DOCUMENTING PLANNING, DESIGN, CONSTRUCTION, AND CHECKOUT OF ENGINEERING CONSERVATION PRACTICES GUIDE

NRCS
Natural Resources
Conservation Service

These documentation procedures for engineering conservation practices are intended to provide guidance for documenting the preliminary investigation, engineering survey, design, construction layout, construction checks, and certification of conservation practices. If specific guidance for documentation of conservation practices is not provided, procedures established for similar conservation practices shall be followed. Additional guidance is provided in Technical Release (TR) 62, Engineering Layout, Notes, Staking, and Calculations, and shall be followed when guidance in these procedures are not applicable to the practice. In situations where documentation guidance is lacking, or contradicting, the State Conservation Engineer should be contacted for clarification and guidance.

NRCS employees providing technical assistance must work within their engineering job approval authority. The engineering job approval authority class must be determined at the inventory and evaluation phase to ensure the person providing technical assistance has the appropriate engineering job approval authority to make recommendations and/or decisions. As technical assistance continues on a project, the engineering job class shall be re-evaluated to ensure the project is properly classified. The engineering job approval authority class shall be documented in the design notes and on the engineering plans.

Partners who are assigned engineering job approval authority must work within their engineering job approval authority and the engineering job approval authority class as NRCS employees.

TSP's shall provide NRCS with a complete set of documentation for the technical service provided. The documentation will be in accordance with the documentation procedures outlined in this document and in accordance with the conservation practice statement of work.

NRCS has developed several engineering forms and engineering standard drawings to help facilitate the design and documentation of conservation practices. NRCS employees, partners, and Technical Service Providers (TSP's) are encouraged to use approved Alabama engineering forms and engineering drawings. However, the use of these forms and standard drawings is not mandatory provided the same information is recorded in a logical sequence, is legible, and contains the same data required on the approved forms and engineering standard drawings.

When design and/or layout of conservation practices are performed by non-certified TSP's (private engineers, contractors, etc.), they must furnish the required data in sufficient detail that it can be checked by NRCS. Data must be in a legible form and be supplied to NRCS as documentation for payment using USDA funds.

Alabama NRCS engineering forms and standard drawings can be obtained from the Alabama NRCS web site http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=AL.

When engineering computer programs are used to document design and construction decisions, a hard copy of the input and output data shall be retained in the documentation file.

The documentation procedure consists of seven elements:

1. preliminary investigation,
2. engineering survey,
3. engineering design,
4. engineering plans and specifications,
5. construction layout
6. construction checks
7. construction checkout and certification.

Preliminary investigation consists of determining the feasibility of the practice in regards to the purpose and applicability of the conservation practice to the site conditions, topography, soils, cost, etc. It is highly recommended that the designer review the criteria in the conservation practice standards

prior to the preliminary investigation and during the design process.

During the preliminary investigation, sufficient data must be gathered and analyzed to determine whether to proceed with the practice.

Engineering surveys shall be obtained for all engineering practices where applicable. Sufficient survey data shall be collected to adequately plan and design the practice. The extent of the survey needed, will be based on the complexity of the engineering practice, physical features, topography, etc. All survey data shall be recorded on the appropriate engineering forms or engineering field book. All surveys will be closed out within tolerances.

Where total stations and survey grade GPS equipment are used to perform part or all of the design or construction survey, hard copies of the survey field notes shall be retained in the documentation file. Appropriate identification shall be made on the survey notes so that someone unfamiliar with the total station or survey grade GPS data can understand the notes. It is also recommended that a copy of the electronic survey notes be retained in the documentation file.

Engineering design consists of using all data gathered along with the criteria in the conservation practice standard to determine the size, extent, quantity, etc., needed to meet the purpose(s) of the conservation practice. Conservation practices must meet the minimum design criteria as contained in the applicable conservation practice standard. Sufficient data must be obtained to document all aspects of the engineering design.

Assessments of geologic conditions must be collected in support of conservation planning and practice implementation. Geologic investigations shall be obtained as needed to support the planning, design, and application of conservation practices. The intensity of geologic investigation is the responsibility of the person responsible for the design. Refer to the NEM Part 531, Geologic Investigations, and NEH Part 631, Geology.

All designs, plans, specifications, and quantities must be checked by someone experienced in the type of design, the criteria, and the procedure. The checker shall initial and date each sheet completed and verify:

- that the basic data and assumptions were used in the computations,
- that mathematic computations are complete and accurate,
- that details are consistent from sheet to sheet,
- that engineering drawings comply with the design,
- that computed critical elevations, sizes, costs, and quantities are accurate, and
- that construction drawings and specifications are complete.

Engineering plans and specifications. Plans and specifications shall be developed in sufficient detail for the landowner and/or contractor to understand the practice requirements and properly install the practice. Plans and specification shall clearly display installation requirements. The final plans and specification shall be approved by someone with appropriate NRCS engineering job approval authority or by a certified TSP.

Copies of the final plans and specifications shall be provided to the landowner and the responsible engineer shall review the final plans and specifications with the landowner.

Quantities required for the components to implement the conservation practices shall be provided to the landowner.

Earthfill and excavation quantity calculated by computer aided design (CAD) software must also be checked. Most CAD packages have two methods to make the calculation, (1) extracting cross sections and (2) 3D volumes.

Method 1 can be checked the conventional way that quantities are calculated. The cross sectional area of the cross sections shall be checked for accuracy and computations computed.

Method 2 is the most accurate and uses the formula for a tetrahedron. During this calculation, CAD determines the depth of fill at each intersection of the TINS (Triangulated Irregular Network) between the design surface and the ground surface. This results in a point whose elevation is equal to the depth of cut or fill. All these points are stored in a separate layer and are processed into a contour map, just like a survey. Inspection of this map for anomalies can provide the user an indication of any errors in the TIN. Errors can be caused by a bad survey point or improper triangulation. Close inspection in this area should reveal the problem.

For the volume calculation in CAD to be correct several procedures must be followed.

1) The survey must accurately represent the ground surface. There must be sufficient survey shots at the right locations to adequately represent the topography. It is much different from using levels or transits for surveying procedures. Surveyors need to visualize the ground surface like the set of hinged triangles (ultimately making up the TIN) and to take a shot at the corner of each triangle. Each set of three points defines the plane between them. Similar to the facets on a diamond, a point must be collected for each vertex.
2) The surveyed points must be properly linked together (to form the triangles visualized in the field). Break lines are used to force the link (edge of triangular plane) to be connected between the correct points. If a link is incorrect, the TIN will bridge the actual ground surface. Close inspection of the resulting contour map (or TIN) should reveal gross errors in the map.
3) The design surface must be correctly defined and completely overlapped by the ground surface.

Quantities can also be checked within a reasonable degree of accuracy by methods other than recalculating using the CAD procedure. The inputs are the main item to be checked. Quantities may be checked using a quick and easy process to arrive at an approximate answer to make sure a gross error was not made. A site specific operation and maintenance (O&M) Plan shall be developed during the design process and provided to the landowner. The O&M Plan shall provide sufficient information for the landowner or operator to properly operate and maintain the practice for its intended life. The O&M Plan must be reviewed with the landowner. See the National O&M Manual, Part 500 for further policy and guidance and the respective conservation practice standard.

Quality Assurance Plan (QAP). A site specific quality assurance plan (QAP) shall be prepared for all engineering conservation practices. The QAP shall outline the minimum inspection required and documentation needed to ensure the practice is installed correctly.

Pre-Construction Conference. Prior to the start of construction a pre-design conference shall be held with the person preparing and approving the design, landowner and contractor to review the engineering plans, and specifications, permit requirements, and QAP. The discussion held at the pre-construction conference shall be documented in writing.

Construction layout consists of providing the landowner or contractor with sufficient field stakes so that the practice can be installed as designed. All construction layout information shall be recorded on the appropriate form or in the engineering field book.

Construction checks consists of site visits during installation of the practice should be made to ensure the conservation practice is installed in accordance with the approved plans and specifications. All site visits shall be recorded in a field book and clearly describe items that were checked. The number of site visits needed varies with the practice complexity, practice impact on public health, safety and risk, and type of construction. Items that cannot be checked after construction such as steel reinforcement, concrete slump, pipe bedding, foundation preparation, etc., should be checked and documented during

construction.

Construction check out and certification consists of gathering sufficient field data to verify if the practice has been installed according to the plans and specifications and to determine the extent of the practice. All field measurements and surveys shall be recorded on an appropriate form, in the engineering field book, or shall be noted in the electronic field notes from the survey grade GPS or total station.

As-Built plans are required for certain conservation measures, ex. Pond, Code 378 – Embankment Type. For most measures As-Built drawings are only required if significant changes were made during construction. If As-Built drawings are required for the measure it will be noted in the procedures. As-built plans shall be prepared and submitted with the checkout documents. As built plans shall be clearly labeled "As-built" and any changes shall be recorded in red ink on the plans. The person preparing the "As-Built" plans shall sign the "As-Built" plans.

The following pages describe the minimum documentation requirements and procedures for planning, designing, layout, construction, check out, and certification of engineering conservation practices.

CONSERVATION PRACTICE **PAGE NO.**

Access Road, Code 560

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Access Road, Code 560.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. USDA – NRCS Hydraulics Formula.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine if the location and site are suitable, the need for water control structures, and to determine the appropriate surface treatment needed in order for the practice to meet the planned use and purpose(s).

B. Engineering Surveys

1. Record all surveys in the engineering field book.
2. Reference all surveys to a bench mark where needed to establish elevations for construction.
3. Surveys shall be taken to determine the location, grades, length, cut and fill volumes, and structures needed. As a minimum, a profile should be taken along the proposed alignment with sufficient cross sections to determine earth work quantities.
4. Note the location of any utilities or utility markers.
5. All measurements for earth work quantities will be performed by field surveys.

C. Design

1. Design in accordance with the conservation practice standard Access Road, Code 560. Record design data on NRCS-ENG-523A (or equivalent) for needed appurtenances such as culvert size or drainage ditches.
2. Obtain sufficient soils/geologic investigations to design the road foundation.
3. Develop engineering plans and specifications. As a minimum the engineering plans and specifications shall include:
   a. Location of road. Can use a sketch on engineering plans, in field notes, on approved forms, or on the conservation plan map.
   b. Road width and length with profile and typical cross section(s).
   c. Location, size, type, length and invert elevations of all required structures.
   d. Design road grades or maximum grades when applicable.
   e. Type and thickness of surface treatment including any sub base preparation.
   f. Cut and fill slopes where applicable.
   g. Location of water bars where applicable.
   h. Drainage areas and structure requirements for culverts, bridges, etc.
   i. Vegetative requirements on slopes and road shoulders.
   j. Safety requirements.
   k. Location of utilities and notification requirements.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record the layout information in the engineering field book or in the electronic field book.

1. Set a sufficient number of stakes to guide the landowner or contractor in constructing the access road. As a minimum, stake the centerline of the proposed road at the beginning, at changes in alignment, changes in grade, at the end, and on a maximum spacing of 100 feet.
2. Stake the location of required structures (e.g. culverts, etc.).
3. State location of water bars.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. The length of the access road shall be measured in the field with a chain, calibrated measuring wheel, GPS, or other equivalent method to the nearest foot. Profile the road with elevations at changes in grade but not to exceed intervals of 500 feet. Determine if the road is constructed to the design grades.
2. Record and plot at least one cross section of the access road that represents the weakest section. Determine if the cross section meets the design width, side slopes, etc.
3. Check the type and thickness and extent of surface treatment installed.
4. Check the location, size, length, gage, coating, and type of material for all culvert structures.
5. Check invert elevations for all culvert structures.
6. Statement of adequacy of vegetation.
7. Prepare as-built drawings showing final construction dimensions, details, etc.
8. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length of road in feet. The extent of the practice to be certified is the quantities used as the basis of payment such as cubic yards of earth moved, area of surface treatment in acres or square yards, etc.

Agrichemical Handling Facility, Code 309

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Agrichemical Handling Facility, Code 309.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Design Aids

1. Alabama Poultry Waste Management Workbook.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the need and feasibility of an agrichemical handling facility considering site topography, floodplain, type and amount of chemicals stored and/or mixed at the facility, potential for ground water contamination, size of application equipment, potential water source and cost.

B. Engineering Surveys

1. An accurate topographic survey of the proposed location shall be taken and shall extend a minimum of 150 feet beyond the limits of the proposed facility and in sufficient detail to determine drainage patterns in the vicinity of the proposed facility. The proposed location of the agrichemical handling facility shall be referenced so that it can be staked in the field. The survey should show the location of existing buildings, utilities, electrical hookup source, wells, planned water source, existing buried pipelines, drainage ditches, streams, etc., in the vicinity of the proposed facility.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the size and type of structure needed. The dimensions of the agrichemical handling facility shall be designed to accommodate the landowner's equipment. Record design data on NRCS-ENG-523A (or equivalent).
2. Determine chemical spill storage volume required based on the largest sprayer equipment or storage tank that will be brought onto the facility.
3. For pole barn type structures, size support posts and beams based on appropriate dead and live loads. Design charts contained in the Alabama Poultry Waste Management Workbook may be used if applicable. Trusses designed by others shall be certified by an Alabama licensed professional engineer.
4. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Planned location of the facility on the topographic survey.
   b. Plan view of agrichemical handling facility.
   c. Cross sections of the agrichemical handling facility, including roof and wall details.
   d. Truss connection detail and cross bracing details.
   e. Knee, girder, and purlin brace detail.
   f. Post embedment detail, when pole building is used.
   g. Electrical components (e.g. switches, lights, outlets, etc.).

h. Pump type, size, and location.

i. Safety signs.

j. Sump detail.

k. Liner detail.

l. Concrete floor, footer, and curb details with steel reinforcement details.

m. Concrete floor sealant.

n. Emergency eyewash/shower details and location.

o. Water supply schematic with anti-syphon device type and location.

p. Location of nearby wetlands, surface waters, wells, sinkholes, and/or surface anomalies and the necessary 100 foot separation buffer.

q. Location and size of backflow prevention device.

r. Location of utilities and notification requirements.

5. Compute quantity of sub base material when used as basis of payment.

6. Compute quantity of concrete when used as basis of payment.

7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record all layout information in the engineering field book.

1. Set a sufficient number of stakes to guide the landowner or contractor in constructing the facility. As a minimum, stake the corners of the facility.

2. Stake location of all appurtenances (e.g. waterline, sump, electrical, etc.).

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the engineering plans and in the engineering field book or in the electronic field book.

1. Elevation of completed agrichemical handling facility and sump. A sufficient number of cross sections shall be taken to document the slope of the slab.

2. Constructed dimensions of the agrichemical handling facility.

3. Structural components.

a. Spacing, height, depth of embedment, and size of support posts and preservative treatment used.

b. Type of trusses used and certification from an Alabama licensed professional engineer.

c. Size of beams and preservative treatment used.

d. Sump dimensions and materials used.

e. Liner type and thickness.

f. Pump type and capacity.

g. Type of sealant used for concrete floor.

h. Emergency eyewash/shower unit used.

i. Backflow prevention devices used.

j. Antisiphon device used.

k. Safety signs.

l. Concrete design mix.

m. Roof details and pitch.

4. Prepare as-built drawings showing final construction dimensions, details, etc.

5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of facilities installed. The extent certified shall be the quantities used as the basis of payment.

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Amendments for Treatment of Agricultural Waste, Code 591

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard Amendments for Treatment of Agricultural Waste, Code 591.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of adding amendments to treat manure, process waste water, or storm water. This conservation practice shall be a part of the overall agricultural waste management system.

B. Engineering Surveys – None Required.

C. Design

1. Design in accordance with the design criteria in the conservation practice standard Amendments for Treatment of Agriculture Waste, Code 591. Record design data on NRCS-ENG-523A (or equivalent).
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include for each field:
   a. The name of the amendment, the purpose(s) for its use, and the planned outcome(s).
   b. Application methodology, including rates, timing, mixing instructions, temperature requirements, etc.
   c. Required tests to determine the effectiveness of the amendment as appropriate.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

None Required.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Record the type, quality, quantity of amendment used.
2. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is in animal units. The extent of the practice to be certified is the quantities used as the basis of payment such as the pounds of amendments used, etc.

Anaerobic Digester, Code 366

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Anaerobic Digester, Code 366.

B. Design Procedure

1. NEH Part 651, AWMFH, Chapter 10.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the need and feasibility of an anaerobic digester considering the purpose of the digester (produce biogas, reduce greenhouse gas emissions, etc.), existing operation, site topography, floodplain, operator's interest and management ability to operate the facility or availability of consultants to provide the services

Determine the characteristics of the manure to be used in the digester. The characteristic of the manure is necessary to access the applicability of this practice.

B. Engineering Surveys

1. An accurate topographic survey of the proposed location shall be taken and shall extend a minimum of 50 feet beyond the limits of the proposed facility and in sufficient detail to determine drainage patterns in the vicinity of the proposed anaerobic digester. The proposed location of the anaerobic digester shall be referenced so that it can be staked in the field. The survey should show the location of existing buildings, utilities, electrical hookup source, wells, existing buried pipelines, drainage ditches, streams, etc., in the vicinity of the proposed facility.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the type of digester applicable for the type and characteristics of waste used.
2. Determine the size and dimensions including minimum design storage, rainfall (if necessary), retention time, and freeboard for the digester vessel.
3. Determine the size, grade, and location of all inlet and outlet pipes.
4. Determine the type, thickness, and quality of the digester cover. See NRCS conservation practice standard Waste Facility Cover, Code 367. Include all applicable appurtenances for installing the digester cover.
5. Design the gas collection, transfer, and control system.
6. Design the gas utilization system.
7. Design and specify all monitoring equipment needed to properly operate the facility.
8. Design and specify all safety requirements for the facility including warning signs.
9. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Planned location of the digester on the topographic survey and location of all appurtenances necessary in the operation of the digester.
   b. Size, location, and grade of all inlet and outlet pipes.

c. Dimensions of the digester vessel. Include typical cross sections of the digester including cover.

d. Details of the gas collection system, including type of pipe, devices, sizes, location, material, and grades.

e. Details of gas control facility, piping layout, components, electrical service if required, and protection from the elements.

f. Appropriate gas safety equipment or protective measures.

g. Location of utilities and notification requirements.

10. Compute quantity of all materials (digester vessel, earth fill, digester cover, pipes, etc.) when used as basis of payment.

11. Develop an O&M Plan specific for the site.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record all layout information in the engineering field book or in the electronic field book.

1. Set sufficient stakes to guide the contractor in installing the practice. As a minimum, stake the corners of the facility.

2. Stake the location and elevations of all pipes, etc.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the engineering plans and in the engineering field book.

1. Location of the anaerobic digester and appurtenances.

2. Constructed dimensions and elevations of the anaerobic digester.

3. Structural components.

a. Type, quality, and quantity of digester cover installed. Check the anchorage of the cover to determine if installed correctly.

b. Type, quality, and quantity of all inlet and outlet pipe installed.

c. Details of the gas collection system.

d. Details of the gas control facility.

e. Document all safety equipment installed.

4. Verify and document that all required warranties are on file.

5. Prepare as-built drawings showing final construction dimensions, details, etc.

6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets

NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of anaerobic digesters installed. The extent certified shall be the quantities used as the basis of payment.

Animal Mortality Facility, Code 316

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Animal Mortality Facility, Code 316.

B. Design Procedures

1. Alabama Poultry Waste Management Workbook

2. AL-ENG-25F

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.

2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids.

1. Nutrient Budget Spreadsheet

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the need and feasibility of an animal mortality facility. If freezers are used, there must be a state approved vendor available to pick up and process the animal mortality from the freezers.

B. Engineering Surveys

1. Only minimal survey is needed. The survey shall show the location of the proposed facility and verify that it will not be installed in a floodplain and to determine drainage patterns in the vicinity of the proposed facility. The proposed location of the animal mortality facility shall be referenced so that it can be staked in the field. The survey should show the location of existing buildings, etc., in the vicinity of the proposed facility.

2. Note the location of any utilities or utility markers.

C. Design

1. Several methods are available for disposing of mortality. Determine type of facility needed. Record design data on NRCS-ENG-523A (or equivalent).

2. Determine facility size. Facility shall be designed to accommodate the landowners operation, mortality data, or in the absence of landowner data, use data from similar facilities in the local area. In the case of freezers, vendor pickup schedule is a factor in determining facility size.

3. Determine number and size of facilities required.

4. Compute quantity of foundation material (earth fill, concrete, timbers, etc.) used for supporting the facility when used as a basis of payment.

5. Develop engineering plans and specifications. As a minimum the plans and specifications for buildings shall include:

   a. Location of the facility on the conservation plan map or topographic map.

   b. Pertinent elevations of the facility.

   c. Location of electrical lines, gas lines, and requirements for burial and quality of materials.

   d. Standard details when concrete or timber is used for the facility foundation.

   e. Number, capacity, and quality of facility (ies).

   f. Location of utilities and notification requirements.

   g. Where a roof structure is used to protect the facility, include design data and building dimensions.

6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record all layout information in the engineering field book or in the electronic field book.

1. Stake the corners and elevation of the foundation support.
2. Stake the location of required facility appurtenances (e.g. electrical, gas, water, etc.).

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans and in the engineering field book and NRCS-ENG-523A (or equivalent).

Rotary Drum

1. Number and capacity of drums.
2. Rotary drum manufacturer and certification of operation.
3. Structural components.
   a. Type and size of foundation used.
   b. Location of electrical lines.
   c. If a roof structure is used, record structural components including size and spacing of timbers, preservative treatment, height, depth of embedment of timber supports, type and spacing of trusses. Trusses must be certified by an Alabama licensed professional engineer.
   d. Calculate the quantity of foundation material (earth fill, concrete, etc.) if used for supporting the facility.
   e. Verify and document that all required warranties are on file.
4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

Incinerator

1. Number and capacity of incinerators.
2. Incinerator manufacturer and certification of operational temperatures.
3. Structural components.
   a. Type and size of foundation used for the incinerator.
   b. Location and type of gas service provided.
   c. Location of electrical lines.
   d. If a roof structure is used, record structural components including size and spacing of timbers, preservative treatment, height, depth of embedment of timber supports, type and spacing of trusses. Trusses must be certified by an Alabama licensed professional engineer.
   e. Calculate the quantity of

foundation material (earth fill, concrete, etc.) if used for supporting the facility.

f. Verify and document that all required warranties are on file.

4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

Freezer

1. Location and elevation of facility.
2. Number of facilities, dimensions, and capacity in cubic feet.
3. Facility components.
   a. Visual screening if part of the design.
   b. Location of electrical lines and components.
   c. Foundation dimensions and type of material used for facility foundation.
   d. Calculate the quantity of foundation material (earth fill, concrete, etc.) if used for supporting the facility.
   e. Verify and document that all required warranties are on file.
4. Prepare as-built drawings showing final construction dimensions, details, etc.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of facilities installed. The extent of the practice certified is the quantities used as the basis of payment.

Animal Trails and Walkways, Code 575

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Animal Trails and Walkways, Code 575.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine that the site is suitable, required structures for drainage, and the appropriate surface treatment needed to stabilize the site.

B. Engineering Surveys

1. Record all surveys in the engineering field book or in the electronic field book.
2. Reference all surveys to a bench mark where needed to establish elevations for construction. Bench marks to NGVD should be used if possible.
3. Surveys shall be taken to determine the location, elevations, cut and fill volumes, erosion and water control structures needed to control runoff. As a minimum, cross sections shall be taken to adequately show the site topography and design the appropriate type of surface treatment.
4. Note the location of any utilities or utility markers.

C. Design

1. Design in accordance with the design criteria in the conservation practice standard Animal Trails and Walkways, Code 575. Record design data on NRCS-ENG-523A (or equivalent).
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of trail or walkway. Can be a sketch on job plans, field notes, approved forms, or on the conservation plan map.
   b. Design width and length of trail or walkway.
   c. Type, location and dimensions of fence where required.
   d. Grade or percent of slope of trail or walkway.
   e. Critical elevations if applicable.
   f. Type and thickness of surface treatment including any base course requirement or reinforcement if concrete is used.
   g. Cut and fill slopes where applicable.
   h. Drainage and structure requirements including size and elevation of required structures.
   i. Vegetative requirements for disturbed areas.
   j. Location of utilities and notification requirements.
3. Compute earth fill or excavation quantities and type and quantity of surface treatment.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly

understand their responsibilities including obtaining all permits, easements, etc.

Record the layout information in the engineering field books or in the electronic field book.

1. Set a sufficient number of stakes to guide the landowner or contractor in constructing the animal trail or walkway. As a minimum, locate the trail or walkway and stake cut and fills.
2. Stake the location and elevations of required structures such as culverts, drainage ditches, etc.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Survey a minimum of one cross section per trail or walkway to determine if it is constructed to the design elevations and dimensions, slopes, and grade.
2. Survey additional measurements as needed to determine the dimensions of the surface area treated. The area shall be measured in the field with a chain, calibrated measuring wheel, GPS, or other equivalent method. Compute the area treated.
3. Check the surface treatment type, thickness and quality and determine if it meets the design requirements.
4. Check the location, size and elevations of all structures and components installed.
5. Check adequacy of vegetation of disturbed areas.
6. Prepare as-built drawings showing final construction dimensions, details, etc.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the length of animal trail or walkway in feet. The extent of the practice to be certified is the quantities used as the basis of payment such as the cubic yards of earth moved, square feet, cubic yards or acres of surface treatment, etc.

Anionic Polyacrylamide (PAM) Erosion Control, Code 450

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Anionic Polyacrylamide (PAM) Erosion Control, Code 450.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation, including obtaining soil samples, to determine if soils at the site are suitable for treatment with PAM and to determine the required application rate.

B. Engineering Surveys – None Required.

C. Design

1. Design in accordance with the design criteria in the conservation practice standard Anionic Polyacrylamide (PAM) Erosion Control, Code 450. Record design data on NRCS-ENG-523A (or equivalent).
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include for each field:
    a. Location of area to be treated.
    b. Sodium adsorption ratios of irrigation water when PAM is used for irrigation.
    c. Characteristics of PAM to be used.
    d. PAM application rate.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

None Required. Area to be treated may be shown on conservation plan map.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Check the area treated to determine if the treatment is effective in reducing erosion.
2. Record the type, quality, quantity of PAM applied.
3. Prepare as-built drawings showing final construction dimensions, details, etc.
4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the area in acres. The extent of the practice to be certified is the quantities used as the basis of payment such as the pounds of PAM applied, etc.

Aquaculture Ponds, Code 397

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Aquaculture Ponds, Code 397.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. NRCS Computer Program "Sites".
2. NRCS Computer Program "Winpond."
3. USDA – NRCS Hydraulics Formula.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice, considering soils, topography, water quality, water availability, structure requirements, availability of outlets, etc. Check requirements of state laws for permitting and notify landowner of his/her responsibility. In many cases a permit may be required prior to construction.

B. Engineering Surveys

The majority of commercial fishponds can be designed and constructed by combining the design survey and construction layout survey into one operation. For small jobs, record design and layout data on form SCS-ENG-28 and -29. For large complex jobs, record survey data for design, layout and construction in the engineering field book or in the electronic field book.

1. Set and describe one permanent bench mark for future reference.
2. Make a survey of the area. The extent of the survey will be based on the complexity of the project and site conditions. For small simple jobs, a few rod readings will be adequate. For large or complex jobs and jobs with more than one pond, a detailed topographical survey will be needed. Where the topography is irregular and earth work quantity is needed, survey a sufficient number of cross sections for determining cut and fill volumes.
3. Set reference stakes for relocation of fishpond.
4. Note the location of any utilities or utility markers.

C. Design

1. Complete soils investigation report and construction recommendations including spoil placement and record on form SCS-ENG-538.
2. Perform hydrologic design using "Winpond" or other methods to establish structure elevations.
3. Determine pond length, width and depth. Record design data on NRCS-ENG-523A (or equivalent) form AL-ENG-2, AL-ENG-3, or AL-ENG-7.
4. Design structures needed to control runoff and discharge from the pond.
5. Compute earth fill and excavation quantities and preliminary cost estimate where needed.
6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location map of fishpond with topographic information.
   b. Typical cross sections of pond showing the elevations and dimensions.

c. Details of all control structures including size, location, material type and elevations.

d. Compaction requirements for earth fill.

e. Disposal of any excess excavated material.

f. Location and type of fence, if required.

g. Vegetative requirements.

h. Location of utilities and notification requirements.

7. Develop a site specific O&M Plan for the practice.

D. Construction Layout (Excavated Ponds)

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book or in the electronic field book.

1. The extent of layout required will depend on site conditions, complexity of the job and the necessity of determining volume of excavation. Record layout information on form AL-ENG-2, AL-ENG-3, or AL-ENG-7 or in the engineering field book or in the electronic field book. The forms may be completed and given to the landowner for constructing the pond.

2. For excavated ponds set a sufficient number of stakes to outline the top dimensions of the pond(s). Set slope stakes, as required, to enable the contractor to excavate the pond and place the spoil to planned lines and grades.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout (Excavated Ponds)

1. Record check-out data on forms AL-ENG-2, AL-ENG-3, AL-ENG-7, in the engineering field book, or in the electronic field book, as appropriate.

a. Survey at least one longitudinal and one lateral cross section of the pond at the location that represents the weakest section. Where the spoil is shaped, extend the cross sections from the outside toe of the spoil on one side to the outside toe of the spoil on the other side.

b. Check constructed grades against planned grades and note difference.

c. Record elevations and lengths of all structures installed.

d. Where required, compute actual earth work quantities.

2. Ponds will be acceptable where the following conditions are met.

a. The top width and length are at least 97 percent of the planned dimensions.

b. The depth of the pond is no shallower than 0.1 foot of the planned dimension.

c. The excavated material placed around the pond is within + 0.5 foot of the planned spoil height and is shaped as specified in the specifications.

d. The as-built cross sectional area equals or exceeds the planned cross sectional area. Where unforeseen physical conditions prohibit completion of the pond as originally planned, and an alternate design that will meet specifications is possible, a new planned earth work quantity should be computed and cleared with all interested parties.

3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Construction Layout and Checkout for Embankment ponds

See Pond, Code 378, Embankment Type, for construction layout and checkout requirements for embankment ponds.

H. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of these practices to be reported is the acres of ponds constructed. The extent of the practice certified shall be the quantities used as the basis of payment.

Bedding, Code 310

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Bedding, Code 310.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the need and feasibility of the practice considering topography, soils, availability of drainage outlets, and cost.

B. Engineering Surveys

1. An accurate topographic map with permanent reference points is always recommended. The plan for the bedding system can be recorded on the topographic map and easily transferred onto the land. A topographic map may not be necessary for small areas with uniform slopes.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine if the outlet is adequate to provide the necessary drainage required for the crop to be grown.
2. Determine bedding spacing and height based on:
   a. Drained root zone required for the crop rooting depth (see conservation practice standard Bedding, Code 310 and Alabama Drainage Guide).
   b. Local construction and maintenance methods.
3. Prepare a plan view sketch of the beds showing location, orientation, spacing, and other appropriate information. An aerial or topographic map may be used. The plans shall include a typical cross section of the beds.
4. Determine drainage area for the beds and compute the required discharge for each channel and structure. One calculation may be used for the typical bed configuration.
5. Design required water control structures and provide typical structure details. See documentation requirement for Structures for Water Control, Code 587.
6. Compute earth work quantities when used as basis of payment.
7. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Typical cross section of bed.
   b. Direction and grade of bed.
   c. Location of utilities and notification requirements.
   d. Vegetative requirements if applicable.
8. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record all surveys in the engineering book.

1. Stake the centerline of at least one bed to provide the landowner or contractor alignment and location of beds. Stakes shall be placed on a maximum spacing of 500 feet.
2. Stake the location of required water control structures.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information in the engineering field book or in the electronic field book.

1. Constructed length of each bed. Length shall be determined by measuring, representative beds using a chain, calibrated measuring wheel, GPS, or equivalent method.
2. For one bed in each field, or for one bed in each group of beds constructed at the same time in a field, select the bed that appears least likely to meet specifications.
    a. Record profile of the top of the bed and channel.
    b. Record and plot the cross section of the bed at the weakest section. Extend the cross section from the channel across the bed to the opposite channel.
3. For all other beds in the field or for each group of beds constructed at the same time in a field, by visual observation or with survey instruments, determine and document whether beds meet specifications.
4. Statement as to adequacy and stability of the outlet.
5. Prepare as-built drawings showing final construction dimensions, details, etc.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the total area in acres of bedding. The extent of the practice certified is acres or the quantities used as basis of payment such as volume of earthwork in cubic yards, etc.

Channel Bed Stabilization, Code 584

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Channel Bed Stabilization, Code 584.

B. Design Procedures

1. NEFH, Part 653, Stream Corridor Restoration Principles, Processes and Practices.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity of the problem and type of treatment needed to protect the channel and extent of survey needed. Make the necessary planning surveys and develop an engineering plan map for at least the area affected by the practice.

B. Engineering Surveys

1. Establish the location of the channel to be stabilized.
2. Set and describe at least one permanent bench mark near the outlet end of the channel. Bench marks to NGVD should be used if possible.
3. Survey profile of the channel with cross sections at intervals not to exceed 100-feet, depending upon irregularity of the natural ground and/or area to be protected. Stations along channel shall be determined by measurement with chain, calibrated wheel or other acceptable method of equivalent accuracy. Elevations along cross sections will show all breaks and should extend from 25 feet from outside top of channel to 25 feet outside of top of channel.
4. Note the location of any utilities or utility markers.

C. Design

1. Plot profiles and cross sections.
2. Determine the appropriate treatment needed to stabilize the channel. Protection shall be in accordance with National Engineering Handbook, Part 653, Stream Corridor Restoration Principles, Processes, and Practices.
3. Develop cross sections with sufficient details (such as slopes) to install the practice.
4. Design necessary grade stabilization structures and structures for water control.
5. Determine quantities of all materials needed to provide stabilization of the channel. Prepare preliminary cost estimate.
6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Site plan layout.
   b. Cross sections and profiles.
   c. Location and details of appurtenant structures.
   d. Special requirements for diverting water and dewatering site.
   e. Special foundation requirements.
   f. Vegetative requirements, if applicable.
   g. Location of utilities and notification requirements.
7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book or in the electronic field book.

1. Stake the centerline of the channel.
2. Set stakes at changes in alignment or grade and on intervals not to exceed 200 feet.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All channel stabilization shall be checked for completion by making an engineering survey as follows:

1. Determine the total length of stream channel protected. The length shall be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.
2. Obtain a profile of the channel bottom and natural ground with rod readings at a spacing not to exceed 100 feet. Record the planned channel bottom grade rod readings on the checkout notes for each station checked.
3. Obtain cross sections of the channel at a spacing not to exceed 200 feet. Rod readings shall be taken at all breaks in slope along the cross section. Extend the cross sections from the center line of the stream to 25 feet beyond the construction on both sides of the channel.
4. Compute quantities of materials installed as needed.
5. Prepare as-built drawings showing final construction dimensions, details, etc.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length in feet. The extent to be certified is the quantities used as the basis of payment such as cubic yards of rock, vegetative material, etc.

Clearing and Snagging, Code 326

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Clearing and Snagging, Code 326.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.
3. NEFH Part 650, stream Restoration Design, Chapter 6, Stream Hydraulics.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity and extent of the obstructions, availability of an outlet, and the type and extent of surveys needed. Make the necessary planning surveys and assessments to develop an engineering plan map of the areas requiring clearing and snagging.

B. Engineering Surveys

1. Minimal surveys are required depending on degree of removal. The area may be designated on an aerial photograph.
2. Note the location of utilities or utility markers.

C. Design

1. Locate areas requiring clearing and snagging on aerial photograph. Location may be sketched on job sheet or plans.
2. Document channel capacity before and after improvement.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of area to be cleared and snagged.
   b. Location of ingress and egress to the site.
   c. Sequence of construction to minimize environmental impacts.
   d. Limits of debris removal.
   e. Disposal location and requirements for debris.
   f. Location of areas off limits for disposal area.
   g. Location and description of trees or woody vegetation to be left undisturbed.
   h. Method of debris removal.
   i. Erosion control measures, as applicable.
   j. Vegetative requirements for disturbed areas.
   k. Location of utilities and notification requirements.
4. An O&M Plan is not required for this practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book or in the electronic field book.

1. Stake the work limits of areas requiring clearing and snagging.
2. Set stakes or flags on intervals not exceeding 200 feet.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All areas cleared and snagged shall be checked for completion by making an engineering survey as follows:

1 Determine the total length of channels cleared and snagged. The length shall be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.

2. Locate area that was cleared and snagged on aerial photograph.

3. Prepare as-built drawings showing final construction dimensions, details, etc.

4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the length in feet. The extent to be certified is the quantities used as the basis of payment such as linear feet cleared and snagged, etc.

Closure of Waste Impoundments, Code 360

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Closure of Waste Impoundments, Code 360.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the extent of the waste impoundment to be closed and the appropriate method of closure to meet the planned purpose.

B. Engineering Surveys

1. Record all surveys in the engineering field book or in the electronic field book.
2. Reference all surveys to a bench mark where needed to establish elevations for construction. Bench marks to NGVD should be used if possible.
3. Surveys shall be taken in sufficient detail to determine the extent of the area to be closed, to determine elevations of structures to be breached, cut and fill volumes, and structures needed to control erosion and runoff. In many cases a topographic map of the area will be necessary to properly design the closure.
4. Note the location of any utilities or utility markers.

C. Design

1. Design in accordance with the design criteria in the conservation practice standard Closure of Waste Impoundments, Code 360. Record design data on NRCS-ENG-523A (or equivalent).
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of impoundment to be closed.
   b. Utilization of nutrients.
   c. Where embankments are to be breached, cross section of embankment and the dimensions of the breach.
   d. Details for structures (pipelines, etc.) to be closed or removed.
   e. Cross section of area to be filled.
   f. Cut and fill quantities where applicable.
   g. Amount of wastewater or sludge to be pumped, if applicable.
   h. Erosion control structure requirements.
   i. Vegetative requirements.
   j. Location of utilities and notification requirements.

   Note: If the site is to be converted for fresh water storage, the documentation procedures shall be in accordance with the appropriate conservation practice standard.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the

landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record the layout information in the engineering field books or in the electronic field book.

1. Set a sufficient number of stakes to guide the landowner or contractor in closing the impoundment.
2. Stake the location and elevations of required structures.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Survey a sufficient number of cross sections to determine if the breach and/or area to be backfilled is constructed to the design elevations.
2. Survey a sufficient number of profiles and cross sections to compute the quantity of earth work and volume of waste or sludge where needed as a basis of payment.
3. Check the location, size, and elevations of all structures.
4. Check adequacy of vegetation.
5. Prepare as-built drawings showing final construction dimensions, details, etc.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of impoundments closed. The extent of the practice to be certified is the quantities used as the basis of payment such as the cubic yards of earth moved, etc.

Composting Facility, Code 317

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Composting Facility, Code 317.

B. Design Procedures

1. Alabama Poultry Waste Management Workbook
2. Alabama Supplement to NEFH Part 650, Chapter 6, Structures
3. NEH Part 637, Chapter 2.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. Alabama NRCS Nutrient Budget spreadsheet.

II. Documentation

A. Preliminary Investigation

1. Make a preliminary investigation of the need and feasibility of a composting facility considering topography, floodplain, location and type of material to be composted, availability and adequacy of land for waste application, proximity to neighboring landowners, and cost. Where small animals or poultry is to be composted, discuss all methods of mortality disposal with the landowner. Other methods include freezing and incineration.
2. Obtain general information and decisions such as desired method of dead bird disposal, type of birds, number of birds, mortality rate, grow-out weight, days of grow-out, and number of flocks per year. Litter clean out is important in sizing the litter storage. The landowner may know the depth of clean out for each house or the type of machine and number of trips required to clean out each house. Some landowners sell some or all of the litter, haul it offsite, or temporarily store it for use later. When sold, the landowner must document who bought the litter and the amount sold. If the landowner is land-applying the waste, information such as number of acres, type of vegetation planted, a soil analysis, a litter/compost analysis, and expected yield is needed.
3. Consider location relative to county code requirements.

B. Engineering Surveys

1. Survey the proposed location when necessary to determine suitability of the site and to resolve design issues related to surface drainage, grade changes and other concerns that may affect the structure design. Note the location of existing buildings, utilities, property lines, water bodies etc., in the vicinity of the proposed facility and record where appropriate in order to document compliance with minimum distance requirements contained in the Standard.
2. Reference all surveys to a bench mark where needed to establish elevations for construction. Bench marks to NGVD should be used if possible.
3. Note location of any utilities and utility markers.

C. Design

1. Designing the composter and litter storage facility requires certain decisions from the landowner such as wood or metal truss, roof pitch, number of walls for the litter storage,

configuration, and litter storage height (maximum height is 7 feet). Post spacing will be determined by the size of the equipment the landowner will be using in moving compost from the primary bins or stack to the secondary bins or stack.

2. Determine volume of dead bird composter and size composter. (Use form AL-ENG-25F).
3. Sizing the composter is determined by the number of birds on the farm per grow out, anticipated mortality for flock, weight of birds near maturity, and life of the flock. The primary bins or stacks are sized according to the total composter volume. At a minimum the secondary bins or stack is the same volume as the primary bins or stack. The height of the compost should not exceed 5 feet. Width of the bins is usually the same as the post spacing. The depth of a standard bin is usually 5 feet to accommodate the equipment (front-end loader).
4. Calculate Storage Volume for Litter (Use form AL–ENG-25E). The maximum litter storage volume is based on the largest clean out per year. Number of houses, dimensions of houses, and clean out depth for each house are the information required to compute the total volume required. Some landowners know the volume of their clean out equipment and the number of trips that is required to clean out each house. If this information is known, the volume of the litter storage facility can be calculated. If the landowner does not want to store one clean out, the minimum storage will be determined by the percentage of litter required to feed other livestock and/or the volume of litter required to compost the dead birds.
5. Design Structure
    a. Select a Storage Structure from the preapproved drawings in Chapters V and IX of the Alabama Poultry waste Management Workbook. In consultation with the landowner select a structure configuration that meets his/her operational requirements. Drawings are available for stand-alone composters and for combined composter/litter storage.

       Where no preapproved drawing is available that meets the needs of the landowner, consult with the team Resource Engineer to develop or adapt a drawing for the site.

    b. Structural Design

Document design on form AL-ENG-25L or NRCS-ENG-523A (or equivalent). Use the appropriate design charts in the Alabama Poultry Waste Management Workbook for selecting post, girder, and purlin sizes. Read and understand the conditions applicable to the charts. The design assumptions are stated on the back of the design charts. Where site conditions are different from those stated on the design charts in the Workbook consult the Team Resource Engineer for guidance. Trusses must be designed by an Alabama licensed professional engineer. The design shall be signed and sealed by the engineer. .

6. Determine final location of structure.
7. Compute quantity of sub base material, concrete, pipeline, etc., when used as a basis of payment.
8. Develop engineering plans and specifications. Utilize Construction Specification CS-313 as appropriate. As a minimum the plans and specifications shall include:
    a. Location of the facility.
    b. Plan view of composting facility.

c. Cross section of composting facility.

d. Truss connection detail.

e. Truss cross bracing details.

f. Knee brace detail.

g. Girder brace detail.

h. Post embedment detail.

i. Composter bin detail.

j. Block wall or wood wall detail.

k. Purlin detail.

l. Concrete floor details including contraction joint detail.

m. Ramp dimensions and construction details.

n. Roof details.

o. Water supply for composting.

p. Location of utilities and notification requirements.

q. Grading and drainage details.

9. Develop a site specific O&M Plan for the practice. Utilize Alabama Job Sheets 317, 317A, 317B, or 317C as appropriate. The Nutrient Budget spreadsheet may be used to calculate the land requirement to utilize the compost.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc. After reviewing plans and specifications with the landowner and contractor have the landowner and contractor sign the top of form AL-ENG-25K.

Establish reference points for determining location and elevations of the structures if needed.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

After construction, complete and sign form AL-ENG-25K. If significant changes were made to the structure during construction, prepare as-built drawings showing final dimensions and details.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of facilities installed. The extent of the practice certified is the quantities used as the basis of payment.

Constructed Wetlands, Code 656

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Constructed Wetlands, Code 656.
2. NEH Part 637, Chapter 3, "Constructed Wetlands"

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice, considering soils, topography, water availability, structure requirements, availability of outlets, etc. Check requirements of state laws for permitting and notify landowner of his/her responsibility. In many cases a permit may be required prior to construction.

B. Engineering Surveys

Constructed wetlands require a detailed topographic survey to determine location of structures; excavation and earth fill requirements, etc. Record survey data for design, layout, and construction in the engineering field book.

1. Set and describe one permanent bench mark for future reference. Bench marks to NGVD should be used if possible.
2. Make a detailed topographical survey of the area. The extent of the survey should extend beyond the boundaries of the proposed work. Locate all existing structures during the survey. Include sufficient survey readings to allow the designer to determine structure locations, earth fill and excavation quantities, etc.
3. Set reference stakes for relocation of constructed wetland.
4. Note location of any utilities or utility markers.

C. Design

1. Complete soils investigation report and construction recommendations including spoil placement and record on NRCS-ENG-523A (or equivalent).
2. Determine extent of the constructed wetland area. Record design data on NRCS-ENG-523A (or equivalent).
3. Design structures for water control required to control runoff and discharge from the constructed wetland.
4. Compute earth fill and excavation quantities and preliminary cost estimate where needed.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of constructed wetland.
   b. Typical cross sections of structures such as dikes, water control structures, etc.
   c. Details of all structures.
   d. Vegetative planting required for the constructed wetland to achieve its purpose. Also develop vegetative requirements to protect dikes, embankments, etc., and disturbed areas.
   e. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. The extent of layout required will depend on site conditions, complexity of the job and the necessity of determining volume of excavation.
2. Set a sufficient number of stakes to outline the outside dimensions of the constructed wetland. Set slope stakes, as required, to enable the contractor to construct dikes, water control structures, and other structures.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Record check-out data in engineering field book.
   a. Survey the extent of the constructed wetland and compare with the planned location and extent.
   b. Survey the location that represents the weakest section. Where the spoil is shaped, extend the cross sections from the outside toe of the spoil on one side to the outside toe of the spoil on the other side.
   c. Check constructed grades of structures, dikes, etc., against planned grades and note difference. For individual practices, refer to the appropriate note keeping procedure in this document.
   d. Record elevations and lengths of all structures installed.
   e. Record the type and quality of all materials installed.
   f. Where required, compute actual earth work quantities.
2. Prepare as-built drawings showing final construction dimensions, details, etc.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of these practices to be reported is the acres of wetlands constructed. The extent of the practice certified shall be the quantities used as the basis of payment such as earth fill, length and size of pipe, etc.

Dam, Code 402

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Dam, Code 402.
2. NRCS TR 60, Earth Dams and Reservoirs.
3. Alabama conservation practice standard, Pond, Code 378.

B. Design Procedures

1. NEFH 210-650, Chapter 11, Ponds and Reservoirs.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. NRCS Computer Program “SITES”
2. NRCS Computer Program “WinPond.”

II. Documentation

A Preliminary Investigation

1. Determine and document hazard classification of the dam. Document the rationale for assigning the hazard classification as a part of the design records.
2. Make a preliminary investigation to determine site suitability, considering soils, topography, etc.
3. Where irrigation is the primary purpose of the impoundment determine that irrigation storage is feasible with an adequate supply of water available.
4. Check appropriate requirements of state laws for permitting and notify landowner of his/her responsibilities. In many cases a permit is required prior to construction.

B. Engineering Surveys

1. The design survey and layout survey for some dams may be combined into one operation. Record all survey data in the engineering field book. Notes recorded in the engineering field book shall be as illustrated in NRCS Technical Release 62, Engineering Layout, Notes, Staking and Calculations.
2. Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible.
3. Set reference stakes for locating the proposed embankment.
4. Survey the dam centerline profile the full length of the embankment extending above the expected elevation of the dam and beyond the location of the auxiliary spillway. Centerline profile rod readings shall be taken at all breaks in grade and at intervals not to exceed 50 feet. Survey a sufficient number of cross sections to accurately compute quantities.
5. Profile the centerline of the auxiliary spillway including the inlet section, level section and outlet section.
6. Show sketch of embankment, reservoir area, auxiliary spillway, proposed fences and other appurtenant structures. Show location of bench marks and reference stakes on sketch.
7. Note location of any utilities and utility markers.

C. Design

1. Re-evaluate the hazard classification

of the proposed dam.

2. Record design data on NRCS-ENG-523A (or equivalent) or print outs from approved computer programs. When using computer programs, make sure that default settings in the program are appropriate for the dam class and size.
3. Complete soils investigation report. Develop construction recommendations and record in the engineering field book or in the electronic field book.
4. Check pipe hydraulics for all flow conditions - pipe, weir, and orifice.
5. Compute earth work quantities. When the elevation of the ground under the base of the embankment does not vary over 2 feet over the cross section, the end area may be taken from approved yardage tables. Where the elevation of the ground varies more than 2 feet, the cross sectional area will be obtained by the rectangular coordinate method or the cross section may be plotted and measured by a planimeter; or calculated by a computer program. Limits for earth work quantity calculations shall be the neat lines and grades of the designed embankment after settlement.
6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
    a. Location of dam.
    b. Plan and profile of the embankment and auxiliary spillway.
    c. Profile of principal spillway.
    d. Typical cross sections of the embankments and structures.
    e. Seepage control details.
    f. Borrow sources.
    g. Structural details of any structural elements.
    h. Location of utilities and notification requirements.
    i. Vegetative requirements.
7. Where needed prepare a preliminary cost estimate.
8. Develop a site specific O&M Plan for the practice.

D. Construction Layout

If the dam is constructed more than one year after the dam was designed, another hazard classification will be performed.

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book. Layout notes recorded in the engineering field book shall be as illustrated in Technical Release No. 62.

1. Set centerline stakes and slope stakes as required to accurately compute quantities where needed and/or enable the contractor to construct the embankment and spillway(s) to the planned lines and grades. Stations along the profile shall be determined by chaining, except where quantities will not be certified.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed. The most important times to inspect construction are during final excavation

of the cutoff and during installation of the principal spillway pipe and drains.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check-out data in the engineering field book.

1. Profile the centerline of the dam. Extend the profile across the spillway. Record profile rod readings at all stations and at all breaks in grade.
2. Survey at least one cross section of the dam at a location that represents the weakest section. Record rod readings at each edge of the crown, at each toe, at intermediate points between the top and each toe and at changes in the side slope.
3. Profile the center line of excavated spillways from a point within the pool area to at least 50 feet below the excavated section. Cross section the auxiliary spillway at the control section.
4. Record appropriate elevations and other information of any components such as the principal spillway, trash rack, etc. Record type of material used, gage, coating, etc.
5. Check constructed grades against planned grades and note difference. Compute constructed side slopes and record on check-out notes.
6. Record data on seepage control measures.
7. Record adequacy and type of vegetative cover established for the auxiliary spillway and embankment.
8. Determine quantities for earth fill, excavations, clearing, etc. if needed.
9. Embankment will be acceptable where all of the following conditions are met:
    a. Embankment will be acceptable with respect to side slopes where side slopes as constructed are not more than 0.1:1 steeper than the designed slope plus allowance for settlement.
    b. Constructed crown elevations are not more than 0.1 foot below planned elevations, with allowance for settlement added.
    c. The auxiliary spillway elevation does not vary from the planned elevation by more than 0.1 foot. The width must not be less than planned.
    d. The minimum required freeboard is not lowered by more than 0.1 foot
    e. Complete dam inventory form as needed.
10. Prepare as-built drawings showing final construction dimensions, details, etc.
11. After the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the

practice to be reported is the number of structures completed. The extent to be certified is the quantities used as the basis of payment such as volume of cubic yards of earth fill, etc.

Dam Diversion, Code 348

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Dam, Diversion, Code 348.
2. NRCS TR 60, Earth Dams and Reservoirs.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. Alabama NRCS Spreadsheet “Cirdis” for pipe drop structures.
2. USDA – NRCS Hydraulics Formula.

II. Documentation

A. Preliminary Investigation

1. Make a preliminary investigation to determine site suitability, considering soils, topography, etc.
2. Check appropriate requirements of state laws for permitting and notify landowner of his/her responsibilities. In many cases a permit is required prior to construction.

B. Engineering Surveys

1. The design survey and layout survey for some diversion dams may be combined into one operation. Record all survey data in the engineering field book. Notes recorded in the engineering field book shall be as illustrated in NRCS Technical Release 62, Engineering Layout, Notes, Staking and Calculations.
2. Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible.
3. Set reference stakes for locating the proposed embankment.
4. Survey the embankment centerline profile the full length of the embankment extending above the expected elevation of the dam and beyond the location of the auxiliary spillway. Centerline profile rod readings shall be taken at all breaks in grade and at intervals no greater than 50 feet. Survey a sufficient number of cross sections to accurately compute quantities.
5. Show sketch of embankment, reservoir area, auxiliary spillway, proposed fences and other appurtenant structures. Show location of bench marks and reference stakes on sketch.
6. Note location of any utilities and utility markers.

C. Design

1. Re-evaluate the hazard classification of the proposed diversion dam.
2. Record design data on NRCS-ENG-523A (or equivalent) or print outs from approved computer programs3. Complete soils investigation report. Develop construction recommendations and record in the engineering field book.
4. Check pipe hydraulics for all flow conditions - pipe, weir, and orifice.
5. Compute earth work quantities. When the elevation of the ground under the base of the embankment does not vary over 2 feet over the cross section, the end area may be taken from approved yardage tables. Where the elevation of the ground varies more than 2 feet, the cross sectional area will be obtained by the rectangular coordinate method or the

cross section may be plotted and measured by a planimeter; or calculated by a computer program. Limits for earth work quantity calculations shall be the neat lines and grades of the designed embankment after settlement.

6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of dam.
   c. Plan and profile of the embankment and auxiliary spillway.
   d. Profile of principal spillway.
   e. Typical cross sections of the embankment and all structures.
   f. Borrow sources.
   g. Seepage control details.
   h. Structural details of any structural element.
   i. Vegetative requirements.
   j. Utility location and notification requirements.
7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

If the dam is constructed more than one year after the dam was designed, another hazard classification will be performed.

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book. Layout notes recorded in the engineering field book shall be as illustrated in Technical Release No. 62.

Set centerline and slope stakes as required to enable the contractor to construct the embankment and spillway(s) to the planned lines and grades. Stations along the profile shall be determined by chaining, except where quantities will not be certified.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed. The most important times to inspect construction are during final excavation of the cutoff and during installation of the principal spillway pipe and drains.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check-out data in the engineering field book.

1. Profile the centerline of the dam diversion. Extend the profile across the spillway. Record profile rod readings at all stations and at all breaks in grade.
2. Survey at least one cross section of the dam diversion at a location that represents the weakest section. Record rod readings at each edge of the crown, at each toe, at intermediate points between the top and each toe and at changes in the side slope.
3. Profile the center line of excavated spillways from a point within the pool area to at least 50 feet below the

excavated section. Cross section auxiliary spillway at the control section.

4. Record appropriate elevations and other information of any components such as the principal spillway, trash rack, etc. Record type of material used, gage, coating, etc.
5. Check constructed grades against planned grades and note difference. Compute constructed side slopes and record on check-out notes.
6. Record data on seepage control measures.
7. Record adequacy and type of vegetative cover established for the auxiliary spillway and embankment.
8. Determine quantities for earth fill, excavations, clearing, etc. if required.
9. Embankment will be acceptable where all of the following conditions are met:
    a. Pond will be acceptable with respect to side slopes where:

        Side slopes as constructed are not more than 0.1:1 steeper than the designed slope plus allowance for settlement.

    b. Constructed crown elevations are not more than 0.1 foot below planned elevations, with allowance for settlement added.
    c. The auxiliary spillway elevation does not vary from the planned elevation by more than 0.1 foot. The width must not be less than planned.
    d. The minimum required freeboard is not lowered by more than 0.1 foot.
    e. Complete dam inventory form as needed.
10. Prepare as-built drawings showing final construction dimensions, details, etc.
11. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of structures completed. The extent to be certified is the quantities used as the basis of payment such as volume of cubic yards of earth fill, etc.

Dike, Code 356

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Dike, Code 356.

B. Design Procedures

1. NEH, Part 624, Drainage, Chapter 6, Dikes.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH, Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine that an adequate outlet is available, or can be made available.

B. Engineering Surveys

1. Record all surveys in the engineering field book.
2. Record profiles and cross sections of the original ground surface in sufficient detail to permit designing the dike.
3. Reference all surveys to a bench mark where needed to establish elevations for construction. Bench mark for complex jobs shall be to NGVD.
4. Note location of utilities and utility markers.

C. Design

1. Design in accordance with the design criteria in the conservation practice standard for Dike, Code 356. Record design data on NRCS-ENG-523A (or equivalent).
2. Determine and document class of dike.
3. Determine earth fill quantities.
4. Obtain sufficient soils/geologic investigations.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of dike.
   b. Profile of top of proposed dike and natural ground along centerline of proposed dike.
   c. Typical cross sections.
   d. Structural details of water control and other structures.
   e. Slope protection requirements, if applicable
   f. Seepage protection, if applicable
   g. Borrow source.
   h. Vegetative requirements.
   i. Disposal of unsuitable soil
   j. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice. For Class I dikes with a height greater than 12 feet, complete an emergency action plan meeting the requirements of 500.70 of the National Operation and Maintenance Manual prior to construction of the dike.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

Set a sufficient number of stakes to guide the landowner or contractor in constructing the dike. As a minimum, stake the location of the beginning of the dike and end of the dike, at changes in alignment, at changes in cross section, and at locations not exceeding a spacing of 500 feet.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed. Critical items that should be inspected prior to backfilling include cutoff excavations, if any, and outlet structure installation.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Profile the dike at a maximum interval of 500 feet. Measure the entire length of the dike. The length shall be measured in the field with a chain, calibrated measuring wheel, GPS, or other equivalent method. Record check out in the engineering field book.
2. Record and plot a minimum of one cross section of the dike that represents the weakest section for each typical cross section. Determine if the cross sectional area meets the design.
3. Check to see that design height plus freeboard and allowance for shrinkage have been met at each station.
4. Check adequacy of vegetation.
5. Prepare as-built drawings showing final construction dimensions, details, etc.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length of dike in feet. The extent of the practice to be certified is the quantities used as the basis of payment such as the cubic yards of earth moved.

Diversion, Code 362

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Diversion, Code 362.

B. Design Procedures

1. NEFH, Part 650, Chapter 9, Diversions.
2. Agricultural Handbook No. 667, Stability Design of Grass-Lined Open Channels.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.
3. Engineering Field Tools.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine that an adequate outlet is available, or can be made available. Needed vegetative outlets must be installed before diversions are constructed.

B. Engineering Surveys

1. Reference all surveys to a bench mark where needed to establish elevations for construction. Bench mark to NGVD should be used if possible.
2. Profile the ground surface on a maximum interval of 100 feet, at changes in grade and changes in alignment.
3. Survey cross sections on a maximum spacing of 500 feet.
4. Note the location of any utilities or utility markers.

C. Design

1. Record design data on NRCS-ENG-523A (or equivalent). Follow the design procedure in Chapter 9 of the Engineering Field Handbook (NEFH), Part 650, or use an approved computer program. As a minimum record the following:
   a. Location sketch. Can be a sketch on job plans, field notes, and approved forms or on a conservation plan map.
   b. Drainage area.
   c. Outlet conditions.
   d. Design flow (peak flow computations).
   e. Channel grade.
   f. Design velocity for capacity and stability.
   g. Tractive stress.
   h. Channel and ridge dimensions including side slopes.
   i. Volume of earth fill when needed as a basis of payment.
   j. Vegetative requirements.
2. Compute volume of earth fill.
3. Complete soils/geologic investigation to determine suitability of earth fill and verify no subsurface impediments such as rock exist in excavated areas.
4. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location sketch. Can be a sketch on job plans, field notes, and approved forms or on a conservation plan map.
   b. Typical cross sections.
   c. Channel grade.

d. Location of utilities and notification requirements.

e. Vegetative requirements.

5. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

1. Record the layout information in the engineering field book.

   a. Set a sufficient number of stakes to guide the landowner or contractor in constructing the diversion. As a minimum, stake the diversion on a maximum spacing of 200 feet, at the beginning of the diversion, at changes in grade, at changes in alignment, and at the end of the diversion.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information in the engineering field book:

1. Profile of the diversion channel and ridge with readings taken at the same interval as in B.2 above. Measure the total length of the diversion by chaining, using a calibrated measuring wheel, GPS, or other equivalent method.

2. Record and plot at least one cross section of the channel and ridge that represents the weakest section for the diversion. Determine if the cross sectional area meets the design.

3. Check to see that design height plus freeboard and allowance for shrinkage have been met at each station.

4. Statement of adequacy of outlet.

5. Adequacy of vegetation.

6. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.

7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length in feet. The extent of the practice to be certified is the quantities used as the basis of payment such as the cubic yards of earth moved.

Drainage Water Management, Code 554

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Drainage Water Management, Code 554.

B. Design Procedures

1. NEH, Part 624, Section 10, Drainage, Water Table Control, and Section 16, Drainage of Agricultural Land.

2. NEH, Part 650, EFH Chapter 14, Water Management (Drainage).

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.

2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine if the practice is feasible considering the availability of an outlet, soil type, topography, etc. Check appropriate requirements of state laws for permitting and notify landowner of his/her responsibilities.

B. Engineering Surveys

1. The extent of surveys needed will be as required for all components such as pumping plant for water control, surface drainage main or laterals, etc. Where flooding the area is a purpose, the design survey shall be in sufficient detail to determine the extent of the area to be flooded and the height of dike needed to adequately flood the area. In general a topographic survey will be needed to plan the system. Surveys shall be recorded in the engineering field book as illustrated in NRCS Technical Release No. 62 or in an electronic data file.

2. Set and describe at least one permanent bench mark. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.

3. Locate the existing or proposed pumping plant and sketch in the engineering field book or in the electronic field book.

4. Survey the outlet including the elevation of the bottom of the outlet and normal ground and the expected high-water mark during a normal cropping season.

5. Note location of any utilities and utility markers.

C. Design

1. Record all design notes on NRCS-ENG-523A (or equivalent).

2. Determine structure locations that will provide the most control of drainage water for the practice purpose. Structure for water control elevations shall be designed to control the drainage water without damaging the crops.

3. Determine the required pumping capacity and the height of dike required where flooding is a purpose.

4. Design of system components shall be in accordance with procedures for that practice.

5. An overall operation plan shall be developed providing a detailed operation of the structures.

6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:

a. Location and extent of area to be flooded.

b. Typical dike section.

c. Pumping plant size and location

d. Location of all systems.

e. Details of water control structures, component practices, etc.

f. Location of utilities and notification requirements.

7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the location of components by procedures developed for that practice sufficient for the contractor to construct the required practices to the planned lines and grades.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Components shall be checked in accordance with procedures developed for the practices installed.

2. Survey at least one cross section of the dike at a location that represents the weakest section.

3. Record check-out data in the field book. Check survey data to verify if the system can be operated to the elevations as noted in the operation plan.

4. Verify that the pumping plant has the minimum capacity specified and note in the field book and engineering plans. Record appropriate elevations and other information of any components such as culverts, etc.

5. Record type of material used

6. Prepare as-built drawings showing final construction dimensions, details, etc.

7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the area served in acres. The extent of the practice certified is the quantities used as the basis for payment.

Dry Hydrant, Code 432

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Dry Hydrant, Code 432.

B. Design Procedures

1. Form AL-ENG-53

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. NRCS computer program "RESOP."
2. USDA – NRCS Hydraulics Formula.

II. Documentation

A. Preliminary Investigation

Determine if the site is feasible considering adequacy of water source, accessibility to the site by vehicles, etc. Determine the need for all-weather roads.

B. Engineering Surveys

1. Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible.
2. A topographic map of the site is recommended and should extend from the low water level to approximately 100 feet beyond the site boundary. If complete topographic coverage of a pond site is not feasible or practical, survey enough contours to provide a sufficiently accurate stage-storage curve. Profile the proposed location of the dry hydrant beginning at the bottom of the water source and extend the profile a minimum of 100 feet beyond the proposed hydrant outlet. Record all survey data in the engineering field book.
3. Set reference stakes so the proposed structure can be easily located at the site.
4. Show sketch of water source and other physical features.
5. Note location of any utilities and utility markers.

C. Design

1. The design shall be according to Alabama conservation practice standard, Dry Hydrant, Code 432.
2. The design shall be recorded on Form AL-ENG-53 or equivalent drawing. 3.Where needed, design all-weather road and show details on the engineering plans. See documentation for access roads.
4. Compute quantities of all pipe material, appurtenances needed, and if applicable, earth fill quantities. Prepare cost estimate.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of dry hydrant.
   b. Plan and profile of dry hydrant.
   c. Details, length, location and cross section of access road.
   d. Type, quantity, and quality of all materials.
   e. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

1. Record layout information in the engineering field book.
2. Set stakes as required for the contractor to accurately install the dry hydrant to the planned lines and grades.
3. As a minimum, set offset stakes along the dry hydrant pipeline at the inverts of the pipeline and any change in alignment.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record survey data in the engineering field book and on the engineering drawings.

1. Profile the centerline of the pipeline with rod readings at the inlet and outlet, the waterline elevation, and bottom of water source.
2. Check all appurtenances. Record in the field book type of material used, manufacturer's markings, diameters and lengths of all pipes, etc.
3. Survey at least one cross section of the access road at a location that represents the weakest section. See documentation for access road.
4. Record adequacy and type of vegetative cover established on disturbed areas.
5. Prepare as-built drawings showing final construction dimensions, details, etc. if significant changes were made during construction.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of dry hydrants completed. The extent of the practice certified is the quantities used as the basis of payment such as linear feet of pipe, earth work quantities, etc.

Farmstead Energy Improvement, Code 374

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Farmstead Energy Improvement, Code 374.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the need and feasibility of the on-farm equipment efficiency improvement from an on-site energy audit.

B. Engineering Surveys

1. The engineering survey will consist of the location of the proposed on-farm equipment efficiency improvement and any structures that may interfere with its installation.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the replacement or retrofit system and related components or devices appropriately to accomplish its intended task.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Replacement or retrofit of on-farm equipment location, if applicable.
   b. Size and type of replacement system.
   c. Details for mounting of the replacement for the on-farm equipment, if applicable (may be left up to the manufacturer).
   e. Retrofit requirements that reduce greenhouse gas or improvement in energy efficiency, if applicable.
   f. Details of appurtenances.
   g. Location of utilities and notification requirements.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book or in the electronic field book.

1. Stake the location and critical location of the proposed replacement or retrofit on-farm equipment, if applicable.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans, in the engineering field book or in NRCS-ENG-523A (or equivalent).

1. Size, type of replacement or retrofit on-farm equipment, model, manufacturer, and required appurtenances.
2. Power unit: type, manufacturer, HP. Note safety of unit (i.e. power shaft covered, etc.).
5. Operational check.
6. Prepare as-built drawings showing final details, etc.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number on-farm equipment efficiency improvement installed. The extent of the practice to be certified is the quantities used as the basis of payment.

Fish Raceway or Tank, Code 398

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Fish Raceway or Tank, Code 398.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice, considering soils, topography, water quality, water availability, structure requirements, availability of outlets, etc. Check requirements of state laws for permitting and notify landowner of his/her responsibility.

B. Engineering Surveys

Record survey data for design, layout and construction of concrete and earthen structures in the engineering field book.

1. Set and describe one permanent bench mark for future reference. Bench marks to NGVD should be used if possible
2. The required extent of the survey will be based on the complexity of the project and site conditions. For small simple jobs, a few rod readings will be adequate. For large or complex jobs and jobs with more than one raceway or tank, a detailed topographical survey will be needed. Where the topography is irregular and earth work quantity is needed, survey a sufficient number of cross sections for determining cut and fill volumes.
3. Set reference stakes for relocation of the structures.
4. Note location of any utilities and utility markers.

C. Design

1. Complete soils investigation report and construction recommendations including spoil placement.
2. Determine structure length, width and depth. Record design data on NRCS-ENG-523A (or equivalent).
3. Design the raceway or tank. The complexity of design will depend on the materials used and size of the structure. Consider all loads, including soil, ground water and equipment loads.
4. Compute quantities and prepare a cost estimate where needed.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of practice.
   b. Typical cross sections of facility.
   c. Details of all control structures.
   d. Vegetative requirements.
   e. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. The extent of layout required will depend on site conditions, complexity

of the job and the necessity of determining volume of excavation.

2. Set a sufficient number of stakes to outline the dimensions of ponds, raceways and other structures.
3. Set slope stakes, as required, to enable the contractor to install structures to planned lines and grades.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Record check-out data in the engineering field book.
   a. Survey at least one longitudinal and one lateral cross section of the raceway or tank at the location that represents the weakest section. Where the spoil is shaped, extend the cross sections from the outside toe of the spoil on one side to the outside toe of the spoil on the other side.
   b. Check constructed grades against planned grades and note difference.
   c. Record elevations and dimensions of all structures installed. Note materials used in non-earthen structures and if they comply with the requirements in the drawings and specifications.
   d. Where required, compute actual earth work quantities.
2. Prepare as-built drawings showing final construction dimensions, details, etc. if significant changes were made during construction.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of these practices to be reported is the acres of ponds constructed. The extent of the practice certified shall be the quantities used as the basis of payment.

Grade Stabilization Structure, Code 410

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Grade Stabilization Structure, Code 410.

B. Design Procedures

1. NEFH, Part 650, Chapter 10, Gully Treatment.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. Alabama NRCS Spreadsheet “Cirdis”
2. Alabama NRCS Spreadsheet “DOT14 Ver2”
3. Alabama NRCS Spreadsheet “riprap flume design v1”
4. NRCS Spreadsheet “rock chute v4.01”
5. USDA – NRCS Hydraulic Formula.
6. WinPond

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine that a stable outlet is available or can be made available.

B. Engineering Survey

1. Set a bench mark for future reference. Bench marks to NGVD should be used if possible.
2. For small overfall structures used to control erosion (i.e., structures with small drainage areas of approximately 3 acres or less without drop inlet or hood inlet):
   a. These types of structures will require minimal surveys. Survey one typical profile and cross section where structure(s) will be installed and record survey data in engineering field book or SCS-ENG-28 and -29.
   b. Number structures and identify with respect to their location in the field.
3. For drop inlets, hood inlets, and other structures to prevent the development or growth of gullies, or to protect vegetative spillways, prepare topographic survey of area. Extend the survey downstream of the gully head to a stable outlet. Record survey data in engineering field book and/or electronic data files.
4. Note location of any utilities and utility markers.

C. Design

1. Record drainage areas, grades, overfall dimensions, site conditions and related hydraulic design data on NRCS-ENG-523A or equivalent.
2. Complete soils/geologic investigation to determine suitability of the earth fill and foundation material for construction; determine if any foundation or seepage issues exist; and to verify if any subsurface impediments such as rock exist in excavated areas.
3. For pipe structures, check hydraulics for all flow conditions (pipe, weir and orifice).
4. On gully control structures, prepare a profile and cross section of the structure.
5. Determine size of all structure components including material type, quantities, etc.
6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:

a. Site location.

b. Site plan layout.

c. Cross section and profile of the embankment.

d. Special requirements for foundation preparation and treatment.

e. Location and details of the principal and auxiliary spillway(s).

f. Profile of principal and auxiliary spillway.

g. Vegetative requirements.

h. Requirements for diverting water, dewatering the site, spoil disposal, and erosion control during construction.

i. Location of utilities and notification requirements.

j. Borrow source.

7. Design seepage control as needed.

8. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the embankment centerline and toe, auxiliary spillway, and clearing limits.

2. Stake pipe location and critical elevations.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record checkout surveys in the engineering field book.

1. Survey a profile along the centerline of the embankment and cross sections of the completed structure. One of the cross sections should extend along the center line of the principal spillway from the upstream invert of the pipe (including crest) to a minimum of 10 feet beyond the pipe outlet invert. Record all breaks in grade along the cross section, including the entrance and exit invert elevation of the pipe.

   Embankments will be acceptable with respect to side slopes where the side slopes as constructed are not more than 0.1:1 steeper than the designed slope including shrinkage.

3. Check and record type, quality and size of materials used.

4. Record adequacy and type of vegetative cover.

5. Prepare as-built drawings showing final construction dimensions, details, etc.

6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the

practice to be reported is the number of structures installed. The extent of the practice to be certified is the quantities used for the basis of payment such as diameter and linear feet of pipe installed, volume of earth fill in cubic yards, etc.

Grassed Waterway, Code 412

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Grassed Waterway, Code 412.

B. Design Procedures

1. NEFH, Part 650, Chapter 7, Grassed Waterways.
2. Agricultural Handbook No. 667, Stability Design of Grass-Lined Open Channels.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. NRCS Electronic Field Tools (EFT)

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine feasibility and location Determine that the outlet is stable, or can be made stable, with adequate capacity for the design flow.

B. Engineering Surveys

1. Record profiles and cross sections of the original ground surface in sufficient details to permit designing the waterway with reaches of approximately uniform slope and shape. As a minimum, profile at breaks in grade, changes in alignment and at a maximum spacing of 200 feet. Cross section the waterway at representative locations to accurately compute earth quantities. The distance between cross sections shall not exceed 200 feet. Record in the engineering field book. When the EFT program is to be used for design, obtain sufficient survey data to develop a topographic map of the waterway area. Survey points should extend a minimum distance of 100 feet beyond the probable limits of the waterway.
2. Reference all surveys to a permanent bench mark where needed to establish elevations for construction. Bench marks to NGVD should be used if possible.
3. Note the location of any utilities or utility markers.

C. Design

1. Determine and record drainage areas along with hydrologic factors to compute designed discharges. Record the design discharge calculations.
2. Record design computations and waterway dimensions. Design for capacity and stability using NEFH, Part 650, and Chapter 7.
3. Complete soils/geologic investigation to determine suitability of the soil for a grassed waterway and determine parameters for grassed waterway design. Also verify if any subsurface impediments such as rock exist in excavated areas.
4. Determine measures needed and include details to minimize erosion and control sediment during construction and vegetation establishment.

4. Measurement

   a. Acreage. When acreage is a basis of payment, calculate the acreage to the nearest 0.1 acre using a planimeter, GPS, CAD, GIS, or other appropriate method. Record calculations on NRCS-ENG-523A (or equivalent). When acreage is determined by planimetering a plotted sketch or map, retain the plotted information with the documentation on NRCS-ENG-523A (or equivalent).

   b. Excavation. When volume excavated is the basis for payment or cost share, record measurements and calculations. Compute the excavated quantities using the natural ground cross section elevations and the elevations of the designed waterway cross section. Record computations and retain the plots of cross sections used in computing excavation quantities. Calculate quantities to the nearest cubic yard.

4. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:

   a. Plan view sketch of the waterway showing location, direction of flow, station numbers, landmarks, bench marks, boundaries and reference points.

   b. Profile and typical cross sections for each waterway reach. .

   c. Vegetative plan for waterway and indicate disposal requirements for excess soil material.

   d. Location of utilities and notification requirements.

5. Develop a site specific O&M Plan for the practice.

D. Construction Layout

   Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

   Record layout information in the engineering field book.

   1. Set centerline and offset stakes with planned cut and fill values at the beginning and end of the waterway, at all changes in grade and alignment, and at sufficient intermediate stations to facilitate construction of the waterway.

   2. Set and record a sufficient number of reference stakes (points) so that waterway can be relocated.

E. Construction

   Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

   Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

   1. Profile waterway on intervals not exceeding 100 feet. Determine that the constructed waterway has sufficient capacity for the designed discharge and will be stable. This will be determined at each reach at the cross-section that will least likely meet the design. The waterway channel must be constructed to the design dimensions and sufficiently uniform to prevent undesirable flow conditions. The constructed cross-sectional area should equal or exceed the planned cross-sectional area at the planned

depth. Record in the engineering field book.

2. Quantity measurements.
   a. Acreage – Compute acreage based on the lengths and average cross section width of each reach.
   b. Excavation – Compute excavation from surveyed cross sections when needed as a basis of payment. Excavation quantities will be based on the design template of the waterway.
3. Determine if runoff has been accurately diverted as planned.
4. Check disposal of excess soil material.
5. Location, size, etc., of subsurface drains if used.
6. Determine adequacy and acreage of vegetation.
7. Prepare as-built drawings showing final construction dimensions, details, etc. if significant changes were made during construction.
8. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. An exception shall be noted on the certification when the waterway has not been vegetated as planned.

The extent of the practice to be reported is the area of the waterway in acres. The extent of the practice certified will be the quantities used as the basis of payment such as the area in acres or the excavation in cubic yards.

Groundwater Testing, Code 355

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Groundwater Testing, Code 355.

B. Design Procedures

1. NEFH, Part 631, Geology, Chapter 33.

II. Documentation

A. Preliminary Investigation

Determine the feasibility and need for the groundwater testing for the planned purpose(s).

B. Engineering Survey

1. Engineering surveys are not normally needed unless the elevation of the water well head is needed by the permitting agency. Note and record the latitude and longitude of well.
2. Note the location of any utilities or utility markers.

C. Design

1. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location to be tested.
   b. Guidelines describing process of collection, storage, transport, testing, and reporting.
   c. Location of utilities and notification requirements.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the testing requirements with the landowner and contractor prior to the start of sample collection. Ensure the landowner/contractor thoroughly understand their responsibilities.

Locate and flag the location to be tested. This will not require a survey and can be noted on the conservation plan map.

E. Construction

No construction is required for this practice.

F. Construction Checkout

1. Review the documentation of the water sample taken, laboratory used, and results of the well water testing.
2. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of testing's completed. The extent of this practice to be reported is quantities used as the basis of payment.

Heavy Use Area Protection, Code 561

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Heavy Use Area Protection, Code 561.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine that the site is suitable, structure requirements, and the appropriate surface treatment needed to stabilize the site.

B. Engineering Surveys

1. Record all surveys in the engineering field book.
2. Reference all surveys to a bench mark where needed to establish elevations for construction.
3. Surveys shall be taken to determine the location, elevations, cut and fill volumes, erosion and water control structures needed to control runoff. As a minimum, cross sections shall be taken to adequately show the site topography and design the treatment.
4. Note location of any utilities or utility markers.

C. Design

1. Design in accordance with the design criteria in the conservation practice standard Heavy Use Area Protection, Code 561. Record design data on NRCS-ENG-523A (or equivalent).
2. Compute earth fill or excavation quantities and quantities of material used for treating the area.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of practice.
   b. Length and width or size of area to be treated.
   c. Critical elevation of heavy use areas.
   d. Type and thickness of surface treatment including any base course requirement or reinforcement if reinforced concrete is used.
   e. Cut and fill slopes where applicable.
   f. Drainage areas and structure requirements.
   g. Vegetative requirements.
   h. Location of utilities and notification requirements.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record the layout information in the engineering field book.

1. Set a sufficient number of stakes to guide the landowner or contractor in constructing the heavy use area.
2. Stake the location and elevations of required structures.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Survey cross sections as needed to determine if the heavy use area is constructed to the design elevations.
2. Survey or otherwise obtain measurements as needed to determine the dimensions of the area treated. Compute the area treated.
3. Check the surface treatment type, thickness and quality and determine if it meets the design requirements.
4. Check the location, size and elevations of all structures.
5. Check adequacy of vegetation.
6. Prepare as-built drawings showing final construction dimensions, details, etc. if changes were made during construction.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed area in acres. The extent of the practice to be certified is the quantities used as the basis of payment such as the cubic yards of earth moved, square feet, cubic yards or acres of surface treatment, etc.

Irrigation Canal or Lateral, Code 320

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation Canal or Lateral, Code 320.

B. Design Procedures

1. TR-25, Design of Open Channels.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity of the site and the type and extent of surveys needed. Make the necessary planning surveys and develop an engineering plan map for at least the area affected by the practice.

B. Engineering Surveys

1. Establish the ditch alignment in the field.
2. Set and describe at least one permanent bench mark near the outlet end of the ditch. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Survey profile rod readings and/or cross sections at not more than 500-foot intervals, depending upon irregularity of the natural ground and/or existing ditch section. Stations along ditch profiles can be determined by pacing or accurate scaling on aerial photographs. Elevations along cross sections should show all breaks and extend each side of the center line beyond the estimated construction area. Record elevation and distance from proposed center line of low areas, which will influence the elevation of the hydraulic gradient.
4. Record outlet conditions, including the elevation of the bottom of the outlet and the expected high-water mark during a normal cropping season.
5. Note the location of any utilities or utility marker.

C. Design

1. Plot profiles and cross sections. Place the ditch number on the profile and cross section sheets. Record outlet conditions on the profile, including the elevation of the bottom of the outlet and high-water marks or design hydraulic gradient of the outlet. See Figure 14-11, NEFH.
2. Determine area served by the ditch and show drainage boundary on a suitable aerial photograph, mosaic, or overlay, and record the area in acres. Determine required ditch capacity. From trial and error determine ditch dimensions and grade.
3. Plot bottom of proposed ditch on the profile. Show elevation of the ditch bottom at the beginning and end of the ditch, and at all breaks in grade. Compute the slope of the ditch bottom and record on the profile. See Figure 14-14, NEFH.
4. Draw the hydraulic gradient on the profile. Show elevation of hydraulic gradient at the end of each segment. Compute the slope of the hydraulic gradient and record on the profile.
5. Design necessary grade stabilization structures and structures for water control.
6. Prepare earth work quantities and preliminary cost estimate, where

needed.

7. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of canals or laterals.
   b. Profile of canals or laterals.
   c. Typical cross section of canals or laterals.
   d. Cross section and details of all structures. See appropriate note keeping for structures.
   e. Type, quantity, and quality of all materials used for structures.
   f. Vegetative requirements.
   g. Location of utilities and notification requirements.
8. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the centerline of the ditch with cut stakes at changes in alignment or grade and on maximum intervals not to exceed 200 feet.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All drainage mains or laterals shall be checked for completion by making an engineering survey as follows:

1. Determine the total length of constructed channels. The length shall be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.
2. Survey ditch bottom and natural ground profile rod readings at a maximum spacing not to exceed 200 feet and at each end of ditch. Record the planned ditch bottom grade rod on the check notes for each station checked.
3. Cross section the ditch at a maximum spacing not to exceed 600 feet with a minimum of one cross section per ditch. Survey rod readings at all breaks in slope along the cross section. Extend the cross sections to the outside toe of the spoil bank, or if spoil banks are spread, extend the cross sections to include the spread material.
4. Compute earthwork quantities as needed.
5. Prepare as-built drawings showing final construction dimensions, details, etc.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed

length in feet. The extent to be certified is the quantities used as the basis of payment such as cubic yards of excavation, etc.

Irrigation Ditch Lining, Code 428

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation Ditch Lining, Code 428.

B. Design Procedures

1. USDA – ARS (Agricultural Research Service) Agricultural Handbook Number 667 – "Stability Design of Grassed-Lined Open Channels" or other comparable channel stability criteria.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity of the problem, availability of an outlet, and the type and extent of surveys needed. Make the necessary planning surveys and develop an engineering plan map for at least the area affected by the practice.

B. Engineering Surveys

1. Establish the ditch alignment in the field.
2. Set and describe at least one permanent bench mark near the outlet end of the ditch. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Survey profile rod readings and/or cross sections at not more than 500-foot intervals, depending upon irregularity of the natural ground and/or existing ditch section. Stations along ditch profiles can be determined by pacing or accurate scaling on aerial photographs. Elevations along cross sections should show all breaks and extend each side of the center line beyond the estimated construction area. Record elevation and distance from proposed center line of low areas, which will influence the elevation of the hydraulic gradient.
4. Record outlet conditions, including the elevation of the bottom of the outlet and the expected high-water mark during a normal cropping season.
5. Note the location of any utilities or utility marker.

C. Design

1. Plot profiles and cross sections. Place the ditch number on the profile and cross section sheets. Record outlet conditions on the profile, including the elevation of the bottom of the outlet and high-water marks or design hydraulic gradient of the outlet. See Figure 14-11, NEFH.
2. Local information on velocity limits for specific soils may be used if available. If such information is not available, stability limits shall be based on the tractive stress design approach as discussed in USDA-ARS Agricultural Handbook Number 667 – Stability Design of Grassed-Lined Open Channels" or other comparable channel stability criteria.
3. Determine area served by the ditch and show area on a suitable aerial photograph, mosaic, or overlay. Determine required ditch capacity based on irrigation requirements. From trial and error determine ditch dimensions including freeboard and ditch grade.
4. Plot bottom of proposed ditch on the

profile. Show elevation of the ditch bottom at the beginning and end of the ditch, and at all breaks in grade. Compute the slope of the ditch bottom and record on the profile. See Figure 14-14, NEFH.

5. Draw the hydraulic gradient on the profile. Show elevation of hydraulic gradient at the end of each segment. Compute the slope of the hydraulic gradient and record on the profile.
6. Determine the material type to line the canal or ditch with consideration to the velocity and required flow rate.
7. Design necessary grade stabilization structures and structures for water control.
8. Prepare earth work quantities and preliminary cost estimate, where needed.
9. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
    a. Location of canals or laterals.
    b. Profile of canals or laterals.
    c. Typical cross section of canals or laterals.
    d. Type, quality, and thickness of lining material.
    e. Cross section and details of all structures. See appropriate note keeping for structures.
    f. Disposal of excavated material.
    g. Type, quantity, and quality of all materials used for structures.
    h. Vegetative requirements.
    i. Location of utilities and notification requirements.
10. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the centerline of the ditch with cut stakes at changes in alignment or grade and on maximum intervals not to exceed 200 feet.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All drainage mains or laterals shall be checked for completion by making an engineering survey as follows:

1. Determine the total length of constructed channels. The length shall be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.
2. Survey ditch bottom and natural ground profile rod readings at a maximum spacing not to exceed 200 feet and at each end of ditch. Record the planned ditch bottom grade rod on the check notes for each station checked.
3. Cross section the ditch at a maximum spacing not to exceed 500 feet with a minimum of one cross section per

ditch. Survey rod readings at all breaks in slope along the cross section. Extend the cross sections to the outside toe of the spoil bank, or if spoil banks are spread, extend the cross sections to include the spread material.

4. Type, quality, thickness, and quantity used for the lining.
5. Compute earthwork quantities as needed.
6. Prepare as-built drawings showing final construction dimensions, elevations, grades, details, etc.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length in feet. The extent to be certified is the quantities used as the basis of payment such as square feet or cubic yards of lining used, cubic yards of excavation, etc.

Irrigation Field Ditch, Code 388

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation Field Ditch, Code 388.

B. Design Procedures

1. TR-25 Design of Open Channels.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice considering availability of an outlet, drainage/irrigation needs, etc.

B. Engineering Surveys

1. Establish the ditch alignment in the field.
2. Set and describe at least one permanent bench mark near the outlet end of the ditch. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Using a transit, total survey station, or survey grade GPS, develop a topographic map of the site with sufficient rod readings to adequately show the lay of the fields. The survey should include any features that will affect the design.
4. Survey the outlet including the elevation of the bottom of the outlet and normal ground and the expected high-water mark during a normal cropping season.
5. Note the location of any utilities or utility markers.

C. Design

1. Determine area served by each ditch (or group of ditches) and determine required capacity. Record on NRCS-ENG-523A (or equivalent) or approved computer program. From the topographic map, determine the ditch grade.
2. Design necessary grade stabilization structures and structures for water control and record on NRCS-ENG-523A (or equivalent) or approved computer program.
3. Profile ditches where needed for design.
4. Where needed, determine total length of ditches to be installed and compute quantity of excavation and cost estimate.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of field ditches.
   b. Plan view and typical cross section.
   c. Grade of irrigation field ditch and profile as needed.
   d. Spoil placement details.
   e. Vegetative requirements.
   f. Location of utilities and notification requirements.
7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly

understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the location and grade of the ditches.
2. Furnish the contractor adequate cut information to excavate the ditch to grade.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All drainage field ditches shall be checked for completion by making an engineering survey as follows:

1. Select and profile a minimum of one representative ditch in each field or group of ditches constructed at one time. Profile by taking rod readings in the bottom and natural ground at a maximum spacing of 200 feet and at apparent highs and lows. Stations along the ditch selected may be determined by chaining or pacing. Evaluate the adequacy of the installation.
2. Determine the constructed length of all the ditches constructed by chaining, calibrated measuring wheel, GPS, or other equivalent method.
3. Survey a minimum of one cross section of at least one ditch in the group being checked. Observe or check, with an instrument, the cross section of other ditches until satisfied that all the ditches in the group meet cross section requirements.
4. Record survey check out data in the engineering field book.
5. Prepare as-built drawings showing final construction dimensions, details, etc.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length in feet. The extent of the practice to be certified is the quantities used as the basis of payment such as volume of excavation in cubic yards, etc.

Irrigation Land Leveling, Code 464

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation Land Leveling, Code 464.

B. Design Procedures

1. NEH, Part 623, Chapter 12, Land Leveling.
2. NEH, Part 623, Chapter 4, Surface Irrigation.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility and complexity of the practice considering soils, topography, drainage outlets, etc.

B. Engineering Surveys

Record field information in the engineering field book and/or electronic files as needed.

1. Grid the field to be leveled and set a sufficient number of permanent stakes to reference the grid system. See NEH Part 623, Chapter 12, Land Leveling, for information on layout of a grid.
2. Set and describe at least one permanent bench mark and show the location and elevation on the plan. Bench marks to NGVD should be used if possible.
3. Fields may be surveyed on a maximum of 200-foot centers where the field is: (1) greater than 40 acres in size with a minimum dimension of 1200 feet, (2) relatively uniform, (3) not cost shared, and (4) where earth work calculations are not needed. All other fields shall be surveyed on 100-foot centers. The surveys shall also include rod readings in existing drainage ways and any existing irrigation facilities that will be affected.
4. Note the location of any utilities or utility markers.

C. Design

1. Plot field information on standard cross section sheets.
2. Prepare contour map where necessary to assist in determining whether the field is to be leveled as a unit or in segments.
3. In the case of bench leveling, use the contour map as a base for design. Lay out the system of benches on contour map, using NEH, Part 623 as a guide.
4. Compute the quantity of earth fill or excavation for each segment or bench using the engineering computer program Plane Surface Design (PSD) or other applicable software. Include the quantity of any drainage or irrigation facilities that will be constructed in the leveling operation.
5. Develop engineering plans and specifications. As minimum the plans and specification shall include:
   a. Location of field drainage system and/or irrigation water distribution system with plotted survey data, including any water control structures.
   b. Field boundaries,
   c. Planned cut and fills,
   d. Grades of each unit or segment.

e. Earthwork volumes and cut/fills ratio,

f. Direction of irrigation,

g. Required water surface and location of irrigation water delivery and tail water disposal,

h. Location of utilities and notification requirements.

6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Furnish the contractor a cut and fill sheet and design grade and cross slope. Where necessary, set permanent stakes representing the center of each 100 foot square with the planned cut or fill at that location.
2. Stake drainage field ditches, water control structures, and irrigation features that are to be constructed during the leveling operation.
3. In the case of bench leveling, lay out the benches on the ground. Handle each bench as an individual segment.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. On fields that have been staked for leveling, rod readings shall be taken as needed during construction to ensure that the field is being leveled to the planned elevation. These rod readings shall be recorded in the engineering field book. The complete construction check shall include profiles and other survey data to satisfactorily show the constructed grade. As a minimum, at least three profiles shall be taken on each field with no less than three profiles per 40 acres whichever is greater. One of the profiles shall be taken along the diagonal of the staked line.

   When larger acreage is involved, one block or at least 10 percent of the acres shall have a complete construction check. All blocks shall be visually inspected and the block(s) which appears least likely to conform to planned grades shall be selected for the complete check. The remaining blocks shall be checked by recording sufficient rod readings to show that planned grades have been constructed.
2. The final construction check profiles shall be taken in the direction of irrigation on areas which appear least likely to conform to planned grades. Rod readings shall be taken along the profiles every 100 feet and at apparent highs and lows. The profiles shall be extended across drainage or irrigation facilities constructed during the leveling operation.
3. In case of bench leveling, profile and cross section each bench near the middle of the bench. Survey profile rod readings at intervals of not more

than 100 feet, and cross sections at intervals not to exceed 50 feet.

4. Record the profile rod readings/elevations to the nearest 0.05 foot in the engineering field book. Check to see that planned grades have been met by plotting the profiles on standard cross section paper. (It is not necessary to plot the profiles when the field has been designed for a flat grade.) The profiles will also provide elevation data for checking planned cross slope. Permissible variation of the finished grade from the planned grade or a plane paralleling the planned plane shall be plus or minus 0.10 foot providing such variation will not affect water distribution or cause drainage problems.
5. Compute the acres leveled.
6. Where needed, verify quantity of earth fill or excavated material.
7. Prepare as-built drawings showing final construction dimensions, details, etc.
8. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by an employee with appropriate engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the acres leveled. The extent of the practice to be certified is the quantities used as the basis for payment such as cubic yards of earth moved.

Irrigation Reservoir, Code 436

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation Reservoir, Code 436.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. Alabama NRCS Spreadsheet "AWEP Irr Needs & Intake Design".
2. USDA - NRCS Hydraulics Formula.

II. Documentation

These instructions shall apply to all embankment ponds with outside drainage area. Embankment ponds are defined as those where the depth of water impounded against the embankment at spillway elevation is three (3) feet or more.

A. Preliminary Investigation

1. Determine and document hazard classification of the pond. Document the rationale for assigning the hazard classification as a part of the design records.
2. Make a preliminary investigation to determine site suitability, considering soils, geology, topography, etc.
3. Determine that irrigation storage is feasible with an adequate supply of water available.
4. Check appropriate requirements of state laws for permitting and notify landowner of his/her responsibilities. In many cases a permit is required prior to construction.

B. Engineering Surveys

1. The design survey and layout survey for some embankment and excavated ponds may be combined into one operation. Record all survey data in the engineering field book, or in electronic files. Notes recorded in the engineering field book shall be as illustrated in NRCS Technical Release 62, Engineering Layout, Notes, Staking and Calculations.
2. Set and describe a minimum of one permanent bench mark. Bench marks to NGVD should be used if possible.
3. Set reference stakes for locating the proposed embankment.
4. Survey the embankment centerline profile the full length of the embankment extending above the expected elevation of the dam and beyond the location of the auxiliary spillway. Centerline profile rod readings shall be taken at all breaks in grade and at maximum intervals not to exceed 50 feet. Survey a sufficient number of cross sections to accurately compute quantities.
5. Profile the centerline of the auxiliary spillway including the inlet section, level section and outlet section.
6. Show sketch of embankment, reservoir area, auxiliary spillway, proposed fences and other appurtenant structures. Show location of bench marks and reference stakes on sketch.
7. Note the location of any utilities or utility markers.

C. Design

1. Re-evaluate the hazard classification of the proposed reservoir.
2. Record design data on NRCS-ENG-523A (or equivalent) or print outs from approved computer programs.

3. Complete soils investigation report and construction recommendations and record in the engineering field book or in the electronic field book. Verify the suitability of the foundation and earth fill for construction and determine if any foundation or seepage issues exist. If needed, request the assistance of a geologist.
4. Determine required capacity to serve the intended purposes.
5. Check pipe hydraulics for all flow conditions - pipe, weir, and orifice.
6. Compute earth work estimate and preliminary cost estimate.
7. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
    a. Location of structure.
    b. Cross section of the reservoir
    c. Profile and cross section of the embankment and auxiliary spillway.
    d. Structural details of structural elements.
    e. Seepage control details.
    f. Details of spoil placement.
    g. Vegetative requirements.
    h. Location of utilities and notification requirements.
8. Develop a site specific O&M Plan for the practice.

D. Construction Layout

If the dam is constructed more than one year after the dam was designed, another hazard classification will be performed.

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

The extent of layout required will depend on site conditions, complexity of the job and the necessity of determining volume of excavation. Record layout information on standard plan sheets or in the engineering field book. Layout notes recorded in the engineering field book shall be as illustrated in Technical Release No. 62.

1. Set centerline and slope stakes as required to accurately compute quantities where needed and/or enable the contractor to construct the embankment and spillway(s) to the planned lines and grades. Stations along the profile shall be determined by chaining, except where quantities will not be certified.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check-out data on form FL-ENG-378A, or in the engineering field book as appropriate.

1. Profile the centerline of the reservoir and embankment. Extend the profile across the spillway. Record profile rod readings at all stations and at all breaks in grade.
2. Survey at least one cross section of the reservoir and embankment at a location that represents the weakest section. Record rod readings at each edge of the crown, at each toe, at

intermediate points between the top and each toe and at changes in the side slope.

3. Profile the center line of excavated spillways from a point within the pool area to at least 50 feet below the excavated section. Cross section auxiliary spillway at the control section.
4. Record appropriate elevations and other information of any components such as the principal spillway, etc. Record type of material used, gage, coating, etc.
5. Check constructed grades against planned grades and note difference. Compute constructed side slopes and record on check-out notes.
6. Record data on seepage control measures.
7. Record adequacy and type of vegetative cover established for the auxiliary spillway and embankment.
8. Determine quantities for earth fill, excavations, clearing, etc. where necessary.
9. Embankment will be acceptable where all of the following conditions are met:
    a. Pond will be acceptable with respect to side slopes where:
        i. Side slopes as constructed are not more than 0.1:1 steeper than the designed slope plus allowance for shrinkage.
        ii. The constructed cross-sectional area equals or exceeds the planned cross-sectional area and has at least 95% of the embankment width at all elevations with shrinkage added.
    b. Constructed crown elevations are not more than 0.2 foot below planned elevations, with allowance for settlement added.
    c. The auxiliary spillway elevation does not vary from the planned elevation by more than 0.2 foot. The width must not be less than planned.
    d. The minimum required freeboard is not lowered by more than 0.2 foot
    e. Complete dam inventory form as needed
10. Excavated reservoirs will be acceptable where the following conditions are met.
    a. The constructed side slopes are not steeper than 1:1.
    b. The depth of the pond or pit is no shallower than 0.2 foot less than the planned elevation.
    c. The excavated material does not exceed the permissible spoil height and is shaped as specified in the specifications.
    d. The as-built cross sectional area equals or exceeds the planned cross sectional area.
11. Prepare as-built drawings showing final construction dimensions, details, etc.
12. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of structures completed and number of acre feet of storage. The extent to be certified is the quantities used as the basis of payment such as volume of cubic yards of earth fill and/or excavation, etc.

Irrigation System, Microirrigation, Code 441

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation System, Microirrigation, Code 441.

B. Design Procedures

1. NEH, Part 623, Irrigation, Chapter 7, Trickle Irrigation.
2. NEH, Part 652, Irrigation Guide, Chapter 6, Alabama Amendment.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.
3. Micro Drip Design Spreadsheet.

II. Documentation

These instructions apply to micro irrigation systems through which water is distributed in the irrigated area by means of small diameter pipes and applied at or near the soil surface. Permanently installed mains and submains shall be documented according to documentation for Irrigation Pipeline, Code 430.

A. Preliminary Investigation

See NEH Part 652, Chapter 6, Irrigation System Design.

B. Engineering Surveys

Gather sufficient survey data to plan the location and size of microirrigation system, calculate quantities and prepare cost estimates. Using the preliminary information obtained in A. above, determine the extent of survey data needed: (1) minimal survey; (2) moderate survey data, or (3) detailed topographic survey. Proceed as outlined below based on the survey requirement. All survey data shall be recorded in the engineering field book or in electronic files.

1. Minimal survey data is required where the mains and submains can be located and staked in the field without the use of a topographic map. It is adapted to areas where the topography is flat and such that the mains and submains can be readily located. Determine degree and direction of land slopes and key elevations by visual inspection or minimal surveying.
2. Moderate survey data is required where the mains and submains can be located and shown on a plan map using random measurements and rod readings for key elevations.
   a. Profile around and across the area to be irrigated. Distances may be chained or paced.
   b. Survey key elevations and locate on a sketch or photo. Distances may be measured from scaled drawings or photos of known scale.
3. Detailed topographic survey is required where a detailed contour map is needed to design and layout the system and is necessary where elevation differences are considerable.
   a. Rod readings shall be taken on a grid spacing not exceeding 50 feet and as needed to define surface features such as breaks in slope, depressions, knobs, etc.

b. Establish reference points for use as vertical and horizontal control in layout and construction check surveys. Describe the location of these points in the field notes.

4. Note location of any utilities or utility markers.

C. Designs

1. Determine the system requirements. See Part 652, National Irrigation Guide, and Chapter 6B, Micro irrigation System, for design example.

2. Record the design information, including existing and proposed structures on forms NRCS-ENG-523A (or equivalent) or other appropriate standard form. Design must conform to conservation practice standard Irrigation System, Microirrigation, Code 441 and the appropriate NRCS conservation practice standard for all components including flush valves and filters.

3. Show all additional computations on NRCS-ENG-523A (or equivalent) when a standard form is not available.

4. Prepare bill of materials and cost estimate as needed.

5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:

a. Plan map of the system. The detail shown on the plan map should be adequate to define the limits of the work and locate all the components of the system. A sufficient number of reference points need to be shown so that any qualified person other than the designer can layout the work.

b. Size, type, and quality of all emitters, laterals, and components.

c. Location and details of filters required.

d. Location and details of flushing system.

e. Location of utilities and notification requirements.

6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Consult with the installer to determine layout needs.

2. Set stakes required to establish alignments, location, and elevation of pipeline, and other appurtenant structures, or furnish necessary information to installer.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Check to determine that the

completed practice conforms to plans, designs, and specifications.

a. Check the system for satisfactory operation. Lateral lines should have been flushed to remove sediment or foreign material, air purged, and leakage repaired before making any measurements.

b. Check lateral size, length, spacing and manufacturer's markings; applicator locations, spacing, type, and kind; valves; filters; pressure regulators; and all other appurtenances for conformance to plan and design. Record on the engineering plans all changes to the plan and design.

c. The measurements shall be recorded along with their locations

d. Record survey data in the engineering field book, or other appropriate form. Include elevations and measured lengths and quantities which are needed.

2. Prepare as-built drawings showing final construction dimensions, details, etc. if changes were made during construction.

3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of systems and the irrigated area in acres. The extent of the practice to be certified is the quantities used as the basis for payment.

Irrigation System, Surface and Subsurface, Code 443

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation System, Surface and Subsurface, Code 443.

B. Design Procedures

1. NEH, Part 623, Irrigation, Chapter 4, surface Irrigation.
2. NEH, Part 624, Drainage, Chapter 10, Water Table Control.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine if the practice is feasible considering soils, topography, water supply, availability of an outlet, etc.

B. Engineering Surveys

1. To adequately plan a subsurface (sub irrigation) system a topographic survey will be needed. The topographic survey shall be in sufficient detail so that planned and existing practices can be located on the engineering plans. Surveys shall be recorded in the engineering field book or in electronic files.
2. Set and describe a minimum of one temporary bench mark. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Survey the drainage outlet including the elevation of the bottom of the outlet and normal ground and the expected high-water mark during a normal cropping season.
4. Note location of any utilities or utility markers.

C. Design

1. Record all designs notes on NRCS-ENG-523A (or equivalent) or other appropriate forms and attach all computer generated computations.
2. Determine structure locations that will provide the most control of drainage water for the practice purpose. Structure water control elevations shall be designed to control the drainage water and without damaging the crops.
3. Design of system components shall be in accordance with procedures for that practice.
4. An overall water control plan shall be developed providing detailed operation of the structures.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Show location of pipelines, ditches, etc., with typical cross sections, etc.
   b. Typical cross section of pipelines, ditches, etc.
   c. Type, quality and quantity of all pipes, structures, etc.
   d. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Set a sufficient number of stakes to enable the landowner or contractor install the practice.
2. Stake the location of all components by procedures developed for that practice (irrigation field ditches, water control structures, pipelines, etc.).

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Components shall be checked in accordance with procedures developed for the practices installed.
2. Survey information will need to be taken to verify if the system can be operated as noted in the operation plan.
3. Prepare as-built drawings showing final construction dimensions, details, etc. if changes were made during construction.
4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the area irrigated in acres. The extent of the practice to be certified is the quantities used as the basis for payment.

Irrigation System, Tailwater Recovery, Code 447

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation System, Tailwater Recovery, Code 447.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine site suitability, considering soils, topography, etc. Check requirements of state laws for permitting and notify landowner of his/her responsibility. In many cases a permit may be required prior to construction.

B. Engineering Surveys

The majority of tailwater recovery ponds can be designed and constructed by combining the design survey and construction layout survey into one operation. Record design and layout data in the engineering field book or on other forms as appropriate.

1. Set and describe one permanent bench mark for future reference.
2. Record an adequate number of rod readings around the perimeter or circumference and inside of planned top to determine average ground elevation. Where the topography is irregular and earth work quantity is needed, record a sufficient number of cross sections for determining quantities.
3. Set reference stakes to allow for relocation.
4. Note the location of any utilities or utility markers.

C. Design

1. Record design data on form NRCS ENG 523A.
2. Complete soils investigation report and construction recommendations including spoil placement and record on form NRCS ENG 523A.
3. Show on the engineering plans typical cross sections and elevations of the planned pond or pit including details of spoil placement and inlet structures if applicable.
4. Calculate earth work quantities and preliminary cost estimate where needed.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Site plan layout, cross sections, profiles, alignment, slope and location details of the tailwater recovery pond and structures.
   b. Type, quality, and quantity of the various system components.
   c. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

The extent of layout required will depend on site conditions, complexity of the job and the necessity of determining volume of excavation. Record layout information on in the engineering field book.

1. Set a sufficient number of stakes to outline the top dimensions of the

pond.

2. Set slope stakes, as required, to enable the contractor to excavate the pond place the spoil to planned lines and grades.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check-out data in the engineering field book. Reestablish the location of the tailwater recovery pond when needed to determine whether the pond or pit was constructed as designed. Compute earth work quantities.

1. Survey at least one longitudinal and one lateral cross section of the excavated pond or pit at the location that represents the weakest section. Where the spoil is shaped extend the cross sections from the outside toe of the spoil on one side to the outside toe of the spoil on the other side.

2. Check constructed grades against planned grades and note difference.

3. Excavated ponds or pits will be acceptable where the following conditions are met.

a. The constructed side slopes are not steeper than 1 horizontal to 1 vertical (1:1).

b. The depth of the pond or pit is no shallower than 0.2 foot less than the planned elevation.

c. The excavated material does not exceed the permissible spoil height and is shaped as specified in the specifications.

d. The as-built cross sectional area equals or exceeds the planned cross sectional area.

e. Prepare as-built drawings showing final construction dimensions, details, etc. when changes were made during construction.

f. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of tailwater recovery system installed. The extent of the practice certified is the quantities used as the basis for payment such as cubic yards of excavation, etc.

Irrigation Pipeline, Code 430

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation Pipeline, Code 430.

B. Design Procedures

1. NEH, Part 623, Irrigation.
2. NEH, Part 652, Irrigation Guide, Chapter 7, Farm Distribution Components.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

These instructions apply to a pipeline and appurtenances installed in an irrigation system.

A. Preliminary Investigation

See NEH Part 652, Irrigation Guide, Chapter 6, Irrigation System Design and Chapter 7, Farm Distribution Components.

B. Engineering Surveys

All pipeline designs require topographic information to properly plan the location, size, quantity of all pipelines and required appurtenances. Topographic maps are optional on lands with 0.5 percent slope or flatter. Topographic data used in design shall be by one of the following methods.

1. Surveys
   a. Refer to NEFH Part 650, Chapter 1 and NRCS Technical Release 62 for methods and documentation.
   b. Set and describe a minimum of one temporary bench mark. Bench marks to NGVD should be used if possible.
   c. Profile pipeline only where summits cannot be determined visually. Record location of water supply and elevation of pump discharge pipe. Survey profile rod readings at all highs and lows and the distance between rod readings should not normally exceed 300 feet. The survey must be sufficient to locate summits and establish water management control elevations.
2. Aerial Topographic Maps

   These may be used when they are in sufficient detail for all system components to be located and their elevations established within tolerances required by conservation practice standard Irrigation Pipeline, Code 430. Location of summits and control elevations on the pipeline are essential. A copy of the map must be a part of the system design.
3. Designs Furnished by Contractors and Others

   The person preparing the design for NRCS approval is not required to use NRCS survey procedures. They should be informed and understand that the NRCS design approval is based on the assumption that the survey information is accurate.
4. Note the location of any utilities or utility markers.

C. Design

1. Prepare designs in accordance with conservation practice standard Irrigation, Pipeline, Code 430.
2. Pipeline designs may be developed by plotting profiles or by computations. Good judgment must

be exercised in determining whether or not profiles should be plotted. When profiles are omitted, the design must include sufficient design data to clearly show critical control points and all planned features of the pipeline. Design shall include design discharge rate, hydraulic gradient or friction losses, appurtenant structures to be installed, showing kind, number, size, location and quantities, and estimated quantity of pipe by sizes and other needed data such as pressure rating, depth of cover, manufacturer's markings, wall thickness, etc. Record all pipe sizing calculations, with references to tables, charts, and graphs used on NRCS-ENG-523A (or equivalent) or using approved computer programs.

3. Prepare engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Complete plan layout of pipeline and appurtenances and as necessary profiles of pipeline.
   b. Material type, size and pressure class for pipe and fittings.
   c. Depth of cover for each diameter of pipeline.
   d. Location, size, type and pressure class for appurtenances (drains, vents, valves, outlets, pressure relief, thrust blocks, etc.).
   e. Pipe trench/backfill requirements.
   f. Safety features for trenches, when applicable.
   g. Note the location of any utilities and notification requirement.
4. Record design on form NRCS-ENG-523A (or equivalent).
5. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Set a sufficient number of construction stakes needed, showing the location and depths of pipelines.
2. State location of other appurtenant structures (e.g. air release valves, thrust blocks, etc.) or furnish the necessary design information to installer.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Prior to final certification of completion, obtain a copy of the written certification and guarantee furnished by the contractor to the purchaser, to be made a part of the supporting records. Where the landowner installs the pipe, the installation guarantee is not required.
2. Record construction check data on the engineering plans, in the engineering field book, or other appropriate form. Construction certification shall include the following:

a. Lengths and size of pipe installed. The length of pipe will be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method. Record pipe class, pressure rating, etc. for all pipe installed.

b. Size and location of all components such as air release valves, pressure release valves, thrust blocks, etc.

c. Pipe depth of cover. Check depths at locations least likely to pass. A minimum of one check will be made on each pipeline with a minimum of one check for each 2,000 feet of pipeline installed.

d. Pressure test.

3. Prepare as-built drawings showing final construction dimensions, details, etc. when changes were made during construction.

4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the length in feet of pipeline installed. The extent of the practice to be certified are the quantities used as the basis of payment such as pipe length by diameter, valves, etc.

Irrigation Water Management, Code 449

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Irrigation Water Management, Code 449.
2. NEH Part 652, Irrigation Guide, Chapter 9, Irrigation Water Management.

II. Documentation

These instructions apply to irrigation water management (IWM) on all types of irrigation systems. The system must meet requirements of a conservation irrigation system, however, IWM assistance can be provided even though every component of the irrigation system does not meet the conservation practice standard. The components must be adequate to convey the required rate of water at the necessary elevation or pressure to meet the performance requirements of the system without significant erosion, waste, or objectionable flow surges and fluctuations. This is not to be interpreted that NRCS may deviate from the appropriate conservation practice standard in providing technical assistance on installation of components.

A. Preliminary Investigation

1. Review the existing irrigation system design and IWM plan. Discuss with the cooperator his/her present water management methods.
2. An evaluation of the irrigation system may be needed. Record evaluation data collected on appropriate forms to document findings.
3. IWM normally will take several contacts with the irrigator before it is properly applied. It is important that this assistance be documented for future follow-up.

B. Design

1. Determine water applied to water required, application rate, moisture in the root zone, uniformity, tailwater loss, deep percolation, erosion, etc.
2. Record recommendations needed for the system to meet standards and those which will improve the system above minimum standards for the cooperator's consideration. Record design and specifications on AL-ENG-10.
3. Develop an IWM Plan for the site. As a minimum the IWM Plan shall include:
   a. Crop type and acres.
   b. Crop water requirements.
   c. Soil series and available water holding capacity.
   d. Method to measure soil moisture.
   e. Method to determine when and how much water to apply.
   f. Method to determine if irrigation system is operating correctly.
   g. Method to determine if erosion or excess of water is applied.
4. Develop a site specific O&M Plan for the practice.

C. Construction Check

1. Determine present irrigation water management methods.

   At the time of assistance, determine and record how the cooperator determines when to irrigate and how long to operate the system. List soil moisture measurement devices being used such as feel and appearance, tensiometers, etc.

2. Determine if adjustments are needed in the way the cooperator applies the IWM plan. This will include gathering such data as system application rate, stream size, application depth, application time, amount of runoff, erosion, moisture penetration, uniformity, etc. Record the changes recommended and the cooperator's decision. Based on his/her decision, develop a current IWM plan.

3. Provide follow-up service to determine if the operator is following the IWM plan. At least one follow-up visit with the cooperator is needed while he/she is irrigating to determine irrigator's knowledge and use of the principles of water management. The basis for reporting IWM needs to be recorded each time it is reported.

4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

D. Reporting and/or Certifying

   After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the irrigated area in acres in which IWM is applied.

Land Clearing, Code 460

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Land Clearing, Code 460.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity and extent of the area to be cleared.

B. Engineering Surveys – None required.

Note the location of any utilities or utility markers.

C. Design

1. Locate on a plan map or aerial photograph area to be cleared. Describe the extent and complexity (general size and type of trees, vegetation, etc.) of land to be cleared.
2. Provide location for debris disposal.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of area to be cleared.
   b. Extent of clearing.
   c. Location of areas off limits and vegetation to be left undisturbed.
   d. Description of any timber to be salvaged.
   e. Disposal requirements including location of any burying and/or burning.
   f. Erosion control measures if applicable.
   g. Vegetative requirements.
   e. Location of utilities and notification requirements.
4. An O&M Plan will be prepared to cover the intent of this practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Locate with stakes, paint, or flags the extent of the area to be cleared.
2. Stake location for material to be stockpiled, buried, or burned.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Determine the total area cleared. The area shall be determined by measurements in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method. This may include average width and length of area cleared. Record measurements in the engineering

field book, or plan map.

2. Prepare as-built drawings showing final cleared dimensions, details, etc. when changes were made during construction.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the area in acres.

Land Reclamation, Landslide Treatment, Code 453

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Landslide Treatment, Code 453.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity and extent of the area to be treated. Note soil type, exposed geologic features, and presence of surface and ground water. Evaluate the need for and probable extent of a detailed geologic investigation. Enlist the assistance of a geologist and other specialists as appropriate.

B. Engineering Surveys

1. Survey profiles through the slide area as required to delineate the vertical and lateral extent of the slide area. One profile should be located at the point of the maximum upper and lower limits of the slide. Shots should be taken at close intervals in order to delineate the upper scarp point or soil crack, the surface shape of the slide, and the lower limit of soil movement. Extend the profiles above and below the slide at least 25 feet or to a point that encompasses the probable work area.
2. Survey information shall be recorded in the engineering field book or in electronic files. Bench marks to NGVD should be used if possible.
3. Note the location of any utilities or utility markers.

C. Design

1. Perform a geologic investigation to determine the cause of the landslide and to obtain data for designing repair measures. The services of a geologist or geotechnical engineer will be required.
2. Design treatment measures in accordance with criteria and guidelines in CPS Code 453.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of site.
   b. Extent of area to be treated.
   c. Location of areas off limits and vegetation to be left undisturbed.
   d. Profiles and sections depicting existing and constructed ground lines and elevations.
   e. Disposal requirements for waste materials such as rock, soil and vegetation.
   f. Details of drains and other structural measures.
   g. Placement details and compaction requirements for fill materials.
   h. Erosion control measures required.
   i. Vegetative requirements.
   j. Location of utilities and notification requirements.
4. An O&M Plan will be prepared to cover the intent of this practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the

start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Locate bench marks and establish reference points from which the contractor can install the measures.
2. Note or stake locations of utilities and other structures to be preserved avoided.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Survey at least one profile located at the point of maximum vertical extent of the landslide. Surface grades are generally acceptable if slopes are within +/- 0.1:1 and elevations are within +/- 0.1 feet of planned grade.
2. Verify and record dimensions, elevations, and materials of drains and other structures.
3. Verify that vegetative measures were applied correctly.
4. Compute final quantities if required.
5. Prepare as-built drawings showing final grades, dimensions, and details.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number or area in acres, etc.

Land Reclamation, Toxic Discharge Control, Code 455

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Toxic Discharge Control, Code 455.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity and extent of the problem and to propose possible treatment methods. Note soil type, geologic features, and sources of toxic water discharges. Evaluate the need for and probable extent of a detailed geologic investigation. Enlist the assistance of a geologist, environmental engineer and other specialists as appropriate.

B. Engineering Surveys

1. The extent of surveys will depend on the nature of the site and proposed treatments. Where extensive earth movement is proposed topographic maps should be developed for the site.
2. Survey information shall be recorded in the engineering field book or in electronic files. Bench marks to NGVD should be used if possible.
3. Note the location of any utilities or utility markers.

C. Design

1. Where treatment of water is anticipated collect water samples and perform tests to determine the type and concentrations of contaminants.
2. Design treatment measures in accordance with criteria and guidelines in CPS Code 455.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of site.
   b. Extent of area to be treated.
   c. Location of areas off limits and vegetation to be left undisturbed.
   d. Profiles and sections depicting existing and constructed ground lines and elevations where earth moving is required.
   e. Disposal requirements for waste materials such as rock, soil, vegetation, and old structures that are to be removed.
   f. Details of structures and other treatment measures to be installed.
   g. State construction safety hazards associated with the toxic discharge and any treatment chemicals or other materials.
   h. Erosion control measures required.
   i. Vegetative requirements.
   j. Location of utilities and notification requirements.
4. An O&M Plan will be prepared to cover the intent of this practice. The O&M Plan should address the requirements for monitoring, long-term chemical treatment and testing if required, and replacement requirements for materials such as limestone rock in anoxic drains.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Locate bench marks and establish reference points from which the contractor can install the measures.
2. Note or stake locations of utilities and other structures to be preserved avoided.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Perform surveys as required to verify excavation and earth fill measures.
2. Verify and record dimensions, elevations, and materials of drains and other structures.
3. Verify that vegetative measures were applied correctly.
4. Compute final quantities if required.
5. Prepare as-built drawings showing final grades, dimensions, and details.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of sites.

Land Smoothing, Code 466

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Land Smoothing, Code 466.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice considering soils, topography, etc.

B. Engineering Surveys.

1. Topographic information shall be gathered to determine the extent of the area to be smoothed. Survey information shall be recorded in the engineering field book or electronic files. Bench marks to NGVD should be used if possible.
2. Note the location of any utilities or utility markers.

C. Design

1. Identify the areas that need to be smoothed.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Show location of areas to be smoothed. This can be shown on an aerial photograph of sufficient scale to locate the area on the ground.
   b. Bench mark, north arrow, scale, grid dots showing existing field elevations and grades, field boundaries and direction of surface drainage.
   c. Areas of cut and fill and designed elevations.
   d. Disposal methods and location of obstructions, vegetative matter, etc.
   e. Location of utilities and notification requirements.
3. An O&M Plan will be prepared to cover the intent of this practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book or in the electronic field book.

1. Stake the limits of the areas to be smoothed.
2. Stake any required grades or elevations required for the smoothing operation.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Profiles shall be taken of areas smoothed to verify that irregularities

were removed. Survey sufficient measurements to determine the area smoothed and compute area. Measurements shall be taken with a chain, calibrated measuring wheel, GPS, or other equivalent method. Measurement data shall be recorded in the engineering field book.

2. Prepare as-built drawings showing final construction dimensions, details, etc., if changes were made during construction.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be certified is the area smoothed in acres. The extent of the practice certified is the quantities used as the basis for payment such as acres smoothed or cubic yards.

Lined Waterway or Outlet, Code 468

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Lined Waterway or Outlet, Code 468.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. USDA – NRCS Hydraulics Formula

II. Documentation

These instructions shall apply to all lined waterways or outlets 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.

A. Preliminary Investigation

1. Make a preliminary investigation to determine feasibility and location. Determine the design storm frequency that is reasonable for the site conditions giving due consideration to the potential damages and liability should the waterway fail.
2. Determine that the outlet is stable with adequate capacity for the design flow.

B. Engineering Surveys

1. Record profiles and cross sections of the original ground surface which should exhibit sufficient details to permit designing the lined waterway with reaches of approximately uniform slope and shape.
2. Reference all surveys to a bench mark where needed to establish elevations for construction.
3. Note the location of any utilities or utility markers.

C. Design

1. Determine and record drainage areas along with hydrologic factors and compute designed discharges. Record the design discharge calculations.
2. Record design computations and lined waterway dimensions.
3. Record and indicate disposal requirements for excess spoil material.
4. Develop construction plans and specifications. As a minimum construction plans and specifications shall include:
   a. Location of lined waterway or outlet.
   b. Profile and typical cross sections of the lined waterway.
   c. Type, quantity, and quality of materials used to line the waterway.
   d. Thickness of liner.
   e. Quantity of excavation and earth fill.
   f. Location of utilities and notification requirements.
   g. Vegetative requirements.
   h. Disposal requirements of excavated material.
5. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Set construction stakes for grade and alignment as needed. Set and record a sufficient number of reference stakes (points) so that lined waterway can be relocated.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Determine that constructed waterway has sufficient capacity for the designed discharge and will have a stable velocity. This will be determined at the cross section least likely to pass. The waterway channel must be constructed to design dimensions and sufficiently uniform to prevent undesirable flow conditions.
2. Measure the total length of lined waterway. The length shall be measured in the field by chaining, calibrated measuring wheel, GPS, or other equivalent method.
3. Profile the lined waterway at changes in grade, at the beginning, at the end, and at a spacing not to exceed 200 feet.
4. Determine if runoff has been accurately diverted as planned.
5 Check disposal of excess soil material.
6. Check type, quality, thickness, and quantity of materials used for the lining.
7. Determine adequacy of vegetation on disturbed areas.
8. Prepare as-built drawings showing final construction dimensions, details, etc. if changes to design were made during construction.
9. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the installed length in feet. The extent of the practice certified is the quantities used as the basis for payment such as the volume of excavation in cubic yards, volume of material used as a liner, etc.

Livestock Pipeline, Code 516

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Livestock Pipeline, Code 516.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. Alabama NRCS spreadsheet "Watering System Design".

II. Documentation

These instructions apply to a pipeline and required appurtenances.

A. Preliminary Investigation

Determine the feasibility of the pipeline considering topography, source of water, location, etc.

B. Engineering Surveys

All pipeline designs require sufficient topographic information to plan the pipeline location, determine quantity of pipe, and need for appurtenances, and elevation differential to size the pipeline. Topographic maps are optional on land with slopes of 0.5 percent or flatter.

1. Engineering Surveys (when needed to adequately design the pipeline)
   a. Set and describe at least one temporary bench mark where necessary to determine elevation differences.
   b. Profile pipeline only where summits cannot be determined visually. Record location of water source and elevation of pump discharge pipe. Survey profile rod readings at all highs and lows and the distance between rod readings should not normally exceed 300 feet. The survey must be in sufficient detail to locate summits.
2. Aerial Topographic Maps

   These may be used when they are in sufficient detail for all system components to be located and their elevations established within tolerances required by the conservation practice standard Livestock Pipeline, Code 516. Location of summits and control elevations on the pipeline are essential. A copy of the map must be a part of the system design.
3. Note the location of any utilities or utility markers.

C. Design

1. Determine the required capacity and quality of pipeline for the intended purpose(s).
2. Design shall be based on the required design flow rate and include friction losses and elevation head losses. Record all pipe sizing calculations, with references to tables, charts, and graphs used on NRCS-ENG-523A (or equivalent) or using approved computer programs.
3. Record design on form NRCS-ENG-523A (or equivalent).
4. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of pipeline.
   b. Complete facility plan layout, cross sections and profiles showing dimensions and elevations.
   c. Material type, size, and pressure class for pipe and fittings.

d. Location, size, type and pressure class for appurtenances (drains, vents, valves, outlets, pressure relief, thrust blocks, etc.).

e. Details for freeze proof system.

f. Depth of cover.

g. Pipe trench/backfill requirements.

h. Safety features for trenches, when applicable.

i. Location of utilities and notification requirements.

6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Set stakes at the beginning, changes in alignment or grade, and at the end.
2. Stake location of appurtenant structures.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Pipeline

a. Inspect the pipe to determine if it conforms to the specifications required in the design and plans with respect to manufacturer's identification, material type and grade, size, and working head.

b. Record construction check data on the engineering plans, in the engineering field book, or other appropriate form. Construction documentation shall include the following:

(1) Lengths and size of each pipeline installed. The length of pipe will be measured by chaining, calibrated measuring wheel, GPS, or other equivalent method.

(2) Pipe class, pressure rating, etc. for all pipe installed.

(3) Size and location of all appurtenances such as air release valves, pressure release valves, etc.

(4) Pipe depth of cover. Check depths at locations least likely to pass. A minimum of one check will be made on each pipeline but not less than one check for each 500 feet of pipe installed.

2. Appurtenances

a. Check appurtenant locations to make sure that they are installed according to plans. Record type, size, pressure setting, etc.

b. Check appurtenances as needed to determine if they will function as designed.

3. Compute quantities of pipeline and appurtenances.

4. Prepare as-built drawings showing final construction location, dimensions, details, etc., if significantly different from design

drawings.

5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the length in feet of pipeline installed. The extent of the practice certified is the quantities used as the basis for payment such as the length of each diameter pipe, fittings, etc.

Livestock Shade Structure, Code 717

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Livestock Shade Structure, Code 717.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the feasibility, need, and extent of the practice based on the landowner's operation. Determine if portable or permanent structures best meet the operator's needs.

B. Engineering Surveys

1. Surveys are not required for this practice.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine size, type and number of structures needed. Record design data on NRCS-ENG-523A (or equivalent).
2. Use standard forms AL-ENG-54 and AL-ENG-54A for construction drawings.
3. Complete engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of structures by fields on plan map.
   b. Complete dimensions, materials and quantities, on Forms AL-ENG-54 or AL-ENG-54A.
   c. Use construction specification CS-717. Add additional requirements to specification or drawings as needed.
   d. Number of structures required.
   e. Location of utilities and notification requirement.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

No survey layout is required for this practice. Location of shade structures shall be shown on the conservation plan map.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans, in the engineering field book and NRCS-ENG-523A (or equivalent).

1. Number and location of structures.
2. Constructed dimensions of the structure.
3. Verify that materials, structural components, and connections comply with the drawings and specifications. Note any deficiencies and required remedies.
4. Compute quantities.
5. Prepare as-built drawings showing final construction dimensions, details, etc. if changes were made during construction.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and

specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of structures installed. The extent of the practice to be certified is the quantities used as the basis of payment.

Mine Shaft and Adit Closing, Code 457

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Mine Shaft and Adit Closing, Code 457.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity and extent of the problem and to propose possible treatment methods. Note geologic features, structure conditions and any sources of toxic water discharges. Enlist the assistance of a geologist, structural engineer, biologist and other specialists as appropriate.

B. Engineering Surveys

1. The extent of surveys will depend on the nature of the site and proposed treatments. Locate the sites on aerial photographs, and topographic maps. If the sites are located in or within close proximity to residential developments it may be advisable to delineate the sites on the property deeds.
2. Survey information shall be recorded in the engineering field book or in electronic files. Bench marks to NGVD should be used if possible.
3. Note the location of any utilities or utility markers.

C. Design

1. Design treatment measures in accordance with criteria and guidelines in CPS Code 457.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of site(s).
   b. Location of areas off limits and vegetation to be left undisturbed.
   c. Profiles and sections depicting existing and constructed ground lines and elevations where earth moving is required.
   d. Disposal requirements for waste materials such as rock, soil, vegetation, and old structures that are to be removed.
   e. Details of structures and other treatment measures to be installed.
   f. State known construction safety hazards associated with toxic gasses and any other hazardous materials on the site.
   g. Erosion control measures required.
   h. Vegetative requirements.
   i. Location of utilities and notification requirements.
3. An O&M Plan will be prepared to cover the intent of this practice. The O&M Plan should address the requirements for monitoring if required.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities

including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Locate bench marks and establish reference points from which the contractor can install the measures.
2. Note or stake locations of utilities and other structures to be preserved avoided.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Perform surveys as required to verify excavation and earth fill measures.
2. Verify and record dimensions, elevations, and materials of structures.
3. Verify that vegetative measures were applied correctly.
4. Compute final quantities if required.
5. Prepare as-built drawings showing final grades, dimensions, and details.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of sites.

Monitoring Well, Code 353

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Monitoring Well, Code 353.

B. Design Procedures

1. Design shall be in conformance with the applicable ASTM's referenced in conservation practice standard, Monitoring Well, Code 353.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.

II. Documentation

A. Preliminary Investigation

Determine the feasibility and need for a monitoring well for monitoring contaminants in seepage from waste storage or treatment facilities.

B. Engineering Survey

1. Engineering surveys should be performed as needed to record the hydrogeological data as required in the Standard. Sites having complex geology may require a detailed topographic map in order to record and interpret subsurface conditions. Record survey data in the engineering field book and/or in electronic files as appropriate. Note and record the latitude and longitude of the well.
2. Identify and describe any tile lines, surface and subsurface drains, irrigation ditches, irrigation wells, water supply wells, septic drain fields, infiltration strips, subsurface quarries, mines, or other water control/management related features that may have the potential to alter the native ground water flow paths.
3. Note the location of any utilities or utility markers.

C. Design

1. The depth and location of the monitoring well(s) shall be determined based on a hydrogeological investigation of the area to be tested. The location (latitude and longitude) and water well head protection required shall be recorded on NRCS-ENG-523A (or equivalent). Develop engineering plans showing the details of the monitoring well, including depth, location, materials, well head protection, and buffer requirements.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. A map showing all features that may have the potential to alter the native ground water flow paths shall be drawn to scale on a geologic evaluation site map
   b. Location of monitoring well(s).
   c. Number of monitoring wells.
   d. Well design including diameter, depth, surface sealing, well head protection.
   e. Materials including casing, type, gage and diameter.
   f. Location of utilities and notification requirements.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Stake the location of the monitoring well(s).

E. Construction

Adequate site visits and checks shall be made during construction to verify that the monitoring wells have been installed at the right locations and plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Wells must be permitted and installed by someone experienced in the installation of monitoring wells Documentation shall include the following information from the well driller:

1. Depth of well, casing, and screen or well casing perforations.
2. Depth and quantity of gravel pack.
3. Type and gage of well casing material.
4. Geophysical log.
5. Depth and method of sealing surface casing.
6. The dimensions of the monitoring well head protection slab or casing head above ground shall be measured and recorded in the engineering field book.
7. Buffer dimensions and method of well head protection.
8. Compute quantities.
9. Prepare as-built drawings showing final construction dimensions, details, etc.
10. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of wells installed. The extent of this practice to be reported is quantities used as the basis of payment.

Obstruction Removal, Code 500

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Obstruction Removal, Code 500.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity and extent of the obstructions and document the rationale for removing the obstruction. Identify the location, type, and extent of obstruction.

B. Engineering Surveys – None required.

Note the location of any utilities or utility markers.

C. Design

1. Locate on a plan map or aerial photograph obstructions to be removed. Describe the extent of removal.
2. Provide location for debris disposal.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of obstruction removal.
   b. Extent of obstruction removal.
   c. Debris disposal required.
   d. Vegetative requirements.
   e. Erosion controls measures if applicable.
   f. Location of utilities and notification requirements.
4. An O&M Plan is not required for this practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book or in the electronic field book.

1. Locate with stakes or flags the area where obstructions are to be removed.
2. If obstructions are to be disposed of on-site, stake the locations and limits of disposal.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Determine the total area where obstructions were removed if the payment is based on area. The area shall be determined by measurements in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.
2. Survey sufficient measurements to obtain the quantity of material removed when payment is based on volume. This may include average width, length and depth of material removed. Record measurements in the engineering field book, or plan map.

3. Compute quantities.
4 Prepare as-built drawings showing final construction dimensions, details, etc. if significant changes were made during construction.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the area in acres. The extent to be certified is the quantities used as the basis of payment such as cubic yards of material removed, etc.

Open Channel, Code 582

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Open Channel, Code 582.

B. Design Procedures

1. NRCS Technical Release 25, Design of Open Channels.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.
3. NEFH Part 650, Chapter 14, Water Management (Drainage).

D. Computer Software Design Aids

1. USDA - NRCS Hydraulics Formula.
2. USACE HEC-RAS

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity of the problem, availability of an outlet, and the type and extent of surveys needed. Make the necessary planning surveys and develop an engineering plan map for at least the area affected by the practice.

B. Engineering Surveys

1. Establish the channel alignment in the field.
2. Set and describe at least one permanent bench mark near the outlet end of the channel. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Survey profile rod readings and/or cross sections at a spacing not to exceed 500 feet, depending upon irregularity of the natural ground and/or existing channel section. Stations along channel profiles can be determined by pacing or accurate scaling on aerial photographs. Elevations along cross sections will show all breaks and should extend from the center line to 25 feet beyond the estimated construction area. Record elevation and distance from proposed center line of low areas, which will influence the elevation of the hydraulic gradient.
4. Record outlet conditions, including the elevation of the bottom of the outlet and the expected high-water mark during a normal cropping season.
5. Note location of any utilities or utility markers.

C. Design

1. Determine drainage area served by the channel and show drainage boundary on a suitable aerial photograph, mosaic, or overlay. Determine required channel capacity. From trial and error determine channel dimensions and grade. Record all design data, computations and summary data from computer programs on NRCS-ENG-532A. Retain computer output in hard copy form and on computer discs where appropriate.
2. Plot profile of the channel bottom. See NEFH Figure 14-14.
3. Compute the slope of the hydraulic gradient and record on the profile.
4. Design necessary grade stabilization structures and structures for water control.
5. Prepare earth work quantities and preliminary cost estimate, where

needed.

6. Develop engineering plans and specifications. As minimum the plans and specifications shall include:
   a. Location of channel.
   b. Plot profiles and cross sections of the channel. Place the channel number on the profile and cross section sheets. Plot bottom of proposed channel on the profile. Show elevation of the channel bottom at the beginning and end of the channel and at all breaks in grade.
   c. Record outlet conditions on the profile, including the elevation of the bottom of the outlet and high-water marks or design hydraulic gradient of the outlet.
   d. Draw the hydraulic gradient on the profile. Show elevation of hydraulic gradient at the end of each segment.
   e. Show typical profile and cross section for structures.
   f. Include type, quality, and quantity of all structural materials.
   g. Spoil disposal location and requirements.
   h. Location of utilities and notification requirements.
   i. Vegetative requirements and any other bank stabilization details.
7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book or in the electronic field book.

1. Stake the centerline of the channel at the beginning, changes in alignment and grade, and at the end.
2. Set grade on intervals not to exceed 200 feet.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All drainage mains or laterals shall be checked for completion by making an engineering survey as follows:

1. Determine the total length of constructed channels. The length shall be measured in the field using a chain, calibrated measuring wheel, GPS or other equivalent method.
2. Survey channel bottom and natural ground profile rod readings at a spacing not to exceed 200 feet and at each end of channel. Record the planned channel bottom grade rod on the check notes for each station checked.
3. Cross section the channel at a spacing not to exceed 500 feet with a minimum of one cross section per channel. Survey rod readings at all breaks in slope along the cross section. Extend the cross sections to the outside toe of the spoil bank, or if spoil banks are spread, extend the cross sections to include the spread material.

4. Compute earthwork quantities as needed.
5. Prepare as-built drawings showing final construction dimensions, details, etc.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length in feet. The extent to be certified is the quantities used as the basis of payment such as cubic yards of excavation, etc.

Pond, Code 378 – Embankment Type

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Pond, Code 378.

B. Design Procedures

1. NEFH, Part 650, Chapter 11, Ponds and Reservoirs.
2. NEH, Part 628, Dams, Chapter 50, Earth Spillway Design.
3. Agricultural Handbook No. 590, Ponds – Planning, Design, Construction.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. NRCS Computer Programs "WinPOND and Sites".
2. Alabama NRCS Spreadsheets "Alabama Yardage Calculator-Embankment Earthwork Computation Sheet, and Riser Base Size to Prevent Flotation."
3. USDA – NRCS Hydraulics Formula.

II. Documentation

At initial stage of project have landowner complete and sign Form AL-ENG-27/27A.

These instructions shall apply to all embankment ponds with outside drainage area. Embankment ponds are defined as those where the depth of water impounded against the embankment at spillway elevation is three (3) feet or more.

A. Preliminary Investigation

1. Determine and document hazard classification of the pond. Document the rationale for assigning the hazard classification as a part of the design records. Use Form AL-Eng-23.
2. For inventory size dams, a potential impact area study shall be made and distributed in accordance with NEM 520.28.
3. Make a preliminary investigation to determine site suitability, considering soils, topography, etc.
4. Where irrigation is the primary purpose of the impoundment determine that irrigation storage is feasible with an adequate supply of water available.
5. Check appropriate requirements of state laws for permitting and notify landowner of his/her responsibilities. In many cases a permit is required prior to construction.

B. Engineering Surveys

1. The design survey and layout survey for some embankment ponds may be combined into one operation. Record all survey data on form AL-ENG-34, Farm pond Embankment Data Sheet, or in the engineering field book. Notes recorded in the engineering field book shall be as illustrated in NRCS Technical Release 62, Engineering Layout, Notes, Staking and Calculations.
2. Set and describe a minimum of one permanent bench mark. If readily accessible or required by permitting agencies, use NGVD.
3. Set reference stakes for locating the proposed embankment.
4. Survey the embankment centerline profile the full length of the embankment extending above the

expected elevation of the dam and beyond the location of the auxiliary spillway. Centerline profile rod readings shall be taken at all breaks in grade and at a maximum interval not to exceed 50 feet. Survey a sufficient number of cross sections to accurately compute quantities.

5. Profile the centerline of the auxiliary spillway including the inlet section, level section and outlet section.
6. Show sketch of embankment, reservoir area, auxiliary spillway, proposed fences and other appurtenant structures. Show location of bench marks and reference stakes on plan.
7. Note the location of any utilities or utility markers.

C. Design

1. Re-evaluate the hazard classification of the proposed pond.
2. Complete soils investigation report and construction recommendations and record in the engineering field book or on Form SCS 538 or similar forms. Verify the suitability of the foundation and earth fill for construction and determine if any foundation or seepage issues exist. If needed, request the assistance of a geologist.
3. Check pipe hydraulics for all flow conditions – pipe, weir, and orifice.
4. Record design data on NRCS-ENG-523A (or equivalent) or print outs from approved computer programs. Attach additional calculation sheets used for the design and design survey notes where a separate design survey is made.
5. Determine pool area and volume.
6. Compute earth work quantities and preliminary cost estimate.
7. Complete engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location. Can be a sketch on job plans, field notes, and approved forms or on the conservation plan map.
   b. Site plan layout, cross sections and profiles of embankment and spillway(s), cutoff trench, borrow areas which show dimensions, elevations and type(s) of construction materials.
   c. Details for pipe conduits include size, type of material, cutoff, sand diaphragm, pipe cradle, special joints, and ballasts if required.
   d. Inlet and outlet structure details showing dimensions, reinforcement details, and ballasts if required.
   e. Geologic soil boring location and classification.
   f. Special requirements for foundation preparation and treatment.
   g. Type of seepage control. Provide details.
   h. Requirements for diverting water, dewatering the site, waste disposal.
   i. Vegetative requirements.
   j. Location of utilities and notification requirements.
8. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information on form AL-ENG-34, or standard plan sheets. For the larger, more complex jobs, layout data may be recorded in the engineering field book. Layout notes recorded in the engineering field book shall be as illustrated in NRCS Technical Release No. 62, Engineering Layout, Notes, Staking and Calculations.

1. Set slope stakes as required to accurately compute quantities where needed and/or enable the contractor to construct the embankment and spillway(s) to the planned lines and grades. Stations along the profile shall be determined by chaining, except where quantities will not be certified.
2. Compute earth work quantities where needed to verify design estimates. When the elevation of the ground under the base of the embankment does not vary over 2 feet over the cross section, the end area may be taken from approved yardage tables. Where the elevation of the ground varies more than 2 feet, the cross sectional area will be obtained by the rectangular coordinate method or the cross section may be plotted and measured by a planimeter or CADD program. Limits for earth work quantity calculations shall be the neat lines and grades of the designed embankment after settlement.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Site visits are especially critical during the cut-off excavation and back fill, pipe installation and backfill, and diaphragm drain installation. Refer to NEM Alabama Supplement AL503.56 (5).

Make a re-evaluation of the hazard classification prior to construction for all ponds where construction begins one year or more after the initial evaluation was made. Record re-evaluation with the original classification documents.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check-out data on form AL-ENG-34 or in the engineering field book as appropriate.

1. Profile the centerline of the embankment. Extend the profile across the auxiliary spillway. Record profile rod readings at all stations and at all breaks in grade.
2. Survey at least one cross section of the embankment at a location that represents the weakest section. Record rod readings at each edge of the crown, at each toe, at intermediate points between the top and each toe and at changes in the side slope.
3. Profile the center line of excavated spillways from a point within the pool area to at least 50 feet below the excavated section. Cross section auxiliary spillway at the

control section.

4. Record appropriate elevations and other information of any components such as the principal spillway, trash rack, etc. Record type of material used, gage, coating, etc. Record adequacy of trash rack.
5. Check constructed grades against planned grades and note difference. Compute constructed side slopes and record on check-out notes.
6. Record data on seepage control measures. Include type, materials, and dimensions.
7. Record adequacy and type of vegetative cover established for the auxiliary spillway and embankment.
8. Determine quantities for earth fill, excavations, clearing, etc. where required.
9. Determine actual pool area.
10. Embankment will be acceptable where all of the following conditions are met:
    a. Ponds will be acceptable with respect to side slopes where:

       Side slopes as constructed are not more than 0.1:1 steeper than the designed slope plus allowance for shrinkage.

    b. Constructed crown elevations are not more than 0.1 foot below planned elevations, with allowance for settlement added.
    c. The auxiliary spillway elevation does not vary from the planned elevation by more than 0.2 foot. The width must not be less than planned.
    d. The minimum required freeboard is not lowered by more than 0.1 foot.
    e. Complete dam inventory form as needed.
11. Prepare as-built drawings showing final construction dimensions, details, etc.
12. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of structures completed. The extent to be certified is the quantities used as the basis of payment such as volume of cubic yards of earth fill, etc.

Pond, Code 378 – Excavated Type

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Pond, Code 378.

B. Design Procedures

1. NEFH, Part 650, Chapter 11, Ponds and Reservoirs.
2. Agricultural Handbook No. 590, Ponds – Planning, Design, Construction.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. NRCS Computer Program "WinPOND.
2. Alabama Excavated Pond Worksheet "ecav_pond.xls"

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine site suitability, considering soils, topography, etc. Check requirements of state laws for permitting and notify landowner of his/her responsibility. In many cases a permit may be required prior to construction.

B. Engineering Surveys

The majority of excavated ponds can be designed and constructed by combining the design survey and construction layout survey into one operation. For small routine jobs, record design and layout data in the engineering field book, or on AL-ENG-6. For large complex jobs, record survey, design, and construction data in the engineering field book and other forms as appropriate.

1. Set and describe one permanent bench mark for future reference.
2. Record an adequate number of rod readings around the perimeter or circumference and inside of planned top to determine average ground elevation. Where the topography is irregular and earth work quantity is needed, record a sufficient number of cross sections for determining quantities.
3. Set reference stakes to allow for re-establishing the location.
4. Note the location of any utilities or utility markers.

C. Design

1. Record design data on form AL-ENG-6 or NRCS-ENG-523A (or equivalent).
2. Complete soils investigation report and construction recommendations including spoil placement and record on form SCS 538 or equivalent. .
3. Calculate earth work quantities and preliminary cost estimate where needed.
4. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of the pond.
   b. Typical cross sections and elevations of the planned pond or pit including details of spoil placement.
   c. Profile and cross section of pipe or other structures.
   d. Type, quality, quantity of outlet or inlet structures, and ballasts if required.

e. Compute earth work quantities where needed.

f. Location of utilities and notification requirements.

g. Vegetative requirements.

5. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

The extent of layout required will depend on site conditions, complexity of the job and the necessity of determining volume of excavation. Record layout information on form SCS-ENG-29 or in the engineering field book. Form AL-ENG-6 may be completed and given to the landowner for constructing pond.

Stake the pond or pit. Set a sufficient number of stakes to outline the top and bottom dimensions of the pond. Set slope stakes, as required, to enable the contractor to excavate the pond or pit and place the spoil to planned lines and grades.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check-out data on form AL-ENG-6 or in the engineering field book as appropriate. Compute earth work quantities.

1. Survey at least one longitudinal and one lateral cross section of the excavated pond or pit at the location that represents the weakest section. Where the spoil is shaped extend the cross sections from the outside toe of the spoil on one side to the outside toe of the spoil on the other side.
2. Check constructed grades against planned grades and note difference.

Excavated ponds or pits will be acceptable where the following conditions are met.

1. The constructed side slopes are not steeper than 1:1. Where livestock will water directly from the pond at least one side or access ramp shall not be steeper than 4:1.
2. The depth of the pond or pit is no shallower than 0.2 foot less than the planned elevation.
3. The excavated material does not exceed the permissible spoil height and is shaped as specified in the specifications.
4. The as-built cross sectional area equals or exceeds the planned cross sectional area. Where unforeseen physical conditions prohibit completion of a pit type pond as originally planned, and an alternate design that will meet specifications is possible, a new planned quantity should be computed and cleared with all interested parties.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with

appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of ponds or pits installed for completion. The extent of the practice certified is the quantities used as the basis for payment such as cubic yards of excavation, etc.

Pond Sealing or Lining, Concrete, Code 522

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Pond Sealing or Lining, Code 521.

B. Design Procedure

1. Liquid Tightness designs must follow either NEM Part 536, Structured Engineering, or Requirements for Environmental Concrete Structures, Slabs- on-Soil, and ACI 350 Appendix H.
2. Reduced seepage designs must follow either ACI 318, 330R, 360R.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine if a lining is required.

B. Engineering Surveys

1. Complete an accurate topographic survey of the area where the pond sealing is required. The survey shall extend a minimum of 100 feet beyond the limits of the proposed lining. The survey shall be referenced so that the proposed location of structures can be staked in the field. Bench marks to NGVD should be used if possible.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the size and type of pond sealing required. Pond sealing and lining shall be in accordance with NRCS conservation practice standard Pond Sealing or Lining, Code 522. Record design data on NRCS-ENG-523A (or equivalent).
2. Perform sufficient soils and geologic investigations to determine the in-place soil properties and underlying geology.
3. Design the concrete mix based on the design documents selected.
4. Compute quantities of materials required for installation of the practice such as cubic yards of concrete, earth fill material, reinforcement.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of structure.
   b. Cross sections of the pond and proposed structures with critical elevations and liner thickness requirements.
   c. Special foundation preparation if needed.
   d. Concrete and reinforcement details including joints.
   e. Earth Fill compaction and concrete placement requirements. Specify any soil compaction and concrete material testing required for construction documentation.
   f. Details of the type and quality of lining and components.
   g. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the

start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the location, elevation, and extent of lining.
2. Stake all components in sufficient detail for installation.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed. Observe and document the contractor's construction procedures. Perform quality assurance testing of the contractors work where deemed necessary.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans and in the engineering field book.

1. Constructed dimensions of the lining including thickness.
2. Verify the quantity and strength of concrete.
3. Compaction of sub base including any compaction test data.
4. Constructed dimensions and elevations of component structures.
5. Measure all components of the practice used as the basis of payment.
6. Record all check out notes in the engineering field book and prepare as-built drawings of the completed practice adequately showing the extent of the practice and components installed and the location of where it was installed.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of ponds lined. The extent certified shall be the quantities used as the basis of payment such as square feet treated, acres treated, cubic yards of earth fill, cubic yards of concrete, and etc.

Pond Sealing or Lining, Compacted Soil Treatment, Code 520

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Pond Sealing or Lining, Code 520.

B. Design Procedure

1. NEH Part 651, AWMFH, Chapter 10.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine if a lining is required.

B. Engineering Surveys

1. Complete an accurate topographic survey of the area where the pond sealing is required. The survey shall extend a minimum of 100 feet beyond the limits of the proposed lining. The survey shall be referenced so that the proposed location of structures can be staked in the field. Bench marks to NGVD should be used if possible.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the extent and type of pond sealing required. Pond sealing and lining shall be in accordance with NRCS conservation practice standard Pond Sealing or Lining, Code 520. Record design data on NRCS-ENG-523A (or equivalent).
2. Perform sufficient soils and geologic investigations to determine the in-place soil properties and underlying geology.
3. Obtain laboratory testing as needed to determine the thickness of liner, soil additives needed and compaction requirements to provide the degree of impermeability desired.
4. Compute quantities of materials required for installation of the practice such as cubic yards or square feet of lining material, earth fill material, liner protection cover, etc.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of structure.
   b. Cross sections of the pond and proposed structures with critical elevations and liner thickness requirements.
   c. Special foundation preparation if needed.
   d. Compaction and placement requirements. Specify any compaction and material testing required for construction documentation.
   e. Details of the any drains or other structures associated with the liner installation.
   f. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the location, elevation, and extent of lining.
2. Stake all components in sufficient detail for installation.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed. Observe and document the contractor's construction procedures. Perform quality assurance testing of the contractors work where deemed necessary.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans and in the engineering field book.

1. Constructed dimensions of the lining including thickness.
2. Verify the quantity and type of soil additive used beutmite or soil dispersant
3. Compaction of sub base and lining, including any compaction test data.
4. Constructed dimensions and elevations of component structures.
5. Measure all components of the practice used as the basis of payment.
6. Record all check out notes in the engineering field book and prepare as-built drawings of the completed practice adequately showing the extent of the practice and components installed and the location of where it was installed.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of ponds lined. The extent certified shall be the quantities used as the basis of payment such as square feet treated, acres treated, cubic yards of earth fill, etc.

Pond Sealing or Lining, Flexible Membrane, Code 521A

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Pond Sealing or Lining, Code 521 A.

B. Design Procedure

1. NEH Part 651, AWMFH, Chapter 10.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine if a lining is required.

B. Engineering Surveys

1. Complete an accurate topographic survey of the area where the pond sealing is required. The survey shall extend a minimum of 100 feet beyond the limits of the proposed lining. The survey shall be referenced so that the proposed location of structures can be staked in the field. Bench marks to NGVD should be used if possible.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the extent and type of pond sealing required. Pond sealing and lining shall be in accordance with NRCS conservation practice standard Pond Sealing or Lining, Code 521 A. Record design data on NRCS-ENG-523A (or equivalent).
2. Perform sufficient soils and geologic investigations to determine the in-place soil properties and underlying geology.
3. Select the type of liner material to be used for the installation. In selecting the liner material consider such things as initial cost, projected life of the liner, replacement cost, ease of installation and availability of experienced contractors, liner cover protection and other factors that may affect the installation and performance of the liner.
3. Compute quantities of materials required for installation of the practice such as square feet of lining material, earth fill material, liner protection cover, etc.
4. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of structure.
   b. Cross sections of the pond and proposed liner with critical elevations and liner dimensions.
   c. Special foundation preparation if needed.
   d. Specify installation requirements, including seaming and seam testing, and anchorage details. Specify documentation required for construction documentation.
   e. Details of the any drains, vents or other structures associated with the liner installation.
   f. Details and placement requirements of protective cover.
   g. Location of utilities and notification requirements.
5. Develop a site specific O&M Plan for the practice. Include requirements for monitoring if needed and liner repair methods.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the location, elevation, and extent of lining.
2. Stake all components in sufficient detail for installation.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed. Observe and document the contractor's construction procedures. Perform quality assurance testing of the contractors work where deemed necessary.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans and in the engineering field book.

1. Constructed dimensions of the lining, material type and thickness.
2. Preparation of sub base, including any compaction test data.
3. Constructed dimensions and elevations of component structures.
4. Measure all components of the practice used as the basis of payment.
5. Record all check out notes in the engineering field book and prepare as-built drawings of the completed practice adequately showing the extent of the practice and components installed and the location of where it was installed.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of ponds lined. The extent certified shall be the quantities used as the basis of payment such as square feet treated.

Precision Land Forming, Code 462

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Precision Land Forming, Code 462.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.
3. NEH Part 623, Irrigation, Chapter 12, Land Leveling.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility and complexity of the practice considering soils, topography, drainage outlets, etc.

B. Engineering Surveys

Record field information in the engineering field book, or in electronic data files suitable for CAD applications as appropriate.

1. Grid the field to be leveled or formed and set a sufficient number of permanent stakes to reference the grid system. See NEH, Part 623, and Chapter 12 for information on layout of a grid.
2. Set and describe at least one permanent bench mark and show the location and elevation on the plan. Bench marks to NGVD should be used if possible.
3. Fields may be surveyed on a maximum of 200-foot centers where the field is: (1) greater than 40 acres in size with a minimum dimension of 1200 feet, (2) relatively uniform, and (3) where earth work calculations are not needed. All other fields shall be surveyed on 100-foot centers or as needed to prepare accurate topographic maps for CAD applications. The surveys shall also include rod readings in existing drainage ways and any existing irrigation facilities that will be affected.
4. Note the location of any utilities or utility markers.

C. Design

1. Plot field information on standard cross section sheets or CAD maps.
2. Prepare contour map where necessary to assist in determining required grades.
3. Determine planned grades and direction required to achieve the intended purpose.
4. Determine if additional conservation practices are required to achieve the intended purpose.
5. Compute the quantity of earth fill or excavation. Earthwork computations may be performed using CAD routines. Print and retain CAD computation summary sheets along with assumptions and grade information sufficient to document the conditions for which the computations apply. Include the quantity of any drainage or irrigation facilities that will be constructed in the land forming operation.
6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of field drainage systems on drafting sheets with plotted survey data, including any water control structures.

b. Direction and grades of area to be graded.

c. Location of facilitating conservation practices.

d. Location on of any required borrow areas including excavation limits.

e. Location of utilities and notification requirements.

7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Furnish the contractor a cut and fill sheet and design grade and cross slope. Where necessary, set permanent stakes representing the center of each 100 foot square with the planned cut or fill at that location.

2. Stake drainage channels and water control structures that are to be constructed during the leveling operation.

3. In the case of bench leveling, lay out the benches on the ground. Handle each bench as an individual segment.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. On fields that have been staked for leveling, rod readings shall be taken as needed during construction to ensure that the field is being leveled to the planned elevation. These rod readings shall be recorded in the engineering field book. The complete construction check shall include profiles and other survey data to satisfactorily show the constructed grade. As a minimum, three profiles shall be taken on each field with no less than three profiles per 40 acres whichever is greater. One of the profiles shall be taken along the diagonal of the staked line.

   When larger acreage is involved, one block or at least 10 percent of the acres shall have a complete construction check. All blocks shall be visually inspected and the block(s) which appears least likely to conform to planned grades shall be selected for the complete check. The remaining blocks shall be checked by recording sufficient rod readings to show that planned grades have been constructed.

2. The final construction check profiles shall be taken in the direction of irrigation on areas which appear least likely to conform to planned grades. Rod readings shall be taken along the profiles every 100 feet and at apparent highs and lows. The profiles shall be extended across drainage or irrigation facilities constructed during the leveling operation.

3. In case of bench leveling, profile and cross section each bench near the middle of the bench. Survey profile

rod readings at intervals of not more than 100 feet and cross sections at intervals of not more than 50 feet.

4. Record the profile rod readings/elevations to the nearest 0.05 foot in the engineering field book. Check to see that planned grades have been met by plotting the profiles on standard cross section paper. (It is not necessary to plot the profiles when the field has been designed for a flat grade.) The profiles will also provide elevation data for checking planned cross slope. Permissible variation of the finished grade from the planned grade or a plane paralleling the planned plane shall be plus or minus 0.10 foot providing such variation will not affect water distribution or cause drainage problems.
5. Compute the acres leveled.
6. Where needed, verify quantity of earth fill or excavated material.
7. Compute earth work quantities.
8. Prepare as-built drawings showing final construction dimensions, details, etc.
9. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by an employee with appropriate engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the acres leveled. The extent of the practice to be certified is the quantities used as the basis for payment such as cubic yards of earth moved.

Pumping Plant, Code 533

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Pumping Plant, Code 533.

B. Design Procedures

1. NEH, Part 624, Drainage, Chapter 7, Drainage Pumping.
2. NEH, Part 623, Irrigation, Chapter 8, Irrigation Pumping Plants

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.
3. Alabama NRCS Spreadsheet "Watering System Design".

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the need and feasibility of the pumping plant. Determine type of pumps (axial flow, centrifugal, etc.) that would be applicable to the proposed project.

B. Engineering Surveys

1. The engineering survey will consist of the location of the proposed pumping plant and any structures that may interfere with its installation. The proposed location of the pumping plant shall be referenced so that it can be staked in the field.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the capacity (gpm) and total dynamic head (feet) required or pump discharge pressure when the pumping lift is not readily available. Record design data on NRCS-ENG-523A (or equivalent). Include manufacturer's pump curve if available.
2. Determine power requirements and availability of power. Where electricity is unavailable design alternative power sources such as photovoltaic panels or wind powered turbines.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Pump location.
   b. Size and type of pump and associated equipment.
   c. Pump discharge capacity (gpm) and required head at pump discharge.
   d. Details for mounting pump (may be left up to the manufacturer).
   e. Details for pump pad including dimensions, type of material, etc.
   f. Details of appurtenances.
   g. Location of utilities and notification requirements.
   h. Details of pressure task if required.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake the location and critical

elevations of the proposed pumping plant.

2. Stake pump intake location and dimensions when required.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans, in the engineering field book and NRCS-ENG-523A (or equivalent).

1. Size, type of pump, model, manufacturer, rated RPM, and required appurtenances.
2. Pump discharge capacity.
3. Gear head if applicable (i.e. HP, RPM, Ratio).
4. Power unit: type, manufacturer, rpm, HP. Note safety of unit (i.e. power shaft covered, etc.).
5. Intake elevation of suction line.
6. Pump elevation.
7. Pressure Tank size & settings if required.
8. Operational check.
9. Dimensions and type of pump pad.
10. Compute earth work quantities where required.
11. Prepare as-built drawings showing final construction dimensions, details, etc.
12. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of pumping plants installed. The extent of the practice to be certified is the quantities used as the basis of payment.

Recreation Land Grading and Shaping, Code 566

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Recreation Land Grading and Shaping, Code 566.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice considering soils, topography, etc.

B. Engineering Surveys.

1. Topographic information shall be gathered to determine the extent of the area to be smoothed. The survey should include any features that will affect the design. Survey information shall be recorded in the engineering field book or in electronic survey files for use in CAD programs.
2. Note the location of any utilities or utility markers.

C. Design

1. Identify the areas that need to be graded and shaped.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Show location of areas to be graded and shaped. This can be shown on an aerial photograph of sufficient scale to locate the area on the ground.
   b. Bench mark, north arrow, scale, grid dots showing existing field elevations and grades, field boundaries and direction of surface drainage.
   c. Areas of cut and fill and designed elevations.
   d. Location of utilities and notification requirements on cover sheet.
3. An O&M Plan is not required for this practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the limits of the areas to be graded and shaped.
2. Stake any required grades or elevations required for the grading and shaping operation.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Profiles shall be taken of areas graded and shaped to verify that irregularities were removed. Survey sufficient measurements to determine the area smoothed and compute

area. Measurements shall be taken with a chain, calibrated measuring wheel, GPS, or other equivalent method. Measurement data shall be recorded in the engineering field book.

2. Prepare as-built drawings showing final construction dimensions, details, etc., where significant changes were made during construction.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be certified is the area graded and shaped in acres. The extent of the practice certified is the quantities used as the basis for payment such as acres graded and shaped or cubic yards.

Roof Runoff Structure, Code 558

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Roof Runoff Structure, Code 558.

B. Design Procedures

1. NEH, Part 651, Chapter 10, AWMFH.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the overall need, and feasibility, type of outlet for disposing of the runoff, etc.

B. Engineering Surveys

1. The roof area that will be treated shall be measured and recorded in the engineering field book. Topographic data will be gathered in accordance with documentation instructions for the component (e.g. subsurface drain). If the system is part of a total waste management plan, etc., a topographical map shall be prepared showing location of all buildings, ground elevations, and outlet locations. Data collected shall be recorded in the engineering field book with appropriate sketches or in electronic files suitable for use in CAD programs. Reference all surveys to a bench mark where needed to establish elevations for construction. Bench marks to NGVD should be used if possible.
2. Note the location of any utilities or utility markers.

C. Design

1. Record design data on NRCS-ENG-523A (or equivalent). The design shall follow the procedures in NEH Part 651, Chapter 10, pages 10-1 through 10-3 of the AWMFH.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of all gutters and downspouts.
   b. Sizes and slope of all gutters.
   c. Size of downspouts.
   d. Type of material used.
   e. Special fasteners details, if needed
   f. Detailed plans for the gutter outlet. See documentation procedures for complementary practices used.
   g. Location of utilities and notification requirements.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake location of all roof runoff structures.
2. Stake location and grades of outlets required.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information in the engineering field book.

1. Size, length, slope and location of gutters and downspouts.
2. Type of material used.
3. Compute quantities.
4. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of systems installed. The extent of the practice to be certified is the quantities used as the basis of payment such as linear feet of gutter by size. Quantities shall be measured in the field.

Roofs and Covers, Code 367

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Roofs and Covers, Code 367.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the need and feasibility of a roof or cover considering site topography, and floodplain.

B. Engineering Surveys

1. An accurate topographic survey of the proposed location shall be taken and shall extend a minimum of 50 feet beyond the limits of the proposed roof and/or cover and in sufficient detail to determine drainage patterns in the vicinity of the proposed facility. Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible. The proposed location of the waste facility cover shall be referenced so that it can be staked in the field. The survey should show the location of existing buildings, utilities, wells, existing buried pipelines, drainage ditches, streams, etc.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the size and type of cover. The dimensions of the roof and/or cover shall be designed to resist anticipated wind loads. Record design data on NRCS-ENG-523A (or equivalent).
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Planned location of the facility on the topographic survey.
   b. Cover type, material, thickness, etc.
   c. Plan view of roof and/or cover.
   d. Cross sections of the roof and/or cover.
   e. Details showing method of anchoring.
   f. Details of all appurtenances including floats, weights, etc.
   g. Details of removing water from roof and/or cover.
   h. Profile and cross sections of all inlet and outlet pipes.
   i. Location of utilities and notification requirements.
3. Compute quantity of cover material and all appurtenances when used as basis of payment.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake the corners of the waste facility

cover and provide offset reference points.

2. Stake the location and critical elevations of all pipes and other required structures.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the engineering plans and in the engineering field book or in the electronic field book.

1. Sufficient cross sections (a minimum of two) shall be taken to document the dimensions of the roof and/or cover.
2. Record the type, thickness, and manufacturer of roof and/or cover used.
3. Check and verify that rainfall is directed from the roof and/or cover.
4. Check and verify roof and/or cover supports, weights, floats, etc.
5. Safety signs and devices.
6. Verify and document that the manufacturer warrants the cover.
7. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.
8. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of roof and/or cover installed. The extent certified shall be the quantities used as the basis of payment.

Row Arrangement, Code 557

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Row Arrangement, Code 557.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice considering site topography, soils, drainage outlets, etc.

B. Engineering Surveys

1. Topographic information shall be in sufficient detail to determine the direction of rows. The survey should include any features that will affect the design. Survey information shall be entered in the engineering field book and/or in electronic files appropriate for CAD use.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the row direction that will meet the purpose of the practice (i.e. surface drainage, erosion control, etc.). Row arrangement design will be documented on NRCS-ENG-523A (or equivalent) or on CAD drawings.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of the area where the rows will be established.
   b. The direction, grade, and length of rows to be established.
   c. Location of utilities and notification requirements.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities.

Record layout data in the engineering field book.

1. Stake out the direction of the rows or have sufficient information on the engineering plans that the contractor can locate the row direction in the field.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Verify row directions, grade, and lengths are in conformance with the plans.
2. Prepare as-built drawings showing final constructed layout, dimensions, details, etc.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be certified and/or reported is the area in acres. The area shall be measured in the field or scaled from a scaled aerial photograph.

Sediment Basin, Code 350

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Sediment Basin, Code 350.

B. Design Procedures

1. NEFH, Part 650, Chapter 10, Gully Treatment.
2. Alabama Handbook for Erosion Control Sediment Control and Storm water Management on Construction Sites and Urban Areas.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. Alabama NRCS Spreadsheet "Discharge for Pipe Drop Structures"
2. USDA - NRCS Hydraulics Formula.
3. NRCS Computer Program "WinPond."
4. Auburn University Civil Engineering "SEDspread" software

II. Documentation

A. Preliminary Investigation

1. Make a preliminary investigation to determine site suitability considering soils, topography, etc., and that a stable outlet is available, or can be made available.
2. Determine and document hazard classification of the pond. Document the rationale for assigning the hazard classification as a part of the design records.
3. For inventory size dams, a potential impact area study shall be made and distributed in accordance with NEM 520.28.
4. Check appropriate requirements of state laws for permitting and notify landowner of his/her responsibilities. In some cases a permit is required prior to construction.

B. Engineering Surveys

1. The design survey and layout survey in some instances may be combined into one operation. Record all survey data in the engineering field book, or in electronic files appropriate for use in CAD programs. Notes recorded in the engineering field book shall be as illustrated in Technical Release No. 62.
2. Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible.
3. Set reference stakes for locating the proposed embankment.
4. Survey the embankment centerline profile the full length of the embankment extending above the expected elevation of the dam and beyond the location of the auxiliary spillway. Centerline profile rod readings shall be taken at all breaks in grade and at intervals no greater than 50 feet. Survey a sufficient number of cross sections to accurately compute earth work quantities. In lieu of surveying profiles, obtain sufficient data to develop an accurate topographic map of the site.
5. Show sketch of embankment, reservoir area, auxiliary spillway, proposed fences and other appurtenant structures. Show location of bench marks and

reference stakes on sketch. Number each structure and identify with respect to their location on the farm.

6. Note the location of any utilities or utility markers.

C. Design

1. Re-evaluate the hazard classification of the sediment basin.
2. Record drainage areas, grades, overfall dimensions, site conditions and related hydraulic design data on NRCS-ENG-523A (or equivalent) or approved computer program.
3. Record computations for hydrology, sediment yield, spillways, and basin size.
4. Obtain sufficient soils/geologic investigations for design purposes.
5. Develop engineering plans and specifications. As a minimum the plans and specification shall include:
   a. Location of the sediment basin.
   b. Site plan layout, cross sections and profiles of embankment and spillway(s), cutoff trench, borrow areas showing dimensions, elevations and type(s) of construction materials.
   c. Details for pipe conduits and skimmer system including size, type of material, seepage control, pipe cradle, special joints, etc.
   d. Inlet and outlet structure details showing dimensions and reinforcement details.
   e. Special requirements for foundation preparation and treatment.
   f. Requirements for diverting water, dewatering the site, and sediment disposal.
   g. Location of utilities and notification requirements.
   h. Vegetative requirements.
5. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Re-evaluate of the hazard classification prior to construction for all ponds where construction begins one year or more after the initial evaluation was made. Record re-evaluation with the original classification documents.

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Set a sufficient number of stakes to guide the contractor in making the necessary excavation and earth fill to the planned grades.
2. Stake location and critical elevations of structures, auxiliary spillways, etc.

E. Construction

Perform a re-evaluation of the hazard classification prior to construction where construction begins one year or more after the initial evaluation was made. Record re-evaluation with the original classification documents.

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check out data in the engineering field book or on appropriate forms.

1. Survey a profile along the centerline of the embankment and cross sections of the completed structure. One of the cross sections should extend along the center line of the principal spillway from the invert of the outlet to the upstream invert of the pipe. Record all breaks in grade along the cross section, including the entrance and exit invert elevation of the pipe. Record survey data in the engineering field book.

   Embankment will be acceptable with respect to side slopes where side slopes as constructed are not more than 0.1:1 steeper than the designed slope including shrinkage. See documentation for pond for calculations.

   Survey a cross section of the auxiliary spillway at the control section.

3. Record type and quality of materials used.
4. Record adequacy and type of vegetative cover.
5. Compute quantities if required.
6. Prepare as-built drawings showing final construction dimensions, details, etc. when significant changes were made during construction.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of structures installed. The extent of the practice certified is the quantities of materials used as the basis of payment such as volume of earth fill and excavation in cubic yards, length of pipe by diameter, etc.

Solid/Liquid Waste Separation Facility, Code 632

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Solid/Liquid Waste Separation Facility, Code 632.

B. Design Procedures

1. NEH Part 651, Agricultural Waste Management Field Handbook.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the structures needed to separate solids from a liquid waste stream. This conservation practice shall be a part of the overall agricultural waste management system.

B. Engineering Surveys

1. Complete an accurate topographic survey of the area where the liquid waste stream is to be collected and separated. The survey shall extend a minimum of 50 feet beyond the limits of the proposed structures and in sufficient detail to determine drainage patterns. The survey shall be referenced so that the proposed location of structures can be staked in the field. The survey should show the location of existing buildings, utilities, etc., in the vicinity of the proposed facility. Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the size and type of structures needed using conservation practice standard Solid/Liquid Waste Separation Facility, Code 632 for minimum criteria. Record design data on NRCS-ENG-523A (or equivalent).
2. Compute quantities of materials required for installation of the practice such as cubic yards of excavation and earth fill material, linear feet of pipe, cubic yards of concrete, etc.
3. Complete engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of the structure(s).
   b. Plan view of the proposed structure(s).
   c. Cross sections of the proposed structures with critical elevations.
   d. Structure details, including concrete and reinforcing steel details.
   e. Type, quality, and quantity of all materials used.
   f. Details of support systems for solid/liquid separation
   g. Fencing and signage as appropriate for safety purposes.
   h. Location of utilities and notification requirements.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the

landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the location of all components in sufficient detail for installation.
2. Layout requirements will be as required for each component installed as part of this practice.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans, in the engineering field, and on NRCS-ENG-523A (or equivalent).

1. Constructed dimensions and elevations of completed structures.
2. Measure all components of the practice when used as the basis of payment. Structural components such as pipelines shall be measured with a chain or calibrated measuring wheel, GPS or other equivalent method.
3. Record all check out notes in the engineering field book.
4. Compute earth work quantities if required.
5. Prepare as-built drawings showing final construction dimensions, details, etc. if significant changes were made during construction.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of solid/liquid manure separation facility installed. The extent certified shall be the quantities used as the basis of payment such as linear feet of pipe, cubic yards of concrete, etc.

Spoil Spreading, Code 572

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Spoil Spreading, Code 572.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the appropriate disposal of spoil from excavations.

B. Engineering Surveys

1. Surveys shall be taken to determine the location, elevations, cut and fill volumes, erosion and water control structures needed to control runoff. As a minimum, cross sections shall be taken to adequately show the site topography and design the treatment.
2. Reference all surveys to a bench mark where needed to establish elevations for construction. Bench marks to NGVD should be used if possible.
3. Record all surveys in the engineering field book.
4. Note location of any utilities or utility markers.

C. Design

1. Record all design data on NRCS-ENG-523A (or equivalent).
2. Determine maximum height that spoil can be spread.
3. Determine side slopes of spoil to ensure stability.
4. Compute quantities of spoil.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of spoil placement.
   b. Cross section of spoil placement including side slopes, height of spoil, distances from channels, waterway, etc.
   c. Vegetative requirements.
   d. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake the limits where spoil is to be spread.
2. Where needed, stake the toe of the spoil.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Survey a minimum of two cross sections to determine if the spoil is spread in accordance with the design.
2. Survey additional measurements as needed to determine the dimensions of the area when spoil is spread. The area shall be measured in the field with a chain, calibrated measuring wheel, GPS, or other equivalent method. Compute the area treated.
3. Check adequacy of vegetation.
4. Compute earth work quantities if required.
5. Prepare as-built drawings showing final construction dimensions, details, etc. if significant changes were made during construction.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the area in acres. The extent of the practice to be certified is the quantities used as the basis of payment such as the cubic yards of earth moved, etc.

Spring Development, Code 574

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Spring Development, Code 574.

B. Design Procedures

1. NEFH, Part 650, Chapter 12, Springs and Wells.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine that the site is suitable for spring development.

B. Engineering Surveys

1. Reference all surveys to a bench mark where needed to establish elevations for construction. Set and describe at least one permanent bench mark.
2. Surveys shall be taken to determine the location, elevations, cut and fill volumes, structures needed to develop the spring and control runoff. As a minimum, cross sections shall be taken to adequately show the site topography.
3. Record all surveys in the engineering field book.
4. Note the location of any utilities or utility marker.

C. Design

1. Design in accordance with the design criteria in the conservation practice standard Spring Development, Code 574. Record design data on NRCS-ENG-523A (or equivalent).
2. Compute quantities of all material used in the development of the spring.
3. Develop engineering plans and specifications. Use AL-ENG 574-01 if appropriate. As a minimum the plans and specification shall include:
   a. Location sketch showing all components.
   b. Length, width, and depth of trench if applicable.
   c. Length, size, and kind of collection pipes and outlet pipes.
   d. Critical elevations of all component structures.
   e. Cut and fill slopes where applicable.
   f. Vegetative requirements.
   g. Location of utilities and notification requirements.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record the layout information in the engineering field book.

1. Set a sufficient number of stakes to guide the landowner/contractor in constructing the spring development.
2. Stake the location and elevations of required structures.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Take measurements as needed to determine the dimensions and critical elevations of all components. Components shall be checked in accordance with the appropriate documentation procedure.
2. Survey elevations of spring area, collection pipes, spring box, and outlet pipe.
3. Check the quantity, size, and type of material used for all components.
4. Check adequacy of vegetation.
5. Compute earth work quantities if required.
6. Prepare as-built drawings showing final construction dimensions, details, etc. if significant changes were made during construction.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of springs constructed. The extent of the practice to be certified is the quantities used as the basis of payment such as the cubic yards of earth moved, linear feet of pipe, cubic yards of concrete, cubic yards of earth fill or excavation, etc.

Sprinkler System, Code 442

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Sprinkler System, Code 442.

B. Design Procedures

1. NEH, Part 623, Irrigation, Chapter 11, Sprinkler Irrigation.
2. NEH, Part 652, Irrigation Guide, Chapter 6.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Determine suitability of site for irrigation, considering field dimensions, soils, topography, etc. Select the type of sprinkler system that is adapted to the site, crop(s) to be grown and the farmer's needs and desires.

1. As a minimum, the following data should be gathered and evaluated.
   a. Soil maps. Verify soils information in the field.
   b. Aerial photos.
   c. Topographic maps. Note topographic features: sloping or flat; irregular or even; relative location of high and low elevations; utilities; existing structures; existing vegetation.
   d. Source of water. Check quality, quantity, and pumping plant capacity.
   e. Other pertinent information.
2. Consider all sprinkler irrigation systems and discuss them with the landowner. Determine the landowner's desires considering cost, labor, method of managing water, etc.
3. Record the preliminary investigation obtained in A.1. and A.2. On NRCS-ENG-523A (or equivalent).

B. Engineering Surveys

Gather sufficient survey data to plan the location and size of sprinkler system, calculate quantities and prepare cost estimates. Using the preliminary information obtained in A. above, determine the extent of survey data needed: (1) minimal survey; (2) moderate survey data, or (3) detailed topographic survey. Proceed as outlined below based on the survey requirement. All survey data shall be recorded in the engineering field book or in electronic files.

1. Minimal survey data is required where the mains and submains can be located and staked in the field without the use of a topographic map. It is adapted to areas where the topography is flat and such that the mains and submains can be readily located. Minimal survey is usually required for a traveling gun and center pivot irrigation system. This is especially true when U.S. Geologic Survey Quadrangle topographic maps are available. Determine degree and direction of land slopes and key elevations by visual inspection or minimal surveying.
2. Moderate survey data is required where the mains and submains can be located and shown on a plan map using random measurements and rod readings for key elevations.
   a. Profile around and across the area to be irrigated. Distances may be chained or paced.
   b. Survey key elevations and locate

on a sketch or photo. Distances may be measured from scaled drawings or photos of known scale.

3. Detailed topographic survey is required where a detailed contour map is needed to design and layout the system and is necessary where elevation differences are considerable.
    a. Rod readings shall be taken on a grid spacing not exceeding 100 feet and as needed to define surface features such as breaks in slope, depressions, knobs, etc.
    b. Establish reference points for use as vertical and horizontal control in layout and construction check surveys. Describe the location of these points in the field notes.
4. Note location of any utilities or utility markers.

C. Designs

1. Determine system requirements. Prepare a plan map. The detail shown on the map will depend on the type of engineering survey selected for designing the system. In general, the plan should show reference points so that any qualified person other than the designer can lay out the work.
2. Record the design information on NRCS ENG-523A or equivalent. See NEH Part 652, Chapter 6 of the National Irrigation Guide, and Alabama Amendment for design examples of sprinkler irrigation systems.
3. For vendor designed systems, obtain the sprinkler package for the system. Verify the designer is a PE or CID.
4. Calculate quantities and prepare cost estimate, where needed.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
    a. The layout for traveling gun and center pivot irrigation systems may be on an aerial photo of a scale of 1 inch = 660 feet or larger and attached to the appropriate design form.
    b. Pipe size, type, pressure class by reach for mainline and laterals.
    c. Lateral spacing, nozzle spacing, pressure and flow requirements.
    d. Requirements for pump and motor.
    e. Requirements for system appurtenances.
    f. Method of measurement and payment if needed.
    g. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Consult with the installer to determine construction layout needs.
2. Set a sufficient number of stakes required to establish pipeline locations, riser locations, alignments, and grades.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Record kind, type, class, sizes, spacing, pressure, and capacity of sprinklers. Record type, size, etc., of all appurtenances. The construction check shall include a system evaluation to determine if the system meets the minimum coefficient of uniformity
2. Final notes and measurement shall include:
    a. Spacing of laterals and nozzles.
    b. Size of nozzles, laterals and mainline.
    c. Location, type and size of filters and other appurtenances.
    d. Applicable supporting data documentation items for mainline pipe and pump.
3. Prepare as-built drawings showing final construction dimensions, details, etc. if changes were made during construction.
4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of irrigation systems and the irrigated area in acres. The extent of the practice to be certified is the quantities used for the basis of payment.

Stormwater Runoff Control, Code 570

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Stormwater Runoff Control, Code 570.

B. Design Procedures

1. NEFH, Part 650, Chapter 11, Ponds and Reservoirs.
2. Agricultural Handbook No. 590, Ponds – Planning, Design, Construction.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine overall need, and feasibility, type of outlet for disposing of the runoff, etc. Also, determine site suitability, considering soils, topography, etc. Check requirements of state laws for permitting and notify landowner of his/her responsibility. In many cases a permit may be required prior to construction.

B. Engineering Surveys

1. The stormwater runoff area that will be treated shall be measured and recorded in the engineering field book. Topographic and other surveys will be performed in accordance with documentation instructions for the engineering practices (e.g. sediment basin) used in the design.

   Data collected shall be recorded in the engineering field book with appropriate sketches. Reference all surveys to a bench mark where needed to establish elevations for construction. Bench marks to NGVD should be used if possible.

2. Note the location of any utilities or utility markers.

C. Design

1. Record design data on NRCS-ENG-523A (or equivalent).
2. Complete soils investigation report and construction recommendations.
3. Refer to the appropriate conservation practice standards for the design of each conservation practice or component of the stormwater runoff control system, such as Pond, Code 378, Roof Runoff Structure, Code 558, Lined Waterway or Outlet, Code 468, Grassed Waterway, Code 412, Diversion, Code 362, Structure for Water Control, Code 587.
4. Calculate earth work and material quantities and preliminary cost estimate where needed.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of the stormwater runoff control practice.
   b. Typical cross sections, if applicable, and elevations of the planned stormwater runoff control measures.
   c. Profile and cross section of pipe or other structures, if applicable.
   d. Type, quality, quantity of outlet or inlet structures, and ballasts if required.
   e. Compute earth work quantities where needed.
   f. Location of utilities and notification requirements.
   g. Vegetative requirements.

h. Additional details required for planned conservation practices as required in this document.

6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake location of all stormwater runoff control structures.
2. Stake location and grades of outlets required.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information in the engineering field book.

1. Size, length, slope and location of the stormwater runoff control structures.
2. Type of material used.
3. Compute quantities if required.
4. Prepare as-built drawings showing final construction dimensions, details, etc. if significant changes were made during construction.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.
6. Additional checkout as identified for conservation practices identified in this document.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of systems installed. The extent of the practice to be certified is the quantities used as the basis of payment such as linear feet of pipe, cubic yard of excavation, etc. Quantities shall be measured in the field.

Streambank and Shoreline Protection, Code 580

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Streambank and Shoreline Protection, Code 580.

B. Design Procedures

1. NEFH, Part 653, Stream Corridor Restoration Principles, Processes and Practices.
2. NEFH, Part 650, Chapter 16, Streambank and Shoreline Protection.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity of the problem and type of treatment needed to protect the streambank and extent of survey needed. Make the necessary planning surveys and develop an engineering plan map for at least the area affected by the practice.

B. Engineering Surveys

1. Establish the location of the area to be protected.
2. Set and describe at least one permanent bench mark near the area to be protected. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Survey cross sections at not more than 100-feet intervals, depending upon irregularity of the natural ground and/or area to be protected. Stations along streambank shall be determined by measurement with chain, calibrated wheel or other acceptable method of equivalent accuracy. Elevations along cross sections will show all breaks and should extend from the stream center line to 25 feet beyond the estimated construction area.
4. Note the location of any utilities or utility markers.

C. Design

1. Plot profiles and cross sections.
2. Determine the appropriate treatment needed to protect the streambank. Protection shall be in accordance with National Engineering Handbook, Part 653, Stream Corridor Restoration Principles, Processes, and Practices.
3. Develop cross sections with sufficient details to install the practice.
4. Design necessary grade stabilization structures and structures for water control.
5. Determine type, quality, and quantities of all materials needed to provide protection of streambank. Prepare preliminary cost estimate.
6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Site plan layout, cross sections and profiles.
   b. Type of materials, rock gradations, as appropriate.
   c. Special foundation or filter requirements.
   d. Special end conditions.

e. Location of utilities and notification requirements.

f. Vegetative requirements.

g. Precautions to minimize erosion and sediment production during construction.

7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake the limits of area to be treated.
2. Stake critical elevations of area protected and provide reference stakes from which the contractor can establish alignment of the work.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All streambanks protected shall be checked for completion by making an engineering survey as follows:

1. Determine the total length of streambank protected. The length shall be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.
2. Survey streambank bottom and natural ground profile rod readings at a spacing not to exceed 100 feet. Record the planned streambank bottom grade rod on the check notes for each station checked.
3. Cross section the streambank at a spacing not to exceed 200 feet with a minimum of one cross section. Survey rod readings at all breaks in slope along the cross section. Extend the cross sections from the center line of the stream to 25 feet beyond the construction.
4. Record type and quality of materials used.
5. Document type and adequacy of vegetative cover.
6. Compute quantities of materials installed as needed.
7. Compute earth work quantities as needed.
8. Prepare as-built drawings showing final construction dimensions, details, etc.
9. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length in feet. The extent to be certified is the quantities used as the basis of payment such as cubic yards of rock, vegetative material, etc.

Stream Crossing, Code 578

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Stream Crossing, Code 578.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. Worksheet for Geotextile and Stone Stream Crossing.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the site is suitable, stability of the channel, type of crossing, and surface treatment of crossing and extent of survey needed. Make the necessary planning surveys and develop an engineering plan map for at least the area affected by the practice.

B. Engineering Surveys

1. Establish the location of the stream crossing.
2. Set and describe at least one permanent bench mark near the stream crossing. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Profile the proposed centerline of the crossing. The profile shall extend from the channel centerline to at least 50 feet beyond the estimated construction on each side. The profile shots shall show all breaks in the ground surface. If the banks at the proposed crossing location are disturbed and do not represent the average cross section for the stream reach, then survey an additional location that is representative of the reach.
4. Profile the stream bottom for at least 100 feet up and downstream from the crossing location in order to establish the average stream gradient for the reach. Profile shots should follow the deepest part of the stream bottom (thalweg) and show all breaks in the profile.
5. Note the location of any utilities or utility markers.

C. Design

1. Plot profiles and cross sections. Compare surveyed stream profiles with profiles obtained from topographic maps. Use stream gradients representative of the stream reach to calculate stream flows and velocities.
2. Determine the type of crossing, critical elevations, dimensions, and appropriate surface treatment for the crossing.
1. Complete soils/geologic investigation. Determine the suitability of the foundation for the crossing and verify if any subsurface impediments exist that would hinder construction.
4. Develop profiles and cross sections with sufficient details to install the practice.
5. Design necessary erosion control measures, grade stabilization structures and structures for water control.
6. Determine type, quality, and quantities of all materials needed to install stream crossing. Prepare preliminary cost estimate.

7. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
    a. Site location
    b. Site plan layout, cross sections and profiles.
    c. Type of materials, rock gradations, as appropriate.
    d. Requirements for concrete and reinforcement, if applicable.
    e. Special foundation or filter requirements.
    f. Pipe type, class and length, if applicable.
    g. Location, type and extent of fencing required.
    h. Method of surface water diversion during construction.
    i. Location of utilities and notification requirements.
    j. Vegetative requirements.
    k. Precautions to minimize erosion and sediment production during construction.
8. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake the centerline of the stream crossing.
2. Stake critical elevations of stream crossing.
3. Stake any additional structures needed.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All stream crossings shall be checked for completion by making an engineering survey as follows:

1. Determine the total length of stream crossing. The length shall be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.
2. Survey a profile of the stream crossing centerline and at least one cross section of the stream crossing. Survey rod readings at all breaks in the slope. Extend the profile and cross section beyond the construction.

3. Profile and cross section any additional structures installed to protect the stream crossing, if applicable.
4. Record type and quality of materials used.
5. Document type and adequacy of vegetative cover.
6. Compute quantities of materials installed as needed.
7. Compute earth work quantities as needed.
8. Prepare as-built drawings showing final construction dimensions, details, etc.
9. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of stream crossings installed. The extent to be certified is the quantities used as the basis of payment such as cubic yards of rock, cubic yards of concrete, feet of pipe, etc.

Structure for Water Control, Code 587

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Structure for Water Control, Code 587.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. USDA – NRCS Hydraulics Formula.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine that an adequate stable outlet is available, or can be made available. Determine if an island type structure is applicable.

B. Engineering Survey

Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible.

1. Pipe overfall structures for water control (i.e. structures without regulating ability).
   a. Record pipe profile and cross section, site conditions, and related hydraulic design data on form NRCS-ENG-523A (or equivalent).
   b. Number structures and identify with respect to their location in the field.
   c. Record quantities, types, specifications, and related items as needed.
2. Drop inlets, hood inlets, flashboard risers and other structures that can regulate water.
   a. Prepare topographic survey of area. The survey shall extend a minimum of 100 feet outside the structure area and show all physical features. Record in engineering field book.
   b. Number structures and identify with respect to their location in the field.
   c. Record quantities, types, specifications, and related items as needed.
3. Note the location of any utilities or utility markers.

C. Design

1. Record drainage areas, design flow, structure elevations, grades, overfall dimensions, site conditions and related hydraulic design data on NRCS-ENG-523A (or equivalent) or approved computer program. Check structure pipe hydraulics for all flow conditions - pipe, weir and orifice.
2. Complete soils/geologic investigation. Determine the suitability of earth fill and the foundation for the embankment and verify if any subsurface impediments exist that would hinder construction.

3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
    a. Location of structure.
    b. Typical profile and cross section of embankment.
    c. Structure dimensions and elevations.
    d. Type, quality, and quantity of material to be used for structures.
    e. Ballast if required to prevent flotation.
    f. Location of utilities and notification requirements.
    g. Vegetative requirements.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Set a sufficient number of stakes to guide the contractor in making the necessary excavation and earth fill.
2. Stake location and critical elevations of pipe structures, auxiliary spillways, etc.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check out data in the engineering field book or on appropriate forms.

1. Survey a profile along the centerline of the embankment and cross sections of the completed structure. One of the cross sections should extend along the center line of the principal spillway from the invert of the outlet to the upstream invert of the pipe and crest of principal spillway. Record all breaks in grade along the cross section, including the entrance and exit invert elevation of the pipe. Record survey data in the engineering field book. On jobs with several small pipe drop structures, only 10 percent of the pipe drop structures will need to be checked. Choose the structure(s) least likely to meet plans and specifications.

    Embankment will be acceptable with respect to side slopes where side slopes as constructed are not more than 0.1:1 steeper than the designed slope including shrinkage.
2. Record size and quantity of materials used.
3. Record elevations of structure.
4. Record type and quality of materials used and manufacturer's markings.
5. Record adequacy and type of vegetative cover.
6. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.
7. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the

checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of structures installed. The extent of the practice to be certified is the quantities used for the basis of payment such as diameter and linear feet of pipe installed, volume of earth fill in cubic yards, etc.

Subsurface Drain, Code 606

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Subsurface Drain, Code 606.

B. Design Procedures

1. NEFH, Part 624, Drainage, Chapter 4, Subsurface Drainage.
2. NEFH, Part 650, Chapter 14, Water Management.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. USDA – NRCS Hydraulics Formula

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine feasibility considering drainage requirements, availability of an outlet, subsurface conditions, and costs.

B. Engineering Surveys

Subsurface drain design requires a topographic survey of the area or a profile of natural ground along each proposed line. The topographic survey is required where variable slopes exist within a field, a network of connected drain lines is required, or where site conditions dictate the need.

1. Set and describe at least one permanent bench mark in a protected location. Bench marks to NGVD should be used if possible.
2. Conduct a topographic survey or run a profile along each proposed drain line. Enter all survey information in the engineering field book. The survey must accurately indicate the relief at the site. In some instances, it will be necessary to prepare a water table contour map as set forth in NEH, Part 624, and Chapter 4.
3. Survey must include outlet information including adequate bottom elevations, base flow water level, and general statement of adequacy of outlet.
4. Note location of any utilities or utility markers.

C. Design

1. Plot survey information on Standard Plan Sheet SCS-ENG-313 or Half Plan/Profile SCS-ENG-317 or use CAD. Draw contours where needed on intervals not to exceed 2.0 feet.
2. Complete form Subsurface Tile Drain Design Data Sheet, AL-ENG-18A. Where interceptor drains are applicable, see NEFH for guidance in determining location and spacing.
3. Determine length, size, type and grades of all conduits and document on NRCS-ENG-523A (or equivalent).
4. Determine vertical distance between invert of outlet pipes and normal water level in outlet channel.
5. Determine size and depth of outlet channel required. Design improvements needed if outlet channel is not adequate.
6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Show location and spacing of subsurface drains on a plan map.

b. Locate proposed drains on plotted survey data. Show depth and grade of each conduit. Draw profiles of drain lines on standard profile paper when determined needed for construction.

c. Show conduit type, size, and quality for all conduits.

d. Show profile and cross section of outlet channel and improvements if required.

e. Location of utilities and notification requirements.

7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Using the plan layout and chaining distances, locate reference hubs offset a minimum of 5 feet left (when looking toward increasing station) of drain centerline location. Record top elevation of each hub.

2. Using planned elevation, obtain the grade rod of drain invert at each station. Determine and record the cut below top of reference hub. Record all layout information in the engineering field book. Provide cooperator with cut sheet for each drain line.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check-out data in the engineering field book.

1. Record the following:

a. Sketch with location of lines installed.

b. Length, pipe diameter, type, and manufacturer's marking for each line installed. Lengths of each pipe shall be determined by chaining, using a calibrated measuring wheel, GPS, or referring to reference hub stations.

c. Type of material used as a filter.

d. Dimensions of all structures.

e. Periodic grade checks.

f. Depth of cover over pipe.

g. Elevation of outlet and normal water level at the outlet.

2. Obtain as-built information for drain lines at each reference hub and occasionally in between, as needed, to determine compliance. Compliance shall be determined by comparing as-built rod readings with grade rod.

3. Prepare as-built drawings showing final construction dimensions, details, etc.

4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with

appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of linear feet of pipe installed. The extent of the practice to be certified are the quantities used as the basis of payment such as linear feet of pipe installed by diameter, etc.

Surface Drain Field Ditch, Code 607

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Surface Drain, Field Ditch, Code 607.

B. Design Procedures

1. National Engineering Handbook, Part 624, Drainage.
2. NEFH, Part 650, Chapter 14, Water Management (Drainage).
3. TR-25, Design of Open Channels.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice considering availability of an outlet, drainage/irrigation needs, etc.

B. Engineering Surveys

1. Establish the ditch alignment in the field.
2. Set and describe at least one permanent bench mark near the outlet end of the channel. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Develop a topographic map of the site with sufficient rod readings to adequately show the lay of the fields. The survey should include any features that will affect the design.
4. Survey the outlet including the elevation of the bottom of the outlet and normal ground and the expected high-water mark during a normal cropping season.
5. Note the location of any utilities or utility markers.

C. Design

1. Location map (may be referenced to and shown on conservation plan map).
2. Determine area served by each ditch (or group of ditches) and determine required capacity. Record onNRCS-ENG-523A (or equivalent) or approved computer program. From the topographic map, determine the ditch grade and capacity. Field ditches shall be designed with non-erosive velocities.
3. Design necessary grade stabilization structures and structures for water control. Record data on NRCS-ENG-523A (or equivalent) or approved computer program.
4. Profile ditches where needed for design.
5. Determine total length of ditches to be installed and prepare quantity of excavation and cost estimate, where needed.
6. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location and spacing of field ditches. This can be on an engineering plan map or conservation plan map.
   b. Typical cross section of field ditches, including spoil placement.
   c. Direction and grade of field ditches.
   d. Typical cross section of structures required.

e. Location of utilities and notification requirements.

7. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake the location of the ditches at the beginning, changes in grade or alignment, and at the end.
2. Furnish the contractor adequate cut information to enable him/her to excavate the ditch to grade.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All drainage field ditches shall be checked for completion by making an engineering survey as follows:

1. Select and profile at least one representative ditch in each field or group of ditches constructed at one time. Survey ditch bottom and natural ground at a spacing not to exceed 200 feet, at apparent highs and lows, and at the end of each ditch. Stations along the ditch selected may be determined by chaining or pacing.
2. Determine the constructed length of all the ditches by chaining, calibrated measuring wheel, GPS, or other equivalent method.
3. Survey a minimum of one cross section of at least one ditch in the group being checked. Observe or check, with an instrument, the cross section of other ditches until satisfied that all the ditches in the group meet cross section requirements.
4. Record survey check out data in the engineering field book.
5. Prepare as-built drawings showing final constructed dimensions, details, etc. where significant changes were made during construction.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length in feet. The extent of the practice to be certified is the quantities used as the basis of payment such as volume of excavation in cubic yards, etc.

Surface Drain, Main or Lateral, Code 608

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Surface Drain, Main or Lateral, Code 608.

B. Design Procedures

1. National Engineering Handbook, Part 624, Drainage.
2. NEFH, Part 650, Chapter 14, Water Management (Drainage).
3. TR-25, Design of Open Channels.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. USDA - NRCS Hydraulics Formula

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the complexity of the problem, availability of an outlet, and the type and extent of surveys needed. Make the necessary planning surveys and develop an engineering plan map for at least the area affected by the practice.

B. Engineering Surveys

1. Establish the ditch alignment in the field.
2. Set and describe at least one permanent bench mark near the outlet end of the ditch. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Survey profile rod readings and/or cross sections at not more than 500-foot intervals, depending upon irregularity of the natural ground and/or existing ditch section. Stations along ditch profiles can be determined by pacing or accurate scaling on aerial photographs. Elevations along cross sections will show all breaks and should extend each side of the center line beyond the estimated construction area by a minimum of 50 feet. Record elevation and distance from proposed center line of low areas, which will influence the elevation of the hydraulic gradient.
4. Record outlet conditions, including the elevation of the bottom of the outlet and the expected high-water mark during a normal cropping season.
5. Note the location of any utilities or utility markers.

C. Design

1. Plot profiles and cross sections. Place the ditch number on the profile and cross section. Record outlet conditions on the profile, including the elevation of the bottom of the outlet and high-water marks or design hydraulic gradient of the outlet. See Figure 14-12, NEFH.
2. Determine drainage area served by the ditch and show drainage boundary on a suitable aerial photograph, mosaic, or overlay. Determine required ditch capacity. From trial and error determine ditch dimensions and grade. Document design data on NRCS-ENG-523A or equivalent forms. Mains and laterals shall be designed with non-erosive velocities.
3. Plot bottom of proposed ditch on the profile. Show elevation of the ditch bottom at the beginning and end of

the ditch, and at all breaks in grade. Compute the slope of the ditch bottom and record on the profile. See Figure 14-11 NEFH.

4. Draw the hydraulic gradient on the profile. Show elevation of hydraulic gradient at the end of each segment. Compute the slope of the hydraulic gradient and record on the profile.
5. Design necessary grade stabilization structures and structures for water control in accordance with conservation practice standard 410 or 587 as appropriate.
6. Prepare earth work quantities and preliminary cost estimate, where needed.
7. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
    a. Site plan layout, grade, size, alignment and cross sections.
    b. Details of appurtenance structures including location, dimensions and elevations.
    c. Type, quality, and quantity of all materials.
    d. Disposal of excavated material.
    e. Vegetative requirements.
    f. Location of utilities and notification requirements.
9. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake the centerline of the ditch with cut stakes at changes in alignment or grade and on intervals not to exceed 200 feet.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

All drainage mains or laterals shall be checked for completion by making an engineering survey as follows:

1. Determine the total length of all constructed ditches. The length shall be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.
2. Survey ditch bottom and natural ground profile rod readings at a spacing not to exceed 200 feet, at apparent highs and lows, and at each end of ditch. Record the planned ditch bottom grade rod on the check notes for each station checked.
3. Survey a minimum of one cross section for each typical section in the field being checked. Cross sections shall not exceed a spacing of 500 feet along the ditch being checked. Survey rod readings at all breaks in slope along the cross section. Extend the cross sections to the outside toe of the spoil bank, or if spoil banks are spread, extend the cross sections to include the spread material. Observe or check, with an

instrument, cross sections of other ditches until satisfied that all ditches in the group meet the minimum cross section requirements

4. Compute earthwork quantities as needed.
5. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the constructed length in feet. The extent to be certified is the quantities used as the basis of payment such as cubic yards of excavation, etc.

Terrace, Code 600

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Terrace, Code 600.

B. Design Procedures

1. NEFH, Part 650, Chapter 8, Terraces.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. NRCS EFT

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation of the need and feasibility of a terrace system based on topography, availability and adequacy of outlets, erodibility of the soils, land use and cost.

B. Engineering Surveys

1. An accurate topographic map with permanent reference points is always recommended. The terrace system plan can be recorded on the topographic map and easily transferred onto the land. A topographic map may not be necessary for small systems of three or less terraces on uniform slopes. When used, topographic surveys shall be made in sufficient detail to plot a contour map on a scale of 1 inch = 100 feet.
2. Note the location of any utilities or utility markers.

C. Design

1. Record design data on NRCS-ENG-523A (or equivalent), or use approved engineering programs. When using approved software, copies of input and output data must be retained for documentation.
2. Determine average land slope and horizontal interval for each terrace.
3. Determine terrace spacing.
4. Plan and locate terraces on topographic maps when used.
5. Determine drainage area and compute the watershed peak discharges and runoff for each outlet.
6. For storage terraces, establish the duration of flooding (hours) based on level of protection selected for crop.
7. Profile each terrace on not over 100-foot stations and record rod readings. In addition, record readings at the beginning, at changes in grade, and at the end of each terrace.
8. From the profile of the terrace, establish cut and fill and the designed top or ridge height for the terrace. For terraces with underground outlets, compute the available storage. (See Exhibit 8-2 or 8-3, NEFH, or other approved method.)
9. Size outlets. For underground outlets see Exhibit 8-6, NEFH, or other approved methods. For grassed waterways see NEFH, Part 650, Chapter 7, and FL Supplements.
10. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
    a. Site plan layout, cross sections, spacing, and grades for gradient terraces.

b. Special outlet requirements, if needed.

c. Location of outlet structures.

d. Typical cross section of the outlet structures.

e. Location of utilities and notification requirements.

f. Vegetative requirements if needed.

11. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake each terrace on not over 100-foot stations and record rod readings. In addition, record readings at the beginning, at changes in grade, and at the end of each terrace.
2. Compute earth work quantities when used as basis of payment.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information in the engineering field book.

1. Constructed length of each terrace. The length of terraces shall be measured in the field using a chain, calibrated measuring wheel, GPS, or other equivalent method.
2. For one terrace in each field, or for one terrace in each group of terraces constructed at the same time in a field, select the terrace that appears least likely to meet specifications.
   a. Record profile of the terrace channel and ridge.
   b. Record and plot the cross section of the channel and ridge at the weakest section. Extend the cross section from natural ground above the terrace to natural ground below the terrace.
   c. For terraces 1.5 feet in height or less, allowance for settlement is not required. Constructed elevations will be measured by reading a level rod placed in the foot print created by the full weight of the rod person.
3. For all other terraces in the field or for each group of terraces constructed at the same time in a field, the technician will, by observation or check with instruments, satisfy himself/herself that all terraces meet specifications.
4. For underground outlets record the following information.
   a. Land slope.
   b. Horizontal interval.
   c. Type and manufacturer of pipe, if applicable.
   d. Length of conduit by size and kind used.
   e. Location, size, and height of intake risers.

f. Vertical distance between invert of outlet pipe and normal water level in outlet ditch or stream.

g. Filter or envelope thickness and kind of material, if applicable.

h. Method of blinding.

i. Depth of cover.

j. Grade checks where appropriate. Periodic reviews or contractor's grade control equipment and the precision he/she uses to control grade can be substituted for complete grade checks.

5. For grassed back slope terraces, adequacy of vegetation.

6. Statement as to adequacy of outlet.

7. For areas which were planned to be graded, the technician will observe that there are no visible obstructions to interfere with the proper functioning of the parallel terrace system and make a record of the acres graded.

8. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.

9. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the total length in feet of all terraces. The extent of the practice certified are the quantities used as the basis of payment such as length, volume of earthwork in cubic yards, etc.

Trail and Walkway, Code 568

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Recreation Trail and Walkway, Code 568.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the feasibility of the practice considering soils, topography, etc.

B. Engineering Surveys.

1. The extent of surveys required will depend upon the terrain, type of trail, and type of structures that may be required. The survey should include any features that will affect the design and provide adequate data for design of the trail and associated structures. Survey information shall be recorded in the engineering field book or in electronic survey files for use in CAD programs.
2. Note the location of any utilities or utility markers.

C. Design

1. Ensure that the trail or walkway has adequate width, grades and surface treatment for the intended use.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location and alignment of the trail or walkway. This can be shown on an aerial photograph or topographic map or other site map of appropriate scale.
   b. Bench mark, north arrow and scale.
   c. Centerline profile of trail if appropriate and needed.
   d. Areas of cut and fill, designed elevations and grade limits as required.
   e. Surface treatment type and installation details.
   f. Details of structures such as steps, culverts, guardrails, etc.
   g. Location of utilities and notification requirements on cover sheet.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake or flag the centerline alignment.
2. Stake the required locations, grades and elevations of culverts and other structures.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Verify that materials, quantities, dimensions, alignments and installation comply with the drawings and specifications. Measurement data shall be recorded in the engineering field book.
2. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.
3. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be certified is the area graded and shaped in acres. The extent of the practice certified is the quantities used as the basis for payment, such as linear feet.

Underground Outlet, Code 620

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Underground Outlet, Code 620.

B. Design Procedures

1. NEFH, Part 650, Chapter 8, Terraces.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. USDA - NRCS Hydraulics Formula.
2. EFT- Terrace.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine feasibility of the underground outlet. Consider discharge requirements, availability of an outlet, subsurface conditions, and costs in making this determination.

B. Engineering Surveys

1. Survey a profile of the proposed outlet alignment and extend the survey a minimum of 50 feet beyond the outlet. A topographic survey is required where variable slopes exist within a field, a network of connected drain lines is required, or where site conditions dictate the need.
2. Set and describe at least one permanent bench mark in a protected location. Bench marks to NGVD should be used if possible. Enter all survey information in the engineering field book. The survey must accurately indicate the relief at the site. The survey must include outlet information including: bottom elevations, base flow water level, and general statement of adequacy of outlet.
3. Note location of any utilities or utility markers.

C. Design

1. Locate proposed drains on plotted survey data. Draw profiles of underground outlets when it is determined necessary for construction.
2. Determine capacity requirements of conduit, riser, and determine required size.
3. Complete design using “Design of Underground Outlet”, AL-ENG-21.
4. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Site plan layout showing location of structure(s).
   b. Details of appurtenance structures (inlets, outlets, etc.) including location, dimensions, elevations, and materials.
   c. Special compaction or bedding requirements.
   d. Conduit size, class, length.
   e. Details for appurtenances such as vents, standpipes, outlets, etc.
   f. Location of utilities and notification requirements.
5. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly

understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Using the plan layout and chaining distances, locate reference hubs offset a minimum of 5 feet left (when looking toward increasing station) of drain centerline location. Record top elevation of each hub.
2. Using planned elevation, obtain the grade rod of drain invert at each station. Determine and record the cut below top of reference hub. Provide cooperator with cut sheet for each drain line.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record check-out data in the engineering field book.

1. Record the following:
   a. Type of pipe, manufacturer, class, size, lengths, and depths of cover. Lengths of underground outlets shall be measured to the nearest foot with a chain, calibrated measuring wheel, GPS, or other equivalent method.
   b. Location, size, and elevation of inlets.
   c. Pipe depth of cover.
   d. Pipe grade and dimensions.
2. Obtain as-built information for drain lines at each reference hub and occasionally in between, as needed, to determine compliance. Compliance should be determined by comparing as-built rod readings with grade rod.
3. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.
4. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the linear feet of pipe installed. The extent of the practice to be certified is the quantities used as a basis of payment such as the length of each diameter pipe in feet, etc.

Vegetated Treatment Area, Code 635

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Waste Water Treatment Strip, Code 635.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the need and feasibility of the vegetated treatment area. Location chosen must consider topography, floodplain, type of vegetation, availability and adequacy of land for waste application, proximity to neighboring landowners, and cost.

B. Engineering Surveys.

1. Record location of the planned vegetated treatment area with approximate slope. If necessary, survey the vegetated treatment area to obtain the slope.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the amount of wastewater and nutrient to flow over the vegetated treatment area.
2. Determine the flow length required for the required purpose(s).
3. Record design computations on NRCS-ENG-523A (or equivalent).
4. Determine vegetative species required to provide adequate treatment.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of vegetated treatment strip. May be shown on conservation plan map.
   b. Plan view of the vegetated treatment area showing location, direction of flow, landmarks, boundaries and reference points.
   c. Vegetative requirements.
   d. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Set construction stakes or flags showing the work limits of the vegetated treatment strip.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Profile vegetated treatment strip to obtain the width and slope.
2. Determine if the vegetated treatment strip has the length as required. Record measurements in engineering field book. Measurement shall be by chain, calibrated measuring wheel, GPS or other equivalent method.
3. Determine adequacy of vegetation.
4. Prepare as-built drawings showing final constructed dimensions, details, etc. if significant changes were made during construction.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. An exception is to be noted on the certification when the vegetated strip has not been vegetated as planned. The extent of the practice to be reported is the area of the filter strip in acres. The extent of the practice certified will be the quantities used as the basis of payment.

Waste Storage Facility, Code 313

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Waste Storage Facility, Code 313.

B. Design Procedures

1. NEFH, Part 651, AWMFH.
2. Alabama Poultry Waste Management, Waste Utilization and Facility Design Workbook

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. NRCS Computer Program "AWM."

II. Documentation

A. Preliminary Investigation

1 Make a preliminary field reconnaissance to determine the complexity of the problem, availability of land for utilizing the waste and waste water, and to select the type of waste management system component which will best meet the needs of the owner to operate the waste management system. Compute volume of waste that will be produced per day in terms of biochemical oxygen demand (BOD_5), raw manure, volatile solids (V.S.), nutrients, and water use. A manure analysis is strongly recommended. Record preliminary information on a copy of the appropriate worksheet (10A-1, 10A-2, 10A-3, 10A-4, 10A-5, or 10A-6) located in Chapter 10 of the AWMFH (AWMFH) or use NRCS-ENG-523A (or equivalent) to record appropriate information.

2. Perform soil borings at the selected site to determine site feasibility. Describe the soils at the site directly in the engineering field book, or other appropriate document. Verify the suitability of the foundation and earth fill for construction and determine if any foundation or seepage issues exist. If needed, request the assistance of a geologist and submit samples for testing.

3. Complete a preliminary sizing of the system components for the purpose of determining components, component locations, structure requirements, cost and needed permits.

4. Discuss preliminary plans and cost estimates with the owner. Make sure the owner understands his/her responsibility as to:

   a. Obtaining permits and approvals from Federal, state and local authorities, where required.

   b. Constructing the waste management system to meet NRCS plans, standards and specifications.

   c. Operation and maintenance of the waste management system after construction.

5. Determine the extent of additional surveys needed after discussing the preliminary design, cost and items A.4.a, b., and c. with the landowner and getting his/her decisions.

6. Determine the extent of additional geologic investigations needed. Refer to NEH Part 651, Chapter 7 of the AWMFH for guidance.

B. Engineering Surveys

The survey must provide all measurements and observations that will be needed to design the waste management system components.

1. Set and describe one permanent bench mark (BM) for future reference. The BM should be placed close to the site of the proposed facility preferably on a concrete foundation of an existing building. The BM should be tied to National Geodetic Vertical Datum (NGVD) when possible.
2. Survey sufficient elevations to determine the drainage area around barns, high intensity area (HIA), and pastures contributing runoff to the proposed facility. When possible, divert uncontaminated runoff, especially roof runoff.
3. Collect adequate topographic information at the proposed location of the waste storage facility in order to determine excavation and/or earth fill requirements. Where liquid wastes are to be land applied, obtain sufficient topographic data within the land disposal area to determine waste distribution system layout, pumping requirements and costs.
4. Record design survey information in the engineering field book, or collect data electronically using GPS or other electronic surveying instruments.
5. Note location of any utilities or utility markers.

C. Design

The design of a practice is the application of Field Office Technical Guide practice standards, NEH Part 651, AWMFH, using experience and judgment in the development of a solution to the problem or the objective. All computations and decisions made during the design of a practice are to be checked by another qualified individual and appropriate notations made.

1. Complete soils investigation report as needed and construction recommendations. See NEH Part 651, Chapter 7, AWMFH.
2. Plot ground profiles at structure site(s) with the elevations of any drains and high intensity areas (HIAs) contributing waste, waste water and storm water runoff into the proposed facility.
3. Size the waste management system using the appropriate engineering practice standard and the NEH Part 651, AWMFH including Alabama Amendments. Record design computations on appropriate worksheets (10A-1, 10A-2, 10A-3, 10A-4, 10A-5, or 10A-6) located in NEH Part 651, Chapter 10 of the AWMFH, AL-ENG-25G, AL-ENG-25H, or on NRCS-ENG-523A (or equivalent).
4. Develop engineering plans and specifications. Engineering plans and specifications shall be prepared for the practice and shall describe the requirements necessary for proper construction. The engineering plans and specifications shall be suitable for the use by the landowner in dealing with contractors. Use AL-CS-313 specifications. Supplement CS-313 for more complex structures or requirements. The vegetative treatment and fencing required on structural practices shall be included as part of the engineering plans and specifications. As a minimum the plans and specifications shall include:

a. Prepare engineering plans and specifications using the appropriate standard engineering drawing sheets SCS-313A, -315A, -316A, 317A, or use computer aided drafting (CAD) where available. Construction plans shall show as a minimum:

   i. Complete waste system layout, waste distribution system, facility plan layout, cross sections and profiles showing dimensions, elevations and type(s) of construction materials.

   ii. Reinforcing steel details for reinforced concrete.

   iii. Requirements for foundation preparation and treatment.

   iv. Location, type, size of construction joints, expansion-contraction joints or special joints for fabricated structures.

   v. Type of materials, thickness, anchorage requirements, lift thickness, covering.

   vi. Safety features, roof covers, fencing, ladders, and safety signs.

   vii. Locations, sizes and type of supply/outlet pipelines/appurtenances.

   viii. Requirements for roof(s).

   ix. Location and type of fence.

   x. Vegetative requirements.

   xi. Location of utilities and notification requirements.

b. Prepare a narrative Project Report describing all aspects of the waste management proposal. Complete the necessary waste management information for the permit application forms if applicable.

c. Make appropriate earth work computations, concrete computations, pipeline size and length, pumping plant requirements, etc., and cost estimates.

d. Furnish to the landowner or his representative copies of the following documents for his/her use in obtaining the necessary permits and approvals.

   i. Owner's Letter of Transmittal. This letter may contain the owner's notice "Notice of Intent" and "Guarantee of installation to meet practice plans and specifications."

   ii. Appropriate data sheets in NEH Part 651, Chapter 10 of the AWMFH or otherwise provided on NRCS computation sheets.

   iii. Project Report.

   iv. Engineering Plans and Specifications.

   v. Quality Assurance Plan (QAP).

   vi. Operation and Maintenance Plan.

   vii. Completed data for permit applications to appropriate agency.

Note: All plans shall be approved in accordance with established job approval authorized prior to providing plans and specifications to owners and prior to construction.

5 Develop a site specific O&M Plan

for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Record needed layout information as illustrated in Chapter 1 of the NEFH Part 650. Notations may be made on plans, as needed, to describe the method of staking so the landowner and contractor will know how to reference the plans at the practice site.
2. Set and mark a sufficient number of stakes to outline the top dimensions. Set slope stakes, as required, to enable the owner or contractor to excavate the planned facility and place spoil materials to planned lines and grades. Set finish stakes for structures only after the rough grading has been completed. The number of finished stakes needed should be pre-determined with the contractor or owner. Use grade rod to set stakes to facilitate performing construction checks.
3. In the staking of a waste storage facility, such as a concrete holding tank, it is essential that all lines and measurements be absolutely correct. All layout notes should be checked for possible errors. A carefully drawn sketch using identifications such as stationing, letters or other designations to show locations, distances or elevations for the various components will aid materially in documenting the structure layout.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval construction.

F. Construction Checkout

1. Construction checks should be performed as the work progresses. The site shall be visited frequently during the installation of the practice. Determine the adequacy of the work by observations, making measurements, and running engineering surveys of the completed components. Construction checks made during construction are considered adequate supporting data and need not be duplicated at the time the facility has been completely installed.
2. Record all survey check data and observations in the engineering field book.
3. Excavated waste storage facility (pond):
   a. Make a visual inspection of the site and note the physical appearance. Side slopes and shaped spoil should be uniform, relatively smooth, and of neat appearance and be not steeper than the minimum specified.

b. Survey at least one longitudinal and one lateral cross section of the excavated waste storage pond. Where the spoil is shaped, extend the cross sections from natural ground beyond the toe of the spoil on one side to natural ground beyond the outside toe of the spoil on the other side.

c. Check constructed grades against planned grades and note difference. Draw final constructed dimensions in red on a set of "as built" plans for easy comparison.

d. Compute excavation quantities when needed for contracting or cost share purposes.

4. Since it is not practical for earth-moving equipment to excavate to exact elevations and side slopes as specified, excavated waste storage pond will be acceptable where the following conditions are met:

   a. The top width and length are not less than 5 percent of the planned dimensions.

   b. Constructed side slopes are not more than 0.1:1 steeper than the design slope and no steeper than 1 horizontal to 1 vertical.

   c. The excavated spoil material does not exceed the permissible height and is shaped as specified in the specifications.

   d. The depth of the pond is no more than 0.1 foot less than the planned elevation.

   e. The as-built cross sectional area equals or exceeds the planned cross sectional area.

5. Waste storage pond with embankments:

   a. Profile the center line of the embankment. Extend the profile across the spillway where applicable. Record profile rod readings at all stations established during layout and at all breaks in grade.

   b. Survey at least one cross section of the embankment at a location that represents the weakest section. Record rod readings at each edge of the crown, at each toe, and at intermediate points between the top and each toe.

   c. Check constructed grades against planned grades and note difference. Compute constructed side slopes and record in check-out notes.

   d. Structures will be acceptable where all of the following conditions are met:

      i. A waste storage pond will be acceptable with respect to side slopes where:

      Side slopes as constructed are not more than 0.1:1 steeper than the designed slope plus allowance for shrinkage.

      ii. Upstream constructed slope shall not be steeper than 2:1.

      iii. The constructed cross-sectional area equals or exceeds the planned cross-sectional area and has at least 95% of the embankment width at all elevations with shrinkage added.

   e. Constructed crown elevations are not more than 0.1 feet below planned elevations, with allowance for settlement added.

f. The spillway elevation does not vary from the planned elevation by more than 0.1 foot.

g. The minimum required freeboard is not lowered by more than 0.1 foot.

6. Concrete, wood, and prefabricated waste storage structures:

   a. Check constructed dimensions, elevations, and grades against planned dimensions, elevations and grades and note differences.

   b. Check quality of finished concrete.

   c. Check placement of steel reinforcement.

   d. Verification that gas release vents, foundation drains and pipes were installed as planned.

   e. Check letter of certification from manufacturer for prefabricated structures, including roof trusses.

   f. Check bolt sizes, connections, lumber and timber dimensions and orientation, pole/post embedment depths and backfill, timber preservative type and rate.

7. Geomembrane lined waste storage facility:

   a. Check and record overall dimensions as mentioned in F.3. above.

   b. Check quality and thickness of liner, manufacturer and note in the engineering field book.

   c. When required, check for proper joining of the liner.

   d. When required, check for proper cover over lining.

   e. Verify gas vents were installed as planned.

8. Prepare as-built drawings showing final construction dimensions, details, etc.

9. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of systems installed. The extent to be certified is the quantities used as the basis of payment such as cubic yards of earth embankment or excavation, cubic yards of concrete, square yards of geomembrane, etc.

Waste Transfer, Code 634

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Manure Transfer, Code 634.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the structures needed to convey manure from the source to the storage area, treatment facility, and/or application area. This conservation practice shall be a part of the overall agricultural waste management system.

B. Engineering Surveys

1. Complete an accurate topographic survey of the area where the manure is to be collected and transferred to storage and/or treatment. The survey shall extend a minimum of 50 feet beyond the limits of the proposed structures and in sufficient detail to determine drainage patterns. The survey shall be referenced so that the proposed location of structures can be staked in the field. Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible. The survey should show the location of existing buildings, utilities, etc., in the vicinity of the proposed facility.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine the size and type of structures needed using conservation practice standard Manure Transfer, Code 634 for minimum criteria. Components shall be designed in accordance with the appropriate conservation practice standard (i.e. pipelines shall meet the requirements of conservation practice standard Irrigation Water Conveyance Pipeline Code 430) as applicable. Record design data on NRCS-ENG-523A (or equivalent).

2 Compute quantities of materials required for installation of the practice such as cubic yards of excavation and earth fill material, linear feet of pipe, cubic yards of concrete, etc.

3. Complete engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of the structure(s).
   b. Plan view of the proposed structure(s).
   c. Cross sections of the proposed structures with critical elevations. See documentation requirements for the various components.
   d. Type, quality, and quantity of all materials used.
   e. Location of utilities and notification requirements.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout information in the engineering field book.

1. Stake the location of all components in sufficient detail for installation.
2. Layout requirements will be as required for each component installed as part of this practice.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following information on the plans, in the engineering field book or NRCS-ENG-523A (or equivalent).

1. Constructed dimensions and elevations of completed structures.
2. Measure all components of the practice when used as the basis of payment. Structural components such as pipelines shall be measured with a chain or calibrated measuring wheel, GPS or other equivalent method.
3. Record all check out notes in the engineering field book and prepare as-built drawings of the completed practice where significant changes were made during construction.
4. Compute quantities if required.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of manure transfer facilities installed. The extent certified shall be the quantities used as the basis of payment such as linear feet of pipe, cubic yards of concrete, etc.

Waste Treatment, Code 629

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Waste Treatment, Code 629.

B. Design Procedures

1. NEFH, Part 651, AWMFH

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine if the practice is feasible considering the character and quantity of waste, cost compared to other alternatives, disposal options, etc.

B. Engineering Surveys

1. The extent of surveys needed will be as required for all components of the measures. Surveys shall be recorded in the engineering field book.
2. Set and describe at least one permanent bench mark. Use the datum established for the farm or ranch (NGVD or assumed elevations), and record bench mark location(s) and elevation(s) on the engineering plan map.
3. Note the location of any utilities and utility markers as appropriate.

C. Design

1. Record all designs notes on NRCS-ENG-523A (or equivalent).
2. Determine structure locations.
3. Design of proprietary systems and components shall be in accordance with the requirements in CPS 629.
4. An overall operation plan shall be developed providing detailed operation procedures of the systems and structures.
5. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of all structures and equipment.
   b. Details of all component practices.
   c. Types and amount of chemicals to be used, as applicable
   d. Type of wetland plants, as applicable
   e. Type and description of monitoring requirements which including frequency and parameters to be monitored
   f. Location of utilities and notification requirements.
6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. This practice consists of several conservation practices and the degree of layout is dependent upon the complexity of each practice.
2. Stake the location of components by procedures developed for that practice.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Components shall be checked in accordance with procedures developed for the practices installed.
2. Record survey data to verify if the system can be operated as noted in the operation plan.
3. Compute earth work quantities if required.
4. Prepare as-built drawings showing final construction dimensions, details, etc. as appropriate.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the area served in acres. The extent of the practice certified is the quantities used as the basis for payment.

Waste Treatment Lagoon, Code 359

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Waste Treatment Lagoon, Code 359.

B. Design Procedures

1. NEFH, Part 651, AWMFH.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. NRCS Computer Program "AWM".

II. Documentation

A. Preliminary Investigation

1. Make a preliminary field reconnaissance to determine the complexity of the problem, availability of land for utilizing the waste and waste water, and to select the type of waste management system component which will best meet the needs of owner to operate of the waste management system. Compute volume of waste that will be produced per day in terms of biochemical oxygen demand (BOD_5), raw manure, volatile solids (V.S.), nutrients, and water use. Record preliminary information on a copy of the appropriate worksheet (10A-1, 10A-2, 10A-3, 10A-4, 10A-5, or 10A-6) located in Chapter 10 of the AWMFH (AWMFH) or use NRCS-ENG-523A (or equivalent) to record appropriate information.
2. Perform soil borings at the selected site to determine site feasibility. Describe the soils at the site in the engineering field book.
3. Complete a preliminary sizing of the system components for the purpose of determining components, component locations, structure requirements, cost and needed permits.
4. Discuss preliminary plans and cost estimates with the owner. Make sure the owner understands his/her responsibility as to:
   a. Obtaining permits and approvals from Federal, state and local authorities, where required.
   b. Constructing the waste management system to meet NRCS plans, standards and specifications.
   c. Operation and maintenance of the waste management system after construction.
6. Determine the extent of additional surveys needed after discussing the preliminary design, cost and items A.5.a, b., and c. with the landowner and getting his/her decisions.
7. Determine the extent of additional geologic investigations needed. Refer to NEH Part 651, Chapter 7 of the AWMFH for guidance.

B. Engineering Surveys

The survey must provide all measurements and observations that will be needed to design the waste management system components.

1. Set and describe one permanent bench mark (BM) for future reference. The BM should be placed close to the site of the proposed facility preferably on a concrete foundation of an existing

building. The BM should be tied to National Geodetic Vertical Datum (NGVD) when possible.

2. Survey sufficient elevations to determine the drainage area around barns, high intensity area (HIA), and pastures contributing runoff to the proposed facility.
3. Collect adequate topographic information at the proposed location of the waste treatment lagoon in order to determine excavation and/or earth fill requirements. Obtain topographic data within the land disposal area to determine waste distribution system layout, pumping requirements and costs.
4. Record design survey information in the engineering field book or collect data electronically using gps or other electronic surveying instruments.
5. Note the location of any utilities or utility markers.

C. Design

The design of a practice is the application of Field Office Technical Guide practice standards, NEH Part 651, AWMFH, using experience and judgment in the development of a solution to the problem or the objective. All computations and decisions made during the design of a practice are to be checked by another qualified individual and appropriate notations made.

1. Complete soils investigation report and obtain laboratory testing as needed to design the lagoon and determine construction methods. See AWMFH, Chapter 7.
2. Obtain soils/geologic investigations sufficient for foundation design.
3. Plot ground profiles at structure site(s) with the elevations of any drains and high intensity areas (HIAs) contributing waste, waste water and storm water runoff into the proposed facility. When possible, divert uncontaminated runoff, especially roof runoff.
4. Size the lagoon using the appropriate engineering practice standard and the AWMFH including Alabama Amendments. Record design computations on appropriate worksheets (10A-1, 10A-2, 10A-3, 10A-4, 10A-5, or 10A-6) located in NEH Part 651, Chapter 10 of the AWMFH or on NRCS-ENG-523A (or equivalent).
5. Develop engineering plans and specifications. Engineering plans and specifications shall be prepared for the practice and shall describe the requirements necessary for proper construction and shall be suitable for the use by the landowner in dealing with contractors. As a minimum plans and specifications shall include:
   a. Prepare engineering plans and specifications using the appropriate standard engineering drawing sheets SCS-ENG-313A, -315A, -316A, 317A, or use computer aided drafting (CAD) where available. The drawings shall show as a minimum:
      - Site plan layout, cross sections and profiles.
      - Foundation treatment required.
      - Requirements for inlets and overflows.
      - Requirements for diverting water, dewatering the site, and waste disposal.
      - Requirements for fencing and rock riprap if needed.

- Vegetative requirements.
- Location of utilities and notification requirements.

b. Prepare a narrative Project Report describing all aspects of the waste management proposal. Complete the necessary waste management information for the permit application forms if applicable.

c. Make appropriate earth work computations, concrete computations, pipeline size and length, pumping plant requirements, etc., and cost estimates.

d. Furnish to the landowner, or his representative, copies of the following documents for his/her use in obtaining the necessary permits and approvals.

- Owner's Letter of Transmittal. This letter may contain the owner's notice "Notice of Intent" and "Guarantee of installation to meet practice plans and specifications."
- Appropriate data sheets in Chapter 10 of the AWMFH or otherwise provided on NRCS computation sheets.
- Project Report.
- Engineering Plans and Specifications.
- Quality Assurance Plan (QAP).
- Operation and Maintenance Plan.
- Completed data for permit applications to appropriate agency.

Note: All plans shall be approved in accordance with established job approval authorized prior to providing plans and specifications to owners and prior to construction.

6. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Record needed layout information as illustrated in NEFH Part 650, Chapter 1. Notations may be made on plans, as needed, to describe the method of staking so the cooperator and contractor will know how to reference the plans at the practice site.
2. Stake the waste treatment lagoon. Set and mark a sufficient number of stakes to outline the top dimensions. Set slope stakes, as required, to enable the owner or contractor to excavate the planned facility and place spoil materials to planned lines and grades. Set finish stakes for structures only after the rough grading has been completed. The number of finished stakes needed should be pre-determined with the contractor or owner. Use grade rod to set stakes to facilitate performing construction checks.
3. In the staking of waste treatment lagoon, such as a concrete holding tank, it is essential that all lines and measurements be absolutely correct. All layout notes should be checked for possible errors. A carefully drawn sketch using

identifications such as stationing, letters or other designations to show locations, distances or elevations for the various components will aid in documenting the structure layout.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

1. Construction checks should be performed as the work progresses. The site shall be visited frequently during the installation of the practice. Determine the adequacy of the work by observations, making measurements, and running engineering surveys of the completed components. Construction checks made during construction are considered adequate supporting data and need not be duplicated at the time the facility has been completely installed.
2. Record all survey check data and observations in the engineering field book.
3. Excavated waste treatment lagoon:
   a. Make a visual inspection of the site and note the physical appearance. Side slopes and shaped spoil should be uniform, relatively smooth, and of neat appearance and be not steeper than the minimum specified.
   b. Survey at least one longitudinal and one lateral cross section of the excavated waste treatment lagoon. Where the spoil is shaped, extend the cross sections from natural ground beyond the toe of the spoil on one side to natural ground beyond the outside toe of the spoil on the other side.
   c. Check constructed grades against planned grades and note difference. Draw final constructed dimensions in red on a set of "as built" plans for easy comparison.
   d. Compute excavation quantities when needed for contracting or cost share purposes.
4. Since it is not practical for earth-moving equipment to excavate to exact elevations and side slopes as specified, excavated lagoons will be acceptable where the following conditions are met:
   a. The top width and length are ± 5 percent of the planned dimensions.
   b. Constructed side slopes are not more than 0.1:1 steeper than the design slope and no steeper than 1 horizontal to 1 vertical.
   c. The excavated spoil material does not exceed the permissible height and is shaped as specified in the specifications.
   d. The depth of the lagoon is not more than 0.1 foot shallower than the planned elevation.
   e. The as-built cross sectional area equals or exceeds the planned cross sectional area.
5. Waste treatment lagoons with embankments:

a. Profile the center line of the embankment. Extend the profile across the spillway where applicable. Record profile rod readings at all stations established during layout and at all breaks in grade.

b. Survey at least one cross section of the embankment at a location that represents the weakest section. Record rod readings at each edge of the crown, at each toe, and at intermediate points between the top and each toe.

c. Check constructed grades against planned grades and note difference. Compute constructed side slopes and record in check-out notes.

d. Structures will be acceptable where all of the following conditions are met:

   i. A waste treatment lagoon with embankment will be acceptable with respect to side slopes where:

   Side slopes as constructed are not more than 0.1:1 steeper than the designed slope plus allowance for shrinkage.

   ii. Upstream constructed slope shall not be steeper than 2:1.

   iii. The constructed cross-sectional area equals or exceeds the planned cross-sectional area and has at least 95% of the embankment width at all elevations with shrinkage added.

e. Constructed crown elevations are not more than 0.1 foot below planned elevations, with allowance for settlement added.

f. The spillway elevation does not vary from the planned elevation by more than 0.1 foot.

g. The minimum required freeboard is not lowered by more than 0.1 foot.

6. Geomembrane lined waste treatment lagoons:

   a. Check and record overall dimensions as mentioned in F.3. above.

   b. Check quality and thickness of liner, the manufacturer, and note in the engineering field book.

   c. When required, check for proper joining of the liner.

   d. When required, check for proper cover over lining.

e. Verify gas vents installed as required.

7. Prepare as-built drawings showing final construction dimensions, details, etc.

8. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of systems installed. The extent to be certified is the quantities used as the basis of payment such as cubic yards of earth embankment or excavation, cubic yards of concrete, square yards of geomembrane, etc.

Waste Utilization, Code 633

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Waste Utilization, Code 633.

B. Design Procedures

1. NEFH, Part 651, AWMFH.

II. Documentation

A. Preliminary Investigation

1. Make a preliminary investigation of the need and feasibility of utilizing waste. Method chosen must consider topography, floodplain, type material, availability and adequacy of land for waste application, proximity to neighboring landowners, and cost.
2. Some landowners sell some or all of the waste (such as poultry litter), haul it offsite, or temporarily store it for use later. When sold or hauled off-site, the landowner must to keep documentation of the date, amount, and to whom he/she is giving or selling the waste to. If the landowner is land-applying the waste, information such as date of application, number of acres and type of vegetation planted and expected yield is needed.

B. Engineering Surveys

None required.

C. Design

1. Based on landowner's decision and feasibility, design appropriate waste utilization plan.
2. Determine method(s) for waste utilization.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location and timing of waste application.
   b. Amount of waste to apply per acre.
   c. Record keeping requirements.
4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

None required.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities.

1. Record sufficient information in the engineering field book and/or forms for the appropriate practices planned.
2. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the acres where waste is applied. The extent of the practice certified is the quantities used as the basis of payment.

Water and Sediment Control Basin, Code 638

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Water and Sediment Control Basin, Code 638.

B. Design Procedures

1. NEH Part 650, Chapter 11, Ponds and Reservoirs.

C. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

D. Computer Software Design Aids

1. Alabama NRCS Spreadsheet "Cirdis."
2. USDA - NRCS Hydraulics Formula.
3. NRCS Computer Program "WinPond."

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine that a stable outlet is available, or can be made available.

B. Engineering Surveys

1. The design survey and layout survey in some instances may be combined into one operation. Record all survey data in the engineering field book, or in electronic files. Notes recorded in the engineering field book shall be as illustrated in NRCS Technical Release No. 62. Where multiple basins are required a topographic survey of the field may be the most efficient form of survey.
2. Set and describe at least one permanent bench mark. Bench marks to NGVD should be used if possible.
3. Set reference stakes for locating the proposed embankment.
4. Survey the embankment centerline profile the full length of the embankment extending above the expected elevation of the embankment and beyond the location of the auxiliary spillway. Centerline profile rod readings shall be taken at all breaks in grade and at intervals not to exceed 50 feet. Survey a sufficient number of cross sections to accurately compute earth work quantities.
5. Show sketch of embankment, reservoir area, auxiliary spillway, proposed fences and other appurtenant structures. Show location of bench marks and reference stakes on sketch. Number each structure and identify with respect to their location on the farm.
6. Note location of any utilities or utility markers.

C. Design

1. Record drainage areas, grades, overfall dimensions, site conditions and related hydraulic design data on NRCS-ENG-523A (or equivalent) or approved computer program.
2. Record computations for hydrology, sediment yield, spillways, and basin size.
3. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of structure.
   b. Typical profile and cross section of embankment, principal and auxiliary spillway.

c. Type, quality, and quantity of materials used for structures.

d. Compaction requirements.

e. Location of alternative water sources, if applicable.

f. Location of utilities and notification requirements.

4. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Set a sufficient number of stakes to guide the contractor in performing the necessary excavation and earth fill.
2. Set location and critical elevation of all structures and spillways.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record checkout data in the engineering field book.

1. Survey a profile along the centerline of the embankment and cross sections of the completed structure. One of the cross sections should extend along the center line of the principal spillway from the invert of the outlet to the upstream invert of the pipe. Record all breaks in grade along the cross section, including the entrance and exit invert elevation of the pipe. Record survey data in the engineering field book.

   Embankment will be acceptable with respect to side slopes where side slopes as constructed are not more than 0.1:1 steeper than the designed slope plus allowance for shrinkage. See documentation for pond for calculations.

3. Type and quality of materials used.
4. Record adequacy and type of vegetative cover.
5. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.
6. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of structures installed. The extent of the practice certified is the quantities of materials used as the basis of payment such as volume of earth fill and excavation in cubic yards, length of pipe by diameter, etc.

Water Well, Code 642

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Water Well, Code 642.

B. Design Procedures

1. NEFH, Part 631, Geology, Chapter 33.

II. Documentation

A. Preliminary Investigation

Determine the feasibility and need for the water well for the planned purpose(s).

B. Engineering Survey

1. Engineering surveys are not normally needed unless the elevation of the water well head is needed by the permitting agency. Note and record the latitude and longitude of well.
2. Note the location of any utilities or utility markers.

C. Design

1. The required capacity of the well shall be determined based on the planned use and purpose. The location (latitude and longitude) and water well head protection required shall be recorded on NRCS-ENG-523A (or equivalent). Develop engineering plans showing the details of the water well head protection including size, thickness, and quality of the concrete pad. Provide the design data and plans to the landowner.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of water well.
   b. Well diameter.
   c. Casing, type, gage and diameter.
   d. Well capacity.
   e. Surface sealing.
   f. Well head protection.
   g. Location of utilities and notification requirements.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Stake the location of the well. This will not require a survey and can be noted on the conservation plan map.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Wells must be permitted and installed by licensed well contractors. Construction check out during installation is not necessary except to verify the water well is installed at the planned location. Documentation shall include the following information from the well driller:

1. Depth of well, casing, and screen or well casing perforations.
2. Depth and quantity of gravel pack.
3. Type and gage of well casing material.
4. Well driller's geophysical log.
5. Depth and method of sealing surface casing.
6. Water well capacity in gpm, must equal or exceed planned capacity.
7. The dimensions of the water well head protection slab or casing head above ground shall be measured and recorded in the engineering field book.
8. Prepare as-built drawings showing final construction dimensions, details, etc.
9. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of wells installed. The extent of this practice to be reported is quantities used as the basis of payment.

Watering Facility, Code 614

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Watering Facility, Code 614.

B. Design/Layout Surveys

1. TR-62 Engineering Layout, Notes, Staking & Calculations.
2. NEFH Part 650, Chapter 1, Engineering Surveys.

C. Computer Software Design Aids

1. Alabama NRCS spreadsheet "Watering System."

II. Documentation

A. Preliminary Investigation

Make a preliminary investigation to determine the approved location of the watering facility. Consider location, size, soil condition and costs in making this determination.

B. Engineering Surveys

1. An engineering survey is normally not required. Location of the watering facility should be recorded on an aerial photograph and/or topographic quad sheet. Elevations and distances obtained from topographic maps are usually sufficient for design purposes. Where suction pumps are to be utilized to draw water from streams or other surface water sources, survey the elevations of the surface of the water source and suction pump location.
2. Note the location of any utilities or utility markers.

C. Design

1. Determine material type, size of trough or tank required, pipe sizes and lengths, pump, pressure tank and other plumbing requirements, and ramp protection needed. For solar powered systems determine the pump power requirement, required water storage volume, and minimum solar panel power requirement.
2. Develop engineering plans and specifications. As a minimum the plans and specifications shall include:
   a. Location of watering facility.
   b. Size and number of watering facilities.
   c. Details of all appurtenances of watering facility including overflow preparations.
   d. Foundation requirements including type and size.
   e. Location of alternative water source, if applicable.
   f. Location of utilities and notification requirements.
   g. Details of freeze- proof requirements if applicable.
   h. Applicable Engineering Forms.
   i. Fencing requirements.
3. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Record layout data in the engineering field book.

1. Stake the location of the watering facility in the field.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Record the following data in the engineering field book.

1. Measurements of watering facility including trough and tank pads, heavy use area dimensions, watering ramp dimensions, pipe lengths, and other structure measurements where size or dimension is critical for the proper functioning of the installation.
2. Trough or tank sizes and material used.
3. Dimensions of facility pad and type of material used for watering ramps or heavy use areas. Record in the engineering field book.
4. Prepare as-built drawings showing final construction dimensions, details, etc. where significant changes were made during construction.
5. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of watering facilities installed. The extent of this practice to be certified is the quantities used as the basis for payment such as number of each size and type of watering facility, volume of ramp material, etc.

Well Decommissioning, Code 351

I. References

A. Design Criteria

1. Alabama FOTG Section IV, conservation practice standard, Well Decommissioning, Code 351.

II. Documentation

A. Preliminary Investigation

Determine the feasibility and need for decommissioning the well.

B. Engineering Survey

1. An engineering survey is not normally needed unless the elevation of the existing well head is needed by the permitting agency. Note latitude and longitude of the well.
2. Note the location of any utilities or utility markers.

C. Design

1. Develop engineering plans and specifications. As a minimum, the plans and specifications shall include:
   a. Location of well.
   b. Log of well from licensed well driller.
   c. If available obtain driller's records from Hydrology Division of the Geological Survey of Alabama.
   d. Description of existing well: depth, size, casing material.
   e. Description and vertical extent of well backfill materials. Show details of surface sealing material and placement requirements. Record details on Forms AL-ENG-45 or AL-ENG-45A.
   f. Use construction specifications CS-351. Add other requirements specific to the site as needed.
2. Develop a site specific O&M Plan for the practice.

D. Construction Layout

Review the plans and specifications with the landowner and contractor prior to the start of construction. Ensure the landowner/contractor thoroughly understand their responsibilities including obtaining all permits, easements, etc.

Stake the location of the well. This will not require a survey and can be noted on the conservation plan map.

E. Construction

Adequate site visits and checks shall be made during construction to verify that the plans and specifications are followed.

Any changes in the design must be reviewed and concurred by the landowner and shall be approved by the designer and person with appropriate engineering design job approval authority.

F. Construction Checkout

Well decommissioning must be performed by an Alabama licensed well contractor. The contractor shall provide the information listed below for documentation of construction. Documentation may be recorded on form AL -ENG-45/45A or otherwise provided to NRCS on the contractor's personal form or letter.

1. Name of landowner.
2. Date of well decommissioning.
3. Location of well.
4. Total depth of well.
5. Inside diameter of well bore or casing.

6. Casing material type or schedule (e.g., standard weight steel, or PVC Schedule-80).
7. Static water level measured from ground surface.
8. Types of materials used for filling and sealing, quantities used, and depth intervals for emplacement of each type.
9. Certification from a licensed well contractor.
10. Prepare as-built drawings showing final construction dimensions, details, etc.
11. If the practice meets NRCS standards and specifications, then the statement "This practice meets NRCS practice standards and specifications" shall be placed on the checkout document and signed and dated by the responsible person with appropriate level of engineering job approval authority.

G. Reporting and/or Certifying

After it has been determined and documented that the practice meets NRCS plans and specifications, it can be reported and certified. The extent of the practice to be reported is the number of wells decommissioned. The extent of this practice to be certified is the quantities used as the basis of payment.