITES 1 - 10

NAME OF COMPANY _____

COMPLETE ADDRESS _____

_____

_____

CONTACT PERSON _____

TITLE _____

TELEPHONE NUMBER _____

FAX NUMBER _____

E-MAIL _____

SIGNATURE _____

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

SPECIAL PROVISIONS

1. LIQUIDIATED DAMAGES

If the work, or any part thereof, is not completed within the time agreed upon in this contract or any extension thereof, the Contractor shall be liable to the Contracting Local Organization in the amount of $50.00 per day for each and every calendar day the completion of the work is delayed beyond the time provided in this contract, as fixed and agreed liquidated damages and not as a penalty; and the Contracting Local Organization shall have the right to deduct from and retain out of monies which may be then due or which may become due and payable to the Contractor, the amount of such liquidated damages; and if the amount so retained by the Contracting Local Organization is insufficient to pay in full such liquidated damages, the Contractor shall pay to the Contracting Local Organization the amount necessary to effect payment in full of such liquidated damages.

2. SEASONAL SHUTDOWN

(a) In the event work on this contract extends into the winter season, which is approximately December 1 to approximately February 20, contract work may be suspended. The Contracting Officer will determine when conditions warrant suspension of work for the season and will issue a suspend work order. He will determine when conditions warrant an end to the seasonal shutdown. He will notify the Contractor at least 7 calendar days before work is to be resumed by issuance of a resume work order.

(b) With approval of the Contracting Officer, the Contractor may schedule and work on any contract item during the seasonal shutdown without charge to performance time. If for any reason the Contracting Officer suspends work on contract items so approved, the Contractor shall not be entitled to any adjustment in contract price or performance time because of such suspension. Work of an emergency, protective or maintenance nature may be performed at any time without prior approval of the Contracting Officer.

(c) The contract completion date shall be extended 1 day for each calendar day of the actual seasonal shutdown period.

3. MINOR ITEMS OF WORK

The following bid items are designated as minor items of work. These items may be performed without charge to performance time during periods when all other work is suspended if such items are excepted in the suspend work order:

	Site 1	Site 2
Item No.	2. Clearing	2. Clearing
	3. Structure Removal	

4. ACCIDENT PREVENTION AND SAFETY MEASURES
The Contractor shall comply with OSHA Part 1926, Construction Standards and Interpretations in effect on the date of issuance of the invitation for bids and with the Soil Conservation Service Supplement to ODHA Part 1926.

5. PERFORMANCE OF WORK BY CONTRACTOR
The contractor shall perform on the site, and with his own organization, work equivalent to at least twenty percent (20%) of the total amount of work to be performed under the contract. If, during the progress of the work hereunder, the Contractor requests a reduction in such percentage, and the Contracting Officer determines that it would be to the advantage of the Contracting Local Organization, the percentage of the work required to be performed by the Contractor may be reduced with the written approval of the Contracting Officer.

6. CLEAN AIR AND WATER REQUIREMENTS
(Applicable only if the contract exceeds $100,000, or a facility to used has been the subject of a conviction under the Air Act (42 U.S.C. 1857(c) (1) or the Water Act (33 U.S.C. 1319(c) and is listed by EPA or the contract is not otherwise exempt.

A. The Contractor agrees as follows:

(1) To comply with all the requirements of section 114 of the Air Act, as amended (42 U.S.C. 1857c-q) and section 308 of the Water Act, as amended (33 U.S.C. 1318), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the signing of this contract by the Contracting Local Organization.

(2) That no portion of the work required by this contract will be performed in a facility listed on the Environmental when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing.

(3) To use their best efforts to comply with clean air standards and clean water standards at the facilities in which the contract is being performed.

(4) To insert the substance of the provisions of this clause in any nonexempt subcontract including this subparagraph (4).

B. The terms used in this clause have the following meanings:

(1) The Term "Air Act" means the Air Act, as amended (42 U.S.C. 1857 et. seq.).

(2) The terms "Water Act" means Water Act, as amended (33 U.S.C. 1251 et. seq.).

(3) The term "clean air standards" means any enforceable rules, regulations, guidelines, standards, limitation, orders controls, probations, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110(d) of the Air Act (42 U.S.C. 1857c-5(d)), and approved implementation procedure or plan under section 111(c) or section 111(d), respectively, of the Air Act (42 U.S.C. 1857c-b(c), (d)), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-d(d).

(4) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the Water Act or

contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

(5) The term "compliance" means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency, or an air or water pollution control agency in accordance with the Air Act or Water Act and regulations issued pursuant thereto.

(6) The term "facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned leased, or supervised by a sponsor, to be utilized in the performance of a contract of subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

EEO-1 REPORTING REQUIREMENTS

1. Each construction prime contractor and first tier subcontractor who has 50 or more employees on total corporate or company payroll and signs a direct Federal or financially-assisted contract or subcontract amounting to $50,000 or more, shall file annually in triplicate on or before the 31st day of March complete and accurate reports on Standard Form 100 (EEO-1) to the Joint Reporting Committee.

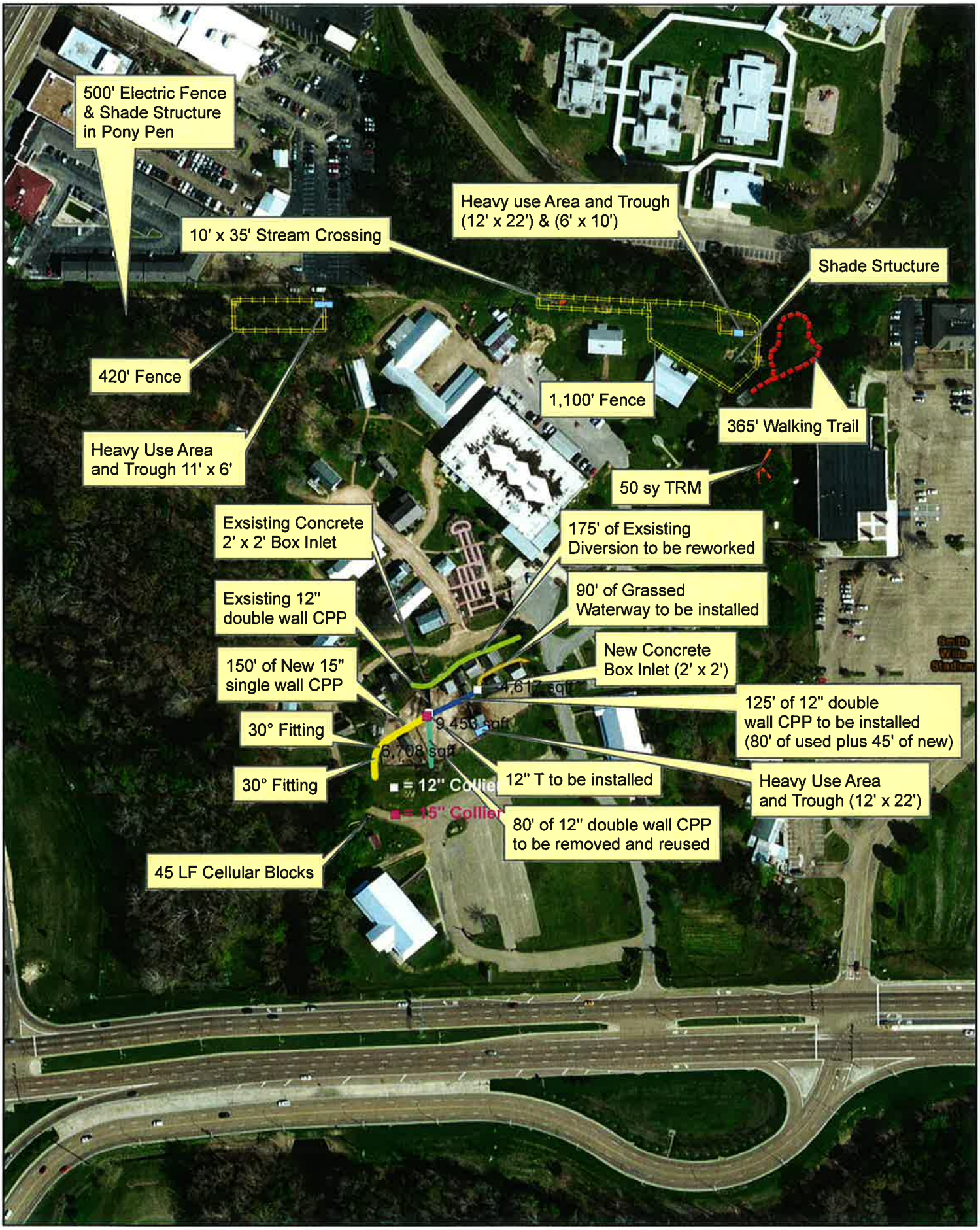
2. Each contractor or subcontractor required in paragraph 1 above shall submit an EEO-1 to the Joint Reporting Committee and shall also file an EEO-1 to the Office of Federal Contract Compliance Programs, U.S. Department of Labor, (Insert Correct Address) WITHIN 30 DAYS after award of such contract or subcontractor as mentioned in paragraph 1 above, UNLESS such contractor or subcontractor has already submitted an EEO-1 report to the Joint Reporting Committee within 12 months preceding the date of award of an NRCS Federal or Federally-assisted contract.

3. Failure to file timely, complete, and accurate reports as required in paragraphs 1 and 2 above constitute noncompliance with the contractor's or subcontractors' obligations under Executive Order 11246, as amended, and is grounds for the imposition by OFCCP of any sanctions authorized by Executive Order 11246 and other rules and regulations issued pursuant thereto.

(d) Contractors and subcontractors may obtain EEO-1 reporting forms by writing to:

Joint Reporting Committee
2401 East Street N.W.
Washington, D.C. 20506

Mississippi Ag Museum



Mississippi Agriculture and Forestry Museum

Conservation Practices

Project Drawings

MIRACO

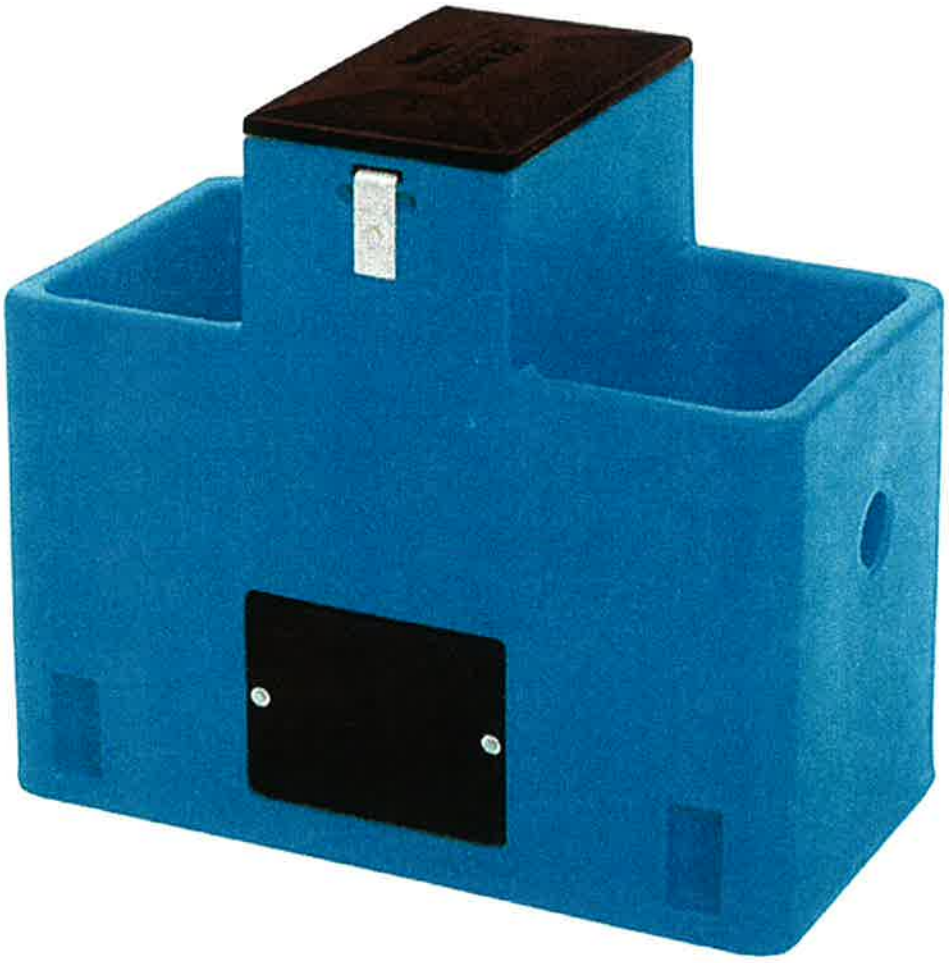
Livestock Water Systems

"Originators of insulated poly waterers"

LilSpring 2900/2901

For those small spaces – Horses, Beef, Dairy

DOWNLOAD THE INSTALLATION GUIDE HERE



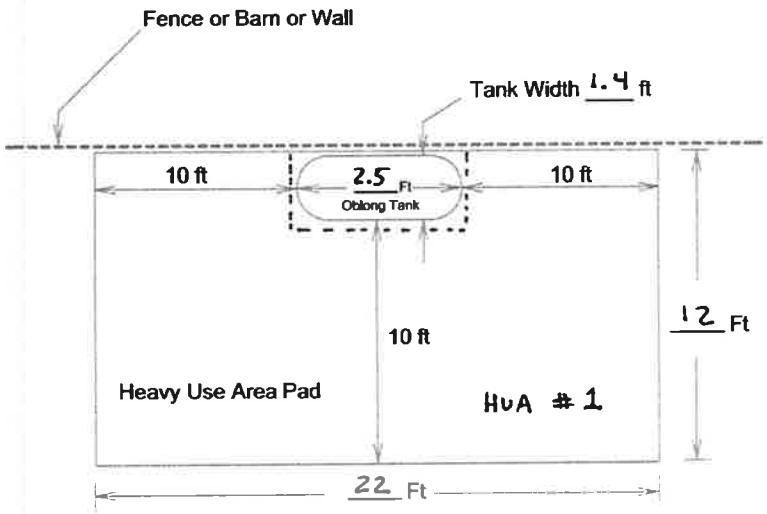
CAPACITY	60 head beef or horses
GALLONS	6 (23 liters)
DIMENSIONS	30.5" x 16.5" x 27" (77.5 x 40.6 x 69 cm)
DRINKING HEIGHT	19" (48 cm)
VALVE	Miraco automatic plastic
WEIGHT	Miraco automatic plastic
HEAT	Optional 110 volt 250 watt submersible heater
INSTALL	200 psi hose w/shut off valve included

New Color Options

Gray Blue(Standard) Black Hunter Green

Crushed limestone rock heavy use area

In this scenario, livestock only have access to 3 sides of the tank due to the tank placement against a permanent fence, barn, or wall.



Plan View

Rounded End Galvanized Tank - Quantity Table for rock Heavy Use Area

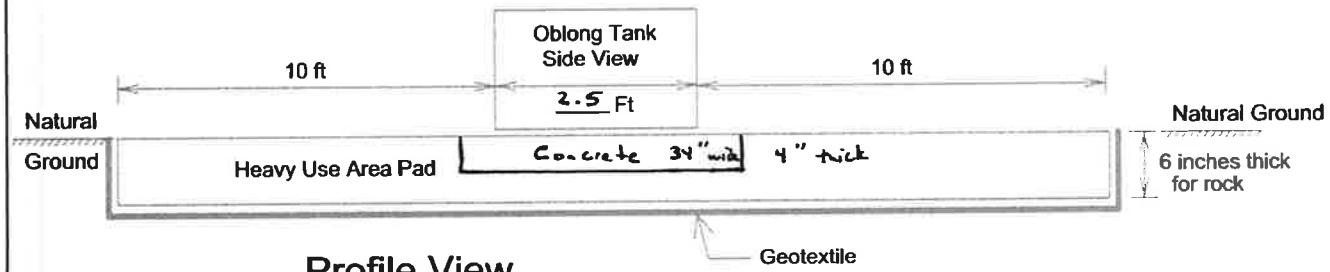
Oblong Tank Dimensions	Gallons	Pad Dimension	Cubic Yards Needed	Geotextile Dimensions	Sq. Yds. Geotextile Needed
3 ft long x 2 ft wide	72	23' x 12'	5.25 CY	24' x 13'	40 SY
4 ft long x 2 ft wide	100	24' x 12'	5.5 CY	25' x 13'	42 SY
5 ft long x 2 ft wide	135	25' x 12'	5.75 CY	26' x 13'	43 SY
6 ft long x 2 ft wide	174	26' x 12'	6 CY	27' x 13'	45 SY
6 ft long x 2 ft wide	230	28' x 12'	6.5 CY	29' x 13'	48 SY
8 ft long x 3 ft wide	320	28' x 13'	7 CY	29' x 14'	52 SY
10 ft long x 3 ft wide	406	30' x 13'	7.5 CY	31' x 14'	55 SY

Oblong Plastic Tank - Quantity Table for rock Heavy Use Area

Oblong Tank Dimensions	Gallons	Pad Dimension	Cubic Yards Needed	Geotextile Dimensions	Sq. Yds. Geotextile Needed
53 in long x 31 in wide	100	24.5' x 13'	6 CY	25.5' x 14'	46 SY
58 in long x 39 in wide	150	25' x 13.5'	6.5 CY	26' x 14.5'	48 SY
63.25 in long x 69 in wide	300	25.5' x 16'	8 CY	26.5' x 17'	50 SY

NOTES:

1. Heavy Use Area should be constructed to ensure proper drainage off of the pad to prevent any pooling.
2. Heavy Use Area must be constructed from either CR 610 crushed limestone rock or concrete.
3. The geotextile should be non-woven, medium weight (6oz - 8 oz).
4. The geotextile should be overlaped a minimum of 12 inches at all joints.
5. The minimum pad thickness for crushed rock is 6 inches. For concrete minimum is 4 inches (See separate standard drawing for concrete heavy use area).



Profile View

DRAWING NOT TO SCALE

Ag and Forestry Museum

Main Mule Pen

Watering Facility - Oblong Tank on Fence or Wall with rock Heavy Use Protection Area

U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE

Designed	Date	Approved by	
Drawn SLM	7/09 Date	Title	
Checked	Date	Sheet No. of	Drawing No.

Concrete Pad is 34" wide x 20" long x 4" thick

United States Department of Agriculture
Natural Resources Conservation Service

MS.A2.561
Rev. 1/11

Heavy Use Area Sizing Worksheet

County: Hinds **Tract(s):** _____ **Farm No.:** _____

Client: Ag and Forestry Museum **Date:** 8/26/14

Section: _____ **Township:** _____ **Range:** _____

This worksheet is for Heavy Use Area Number: 1 **located in Field No.:** Mule Pen

GPS Location: _____

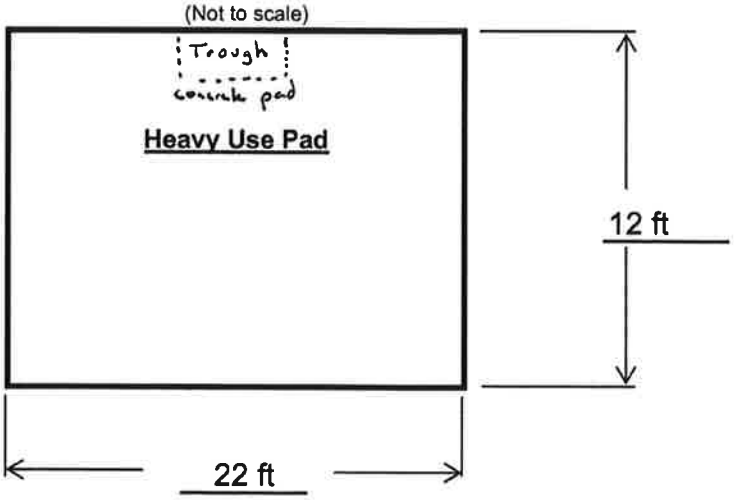
This is a stand alone Heavy Use Area: No **This HUA is under a 614:** Yes

Dimensions:

Size of Heavy Use Area: 22 ft X 12 ft Area = 264 Sq. Ft.

Depth of rock = 6 inches

Plan View
(Not to scale)



Quantities: These calculations are for crusher run limestone rock only.

Crusher Run Rock (610 Aggregate): 5 CY or 7 TONS

Non-woven Geotextile Fabric (8 oz weight): 38 SY or 344 Sq Ft

For a roll of geotextile 15 ft wide you will need to purchase a piece 23 ft long.

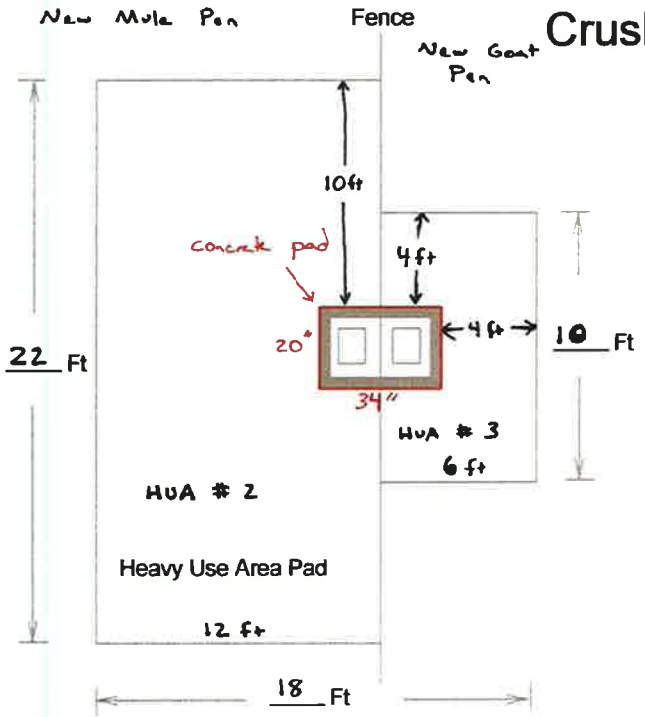
NOTE: If the geotextile roll width is not 15 feet you will need to calculate the needed length to purchase using the formula listed below.

Length Needed = Square Footage of Geotextile Needed (sq ft) / Width of Geotextile Roll (ft)

Concrete Pad needed to mount tank on → 34" wide x 20" long x 4" thick

⇒ 1.5 ft^3 of concrete

Crushed limestone rock heavy use area



Plan View (not to scale)

Quantity Table for Crushed Limestone Rock Heavy Use Area						
	Length ft	Width ft	Area Sq Ft	Cubic yards Rock	Tons of Rock Needed	Sq. Yards of Geotextile Needed
Mule	22'	12'	264 ft²	5 CY	7 tons	38 SY
Goat	10'	6'	60 ft²	1 CY	2 tons	10 SY

If heavy use area is not a square or rectangle configuration, then sketch planned configuration in the space below or attach a separate sheet showing planned configuration and dimensions. Also show all quantity calculations for that configuration.

Concrete Pad is 34" x 20" x 4" thick

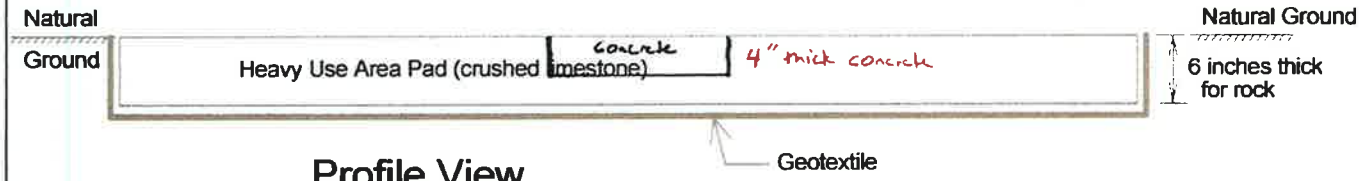
Crushed limestone pad should extend 10 ft past edge of tank in mule pen and 4 ft past edge of tank in goat pen.

Water trough will be bolted to concrete slab per Miraco installation

NOTES:

1. Heavy Use Area should be constructed to ensure proper drainage off of the pad to prevent any pooling.
2. Heavy Use Area must be constructed from either CR 610 crushed limestone rock or concrete.
3. The geotextile should be non-woven, medium weight (6oz - 8 oz).
4. The geotextile should be overlaped a minimum of 12 inches at all joints.
5. The minimum pad thickness for crushed rock is 6 inches. For concrete minimum is 4 inches (See separate standard drawing for concrete heavy use area).

DRAWING NOT TO SCALE



Profile View

Ag and Forestry Museum
Mule and Goat Pens New
Heavy Use Protection Area

U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE

Designed		Date	Approved by
Drawn	SLM	2/14 Date	Title
Checked		Date	Sheet No. of / Drawing No.

United States Department of Agriculture
Natural Resources Conservation Service

MS.A2.561
Rev. 1/11

Heavy Use Area Sizing Worksheet

County: Hinds **Tract(s):** _____ **Farm No.:** _____

Client: Ag and Forestry Museum **Date:** 8/26/14

Section: _____ **Township:** _____ **Range:** _____

This worksheet is for Heavy Use Area Number: 2 **located in Field No.:** New Mule Pen

GPS Location: _____

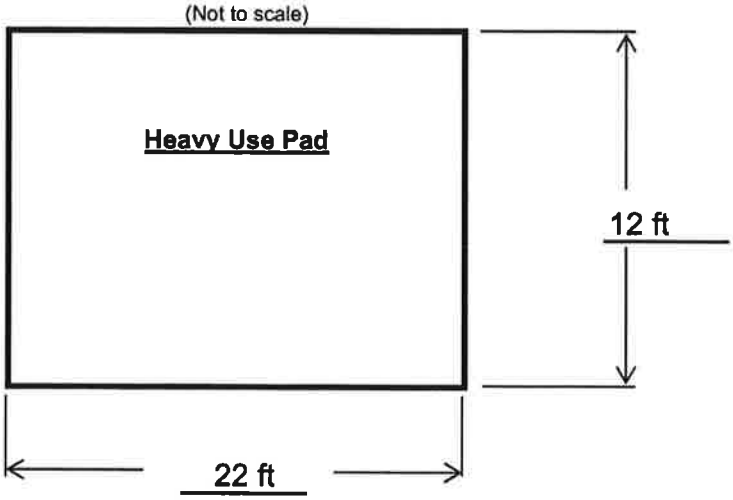
This is a stand alone Heavy Use Area: No **This HUA is under a 614:** Yes

Dimensions:

Size of Heavy Use Area: 22 ft X 12 ft Area = 264 Sq. Ft.

Depth of rock = 6 inches

Plan View
(Not to scale)



Quantities:

These calculations are for crusher run limestone rock only.

Crusher Run Rock (610 Aggregate): 5 CY or 7 TONS

Non-woven Geotextile Fabric (8 oz weight): 38 SY or 344 Sq Ft

For a roll of geotextile 15 ft wide you will need to purchase a piece 23 ft long.

NOTE: If the geotextile roll width is not 15 feet you will need to calculate the needed length to purchase using the formula listed below.

Length Needed = Square Footage of Geotextile Needed (sq ft) / Width of Geotextile Roll (ft)

United States Department of Agriculture
Natural Resources Conservation Service

MS.A2.561
Rev. 1/11

Heavy Use Area Sizing Worksheet

County: Hinds **Tract(s):** _____ **Farm No.:** _____

Client: Ag and Forestry Museum **Date:** 8/26/14

Section: _____ **Township:** _____ **Range:** _____

This worksheet is for Heavy Use Area Number: 3 **located in Field No.:** Goat pen

GPS Location: _____

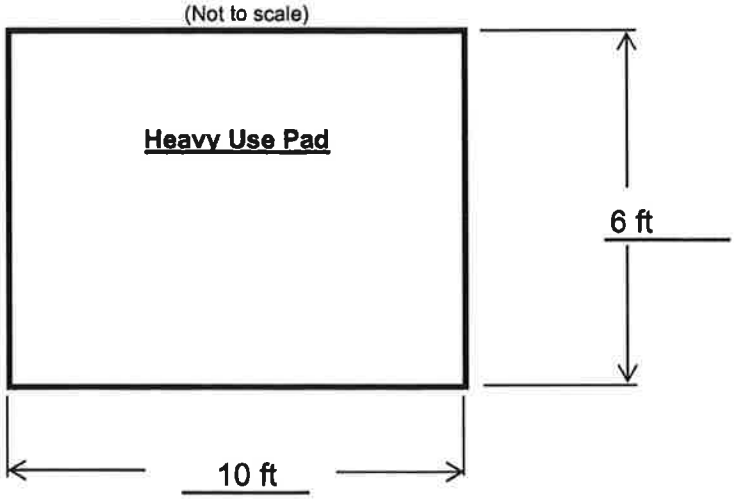
This is a stand alone Heavy Use Area: No **This HUA is under a 614:** Yes

Dimensions:

Size of Heavy Use Area: 10 ft X 6 ft Area = 60 Sq. Ft.

Depth of rock = 6 inches

Plan View
(Not to scale)



Quantities: These calculations are for crusher run limestone rock only.

Crusher Run Rock (610 Aggregate): 1 CY or 2 TONS

Non-woven Geotextile Fabric (8 oz weight): 10 SY or 89 Sq Ft

For a roll of geotextile 15 ft wide you will need to purchase a piece 6 ft long.

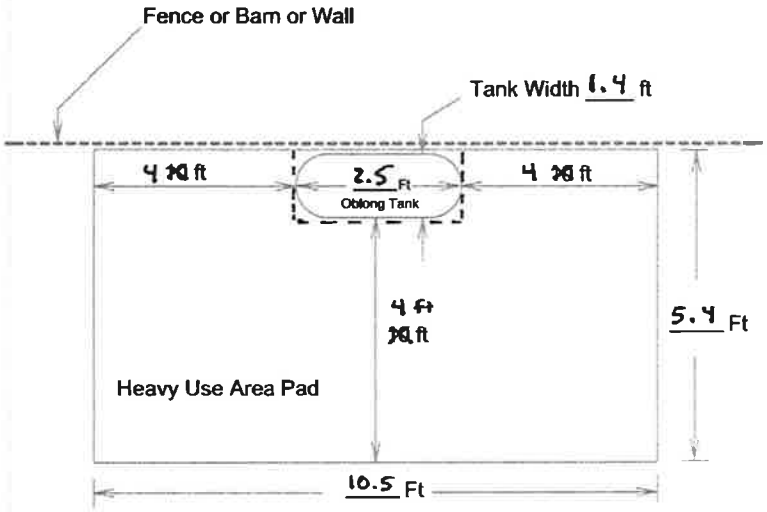
NOTE: If the geotextile roll width is not 15 feet you will need to calculate the needed length to purchase using the formula listed below.

Length Needed = Square Footage of Geotextile Needed (sq ft) / Width of Geotextile Roll (ft)

HUA # 4

Crushed limestone rock heavy use area

In this scenario, livestock only have access to 3 sides of the tank due to the tank placement against a permanent fence, barn, or wall.



Plan View

Tank Dimensions : 30.5" long x 16.5" wide

Rounded End Galvanized Tank - Quantity Table for rock Heavy Use Area

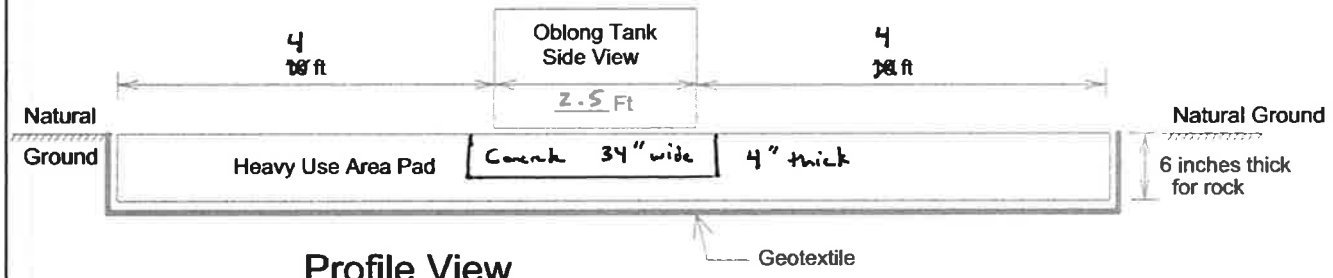
Oblong Tank Dimensions	Gallons	Pad Dimension	Cubic Yards Needed	Geotextile Dimensions	Sq. Yds. Geotextile Needed
3 ft long x 2 ft wide	72	22" x 12"	5.25 CY	24" x 13"	40 SY
4 ft long x 2 ft wide	100	24" x 12"	5.5 CY	25" x 13"	42 SY
5 ft long x 2 ft wide	135	25" x 12"	5.75 CY	26" x 13"	43 SY
6 ft long x 2 ft wide	174	26" x 12"	6 CY	27" x 13"	45 SY
8 ft long x 2 ft wide	230	28" x 12"	6.5 CY	29" x 13"	48 SY
6 ft long x 3 ft wide	320	28" x 13"	7 CY	29" x 14"	52 SY
10 ft long x 3 ft wide	406	30" x 13"	7.5 CY	31" x 14"	55 SY

Oblong Plastic Tank - Quantity Table for rock Heavy Use Area

Oblong Tank Dimensions	Gallons	Pad Dimension	Cubic Yards Needed	Geotextile Dimensions	Sq. Yds. Geotextile Needed
53 in long x 31 in wide	100	24.5" x 13"	6 CY	25.5" x 14"	46 SY
58 in long x 39 in wide	150	25" x 13.5"	6.5 CY	26" x 14.5"	48 SY
63.25 in long x 69 in wide	300	25.5" x 16"	8 CY	26.5" x 17"	56 SY

NOTES:

1. Heavy Use Area should be constructed to ensure proper drainage off of the pad to prevent any pooling.
2. Heavy Use Area must be constructed from either CR 610 crushed limestone rock or concrete.
3. The geotextile should be non-woven, medium weight (6oz - 8 oz).
4. The geotextile should be overlaped a minimum of 12 inches at all joints.
5. The minimum pad thickness for crushed rock is 6 inches. For concrete minimum is 4 inches (See separate standard drawing for concrete heavy use area).



Profile View

DRAWING NOT TO SCALE

Ag and Forestry Museum
Steer Pen
Watering Facility - Oblong Tank on Fence or Wall with rock Heavy Use Protection Area

U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE

Designed		Date	Approved by	
Drawn	SLM	7/09 Date	Title	
Checked		Date	Sheet No. of	Drawing No.

Concrete Pad is 34" wide x 20" long x 4" thick

United States Department of Agriculture
Natural Resources Conservation Service

MS.A2.561
Rev. 1/11

Heavy Use Area Sizing Worksheet

County: Hinds **Tract(s):** _____ **Farm No.:** _____

Client: Ag and Forestry Museum **Date:** 8/26/14

Section: _____ **Township:** _____ **Range:** _____

This worksheet is for Heavy Use Area Number: 4 **located in Field No.:** Steer Pen

GPS Location: _____

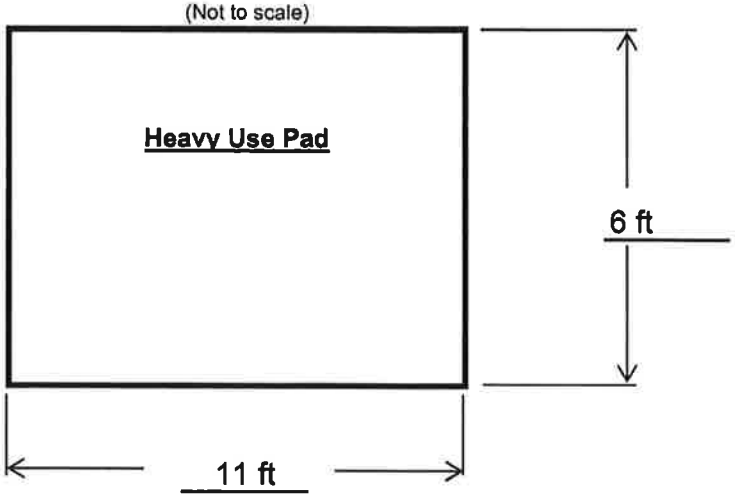
This is a stand alone Heavy Use Area: No **This HUA is under a 614:** Yes

Dimensions:

Size of Heavy Use Area: 10.5 ft X 6 ft Area = 63 Sq. Ft.

Depth of rock = 6 inches

Plan View
(Not to scale)



Quantities: These calculations are for crusher run limestone rock only.

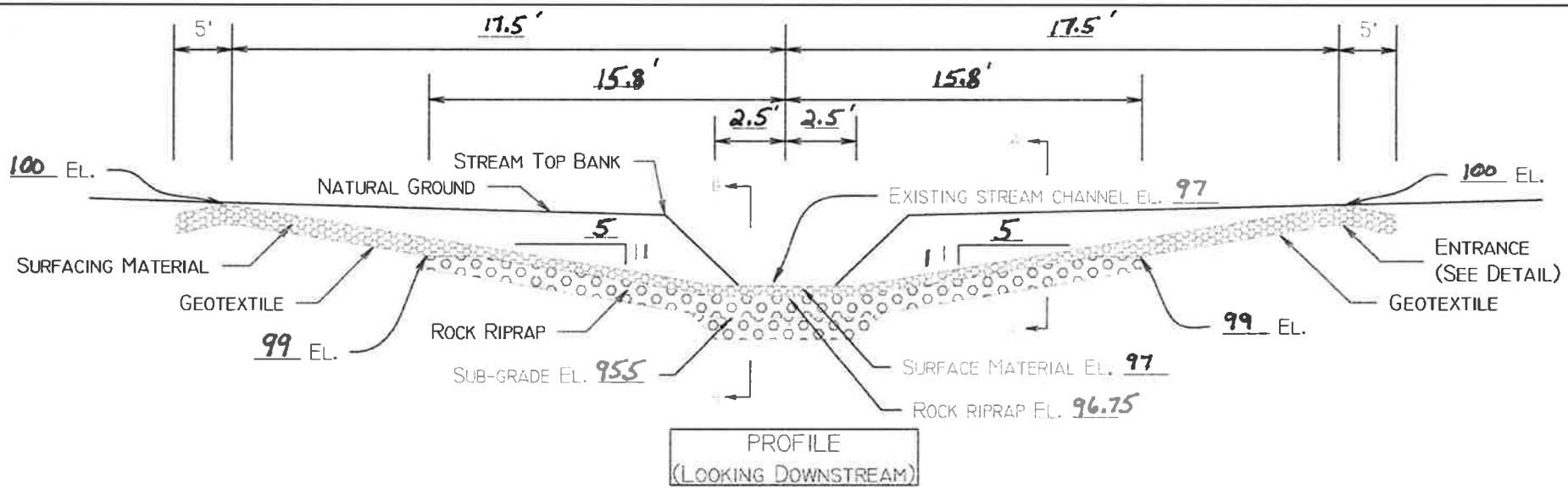
Crusher Run Rock (610 Aggregate): 1 CY or 2 TONS

Non-woven Geotextile Fabric (8 oz weight): 10 SY or 93 Sq Ft

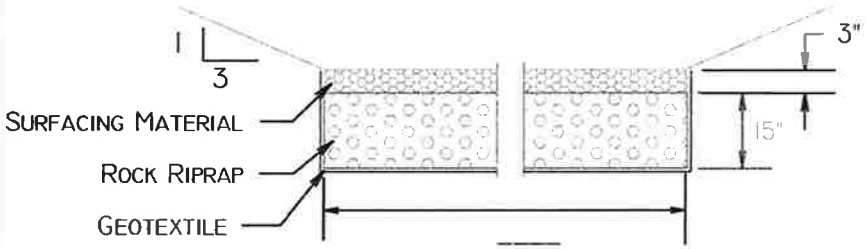
For a roll of geotextile 15 ft wide you will need to purchase a piece 6 ft long.

NOTE: If the geotextile roll width is not 15 feet you will need to calculate the needed length to purchase using the formula listed below.

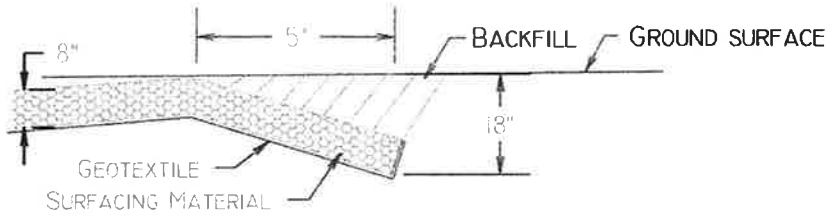
Length Needed = Square Footage of Geotextile Needed (sq ft) / Width of Geotextile Roll (ft)



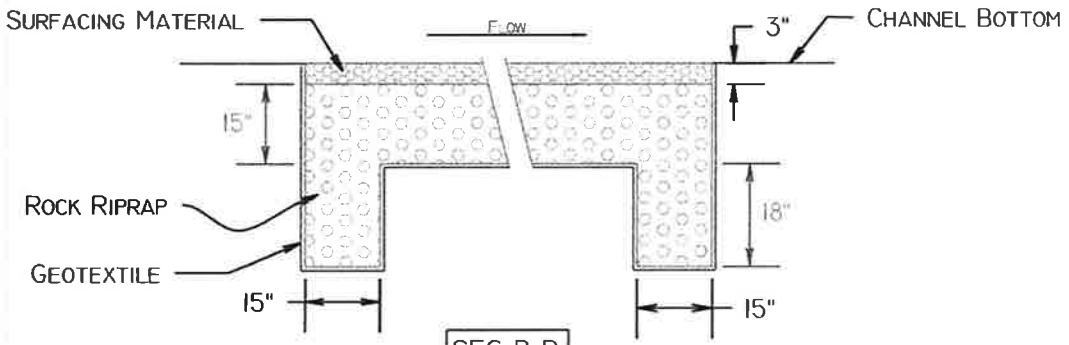
PROFILE
(LOOKING DOWNSTREAM)



SEC A-A



ENTRANCE DETAIL



SEC B-B

Ag and Forestry Museum
Stream Crossing

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

DESIGNED	APPROVED BY
DRAWN	TITLE
CHECKED	STCROSS ROCIxs 0201

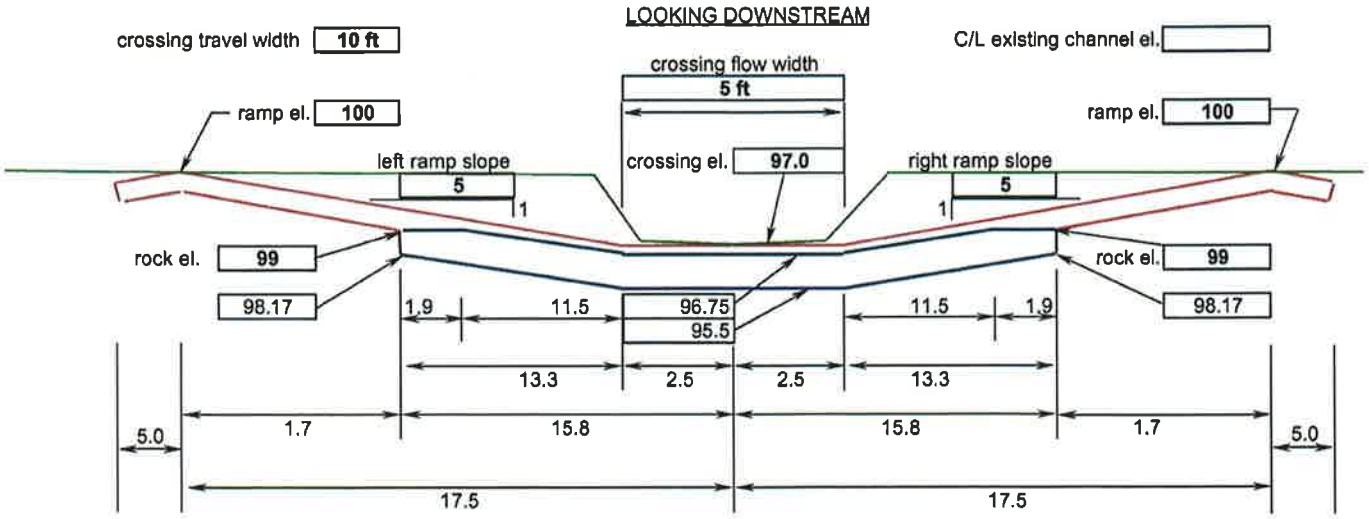
QUANTITY CALCULATIONS FOR ROCK RIPRAP STREAM CROSSING

Rev. 06.02

Client: **Ag and Forestry Museum**

County: **Hinds**

Prepared by: _____ 08/27/14



Crossing width (feet)	Bottom flow width (feet)	Ramp slopes Left (_:1)	Ramp slopes Right (_:1)	Rock Riprap thickness (inches)	Rock riprap flow depth Left (feet)	Rock riprap flow depth Right (feet)	Gravel thickness on rock (inches)	Gravel thickness on ramps (inches)	Gravel flow depth Left (feet)	Gravel flow depth Right (feet)	Earthwork (cy)
10	5	5	5	15	2.25	2.25	3	8	3.0	3.0	111

total length of crossing 45 ft

toewalls (not shown) 6 x1.5x1.25

Rock Riprap 410.6 cf

15.2 cy

22.8 tons

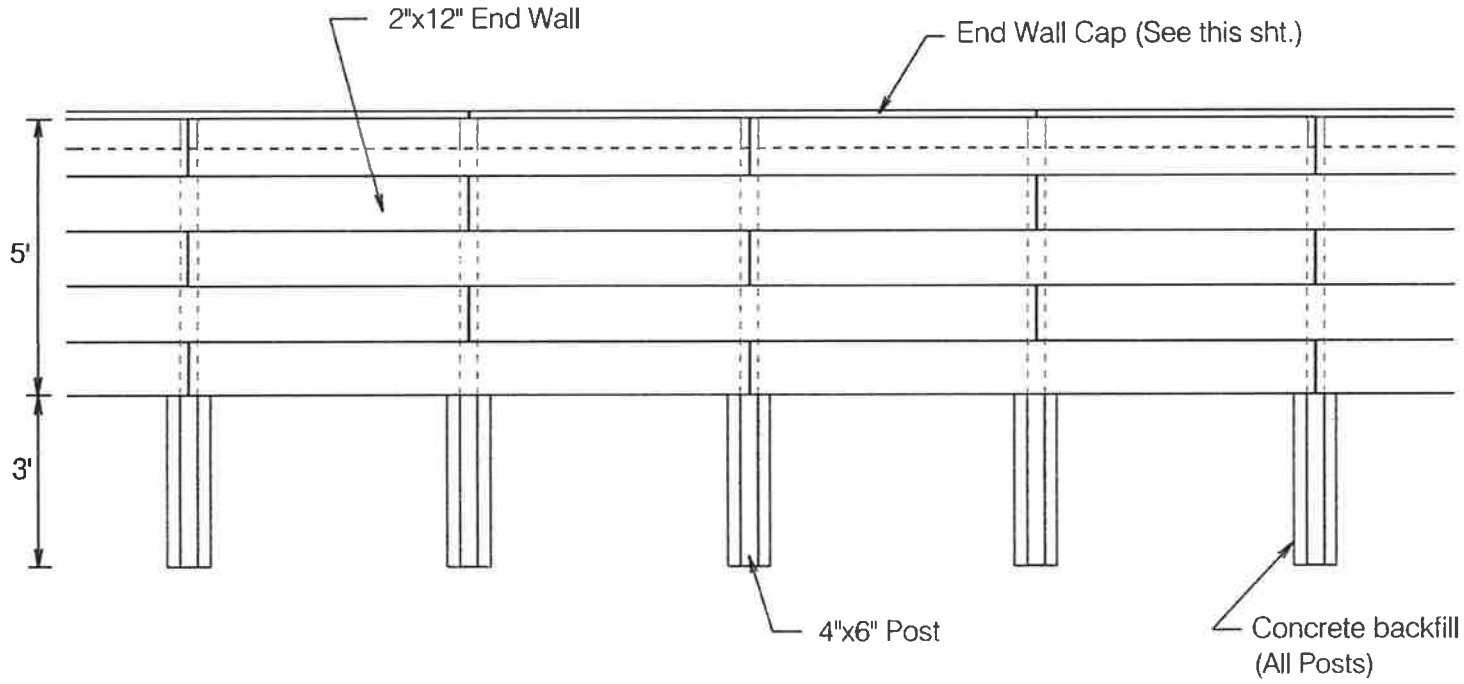
Gravel 179.8 cf

6.7 cy

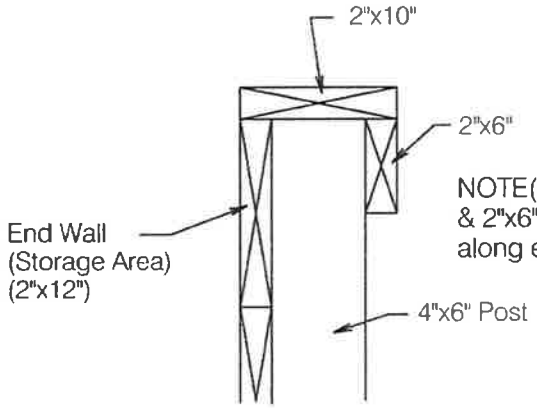
Geotextile 71.6 sy

Composter 8 foot by 10 foot with removable bin boards on front.

Isometric View – Drawing Not to Scale



End Wall Board Placement Detail



NOTE(3): Fasten 2"x10" to 2"x12" & 2"x6" using 16d nails @ 20" O.C. along each side.

End Wall Cap Detail

NOTE(1): Joints on adjacent endwall boards shall be staggered.

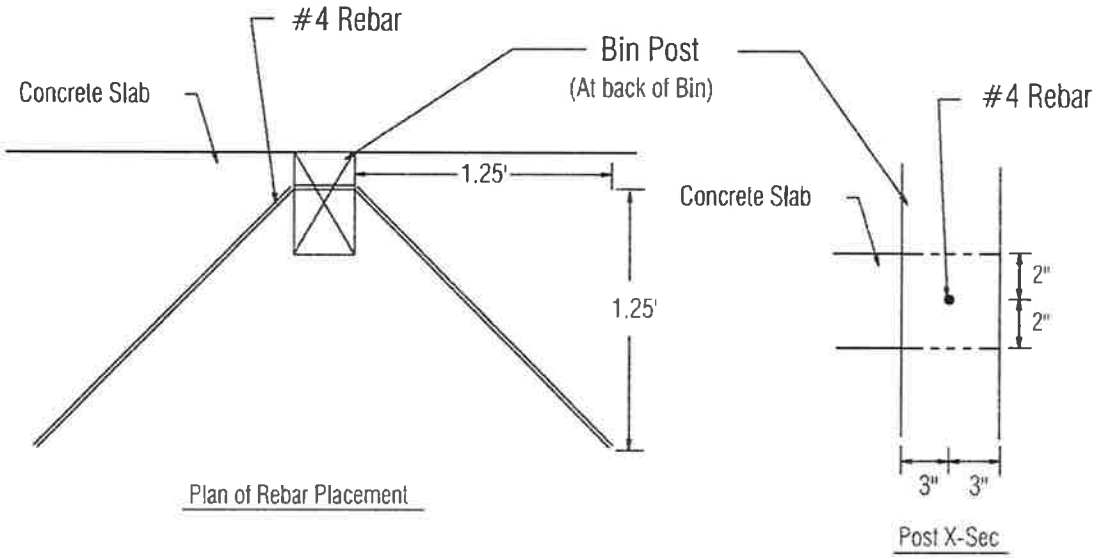
NOTE(2): All posts shall extend at least 3 feet into natural ground.

Mississippi AG Museum

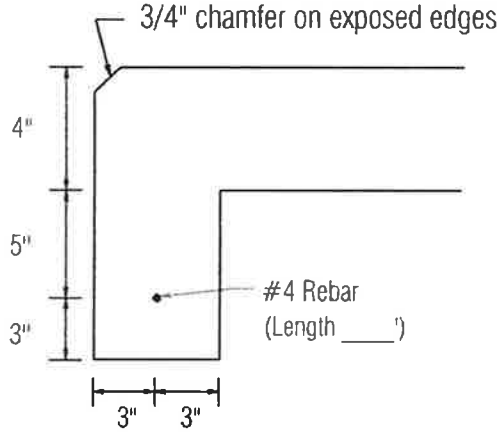
END WALL DETAILS

U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE

Designed	Approved by
Drawn	Title
Checked	



Post Reinforcement Detail



Concrete Footer Detail

NOTE: All concrete shall be fiber reinforced. Fibers and mix design shall be in accordance with the manufacturers recomendations.

Mississippi AG Museum

DETAILS

U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE

Designed	Approved by
Drawn	Title
Checked	

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS

FENCE

General

The construction and operation of the fence shall comply with all federal, state and local law, rules and regulations.

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

The completed job shall present a workmanlike appearance and shall conform to the requirements indicated and shown on the drawings.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used. Contractor shall not begin construction prior to confirming buried utilities have been located.

Materials

Materials must be manufactored for the purpose of fence construction and shall conform to the requirements shown on the drawings. **Producers receiving financial assistance must utilize new materials with the exception of organic initiative participants.**

Pressure treated wood shall be treated with pentachlorophenol (0.4 lbs/ft^3), creosote and creosote solutions (6.0-8.0 lbs/ft^3) or chromated copper arsenate (0.4 lbs/ft^3). Treated round posts will be 4 inches or more in diameter at the small end. Line posts should be 84 inches in length and should be buried or driven a minimum of 30 inches below the soil surface. Steel t-posts may also be used, if so, t-post shall be driven so that flange is below the soil surface.

Brace pins shall be class III galvanized steel with a minimum diameter of 3/8 inches. Brace pins shall be a minimum length of 5 inches on the end post and 10 inches on the pull post. The horizontal brace piece for "H" braces shall be placed at 12 inches from the top of the post. Brace post may be notched 1/2 inch to fit cross member and fasten with galvanized nails or brace pins.

Corner, Gate and Brace Posts. Corner, gate and vertical brace posts should be at least 6 inches in diameter. Horizontal brace Cross members shall be at least 5 inches in diameter. Corner, gate and vertical brace posts shall be minimum length of 8 feet and should be buried a minimum of 3 ½ feet below the soil surface. Horizontal brace posts should be 8 to 10 feet in length. Corner, gate and vertical brace posts must be anchored securely. Install a deadman where needed. Locate braced line post units at 660 feet intervals or at points of change in slope and in curves. Brace wire composed of number 9-gauge smooth wire or 12^1/2-gauge high tensile smooth wire may be used. Twist sticks (1/2 inch metal) or inline strainers will be used to tighten brace wire.

Post Installation Wood posts may be set in holes and backfilled with concrete or tamped earth except where otherwise specified. Steel and fiberglass posts shall be and wood posts may be driven unless otherwise specified. Wood posts may be set in holes with tamped ground limestone except where otherwise specified.

Post holes shall be at least 6 inches larger than the maximum diameter or side dimension of the posts when set in concrete or tamped ground limestone. Posts holes shall be at least 4 inches larger than

when set in concrete or tamped ground limestone. Posts holes shall be at least 4 inches larger than the maximum diameter or side dimension of the posts when tamped with earth except where otherwise specified.

Earth and limestone backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the post hole up to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than 12 inches and shall fill post hole six inches below ground surface or crowned above the ground surface. No stress shall be applied to posts set in concrete until at least 24 hours after the concrete has set.

Pull Assemblies Unless otherwise specified, corner assemblies shall be installed at all points where the fence alignment changes 15 degrees or more, at any section end including at gates, at stretches over 660 feet, and where the vertical angle change exceeds 15 percent or as otherwise specified. Double assemblies shall be used in corner and end assemblies in fence stretches over 1320 ft.

Wire and Hardware. All barbed wire fences will consist of a minimum of four strands of wire. Five strand fences should be used for farm borders. The first strand of a five strand fence will be placed at a minimum height of 10 inches above the soil surface with the remaining four strands placed at equal spaces not to exceed 12 inch intervals to comprise a total minimum height of 48 inches. Four strand fences will be used for interior fences. The first strand of a four strand fence will be placed 12 to 15 inches above the soil surface with the remaining three strands placed at equal spaces not to exceed 12 inch intervals to comprise a total minimum height of 48 inches. All wire and hardware used in the construction of this fence will be new galvanized material. All barbed wire will be double strand type and at least 12 ½ gauge or heavier malleable steel wire. Crimped, commercial designed splice sleeves or "Western Union" splice will be used where splicing is necessary.

Wire shall conform to the requirements shown on the drawings. Staples shall conform to the requirements shown on the drawings. Staples shall allow for wire movement. Wire attachment to steel and fiberglass posts shall be according to post manufacturers recommendations or two turns of 14 gauge galvanized wire.

The fencing wire (woven and barbed) shall be fastened to each end post, corner post, and pull post by wrapping each horizontal strand around the post and tying it back on itself with not less than three tightly wound wraps. High Tensile wire shall be fastened likewise except it shall be wound no less than five tight wraps or attached with a crimping sleeve.

Barbed wire shall not be energized.

Barbed wire Fence with T posts uses wood posts for all bracing ends and wood and/or steel T posts for line posts. A maximum of 10 ft. spacing shall be between post.

Energizers. Use a low-impedance energizer with a minimum of 5,000 volt output. The number of joules needed depends on the length of the fence, the number of electrified wires and severity of conditions. As a general rule you will need an energizer with a rating of 1 joule for every 5 miles of wire you want to electrify. Pulse duration should be between 30-65 pulses per minuet. The energizer should provide a minimum of 3,000 volts throughout the fence. All (110V/220V) operated energizers should be installed under cover in a protected area. Permanently installed solar powered energizers are best placed in the center of the area to be fenced.

Wire. High tension power fences (200-300 lbs. tension per wire) should be constructed of a minimum of 12 ½ gauge, 160,000 psi break strength, type III galvanized wire. Install the bottom wire first, then the next highest, etc. Attach wire to the livestock side of fence. All splices should be made using sleeves or links in order to maintain 100% of the strength of the wire.

Tensioning the Wire. Install strainers on each strand of wire at least 6 feet from any post. Attach strainers facing away from the end/corner post so that the wire strand is pulled toward the post. One in-line strainer per wire can tension approximately 4,000 linear feet of high tensile wire on a straight line fence over level terrain. Tensioning from the top down will provide clearance for turning the in-line handle. After 24 hours, check each wire again and correct the tension to the recommended 200 lb. pull.

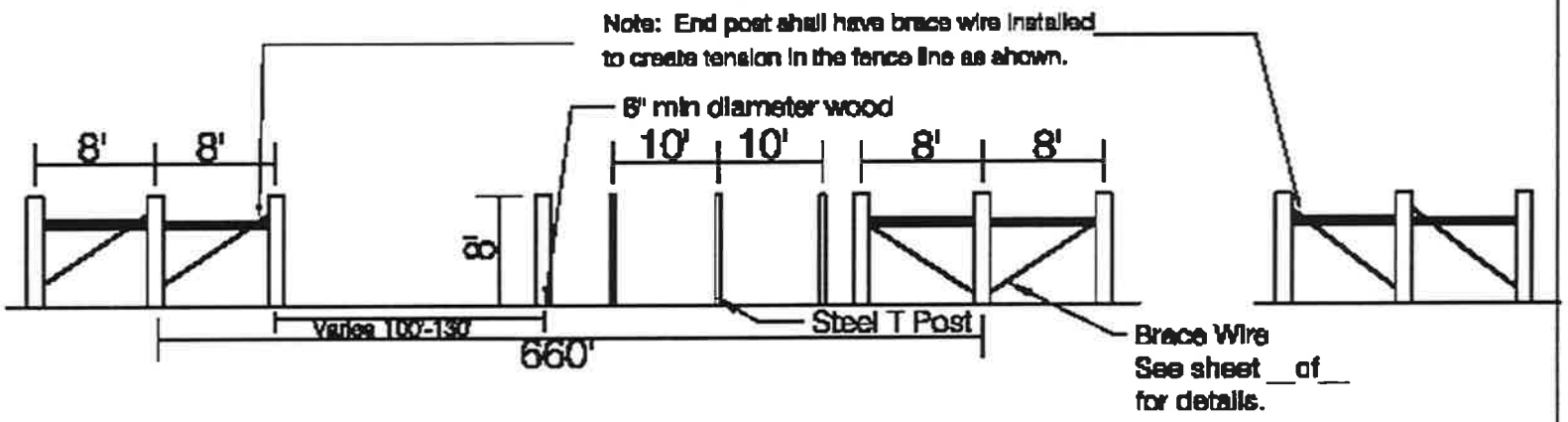
Staples. Use 1 ½ inch to 2-inch long, 9-gauge, hot-dipped, galvanized staples with cut points and barbs. Staples should be driven diagonally into posts without crimping the wire. The wire should be able to move through the staple to allow expansion and contraction of the wire.

Grounding. The energizer grounding system should be separate (at least 30 feet away) from any other driven grounds. The grounding system should consist of at least 24 feet (usually three 8-foot rods spaced 10 feet apart) of ground rod. One half inch diameter galvanized steel rods make the best ground rods. Energizers should be connected to ground rods with 12 ½ gauge direct burial (insulated) cable attached with ground rod clamps. Use one continuous wire to connect all ground rods for the energizer. Using a digital volt meter, the measured voltage between the last ground rod installed and an independent ground rod (a steel rod driven at least 8 inches into the soil, at least 3 feet away from the last ground rod in sequence) must be less than 200 volts.

Live Trees as Line Bracing

Live trees used for bracing and line posts shall have a diameter (DBH) equal to or greater than those prescribed for normal wooden posts (6 inches). A maximum of one tree per 660 ft. of fence will be allowed with no tree used as corner or end post. Some alignment variation shall be allowed, but caution should be taken to minimize offsets. Wire will not be fastened directly to trees. When using live trees, protection will be provided between the tree and wire (UC3 treated 2 x 4's, fiberglass or rigid plastic strip). Do not attach wire to short lived species such as elm. Do not use fast growing trees as post.

Maintenance. Repair or replace anchor post assemblies when they show signs of weakness. Refasten loose wires to posts and splice broken wires when necessary. Keep the fence wires properly stretched. This will be needed once or twice per year for high-tensile fences. Keep weeds and brush cleared from the fence line. Plan and follow a regular inspection routine for any needed maintenance. All earth (ground) systems should be tested at least once a year during the height of the dry season and, if necessary, improved by adding more ground rods.



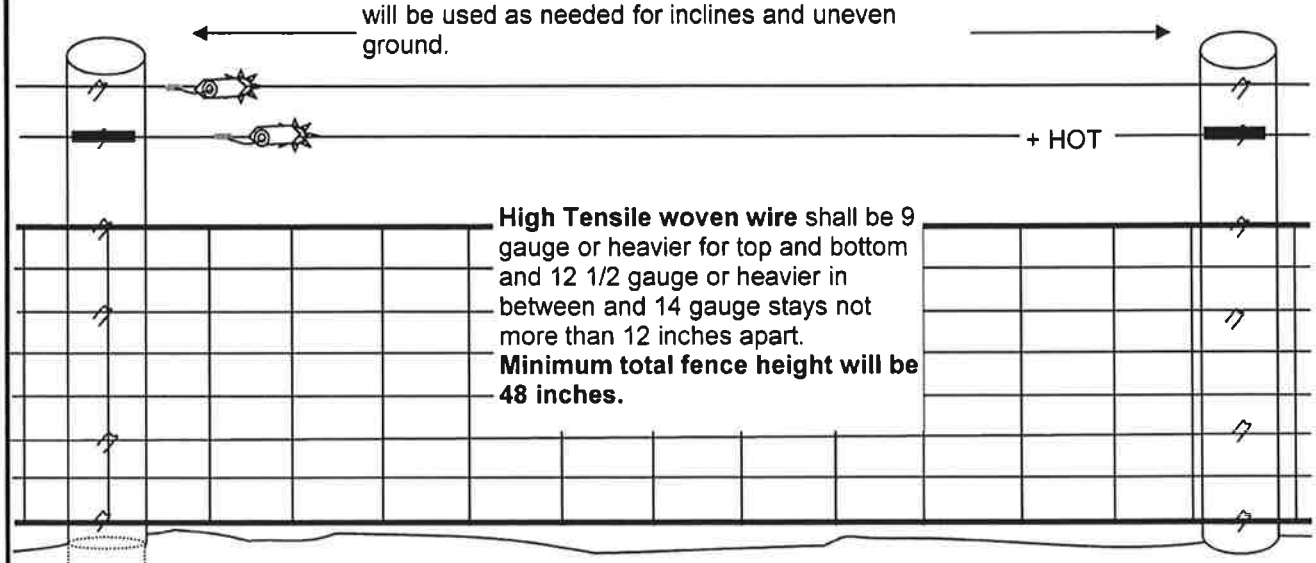
Fence

Not to Scale

Fence

Note: Wire not shown.

Maximum 25 feet between posts. Additional posts will be used as needed for inclines and uneven ground.

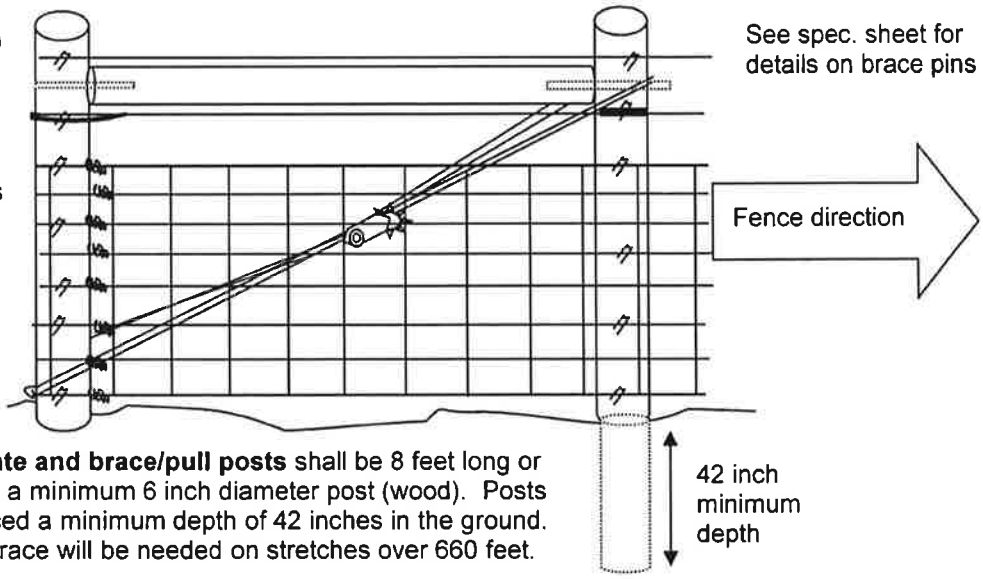


High Tensile woven wire shall be 9 gauge or heavier for top and bottom and 12 1/2 gauge or heavier in between and 14 gauge stays not more than 12 inches apart. **Minimum total fence height will be 48 inches.**

Wooden line posts shall be 84 inches long or longer with a minimum 4 inch diameter post. Posts will be placed a minimum depth of 30 inches in the ground. Posts can be driven or placed in a dug/drilled hole with well packed/tamped soil around them. Packed/tamped posts may need extra time to settle before applying full tension to high tensile wire or stretching woven wire.

High tensile wire must be Type III galvanized wi 12 1/2 gauge with a minimum tensile strength of 140,000 psi. **Insulators or Polytube Strips** that are used to fasten wire to wood posts shall be of high quality and have at least a 10 year warranty. Wire tension should be maintained at a mimimum of 2(pounds pressure per wire.

Wire for bracing shall be 1 or more strands of 9 gauge wire or heavier or 2 or more strands of 12 1/2 gauge High Tensile wire. Either rot resistant wood battons or strainers can be used to tighten the brace wire. Strainers provide an easier way to add tension after fence wires are in place.

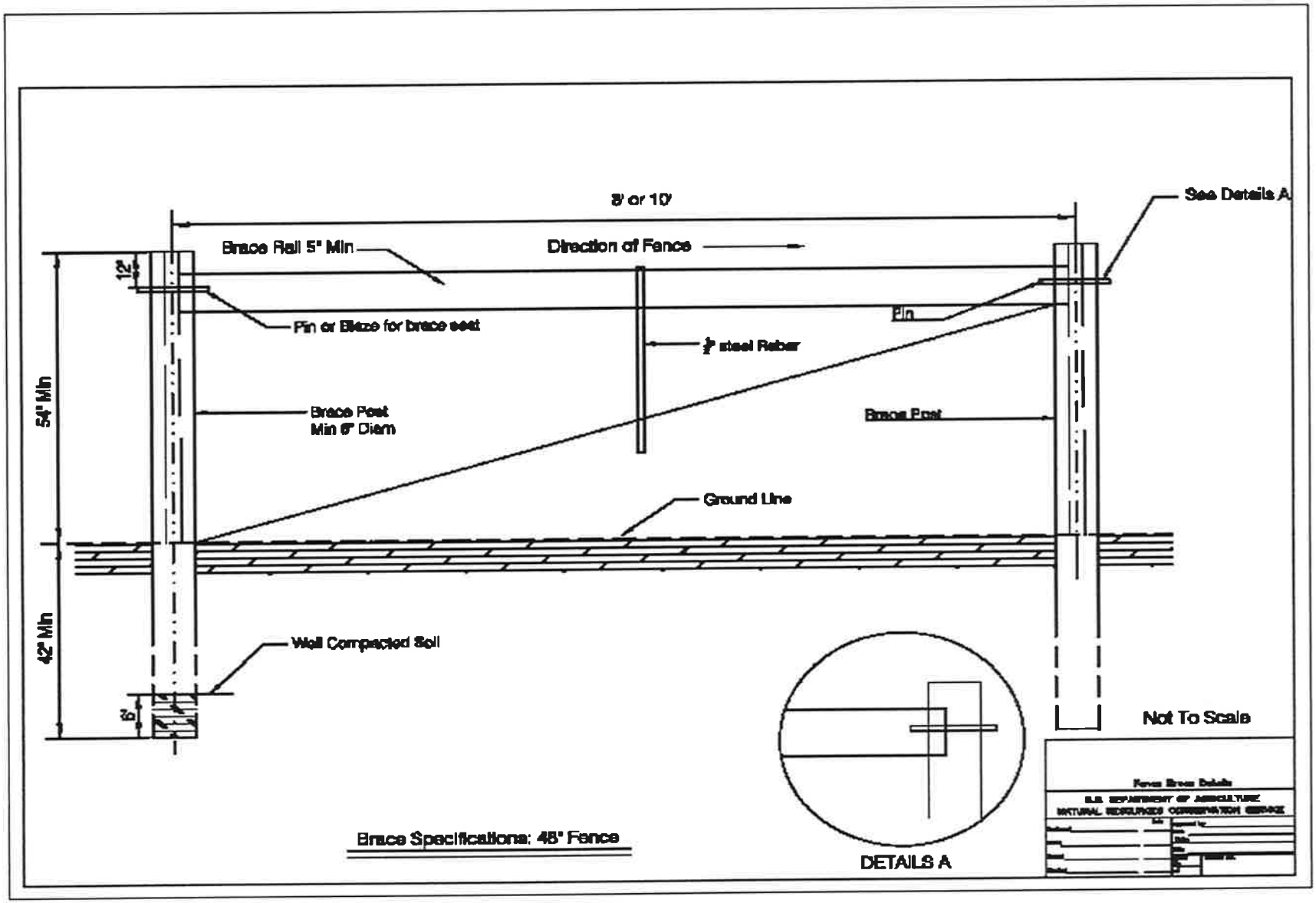


Corner, gate and brace/pull posts shall be 8 feet long or longer with a minimum 6 inch diameter post (wood). Posts will be placed a minimum depth of 42 inches in the ground. A double brace will be needed on stretches over 660 feet.

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Permanent High Tensile Woven Fence with Wood Posts MS-ecs 382 10 (js-ss)

Material Estimate for


8' or 10'
See Details A
Brace Rail 5" Min
Direction of Fence
12"
Pin or Blaze for brace seat
Pin
½" steel Rebar
54" Min
Brace Post
Min 6" Diam
Brace Post
Ground Line
42" Min
Well Compacted Soil
6"
Not To Scale
DETAILS A
Brace Specifications: 48" Fence

NOTE:

1. MAXIMUM ALLOWABLE DIMENSIONS ARE NOTED IN PARENTHESIS. PLANNED DIMENSIONS ARE TO BE INSERTED IN THE BLANK SPACES.
2. ALL PIPE DIAMETERS ARE NOMINAL SIZES. ALL PIPE SIZES ARE THE MINIMUM REQUIRED. PIPE MATERIAL SHALL MEET OR EXCEED ASTM A-53 FOR SCHEDULE 40 PIPE.
3. ALL STRUCTURAL MEMBERS, WELDS AND AREAS OF DAMAGE COATINGS SHALL BE GALVANIZED OR OTHERWISE PROTECTED WITH A ZINC DUST-OXIDE COATING.
4. LIVESTOCK SHADE STRUCTURE SHALL MEET THE REQUIREMENT OF NRCS-LA CONSERVATION PRACTICE STANDARD CODE 717.
5. MESH SHADE CLOTH SHALL PROVIDE AT LEAST 80% SHADE. SEE NRCS-LA CONSERVATION PRACTICE STANDARD CODE 717. FOR FABRIC MATERIAL, EDGING REQUIREMENTS AND ATTACHMENT METHODS.

BILL OF MATERIALS

GALVANIZED STEEL PIPE (SCHEDULE 40)

2" DIA. = _____ LIN. FT. (FRAME)

1¼" DIA. = _____ LIN. FT. (FRAME)

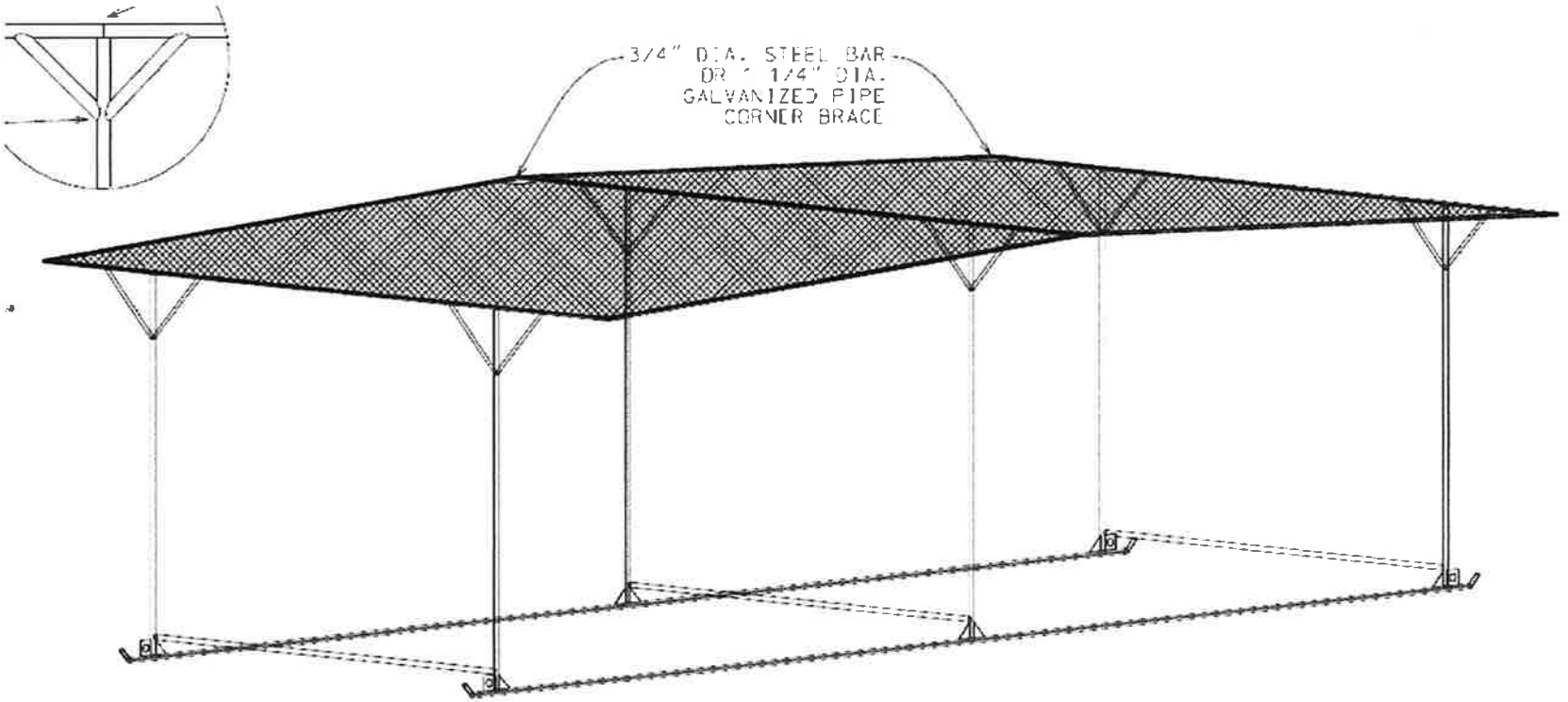
1¼" DIA. = 30.7 LIN. FT. (FRAME BRACES)

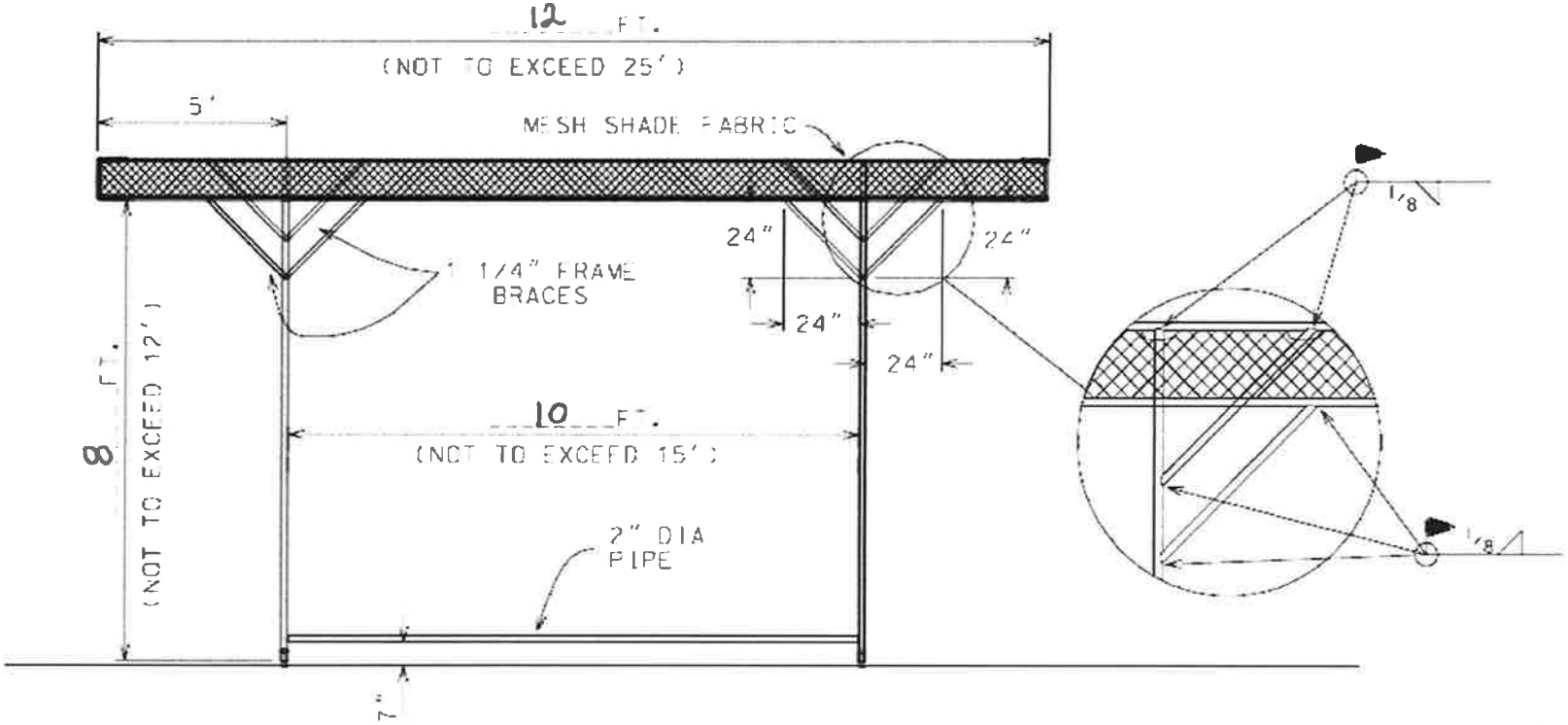
SHADE CLOTH:

12 FT. X 12 FT. = 144 SQ. FT.

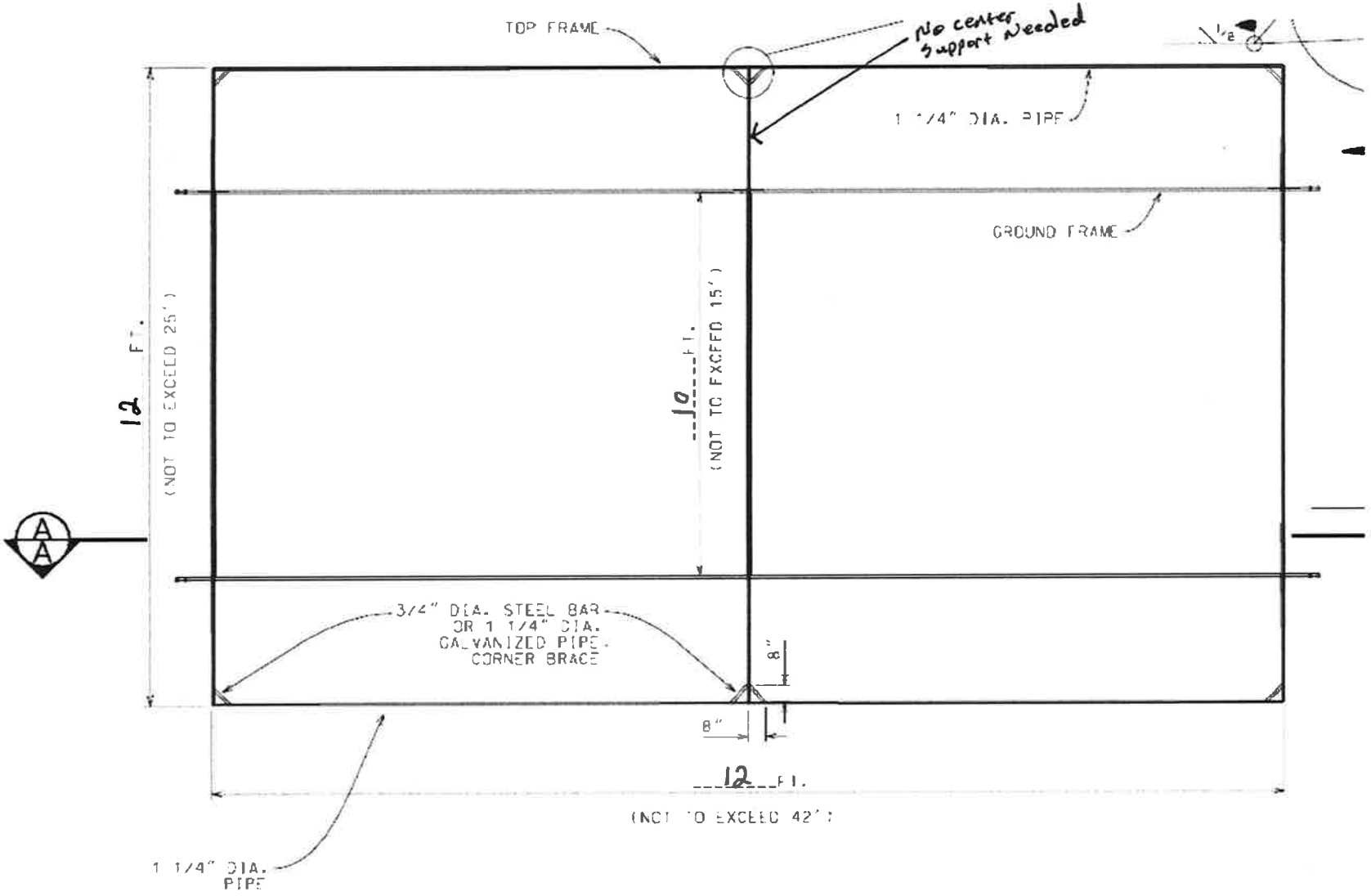
¼" STEEL PLATE = 2 SQ. FT.

¾" STEEL BAR OR 1¼" DIA. GALVANIZED PIPE FOR CORNER BRACES = 7.5 LIN. FT.

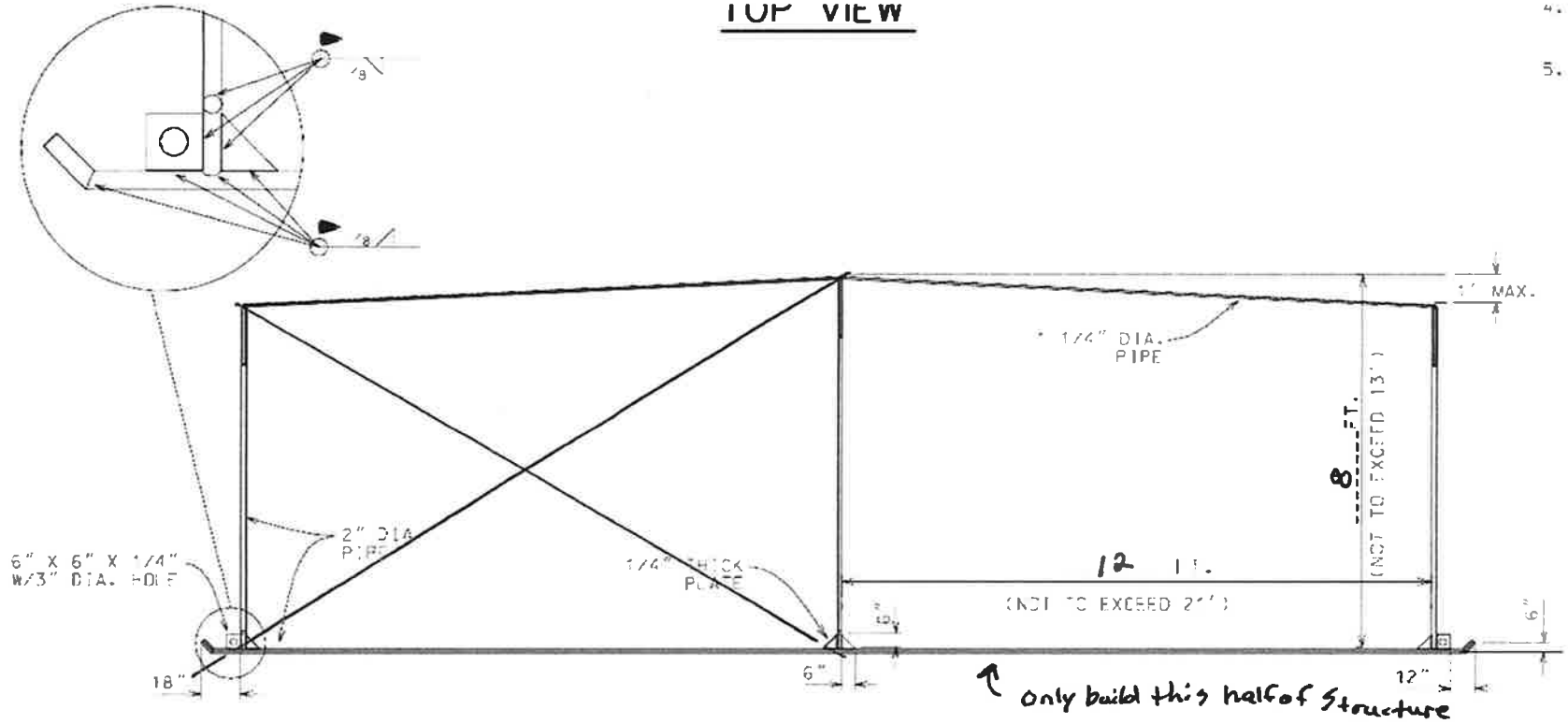



12 FT.
(NOT TO EXCEED 25')
5'
MESH SHADE FABRIC
1 1/4" FRAME BRACES
24"
24"
24"
24"
8 FT.
(NOT TO EXCEED 12')
10 FT.
(NOT TO EXCEED 15')
2" DIA PIPE
1/8
1/8

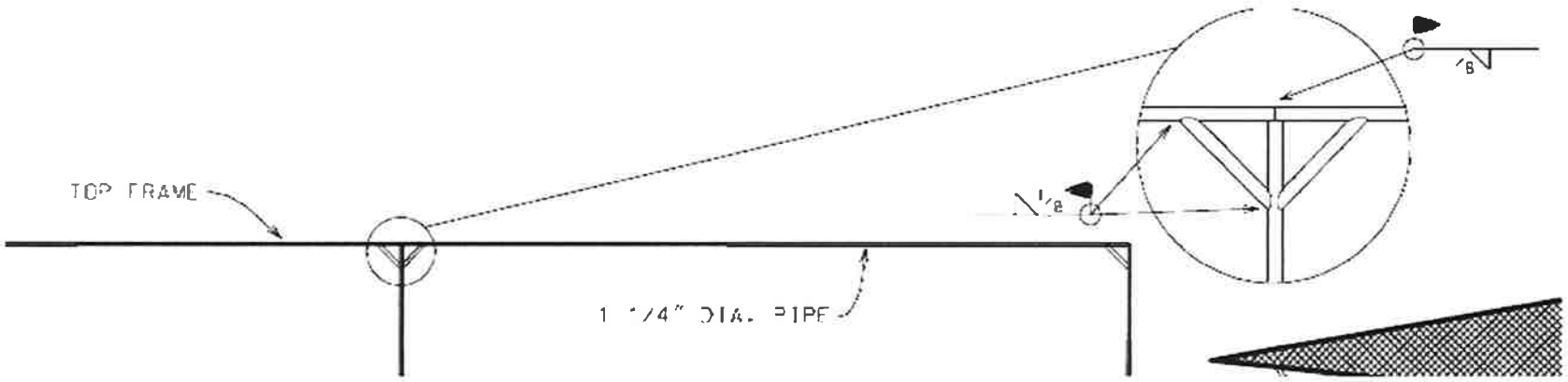
END VIEW


TOP FRAME
No center support Needed
1/2
1 1/4" DIA. PIPE
GROUND FRAME
12 FT.
(NOT TO EXCEED 25')
10 FT.
(NOT TO EXCEED 15')
A
A
3/4" DIA. STEEL BAR OR 1 1/4" DIA. GALVANIZED PIPE. CORNER BRACE
8"
8"
12 FT.
(NOT TO EXCEED 42')
1 1/4" DIA. PIPE

TOP VIEW



SECTION (A A)



Mississippi Agriculture and Forestry Museum

Conservation Practices

Practice Specifications

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

WATERING FACILITY

(No.)

CODE 614

DEFINITION

A permanent or portable device to provide an adequate amount and quality of drinking water for livestock and or wildlife.

PURPOSE

To provide access to drinking water for livestock and/or wildlife in order to:

- Meet daily water requirements
- Improve animal distribution

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where there is a need for new or improved watering facilities for livestock and/or wildlife.

CRITERIA

General Criteria Applicable To All Purposes

Design watering facilities with adequate capacity and supply to meet the daily water requirements of the livestock and/or wildlife planned to use the facility. Include the storage volume necessary to provide water between periods of replenishment. Refer to the National Range and Pasture Handbook for guidance on livestock water quantity and quality requirements. For wildlife, base water quantity and quality requirements on targeted species needs.

Locate facilities to promote even grazing distribution and reduce grazing pressure on sensitive areas.

Design the watering facility to provide adequate access to the animals planned to use the facility. Incorporate escape features into the watering facility design where local knowledge and experience indicate that wildlife may be at risk of drowning.

Include design elements to meet the specific needs of the animals that are planned to use the watering facility, both livestock and wildlife.

Protect areas around watering facilities where animal concentrations or overflow from the watering facility will cause resource concerns. Use criteria in NRCS Practice Standard 561, Heavy Use Area Protection to design the protection.

Install permanent watering facilities on a firm, level, foundation that will not settle differentially. Examples of suitable foundation materials are bedrock, compacted gravel and stable, well compacted soils. The site shall be well drained; if not, drainage measures shall be provided.

Design and install watering facilities to prevent overturning by wind and animals.

Design watering facilities and all valves and controls to withstand or be protected from damage by livestock, wildlife, freezing and ice damage.

Construct watering facilities from durable materials that have a life expectancy that meets or exceeds the planned useful life of the installation. Follow appropriate NRCS design procedures for the material being used or industry standards where NRCS standards do not exist.

Use the criteria in NRCS Practice Standard 516, Pipeline to design piping associated with the watering facility. Include backflow prevention devices on facilities connected to wells, domestic or municipal water systems.

Design

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office, or download it from the electronic Field Office Technical Guide.

NRCS, Mississippi
January 2012

Capacity/size. The trough or tank shall have adequate capacity to meet the water requirements of the livestock (50 to 100 percent of the cattle needs for the day). This will include the storage volume necessary to carry over between periods of replenishment. A plastic trough or tank (livestock waterers) shall be sized and provided in sufficient numbers according to the manufacturer's recommendations.

A trough or tank that is supplied by city or rural water systems or by gravity flow from a pond shall have a minimum capacity of 50 gallons.

The inside perimeter of an open top watering trough or tank shall provide a minimum of 1.5 inch of drinking space per animal unit (1 animal unit equals 1,000 lb. of animal).

The trough or tank height may vary from 22 to 36 inches for horses, beef and dairy cattle. For sheep and goats, the minimum height shall be 8 inches.

The capacity of the water supply system to the trough or tank shall be based on the anticipated herd size served by the system and shall deliver the water in a relatively short period of time each day (6 hours or less). For supplying livestock water, the system shall have a capacity to provide at least 12 gallons per head per day for beef cattle and horses, 25 gallons per head per day for dairy cattle, and 1.5 gallons per head per day for sheep and goats. These requirements may need adjusting based on climatic conditions, type of feed, and other factors.

Gravity feed systems shall have sufficient head to supply the water for the design number of animals. Minimum elevation head shall be 4 feet (planned permanent water surface of pond or spring box to lip of trough or tank).

Location. The trough or tank shall be located to provide natural surface and subsurface drainage. The trough or tank shall not be located adjacent to any well head. A separation distance of at least 150 ft. is needed for well head protection. If possible, locate the trough or tank down gradient from the well head. The location shall have easy access by livestock and also provide good grazing distribution.

Heavy use protection. An area of at least 10 ft. outside of the trough or tank that will be trampled by livestock shall be graveled, paved, or otherwise treated to provide firm footing and reduce erosion according to Conservation Practice Standard Code 561, Heavy Use Area Protection. A portable trough or tank used in intensive rotational systems which can maintain vegetative growth around the trough or tank is not required to have heavy use area protection. When concrete is used as a heavy use protection, the surface shall have a roughened finish and slope away from the trough or tank to prevent ponding of water on the concrete surface.

Trough or tank materials. The quality and durability of all materials shall be in keeping with the planned useful life of the installation. Common construction materials are reinforced concrete, galvanized steel, plastic, fiberglass, and large used equipment tires.

A reinforced concrete trough or tank shall be constructed of good quality concrete using sound, clean aggregates. The concrete mix shall be such that it will produce a compressive strength of 3,000 psi at 28 days. A concrete cast trough or tank shall have a minimum base thickness of 4 inches and a minimum wall thickness of 3 inches. Minimum steel reinforcement shall be one of the following:

- 3/8" bars spaced on 8-inch centers in both directions.
- 8 gauge welded wire mesh.

A galvanized steel tank shall have a wall thickness of at least 20 gauge.

A fiberglass tank shall be made of glass reinforced polyester to the manufacturer's design for the intended purpose. Minimum thickness of the walls and floor shall be 1/4 inch. All surfaces shall be coated with either a white gel coat at the time of manufacture or a polyester resin at time of installation to prevent deterioration due to sunlight and to keep the tank serviceable. The top edge of the tank rim shall be protected with a 1 to 2 inch molded flange or other acceptable reinforcement.

A plastic trough or livestock waterers shall be made of polyethylene material to the manufacturer's design for the intended purpose. A freeze-proof plastic trough shall be equipped with floating plastic balls, electric heat elements, or heat wells as needed to ensure the water in the trough does not freeze.

When a heavy equipment tire is used as a trough or tank, it shall be of suitable quality to perform as intended for the useful life of the practice. The tire shall be free of chemicals injurious to livestock. An approved standard drawing shall be used to prepare site specific designs for this type of tank.

Appurtenances. A trough or tank shall be equipped with a suitable water supply pipe, drainage outlet, and overflow outlet, either as individual outlets or a combination of outlets. Plumbing shall be new galvanized steel, copper, bronze, or plastic pipe and fittings in conformance with Conservation Practice Standard- Pipeline, Code 516. Water supply pipelines are to have a minimum inside diameter of 1 1/4 inch for gravity flow systems or 3/4 inches for pressurized systems. The supply lines shall be connected in a manner to prevent leakage.

A water level control valve or overflow pipe shall be used to maintain the water at least 1 1/2 inches below the top of the trough or tank. New galvanized steel or plastic pipe and fittings shall be used for the overflow pipe and shall have a minimum diameter of 1 1/2 inches.

Drainage outlets for systems with flow-through water must extend at least 10 feet from the trough or tank and outlet at a location to provide a safe and stable discharge. The outlet location must not be accessible to the livestock.

Provisions shall be provided in the plumbing for drainage of the tank or trough for maintenance.

CONSIDERATIONS

Design fences associated with the watering facilities to allow safe access and exit for area wildlife species. To protect bats and other species that access water by skimming across the surface, fencing material should not extend across the water surface. If fencing across the water is necessary it should be made highly visible by avoiding the use of single wire fences and using fencing materials such as woven wire or by adding streamers or coverings on the fence.

For watering facilities that will be accessible to wildlife, give consideration to the effects the location of the facility will have on target and non-target species. Also consider the effect of introducing a new water source within the ecosystem in the vicinity of the facility. This should include things such as the concentration of grazing, predation, entrapment, drowning, disease transmission, hunting and expansion of the wildlife populations beyond the carrying capacity of available habitat.

Consider the following guidelines for materials commonly used for watering facilities.

Concrete	3000 psi compressive strength
Galvanized Steel	20 gauge thickness
Plastic	Ultraviolet resistance
Fiberglass	Ultraviolet resistance

Where water is supplied continuously or under pressure to the watering facility, consider the use of automatic water level controls to control the flow of water to the facility and to prevent unnecessary overflows.

Watering facilities often collect debris and algae and should be cleaned on a regular basis. Consider increasing the pipe sizes for inlets and outlets to reduce the chances of clogging. Maintenance of a watering facility can be made easier by providing a method to completely drain the watering facility.

Steep slopes leading to watering facilities can cause erosion problems from over use by animals as well as problems with piping and valves from excess pressure. Choose the location of watering facilities to minimize these problems from steep topography.

PLANS AND SPECIFICATIONS

Plans and specifications for watering facilities shall provide the information necessary to install the facility and shall be in keeping with this standard. If the watering facility is a component of a system that includes additional conservation practices, the information necessary to construct these additional practices shall be conveyed on the plans. As a minimum this shall include the following:

- A map or aerial photograph showing the location of the facility
- Detail drawings showing the facility, necessary appurtenances (such as foundations, pipes and valves) and stabilization of any areas disturbed by the installation of the facility
- Construction specifications describing the installation of the facility

OPERATION AND MAINTENANCE

An O&M plan specific to the type of watering facility shall be provided to the landowner. As a minimum the plan shall include, but not be limited to, the following items:

- a monitoring schedule to ensure maintenance of adequate inflow and outflow;
- checking for leaks and repair as necessary;
- if present, the checking of the automatic water level device to insure proper operation;
- checking to ensure that adjacent areas are protected against erosion;
- if present, checking to ensure the outlet pipe is freely operating and not causing erosion problems;
- a schedule for periodic cleaning of the facility;
- winter weather guidance.

REFERENCES

Brigham, William and Stevenson, Craig, 1997, Wildlife Water Catchment Construction in Nevada, Technical Note 397.

Tsukamoto, George and Stiver, San Juan, 1990.Wildlife water Development, Proceedings of the Wildlife Water Development Symposium, Las Vegas, NV, USDI Bureau of Land Management.

Yoakum, J. and W.P. Dasmann. 1971. Habitat manipulation practices. Ch. 14 in Wildlife Management Techniques, Third Edition. Ed. Robert H. Giles, Jr. Pub. The Wildlife Society. 633 pp.

National Engineering Handbook, Part 650 Engineering Field Handbook, Chapters 5, 11 & 12, USDA Natural Resources Conservation Service.

National Range and Pasture Handbook, Chapter 6, Page 6-12, Table 6-7 & 6-8, USDA-Natural Resources Conservation Service.

NRCS Practice Standard 561, Heavy Use Area

NRCS Practice Standard 516, Pipeline

Table 1. COARSE AGGREGATE (CRUSHED STONE) GRADATIONS											
Aggregate	Percent Passing by Weight (mass), each Laboratory Sieve										
	2 in.	1.5 in.	1 in.	3/4 in.	1/2 in.	3/8 in.	#4	#8	#16	#50	#200
5		100	90-100	20-55	0-10	0-5					
56		100	90-100	40-85	10-40	0-15	0-5				
57		100	95-100		25-60		0-10	0-5			
6			100	90-100	20-55	0-15	0-5				
67			100	90-100		20-55	0-10	0-5			
68			100	90-100		30-65	5-25	0-10	0-5		
610			100	90-100		25-60		7-30		0-15	
Type "A" Crushed Aggregate Base			100	86-100			26-55	15-41		3-18	5-15
Type "B" Crushed Aggregate Base	100	90-100	75-98		55-80		40-70	28-54	19-42	9-32	7-18

Natural Resources Conservation Service
Construction Specifications

HEAVY USE AREA PROTECTION

1. SCOPE

This item shall include all plans, specifications, construction operations, and vegetation required for the installation of heavy use areas. Construction operations shall be done in such a manner that soil erosion and air, water, and noise pollution will be minimized and held within legal limits as specified by state regulations.

2. CLEARING AND GRUBBING

All trees, stumps, roots, brush, weeds, and other objectionable material will be removed from the work area as required for proper installation of the planned and designed measure. Disposal shall be by burning, burying at approved locations, or removing from the site and stacking. All burning shall conform to state laws and regulations.

3. CONSTRUCTION

Where surface treatment of the area is required, prescribed construction procedures shall be followed.

If subgrade is required, it shall be brought to the required elevations by the removal of unsuitable material and by necessary grading, filling, and leveling. The subgrade surface shall be compacted according to design specifications. All soft spots discovered during compaction operations will be removed and replaced with suitable material.

After subgrade preparation in urban and recreational areas, the base course will be laid, mixed as necessary to provide a pulverized, homogeneous mixture, and thoroughly compacted, first with a sheepsfoot roller and then with a rubber-tired or pneumatic-tired roller.

Geotextile will be non-woven type of the grade specified and installed according to manufacturer's or design specifications. Equipment will not be allowed to operate directly on top of the geotextile fabric without a cushion of gravel or stone.

4. PROTECTION

Vegetation or heavy use area treatment shall be applied as shown in the plans and specifications. Vegetation will include seedbed preparation, liming, fertilizing, seeding, and either mulching or netting when needed and specified.

Natural Resources Conservation Service
Construction Specification

LIVESTOCK PIPELINE (516)

1. SCOPE

Work shall consist of furnishing and installing the pipeline, fittings, and appurtenances as specified on the drawings. The pipeline shall be located as shown on the drawings or as staked in the field.

2. SITE PREPRATION

The pipeline location shall be cleared as needed for trenching and installation of the pipeline. Cleared material shall be disposed of by burning, burying, or other approved method.

3. INSTALLATION

a. Placement

Pipelines shall be placed so that they are protected against hazards imposed by traffic, farm operations, freezing temperatures, or soil cracking. Other means of protection must be provided if the depth required for protection is impracticable because of shallow soils over rock or for other reasons. The minimum cover over the pipeline shall be 30 inches. Low areas may be filled to provide minimum cover. Abrupt changes in grade must be avoided to prevent rupture of the pipe.

Trenches for plastic pipelines all be free of rocks and other sharp-edged materials, and the pipe shall be carefully placed to prevent damage.

Plastic pipelines may be placed by plow-in equipment if soils are suitable and rocks and boulders will not damage the pipe.

All fittings and connections shall be installed and sealed in accordance with manufacturer's recommendations.

b. Testing

Pipelines shall be pressure tested by one of the following methods:

(1) Before backfilling, the pipe should be filled with water and tested at the design working head or at a head of 10 feet, whichever is greater. All leaks must be repaired. The test must be successfully repeated without leaks before backfilling.

(2) The pipe should be pressure tested at the working pressure for 2 hours. The allowable leakage shall not be greater than 1 gallon per diameter inch per mile. If leakage exceeds this rate, the defect must be repaired until retests show that the leakage is within the allowable limits. However, all visible leaks must be repaired.

c. Backfilling

All backfilling shall be completed before the line is placed in service. For plastic or copper pipe, the initial backfill shall be of selected material that is free of rocks or other sharp-edged material that can damage the pipe. Deformation or displacement of the pipe must not occur during backfilling.

Plastic pipelines installed by the plow-in method require surface compaction and shaping in addition to the normal plow-in operations.

Installation and backfilling shall be done in a workmanlike manner. Provisions shall be made for stabilizing disturbed areas and controlling erosion, as necessary.

4. VEGETATION

All disturbed areas shall be shaped and graded to blend with the surrounding area. Fertilizers and lime shall be applied as necessary to the disturbed area, incorporated by disking as necessary, and the area seeded in accordance with requirements of Critical Area Planting (342).

Natural Resources Conservation Service
Conservation Practice Standard

GRASSED WATERWAY
(Ac.)
CODE 412

DEFINITION

A shaped or graded channel that is established with suitable vegetation to carry surface water at a non-erosive velocity to a stable outlet.

PURPOSE

- To convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding.
- To reduce gully erosion.
- To protect/improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

All sites where added water conveyance capacity, vegetative protection, or both are required to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices. This practice is not applicable where its construction would destroy important woody wildlife cover and the present watercourse is not seriously eroding.

CRITERIA

General Criteria Applicable to All Purposes

Plan, design, and construct grassed waterways to comply with all Federal, State, and local laws and regulations.

Capacity. The minimum capacity shall convey the peak runoff expected from the 10-year frequency, 24-hour duration storm. Capacity shall be increased as needed to account for potential volume of sediment expected to accumulate in the waterway between planned maintenance activities. When the waterway slope is less than 1 percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum in such cases shall be the capacity required to remove the water before crops are damaged.

Stability and Velocity. Determine the minimum depth and width requirements for stability of the grassed waterway using the procedures in the NRCS National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 7, Grassed Waterways; Agricultural Research Service (ARS) Agriculture Handbook 667, Stability Design of Grass-Lined Open Channels; or other equivalent method.

Design velocities shall not exceed those obtained by using the procedures, "n" values, and recommendations in the Engineering Field Handbook. Design velocities in grassed waterways shall not exceed 5.0 ft/sec. Good vegetative cover, mulch netting, temporary gully barriers, and proper maintenance will be needed to establish and maintain waterways having velocities approaching 5.0 ft/sec.

Width. The bottom width of trapezoidal waterways shall not exceed 100 ft unless multiple or divided waterways or other means are provided to control meandering of low flows.

Side slopes. Side slopes shall not be steeper than a ratio of two horizontal to one vertical. Accommodate the equipment anticipated to be used for maintenance and tillage/harvesting equipment that will cross the waterway in the designed width.

Depth. The minimum depth of a waterway that receives water from terraces, diversions, or other tributary channels shall be that required to keep the design water surface elevation at, or below, the design water surface elevation in the terrace, diversion, or other tributary channel at their junction when both are flowing at design depth. A minimum of 0.2 foot shall be added to the design depth for freeboard.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Drainage. Subsurface drains (606), underground outlets (620), stone center waterways, or other suitable measures shall be provided for in the design for sites having prolonged flows, a high water table, or seepage problems. Water-tolerant vegetation may be an alternative on some wet sites.

Outlets. All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earth ditch, a grade stabilization structure, or other suitable outlets.

Waterbars or berms. Waterbars or berms should be installed if needed to force water into the waterway.

Vegetation Establishment. Grassed waterways shall be vegetated according to NRCS Practice Standard Critical Area Planting (342). Species selected shall be suited to the current site conditions and intended uses. Selected species will have the capacity to achieve adequate density, height, and vigor within an appropriate time frame to stabilize the waterway.
Establish vegetation as soon as conditions permit. Use mulch anchoring, nurse crop, rock, straw or hay bale dikes, fabric checks, filter fences, or runoff diversion to protect the vegetation until it is established. Planting of a close growing crop, e.g. small grains or millet, on the contributing watershed prior to construction of the grassed waterway can also significantly reduce the flow through the waterway during establishment.

CONSIDERATIONS

Timing. The vegetation should be well established before large flows are permitted in the channel. Vegetation will be established prior to construction of terraces or diversions unless special protection such as mulch anchoring or other suitable methods are used.

Establish an appropriate width of vegetation on one or both sides of the waterway or add other sediment control measures above the waterway such as residue management to improve water quality and reduce sediment deposition in the waterway. Consider increasing the channel depth and/or designing areas of increased width or decreased slope to trap and store sediment to reduce the amount of sediment that leaves a field. Be sure to provide for regular cleaning out the waterway when trapping sediment in this manner.

Avoid areas where unsuitable subsurface, subsoil, substratum material that limits plant growth such as salts, acidity, root restrictions, etc., may be exposed during implementation of the practice. Where areas cannot be avoided, seek recommendations from a soil scientist for ameliorating the condition or, if not feasible consider over-cutting the waterway and add topsoil over the cut area to facilitate vegetative establishment.

Avoid or protect if possible important wildlife habitat, such as woody cover or wetlands when determining the location of the grassed waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of grassed waterways so they do not interfere with hydraulic functions. Medium or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat. Waterways with these wildlife features are more beneficial when connecting other habitat types; e.g., riparian areas, wooded tracts and wetlands. When possible, select the species of vegetation that can serve multiple purposes, such as benefiting wildlife, while still meeting the basic criteria needed for providing a stable conveyance for runoff.

Water-tolerant vegetation may be an alternative to subsurface drains or stone center waterways on some wet sites.

Use irrigation in dry regions or supplemental irrigation as necessary to promote germination and vegetation establishment.
Provide livestock and vehicular crossings as necessary to prevent damage to the waterway and its vegetation.

Add width of appropriate vegetation to the sides of the waterway for wildlife habitat.

Consider including diverse legumes or other forbs that provide pollen and nectar for native bees. In dry regions, these sites may be able

to support flowering forbs with higher water requirements and thus provide bloom later in the summer.

The construction of a grassed waterway can disturb large areas and potentially affect cultural resources. Be sure to follow state cultural resource protection policies before construction begins.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for grassed waterways that describe the requirements for applying the practice according to this standard. As a minimum the plans and specifications shall include:

- A plan view of the layout of the grassed waterway.
- Typical cross sections of the grassed waterway(s).
- Profile(s) of the grassed waterway(s).
- Disposal requirements for excess soil material.
- Site specific construction specifications that describe in writing the installation of the grassed waterway. Include specification for control of concentrated flow during construction and vegetative establishment.
- Vegetative establishment requirements.

OPERATION AND MAINTENANCE

Provide an operation and maintenance plan to review with the landowner. Include the following items and others as appropriate in the plan.

- Establish a maintenance program to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.
- Protect waterway from concentrated flow by using diversion of runoff or mechanical means of stabilization such as silt fences, mulching, haybale barriers and etc. to stabilize grade during vegetation establishment.
- Minimize damage to vegetation by excluding livestock whenever possible, especially during wet periods. Permit grazing in the waterway only when a controlled grazing system is being implemented.
- Inspect grassed waterways regularly, especially following heavy rains. Fill, compact, and reseed damaged areas immediately. Remove sediment deposits to maintain capacity of grassed waterway.
- Avoid use of herbicides that would be harmful to the vegetation in and adjacent to the waterway area.
- Avoid using waterways as turn-rows during tillage and cultivation operations.
- Mow or periodically graze vegetation to maintain capacity and reduce sediment deposition. Mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover.
- Apply supplemental nutrients as needed to maintain the desired species composition and stand density of the waterway.
- Control noxious weeds.
- Do not use waterways as a field road. Avoid crossing with heavy equipment when wet.

REFERENCES

USDA, ARS. 1987. Stability design of grass-lined open channels. Agriculture Handbook 667.

USDA, NRCS. 2007. National Engineering Handbook, Part 650, Engineering Field Handbook, Chap. 7, Grassed waterways.

NRCS Conservation Practice Standard:
342 – Critical Area Planting
606 – Subsurface Drains
620 – Underground Outlets

Natural Resources Conservation Service
Construction Specifications

DIVERSION

1. SCOPE

Work shall consist of constructing the diversion, including the channel, supporting ridge, and outlets to the lines and grades as shown on the drawings or as staked in the field. The location of the diversion shall be as shown on furnished drawings or as staked in the field.

2. SITE PREPARATION

All old terraces, fence rows, brush, and tall standing vegetation shall be removed from the area occupied by the diversion ridge and the area from which the earthen construction material will be taken. All brush, logs, stumps, or other debris must be removed from the diversion ridge or channel area and disposed of by burning, burying, or removal from field area.

3. MATERIAL

Material for earthfill shall be obtained from one or a combination of the following locations: (1) excavation in the channel, (2) immediately downhill of supporting ridges, or (3) other designated areas. Earthfill shall be free of objectionable materials such as brush, roots, and rock particles that endanger the performance of the diversion. Topsoil should be stockpiled and spread over excavated channel and borrow areas to facilitate re-vegetation.

4. PLACEMENT OF EARTHFILL

All fills shall be full-bodied, with cross section conforming to that specified at all stations. Top of the constructed ridge shall not be lower at any point than the design elevation with required freeboard plus the specified overbuild for settlement. The specified overbuild for settlement shall be as follows:

- 5% of the designed fill height for motorgraders and similar equipment
- 10% of the designed fill height for dozers, disk plows, and similar equipment

All survey rod readings taken to determine ridge dimensions shall be taken in a man's footprint that has had his full weight applied. Construction equipment shall be routed over the fill to provide compaction such that no bridging results. The ridge top, side slopes, end closures, channel, and other excavated areas shall be finished to smoothness so the surface can be readily traveled upon by farm type equipment.

Final construction shall be considered satisfactory when:

- Fill elevations are at or within 0.5 foot above design height (including settlement).
- Excavation elevations are within $\pm$ 0.2 foot of design grade and have a positive slope toward the outlet.
- Fill slopes are no steeper than 3.0:1 on the diversion ridge of steeper than 6.0:1 on uphill channel slope.

5. UNDERGROUND CONDUIT

Underground conduits, when used, will be located under the diversion and be installed using mechanical compaction or water packing procedures. Installation and backfill of conduit trenches shall be made in advance of diversion construction to allow adequate settlement. Materials used for the inlet and conduit shall be suitable for the purpose intended and meet the requirements of subsurface drains (606).

Underground conduit installations shall be considered satisfactory when the pipe is within +0.3 foot of design grade and has a positive slope toward the outlet.

6. MEASUREMENT

Measurement will be along the diversion ridge. The amount of earthfill or excavation, as appropriate, will be the design yardage computed from the natural ground line to the neat line as specified. Linear measurement along the diversion ridge shall be to the nearest 1 foot. When used, volume of

earthfill or excavation will be computed to the nearest cubic yard.

Measurement for vegetative planting area will cover all disturbed areas (ridge, channel, borrow, disposal) that are not to be cultivated. Areas will be measured to the nearest 0.1 acre.

Measurement of underground conduit will be the field laying length from the inlet end to the outlet end. No separate accounting of appurtenances (band, tee, ell, etc.) will be made. The length of each pipe size used will be identified.

7. CONSTRUCTION DETAILS

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

INTERIM STANDARD
LIVESTOCK SHADE STRUCTURE
(No.)

Code 717

DEFINITION

A permanent or portable, framed structure with a mesh fabric roof to provide shade for livestock.

PURPOSE

This practice may be applied as part of a resource management system to provide shade areas for livestock, helping protect surface waters from pollution and the livestock from excessive heat.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to areas:

(1) where animal productivity and well being is adversely affected by heat generated from sunshine; or

(2) where livestock are excluded from natural shade along streambanks or other water courses.

CRITERIA

Federal, state, and local laws. All planned work shall comply with all Federal, state, and local laws and regulations.

General. Livestock shade structures can be permanent or be made to be moveable with farm equipment. The structure(s) shall be sized to meet the needs of the livestock operation but shall not be less than 80% of the recommended shade requirement (see Table 1). The maximum size of an individual portable unit (shade frame) shall be limited to 25 feet by 42 feet.

Orientation. If it is desirable for the area to be kept dry, the longest axis shall be oriented in a general north to south direction. This will permit a greater amount of sunshine to affect the total shaded area. If the animals are to be confined under the structure, then an east to west orientation of the long axis is more desirable.

Protection. The top of the structure shall be relatively flat so that strong winds will have minimum effect on the structure. A 1.0-foot pitch for the top of the structure is permissible to provide faster rain runoff from the roof.

Location. The structure shall be located on a well-drained site, if possible, and as far as practicable but no less than 200 feet from any surface water, at least 150 feet from an up gradient well, and at least 300 feet from a down gradient well. If a well-drained site is not possible, a portable structure shall be used. The structure shall be located a minimum of 50 feet from any type structure that could be an obstruction to the circulation of air. Portable structures shall be moved to new locations periodically to prevent destruction of vegetation in the immediate area. The structure shall not be located in the general vicinity of a water source or mineral block in order to create a desired livestock-grazing pattern.

Materials. Planning, design, and construction shall ensure the structure is sound and of durable materials commensurate with an anticipated life of 10 years.

Steel Structural Members. The main structural members shall be constructed of 2 inches minimum, nominal diameter steel pipe meeting or-exceeding the requirements of ASTM A-53 for Schedule 40 pipe (wall thickness of 0.154 inch). Longitudinal members of the top frame shall be constructed of $1^{1}/_{4}$ inches minimum nominal diameter steel pipe meeting or exceeding the requirements of ASTM A-53 for Schedule 40 pipe

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.

(wall thickness of 0.140 inch). All structural members, welds and areas of damaged coatings shall be galvanized or otherwise protected with a zinc dust-oxide coating. The protective coating of the pipe is not required if the pipe wall thickness exceeds the minimum wall thickness by at least 20 percent.

Vertical member spacing shall not exceed 21 feet in the longitudinal direction and 15 feet in the traverse direction. The length of vertical members shall not exceed 12 feet except that length may be increased to 13 feet to provide slope (pitch) to the top of structure. A minimum height of 7 feet shall be provided for a swine shade structure.

Bracing shall be provided at the junction of all structural members. The corners of the roof frame shall be braced with a $^3/_4$-inch diameter steel bar, $1^1/_4$ inches minimum steel pipe or other methods providing equivalent rigidity. At junctions of vertical members with roof frame and ground frame, knee braces of equivalent section shall provide bracing to the main members, 1/4-inch gusset plates or other methods providing equivalent rigidity. All welding shall be continuous, professionally completed, and suitable for the material used.

Wooden Structural Members. Wood design for permanent or portable structures shall be in accordance with sound engineering principles. Pressure treatment requirements shall be accordance with criteria in NRCS conservation practice Waste Storage Facility, Code 313.

Fabric. Mesh shade cloth shall be constructed of high-quality polypropylene fabric or similar materials and shall be recommended by the manufacturer to be suitable for this use. The cloth shall provide at least an 80% shade level and be made with ultraviolet light (UV) protective materials. The edges of the fabric shall be taped and/or sewn to not unravel and grommets shall be installed on the edges of the cloth at maximum intervals of 2 feet.

The shade cloth shall be adequately secured to the shade cloth frame with UV protected polypropylene rope or other equivalent methods so as to provide adequate and even tension on the fabric in accordance with the manufacturer's recommendations.

CONSIDERATIONS

The recommended shade requirement for livestock is shown in Table 1:

Table 1- Recommended shade requirement.

Animal Type	Recommended Shade Requirement (ft^2/hd)
400 pound calves	23
800 pound feeders	32
Beef cows	40
Dairy cows	50
Mature swine	20

The manufacturer typically warrants the cloth for at least 5 years. Replacement of the cloth may be necessary during the life of the structure.

Tie-down of portable structures at the four corners is recommended for protection.

Removal and storage during the winter months can extend the life of the shade cloth.

Consider the use of fabric designed to allow wind to easily pass through the fabric while still providing shade.

Construct the bottom of portable structures with skids to make relocation easier.

Consider applying NRCS conservation practice Heavy Use Area Protection, Code 561 where vegetation cannot be maintained underneath the shade structure.

Shade structures will have a minimal or no affect on the water budget.

The shade structure should have an overall positive impact on water quality by reducing the cattle loafing times in riparian areas.

Due consideration should be given to economics, the overall waste management system plan, and safety and health factors.

PLANS AND SPECIFICATIONS

Plans and specifications for livestock shade structure shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purposes. Plans and specifications shall include construction plans, drawings, job sheets or other

similar documents. These documents shall specify the requirements for installing the practice, including the kind, dimensions, amount, material coatings, and quality of materials to be used.

OPERATION AND MAINTENANCE

Shade cloth should always be kept tight so that it will not be damaged by wind.

Replace the cloth when it has deteriorated due to environmental conditions.

Maintenance coatings may need to be replaced on the structural steel components.

Portable structures should be moved periodically to prevent destruction of vegetation in the immediate area.

REFERENCES

NRCS Louisiana Conservation Practice Standards

Code 561 - Heavy Use Area Protection

Code 313 - Waste Storage Facility

Natural Resources Conservation Service
Construction Specifications

COMPOSTING FACILITY

1. SCOPE

Work shall consist of constructing the composting facility and include site preparation, concrete, water line, and building material to the location and elevations shown on the drawings or as staked in the field.

2. SITE PREPARATION

The building site shall be cleared to the extent needed. All logs, stumps roots, sod, and other material shall be removed from area within six (6) feet of the concrete floor.

The area shall be shaped, graded, and filled, if necessary, to provide a slope away from building for drainage. Any fill material used shall be free from all sod, roots, frozen soil, stones over 6 inches in diameter, and other objectionable material. Fill material shall be compacted with at least one pass of construction equipment over entire surface of each layer placed. Layers should be less than 9 inches thick.

3. CONCRETE

Design mix. The concrete mixture shall be no less than five bags per yard mix. The water content shall not exceed 6 gallons per bag of cement. Any mix selected shall have a designed minimum 28 day compressive strength of 3,000 pounds per square inch (psi). The concrete shall contain a standard known brand of Portland cement with washed sand and gravel. Clean water shall be used in the mix.

Consistency. The amount of water used in the concrete shall be the minimum necessary to obtain the required workability. The consistency of the concrete shall be such that it can be worked readily into the corners and angles of the forms and around reinforcement but without permitting the materials to segregate or excess free water to collect on the surface. The slump shall be between 2 and 5 in. as tested by "The Test for Slump for Portland Cement Concrete", ASTM Specification C-143.

Fiber reinforced concrete. Fiber shall consist of 3/4" length virgin homopolymer polypropylene fiber, either the collated fibrillated type or the monofilament type. The minimum rate of application is 1.5 lbs. of fiber per cubic yard of concrete.

4. STEEL REINFORCEMENT

Reinforcement steel and welded wire fabric shall be new, clean, and free of oil, grease, paints, and flaky rust. Steel bars for concrete reinforcement shall be deformed billet-steel bars, conforming to ASTM Specification A-615, Grade 40 to 60. Welded wire fabric shall conform to the requirements of ASTM Specification A-185.

Reinforcement steel and welded wire fabric shall be suspended off the ground and other concrete contact surfaces by using scotches of concrete bricks, concrete blocks or pieces of blocks, wire stands, or other approved method prior to the placing of concrete. Scotches of stones, wood materials, earth, earth clods, clay bricks, scrap metal and other unapproved materials are not acceptable. During concrete placement welded wire reinforcement shall be pulled into the middle of the concrete. Welded wire fabric shall be spliced by overlapping a minimum of one full mesh plus 2 in. or 6 in., whichever is greater.

5. WOOD AND TIMBER

All material shall be full section sound wood, free from decay, and of new quality. All timber beams shall be dense, structural quality, and graded in accordance with the Standard Grading Rules for Southern Pine Lumber.

All structural timber, posts, poles and lumber, except roof girders, rafters, purlins, trusses, knee braces, and attic bracing shall be pressure treated. Treated timber and lumber shall be impregnated with the specified type and quantity of preservative and conform to Federal Specification TT-W-571. The minimum net retention of the common

preservative, chromated copper arsenate, shall be 0.4 lbs/cf (pcf) for dimension lumber used above ground and 0.6 pcf for structural posts or timbers in contact with the ground. Posts or timbers encased in concrete should not be considered in contact with the ground.

Roof truss design and support shall be in accordance with local government codes and follow manufacturer's standard dimensions. Roof truss shall be securely attached to the support posts.

Posts and poles shall be set plumb and to the depths shown on the drawings. Backfill around post/poles shall be concrete as shown on the drawings or shall be hand tamped earth if allowed on the drawings. Posts/poles shall be temporarily braced until girders, plates or other members are installed to maintain plumb alignment.

6. VEGETATION

A protective cover of vegetation shall be established on all exposed surfaces of fills, borrow areas, or other disturbed areas. Newly vegetated areas shall be fenced where necessary to protect the vegetations. The establishment of vegetation shall be in accordance with Conservation Practice Standard 342 - Critical Area Planting.

7. CONSTRUCTION DETAILS

Natural Resources Conservation Service
Conservation Practice Standard

CONSTRUCTION SPECIFICATION
IRRIGATION SYSTEM, SPRINKLER

1. SCOPE

The designer of the sprinkler irrigation system (consulting engineer, equipment vendor, or others) shall furnish the owner with a complete set of engineering plans and specifications covering all components of the system and performance requirements. The engineering plans and specifications shall contain sufficient details to allow the irrigation system to be installed by someone unfamiliar with the job. The installation shall be checked for conformance to this standard. The plan shall specify type, grades, quality, size, and construction materials of all equipment and appurtenances included in the system design.

2. MATERIALS AND INSTALLATION

The irrigation system and components shall be installed as designed and shown on the engineering plans or as staked in the field. Materials and components shall be of type, size, and quantities specified in the plans and specifications.

Pumps, power units, and filters shall be set on a firm base and be placed in proper alignment. All pertinent safety codes and manufacturer's recommendations shall be met for the type of equipment installed. They shall meet the power, capacity, and pressure requirements specified.

Sprinklers shall be installed as recommended by the manufacturer. Sprinkler performance tables provided by the manufacturer shall be used to determine that the sprinklers meet the requirements specified in the plan and design.

Risers may be constructed of standard galvanized steel, aluminum, or plastic. On permanent sprinkler systems, they shall be installed in a vertical position and adequately supported by anchor blocks or other suitable means. Plastic materials that will be exposed to sunlight shall be made of ultraviolet-resistant materials or protected by coating or shielding as recommended by the manufacturer. Plastic risers shall meet or exceed the pipe material requirements specified for the mains and laterals.

All joints and connections shall be made in accordance with the manufacturer's recommendations. All valves shall be equal to the size of pipe in which they are installed and of the material and type specified. All joints, connections, and valves shall be constructed to withstand the maximum design working pressure for the pipelines without damage or leakage. They shall meet the performance requirements of the system without damage or leakage.

3. TESTING

The system shall be thoroughly and completely pressure tested at the design pressure for proper functioning and leakage. Any leaks shall be repaired and the system retested.

The system shall be checked to ensure that it functions properly at design capacity, that the distribution pattern and spacing requirements are met, and that the variation in pressure or discharge rate is within the allowable specified. At or below design capacity, there shall be no objectionable flow conditions and all appurtenances shall perform properly.

ESTABLISHING GRASSES AND LEGUMES ON CRITICAL AREAS

INTRODUCTION

Critical area planting is planting vegetation, such as grasses and/or legumes on highly eroding areas (sheet and rill erosion rates above 2T and/or gully erosion). These areas usually cannot be stabilized by ordinary conservation treatment and management, and if left untreated will cause severe erosion and sediment damage.

The critical area planting practice can be applied to highly disturbed areas such as urban conservation sites, road construction areas, conservation practice construction sites, and areas needing stabilization before and after natural disasters such as floods, hurricanes. Examples of critical areas include: dams, dikes, levees, cuts, fills, gullied areas, or excessively eroding sloping cropland fields where vegetation is difficult to establish by usual planting methods.

SITE PREPARATION

Site preparation is essential to the establishment of vegetation on critical areas. First, gullied, rilled, or rough sites should be smoothed and shaped to permit the use of equipment for establishment and maintenance of vegetation. Graded slopes in the treated area should not be steeper than 2:1.

PLANTING

Plants used in critical area plantings should be selected on the basis of species characteristics, site and soil conditions, planned use, maintenance of the treated area, method of planting, time of the year to be planted, and the needs and desires of the land user. Native plant species well adapted to the site, with multiple values (e.g., wildlife value, aesthetics) are recommended for critical area planting mixtures. Species that harbor pests should be avoided. In

addition, species diversity should be considered to avoid loss of function due to species-specific pests.

GRASSES AND LEGUMES

- After smoothing and shaping, the soil should be pulverized to a minimum depth of 4 inches and harrowed to a uniformly smooth surface.

- **FERTILIZER**: Apply fertilizer and lime according to the nutrient management guidelines used in this document. In lieu of a soil test, use fertilizer recommendations provided in Tables 1 through 5 for initial establishment. For lime recommendations apply 2 tons/acre of agricultural lime to acid soils.

- **SEED**: Plant seed on a well prepared firm seedbed. For best results, cultipack freshly prepared seedbed before and after planting. If a cultipacker cannot be used, allow rain to settle a freshly prepared seedbed before planting, and then harrow before planting seed. Sow seed and cover lightly. Refer to Tables 1 through 5 for grass and legume planting recommendations.

  For **concentrated flow areas** that have been seeded to grasses, it may be necessary to use checkdams constructed of "silt fences" or "hidabales". Silt fences consist of burlap or synthetic material at least 24 inches high stretched across the concentrated flow area and held in place by steel posts spaced no more than eight feet apart. The bottom of the silt fence should be buried at least two inches. Attach the burlap to the steel post in an upright position using small gauge electric fence wire. Once vegetation is well established in the concentrated flow area, the silt fence can be removed. Hidabales can be placed across the concentrated flow area to help control erosion. Hidabales consist of square bales of hay placed length-ways with the cut side up in a trench across the concentrated flow area with four to six inches left above the trench or soil line. In either case, the ends of the checkdam must be 6" higher than the center of the checkdam (water will flow over the top of the checkdam). Multiple checkdams are used so that one check dam will pool water back to the upstream checkdam.

  Where high velocities exist, Rolled Erosion Control Products (RECPs) may be needed to hold seed and vegetation in place temporarily and permanently.

- **SOLID SOD:** Solid sod may be applied on sites where immediate cover is required such as steep slopes, waterways, or other areas where large volumes of water are concentrated and where establishment of turf from seed is impractical.

  Areas to be sodded should be watered to wet the soil two to three inches on the same day prior to placement of the sod.

  Solid sod should be dense and well rooted. The sod should be 90 percent pure and free of weeds and weedy grasses. Do not allow sod to dry out, freeze, or go through a heat after harvesting and prior to placement. Transfer and place sod within 24 hours after harvesting. Cut the sod at least two inches thick, excluding top growth, and to uniform size for convenient handling and placement. Solid sod should be alternately placed on well prepared firm seedbeds.

The placement of sod should be across the slope starting at the bottom and working up the slope. Fit the sod closely together to avoid open spaces. Stagger sod strips. Do not overlap sod strips. Roll or tamp the sod after placement to insure contact of the grass roots with the soil. On slopes greater than 4:1, secure the sod to the soil surface with wooden pegs or staples. Cover the upper edge of the sodded area with a soil retention blanket for protection against water lifting and undercutting the sod. Use wire staples to anchor soil retention blankets. Immediately after anchoring, water the sod until moisture penetrates to the soil beneath. Maintain adequate moisture for at least two weeks to insure establishment of the sod.

- **MULCHING:** All planted areas except those to be used for hay or grazing or where solid sod is applied should be mulched with acceptable mulch materials such as small grain straw or grass mulch (materials containing noxious weeds should be avoided). Mulch should be applied immediately after shaping, seeding or sprigging. A minimum of 1 ½ to 2 tons per acre of small grain straw, hay, or pine needles should be applied. Mulch should be applied evenly resulting in 65 to 75 percent groundcover.

  A tractor drawn mulch anchoring tool can be used to adequately anchor mulch to the soil. This tool should be used immediately after mulch has been applied. A regular farm disk can be used if a mulch anchoring tool is unavailable, however, the disk should not be sharp enough to cut the straw. These methods are limited to slopes no steeper than 2:1, where equipment can operate safely on the contour. Liquid mulch binders and tackifiers can also be used to anchor straw, but these methods are often not cost-effective.

  Cotton burs, peanut hulls, seed screening, and other materials may be used where weed seeds are acceptable in mulch. These materials should not be used on slopes steeper than 5:1, and should be evenly distributed at a rate which provides about 75 percent groundcover.

  Where erosion hazards are very high, Rolled Erosion Control Products (RECPs) and Hydroseeding may be used.

- **HYDROSEEDING:** a method of planting seed that consists of mixing a slurry solution of cellulose fiber mulch, seed, fertilizer, and water, which is then mechanically sprayed as a uniform layer onto an eroding or potentially eroding area. The method is more effective at establishing seed compared to typical broadcasting of seed because seed germination and healthy root systems are enhanced. Hydroseeding is also favored over conventional straw mulch applications because weed seed is not introduced and more effective erosion control is achieved.

- **ROLLED EROSION CONTROL PRODUCTS (RECPs):** a blanket-like mat used to prevent soil erosion during vegetation establishment on highly erodible areas. Once seed and mulch have been applied to a critical area, RECP can be placed and tacked down at edges to secure placement. Vegetation will then begin to emerge through spaces between the RECP fibers.

  RECP are generally divided into two distinct types: natural and synthetic. Natural RECPs are often made of biodegradable jute or coconut fiber, and synthetic RECPs are primarily made of PVC. Synthetic RECP are generally non-biodegradable and provide tough, permanent support on slopes; however, this synthetic material does not retain moisture or available nutrients as well as natural materials. In high velocity concentrated

flow areas where vegetation protection alone is not sufficient. Turf Reinforcement Material (TRM) can be used to provide permanent scour protection and to hold vegetation in place. This allows vegetation to be used over a higher range of flows before hard armoring (rip-rap) is required. TRM is also used on steep slopes (>5:1).

COASTAL VEGETATION

Many native coastal plant species play a major role in the shoreline protection and sand dune formation. These plants often produce dense foliage and deep root systems that prevent erosion along coastal areas. For a list of recommended coastal plant species used for shoreline stabilization and sand dune formation refer to Technical Note. 104 "Planting Guide for Establishing Coastal Vegetation on the Mississippi Gulf Coast." for complete information on establishing or restoring native coastal vegetation on the Mississippi Gulf Coast.

TABLE 1. Specifications for forage, hay, critical areas within wildlife habitat, recreation, and/or protection of structural measures.

Plant Species 1/	Seeding Rates Per Acre Alone	Seeding Rates Per Acre Mixture 2/	Seeding Dates	Planting Depth (Inches)	Minimum Fertilizer 3/ Lbs/acre $N-P_2O_5-K_2O$
Perennials:					
Bahiagrass, Pensacola 4/	30 lbs	20 lbs	Mar-May Sep-Oct 5/	¼	400 lbs (13-13-13)
Bermudagrass:					
Common (Hulled)	8 lbs	3 lbs	Mar-May	¼	400 lbs (13-13-13)
Hybrid 6/	25,000	20,000	Mar-June	2-3	400 lbs (13-13-13)
Common (Unhulled)	10 lbs	5 lbs	Sep-Oct 7/	¼	400 lbs (13-13-13)
Tall Fescuegrass 8/	30 lbs	20 lbs	Sep-October Feb 15-Mar 15 9/	¼-½	400 lbs (13-13-13)
Lespedeza:					
Sericea	30 lbs	20 lbs	Mar-April	¼	
Appalow Sericea	30 lbs	20 lbs	Mar-April	¼	
White Clover 10/		3 lbs	Sep-Oct 15	¼	300 lbs (0-20-20)
Annuals:					
Clover: 10/					
'Meechee' Arrowleaf		10 lbs	Sep-Oct 15	¼	300 lbs (0-20-20)
Ball		3 lbs	Sep-Oct 15	¼	300 lbs (0-20-20)
Crimson		20 lbs	Sep-Oct 15	¼	300 lbs (0-20-20)
Subterranean		20 lbs	Sep-Oct 15	¼	300 lbs (0-20-20)
Red Clover 11/		5 lbs	Sep-Oct 15	¼	300 lbs (0-20-20)
Lespedeza: 10/					
Common		15 lbs	Mar-May	¼	300 lbs (0-20-20)
Kobe		15 lbs	Mar-May	¼	300 lbs (0-20-20)
Korean		15 lbs	Mar-May	¼	300 lbs (0-20-20)
Peas, wild winter 10/		20 lbs	Sep-Oct	¼	300 lbs (0-20-20)
Vetch, hairy 10/		20 lbs	Sep-Oct	½	300 lbs (0-20-20)
Rye, Cereal 12/	120 lbs	90 lbs	Sep-Oct	½-1	400 lbs (13-13-13)
Wheat	120 lbs	90 lbs	Sep-Oct	½-1	400 lbs (13-13-13)
Ryegrass	40 lbs	20 lbs	Sep-Nov	½-1	400 lbs (13-13-13)
Millet, browntop	30 lbs	15 lbs	May-Jun	½-1	400 lbs (13-13-13)

1/ Refer to the Technical Note No. 102 Mississippi Planting Guide for recommended varieties.
Also refer to: http://msucares.com/pubs/infosheets/is1168.htm
2/ Planned seed mixtures must include at least one perennial grass species.
3/ In lieu of soil test recommendations use these minimum fertilizer recommendations for establishment.
4/ Pensacola bahiagrass is not recommended north of Hwy. 82.
5/ Fall seeded bahiagrass will be seeded in combination with cool season grasses such as rye, wheat, ryegrass. Not recommended north of Hwy. 80. Use 30 lbs bahiagrass seed per acre.
6/ May include coastal, alicia, or tifton. 20,000 springs = 1 bushel. 1 bushel = 1.25 cu. Ft. Clippings not recommended.
7/ Fall seedling will be in combination with cool season grasses. Use 10 lbs unhulled seed per acre.
8/ Not recommended south of Hwy. 80.
9/ North of Hwy. 82 and any county which Hwy. 82 crosses only. For cropland practices only.
10/ Legume seed will be inoculated with proper inoculant.
11/ Should be seeded with cool season annuals such as rye, wheat, or ryegrass.
12/ Rye may be planted alone, as a temporary cover, between Nov 15 and Dec 15.

Note: Bermudagrass, fescue, and sericea lespedeza are not acceptable grasses for wildlife habitat since they are not desirable for wildlife.

TABLE 2. Specifications for landscape improvement (roadsides) purposes.

Plant Species	Seeding Rates Per Acre Alone	Seeding Rates Per Acre Mixture	Depth	Planting Depth Inches	Minimum Fertilizer 2/ Rate/acre $N\text{-}P_2O_5\text{-}K_2O$
Perennials: 1/					
Bahiagrass, Pensacola	30 lbs	20 lbs	Mar-May Sep-Oct 3/	¼	400 lbs (13-13-13)
Bermudagrass, common					
Hulled	8 lbs	3 lbs	Mar-May	¼	400 lbs (13-13-13)
Unhulled	10 lbs	5 lbs	Sep-Oct 3/	¼	400 lbs (13-13-13)
Fescue	30 lbs	20 lbs	Sep-October	¼-½	400 lbs (13-13-13)
Lespedeza, Sericea	30 lbs	20 lbs	Mar-April	¼-½	
Annuals					
Clover, crimson 4/		20 lbs	Sep-Oct 15	¼	300 lbs (0-20-20)
Rye, cereal		90 lbs	Sep-October	½	400 lbs (13-13-13)
Vetch, hairy 4/		20 lbs	Sep-Oct	½	300 lbs (0-20-20)
Millet, browntop		15 lbs	May-Jun	½-3/4	400 lbs (13-13-13)
Wheat		90 lbs	Sep-Oct	½	400 lbs (13-13-13)

1/ Seeding mixtures must include a perennial species.
2/ In lieu of soil test recommendations use these minimum fertilizer recommendations for establishment.
3/ Fall seeding will be in combination with cool season annuals such as rye, wheat, or ryegrass.
4/ Legume seed will be inoculated with recommended inoculant.

TABLE 3. Specifications for landscape improvement or recreation (turf) purposes.

Plant Species	Planting Method 1/	Planting Rate/ 1000 Ft^2	Seeding Depth (Inches)	Planting Dates	Minimum 2/ Fertilizer Rate/1000 Ft^2 (13-13-13)
Perennial Grass Cover					
Bermudagrass					
Common	Seed	1 lb	¼	Mar-May	20 lbs
	Sprig	1,000	1-2	Mar-Aug	20 lbs
	Plug	1,000	-	Mar-Aug	20 lbs
Hybrids	Sprig	1,000	1-2	Mar-Aug	20 lbs
	Plug	1,000	-	Mar-Aug	20 lbs
Carpetgrass	Seed	½ lb	¼	Apr-May	20 lbs
	Plug	1,000	-	Apr-Aug	20 lbs
Centipede	Seed	¼ lb	¼	Apr-May	15 lbs
	Sprig	1,000	1-2	Apr-Aug	15 lbs
Fescue, Ky-31	Seed	3 lb	¼-½	Sep-Nov 15	20 lbs
St. Augustine	Sprig	1,000	1-2	Apr-Aug	20 lbs
	Plug	1,000	-	Apr-Aug	20 lbs
Zoysia	Sprig	4,000	1-2	Apr-Aug	20 lbs
	Plug	4,000	-	Apr-Aug	20 lbs
Temporary Cover 3/					
Millet, browntop	Seed	1 lb	½- 3/4	May-Jun	20 lbs
Rye, cereal	Seed	3 lbs	½ -1	Sep-Oct	20 lbs
Ryegrass, annual	Seed	1 lb	½-1	Sep-Nov	20 lbs
Wheat	Seed	3 lbs	½-1	Sep-Oct	20 lbs

1/ One square yard of solid sod yields: 1,500 bermuda or zoysia sprigs or 500-700 carpetgrass, centipede or St. Augustine sprigs or 324 2-inch plugs. 1,000 square feet requires 1,000 sprigs at 1-foot centers, 4,000 sprigs at 6-inch centers.

2/ Any fertilizer source may be substituted to provide minimum requirements of $N\text{-}P_2O_5\text{-}K_2O$. Use 800 pounds per acre of 13-13-13 or equivalent on large areas. Apply lime at rate of 90 pounds per 1,000 square feet or 2 tons per acre.

3/ For temporary seedings only. Annual ryegrass may be overseeded on established sod at a rate of 10 pounds per 1,000 square feet.

TABLE 4. Specifications for stabilizing structural practices with mulch/plants by month.

Month	Mulch 1/	Plant Species	Seeding Rate/Acre	Seeding Depth	Minimum Rates $N\text{-}P_2O_5\text{-}K_2O$
Dec-Feb	2 tn/ac	Lespedeza, Sericea	30 lbs	¼	18-72-72
Dec-Feb	2 tn/ac	Unhulled Bermuda	10 lbs	¼	72-72-72 2/
Dec-Feb	2 tn/ac	Bahiagrass 3/	30 lbs	¼	72-72-72 2/
Mar-May	2 tn/ac 4/	Lespedeza, Sericea	30 lbs	¼	18-72-72
Mar-May	2tn/ac 4/	Hulled Bermuda	8 lbs	¼	72-72-72
Mar-May	2tn/ac 4/	Bahiagrass 3/	30 lbs	¼	72-72-72
June	Optional	Hulled Bermuda	8 lbs	¼	72-72-72
June	Optional	Bahiagrass 3/	30 lbs	¼	72-72-72
July-Aug	2/tn/ac	Lespedeza, Sericea plus	30 lbs	¼	72-72-72
		Browntop Millet	25 lbs	½	
Sept-Oct	Optional	Tall Fescue 5/	30 lbs	½	72-72-72
Sept-Oct	Optional	Bahiagrass 6/ plus	30 lbs	¼	72-72-72
		Ryegrass	40 lbs	½	
Nov	2/tn/ac	Lespedeza, Sericea plus	30 lbs	¼	18-72-72
		Vetch or W.W. Peas 7/	30 lbs	½	
Nov	2tn/ac	Unhulled Bermuda plus	10 lbs	¼	18-72-72
		Vetch or W.W. Peas 7/	30 lbs	½	

1/ Refer to Mulching Practice Code 484.
2/ Apply fertilizer when grass begins to green up.
3/ Not recommended north of Hwy. 82.
4/ Apply mulch only in March. Mulch for April or May is optional.
5/ Not recommended south of Hwy. 80.
6/ Not recommended north of Hwy. 80.
7/ Vetch or wild winter peas will be inoculated with the proper inoculant.

NOTE: Table 7 may be used in lieu of a soil test or nutrient budget on gullied and eroded areas that require land shaping and grading.
NOTE: Lime should be applied at the rate of 2 tons/acre before planting and mixed with the soil.
NOTE: To improve wildlife benefits, legumes can be added to the seedings using seeding rates in Table 1.

TABLE 5. Specifications for native herbaceous and woody plant species used as forage, hay, wildlife habitat, recreation, and/or protection of structural measures.

Plant Species 1/	Seeding Rates Lbs Per Acre Alone	Seeding Rates Lbs Per Acre Mixture 2/	Seeding Dates	MS Adaptation Zone 3/	Planting Depth (In.)	Minimum Fertilizer 4/ Lbs/acre $N-P_2O_5-K_2O$
Native Warm Season Perennial Grasses 5/						
Big bluestem (*Andropogon gerardii*)	10 lbs drilled 12 lbs broadcast	1-2 lbs 7/	Mid-April to Early June	1	1/2	300 lbs (0-20-20) 8/
Little bluestem 6/ (*Schizachyrium scoparium*)	10 lbs drilled 12 lbs broadcast	3-4 lbs	Mid-April to Early June	1	1/2	300 lbs (0-20-20)
'Highlander' Eastern gamagrass (*Tripsacum dactyloides*)	15 lbs drilled	n/a	Mid-April to Early June	1, 2, 3	1 to 1 1/2	300 lbs (0-20-20)
Indiangrass (*Sorghastrum nutans*)	9 lbs drilled 11 lbs broadcast	1-2 lbs	Mid-April to Early June	1, 2	1/2	300 lbs (0-20-20)
Switchgrass (*Panicum virgatum*)	8 lbs drilled 10 lbs broadcast	2 lbs	Mid-April to Early June	1, 2, 3	1/4	300 lbs (0-20-20)
Legumes:						
'Lark Selection' Partridge Pea (*Chamaecrista fasciculata*)	n/a	4 lbs	Feb. to Mid-May	1, 2, 3	Broadcast or shallowly drill	200-300 lbs (0-20-20)
Wildflowers:						
Annuals:						
Bur marigold (*Bidens aristosa*)	n/a	0.5 lbs	Aug.-Oct.	1, 2, 3	Soil surface to ¼"	100-150 lbs (13-13-13)
Plains coreopsis (*Coreopsis tinctoria*)	n/a	0.5 lbs	Aug.-Sept.	1, 2, 3	Soil surface to 1/8"	100-150 lbs (13-13-13)
Clasping coneflower (*Dracopis amplexicaulis*)	n./a	0.5 lbs	Aug.-Sept.	1, 2, 3	Soil surface to 1/8"	100-150 lbs (13-13-13)
Sunflower (*Helianthus annuus*)	n/a	0.5 lbs	April-May	1, 2, 3	1"	400 lbs (13-13-13)
Perennials:						
Black-eyed susan (*Rudbeckia hirta*)	n/a	0.5 lb	Aug. - Sept.	1, 2, 3	Soil surface to 1/8"	100-150 lb (13-13-13)
Lance-leaf coreopsis (*Coreopsis lanceolata*)	n/a	0.5 lb	July-Sept.	1, 2, 3	Soil surface to 1/8"	100-150 lbs (13-13-13)
Lyre-leaf sage (*Salvia lyrata*)	n/a	0.5 lb			Soil surface to 1/8"	100-150 lbs (13-13-13)
Meadow beauty (*Rhexia mariana*)	n/a	0.5 lb	Aug.-Oct.	1, 2, 3	Soil surface	100-150 lbs (13-13-13)
Mistflower (*Eupatorium coelestinum*)	n/a	0.5 lb	Sept.-Oct.	1, 2, 3	Soil surface	100-150 lbs (13-13-13)

1/ Refer to Tech. Note 102 Mississippi Planting Guide for recommended varieties.
2/ Planned seed mixtures must include at least one perennial grass species.
3/ See Figure 1 for Mississippi Plant Adaptation Zones.
4/ In lieu of soil test recommendations use these minimum fertilizer recommendations for initial establishment.
5/ Plant native warm season grasses using the pure live seed method (pp. 10-11)
6/ Little bluestem is not recommended south of I-20.
7/ Mixes should be based on percentage of the mix and the seeding rate. (ex. Species 1 @ 2 lbs/acre * 0.4 of mix = 0.8 lbs/acre)
8/ After establishment of native warm season grasses, apply 50 lbs N/acre.

Planting Native Grasses Using the Pure Live Seed Method:

Native grass seed lots vary widely in quality and price with lots containing various amounts of inert material, weed seeds and grass seeds that will not grow. To account for the variability in seed lots, the pure live seed (PLS) method of planting was developed to insure correct seeding rates. Since only live seeds of the desired crop are of value, the amount of other material in a seed lot must be accounted for in the seeding rate. Seed sold by bulk pounds (lbs/acre) may not consider the quality of the seed being sold.

To calculate the pure live seed in a lot of seed simply use the following formula.

$$\frac{\%\text{Purity} \times \%\text{Germination}}{100} = \text{Pure Live Seed (PLS)}$$

It is important to plant seed with the highest purity percentage. This reduces the amount of detrimental materials, i.e., other crop or weed seed which will compete with grass seedlings during establishment. The other factor to consider when calculating PLS is germination percentage. Germination percentage is calculated by the number of seed which will produce a viable seedling in germination tests divided by the total number of seed tested. All of this information can be found on a seed tag (see example) that is attached to the bag of seed.

Sample Seed Tag from *XYZ Seed Company*

Kind: Switchgrass	**Purity: 99.98%**	Weed Seed: 0.00%
Lot: SSG 1-98	Other Crop: 0.01%	Bulk Wt: 50 lbs
Test Date: 12/98	Inert: 0.01%	**Germination: 88.00%**
Origin: Native grass USA	Noxious Weed Seed: 0	Hard Seed: 5.00%
Net Wet. 44 (lbs PLS)	Dormant Seed: 0.00%	

To plant 10 pls pounds of switchgrass from the *XYZ Seed Company*, first calculate the %PLS:

$$\frac{99.98\% \text{ (Purity)} \times 88.00\% \text{ (Germination)}}{100} = 87.98\% \text{ PLS}$$

Then:

$$\frac{10 \text{ pls (Desired Rate)}}{87.98\% \text{ (PLS)}} \times 100 = 11.36 \text{ lbs of bulk seed to plant 10 pls/acre.}$$

A helpful reference chart for determining the number of bulk pounds needed to plant a lot of seed with a specified %purity and %germination is included on the next page.

To use this chart, simply cross reference the % Germination down to the corresponding % Purity. Using the *XYZ Seed Company* example from the previous page, 88% would round to 90% Germination and 92.30% would round to 90% Purity. Multiply the desired PLS (10 lbs) by the number from table (1.3). 13 lbs of seed from the *XYZ Seed Company* would be needed to plant 10 pls per acre.

								% Germination											
% Purity	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10
100	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.3	2.5	2.9	3.4	4.0	5.0	6.7	10.0
95	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.2	2.4	2.7	3.1	3.6	4.3	5.3	7.1	10.6
90	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.8	1.9	2.1	2.3	2.5	2.8	3.2	3.8	4.5	5.6	7.5	11.2
85	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.9	2.0	2.2	2.4	2.7	3.0	3.4	4.0	4.8	5.9	7.9	11.8
80	1.3	1.4	1.4	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.5	2.8	3.2	3.6	4.2	5.0	6.3	8.4	12.5
75	1.4	1.5	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.5	2.7	3.0	3.4	3.9	4.5	5.4	6.7	8.9	13.4
70	1.5	1.6	1.6	1.7	1.8	2.0	2.1	2.2	2.4	2.6	2.9	3.2	3.6	4.1	4.8	5.8	7.2	9.6	14.3
65	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.6	2.8	3.1	3.5	3.9	4.4	5.2	6.2	7.7	10.3	15.4
60	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.6	2.8	3.1	3.4	3.8	4.2	4.8	5.6	6.7	8.4	11.2	16.7
55	1.9	2.0	2.1	2.2	2.3	2.5	2.6	2.8	3.1	3.4	3.7	4.1	4.6	5.2	6.1	7.3	9.1	12.2	18.2
50	2.0	2.2	2.3	2.4	2.5	2.7	2.9	3.1	3.4	3.7	4.0	4.5	5.0	5.8	6.7	8.0	10.0	13.4	20.0
45	2.3	2.4	2.5	2.7	2.8	3.0	3.2	3.5	3.8	4.1	4.5	5.0	5.6	6.4	7.5	8.9	11.2	14.9	22.3
40	2.5	2.7	2.8	3.0	3.2	3.4	3.6	3.9	4.2	4.6	5.0	5.6	6.3	7.2	8.4	10.0	12.5	16.7	25.0
35	2.9	3.1	3.2	3.4	3.6	3.9	4.1	4.4	4.8	5.7	5.8	6.4	7.2	8.2	9.6	11.5	14.3	19.1	28.6
30	3.4	3.6	3.8	4.0	4.2	4.5	4.8	5.2	5.6	6.1	6.7	7.5	8.4	9.6	11.2	13.4	16.7	22.3	33.4
25	4.0	4.3	4.5	4.8	5.0	5.4	5.8	6.2	6.7	7.3	8.0	8.9	10.0	11.5	13.4	16.0	20.0	26.7	40.0
20	5.0	5.3	5.6	5.9	6.3	6.7	7.2	7.7	8.4	9.1	10.0	11.2	12.5	14.3	16.7	20.0	25.0	33.4	50.0
15	6.7	7.1	7.5	7.9	8.4	8.9	9.6	10.3	11.2	12.2	13.4	14.9	16.7	19.1	22.3	26.7	33.4	44.5	66.7
10	10.0	10.6	11.2	11.8	12.5	13.4	14.3	15.6	16.7	18.2	20.0	22.3	25.0	28.6	33.4	40.0	50.0	66.7	100.0

Figure 1: Plant Adaptation Zones in Mississippi.

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